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Gender Equality in the Context of One Health

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Reflexivity statement

In this chapter, you may notice that all authors are female, which reflects the composition of our working group, predominantly consisting of female researchers. However, this is not discriminatory; rather, we are actively engaging male researchers to contribute to our collaborative endeavours in promoting gender equity in One Health.

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Chapter Overview

Elevator pitch

Men and women and gender diverse people¹ may have different roles in society, different access to resources and decision making. In consequence they impact their environment and are impacted by it in distinct ways. Other factors such as class, skin colour, cultural, religious, sexual orientation and linguistic origin inform the way people impact and are impacted by their environment. Understanding how those factors intersect and contribute to different layers of vulnerability is important for delivering more impactful work and for contributing to a more equitable and inclusive society.

Book objectives the chapter relates to

- ☐ 1. Understand what One Health and Ecohealth mean
- ☒ 2. Think in a One Health and Ecohealth way
- ☒ 3. Apply One Health and Ecohealth in their professional and personal life
- ☐ 4. Know how to share One Health and Ecohealth knowledge
- ☐ 5. Integrate One Health and Ecohealth knowledge actively
- ☒ 6. Acquire or enhance core One Health competencies

One Health competencies covered

- ☐ 1. Effective communication
- ☒ 2. Collaborative and resilient working
- ☒ 3. Systems understanding
- ☒ 4. Transdisciplinarity
- ☒ 5. Social, cultural and gender equity and inclusiveness
- ☒ 6. Collective learning and reflective practice
- ☐ 7. One Health concepts

- ☐ 8. Theoretical and methodological pluralism
- ☐ 9. Harnessing uncertainty, paradox and limited knowledge

After having worked through this chapter, you will be familiar with key gender concepts and have an understanding of how important they are and how they can be applied to One Health situations.

Learning outcomes

1. Understand a number of key gender concepts (gender roles, equality, equity, discrimination, empowerment, gender-based One Health).
2. Identify the areas where the gender gap is more evident.
3. Use a gender lens in health, agriculture, biodiversity and climate change.

Summary

In this chapter, you will learn about gender and the importance of having a gender sensitive approach when applying One Health. You will also explore the role of gender across disciplines and in various aspects of life. The first part of the chapter presents definitions of gender, sex, gender equality and equity, empowerment and other terms that are increasingly used but not always thoroughly explained. Later in the chapter, examples of a gender equality approach and gender inequalities are illustrated through different One Health topics, including endocrine disruptor chemicals, antimicrobial resistance, COVID-19 and brucellosis. The second part of the chapter includes graphs and pictures to enhance comprehension, with key points highlighted. The primary objective is to identify gender sensitive activities within One Health initiatives and to understand why implementing gender equality or inclusion is crucial, given that the One Health approach should promote equality and inclusion at all levels.

9.1 Gender Equality in the Context of One Health



According to Scott (1988):

GENDER is a 'constitutive element of social relationships based on perceived differences between the sexes, and gender is a primary way of signifying relationships of power'.

At birth, based on the genitalia of a child, a set of values and stereotypes is associated with male and female bodies. Those values and stereotypes often define how people parent, what work people do, what social groups they belong to, who people partner with and how people gain access to resources (FAO, 2014). These differences define roles and access to, control over and benefits of resources such as education, land or decision making.

Gender relations are relations of power. They are not fixed. They are flexible and are affected by other markers of identity such as age, class, skin colour, linguistic group, sexual orientation, religion, and the geographical, economic and political **environment**. Thus, gender takes into consideration relations that are given (colour of skin, age, place of birth, order of birth, etc.) and aspects of people's identity that are acquired (class, education, profession, religion, place of residence, etc.) (Fig. 9.1). Gender relations are not universal, they are

specific to a context. Intersectionality is an important approach as it helps us understand how different forms of discrimination interact and exacerbate inequality. For example, an African woman is often discriminated against because she is a woman, because of her skin colour and because of her socio-economic and cultural background.



People facing one or more forms of discrimination are at greater risk of being left behind in accessing disease response services, including testing, treatment, social protection and care.² If we fail to integrate intersectionality in our analysis, our understanding of risks and possibilities to prevent diseases is limited.

In Chapters 4 and 5, you learned about the many different forms of **knowledge** and knowledge generation as well as **knowledge integration** and the pathway from **data** to **knowledge** and **wisdom**. Covering all forms of knowledge would go beyond the purpose of this chapter, and we therefore focus here explicitly on scientific knowledge. We acknowledge that people of all genders contribute to various forms of knowledge, and that the intersections of gender with other aspects of identity, such as race, ethnicity and culture, further enrich the diversity of perspectives in knowledge generation. We recognize and value these diverse contributions, as they are essential for fostering holistic and comprehensive understanding in academia, research

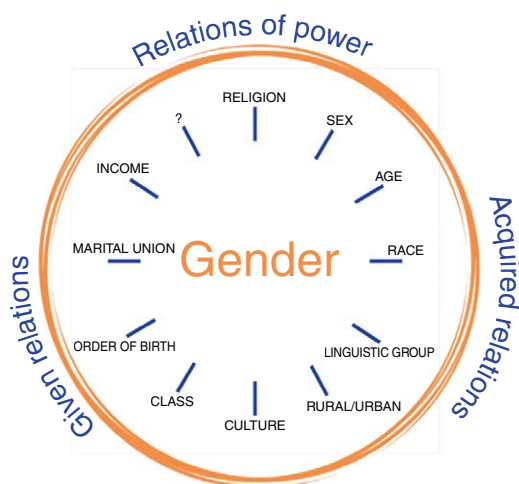


Fig. 9.1. In addition to sex, other markers of identity influence gender relations (figure created by Brigitte Bagnol).

and society as a whole and contribute to transdisciplinarity that is an essential principle of One Health (Chapter 3).

Changes in gender relations often occur over time in response to changing economic, natural or political circumstances, including development efforts. Gender shapes everything we do and all sectors in society. In fact, all institutions, including those related to family, workplaces, politics, arts, sports, culture and development institutions, are gendered. Gender is everywhere in our daily lives, so much so that we usually take many aspects of gender for granted and 'natural'. Development interventions can support or hamper processes of change and reinforce or reduce inequalities between people of different gender (FAO, 2014) including people whose identities do not correspond to established ideas of a gender transformative approach.

Being such a pervasive feature of our lives, gender is clearly intertwined with **health** conditions too. Several authors (Bagnol *et al.*, 2015; FAO *et al.*, 2019; Friedson-Ridenour *et al.*, 2019; Garnier *et al.*, 2020, 2022) have been advocating for the integration of gender and human rights dimensions in the One Health approach. This means to recognize that men and women do not impact the world in the same way and that men and women are impacted differently by the world around them (Bagnol *et al.*, 2015).³ Roles imposed on people define the ways in which women and men relate with resources and how human disease, animal disease or environmental problems affect women and men and what the impacts are of their activities and behaviours (Garnier *et al.*, 2020). Consequently, this implies differences in perception about risks and solutions and different needs to prevent these. Gender plays an important role in biosafety, as well as in the control, prevention and response to infectious diseases and emerging pandemics.⁴ Gender aspects also play a fundamental role in **eco-system** management,⁵ community health management, the effects of climate change,⁶ natural disasters and the effects of pollution on health.

Integrating a **gender perspective** in the **One Health approach** allows us to promote a more sustainable world where the health of humans, animals and the environment is balanced and optimized. There cannot be **sustainability** without gender equality; there cannot be a just world without 'the enjoyment of equal rights, opportunities and treatment by men and women and by boys and girls in all spheres of life' (ILO, International Labour Organization) or 'the absence of discrimination

on the basis of a person's sex in opportunities, the allocation of resources and benefits, or access to services' (UN Women, 2021).

The integration of gender issues in One Health frameworks and vision has become critical in the 2020 COVID-19 pandemic context, which laid bare social and gender inequities and exposed the need to adopt a gender-responsive One Health approach (Garnier *et al.*, 2020, 2022; UN Women, 2021). WHO (2019) recommended that the health sector takes a gender and equity focus to improve population health in its recent 13th General Program of Work (2019–2023). In fact, women make up 70% of the human health workforce, but only 25% of global health organizations have gender parity at senior management levels (Betron *et al.*, 2019). As a result, women's and gender minorities' voices are barely heard at decision-making tables and gender perspectives are still largely ignored, exacerbating gender and social inequities.



The differences between gender equality and gender equity:

Gender equality refers to women, men and people who identify differently having equal and equally respected rights, and equal access to resources and opportunities. It is equally concerned by the situation of men and of women. However, since it is often women who face greater risks and vulnerabilities in different sectors, it is often associated with a greater focus on women.

Gender equity refers to the process of ensuring fairness for women, men and people who identify differently as part of a gender transformative approach creating a level playing field for them. This goes beyond treating people equally, to actively compensating for the historical processes of discrimination that shape current economic, social and political disadvantages depending on the contexts.

Gender equality is the objective, while gender equity is the process to reach equality.

There are multiple reasons why gender needs to be integrated into One Health in a systematic manner (Garnier *et al.*, 2020):

- Gender equality needs to be recognized as a basic human right.

- Gender equality is critical to address the health, **climate** and **biodiversity** crisis we currently face. These crises impact people differently, often to the detriment of women and people from marginalized groups, and existing gender inequalities are likely to be exacerbated by these crises.
- Gender equity is indispensable for achieving progress in all 17 **Sustainable Development Goals**. Increased gender equity is firmly linked to enhanced productivity, better development outcomes for future generations and improvement in the functioning of institutions.
- Different gender roles and responsibilities in health, food, water and energy management, as well as in the use of other natural resources, contribute to different impacts on the environment and different exposure to risks.
- Men, women and gender-diverse people are impacted differently by human, animal and plant disease, as well as by climate change and environmental disasters, and this impact varies also according to other factors of vulnerability (such as age, skin colour, level of education, class, religion, sexual orientation, etc.).

In 2020, a framework for mainstreaming a gender-responsive One Health approach was proposed by Garnier *et al.* (2020) suggesting (i) 'a change of mindset and paradigm, going from a pursuit of wealth, GDP and overconsumption, towards a goal of well-being of humans and their re-connection to healthy and diverse ecosystems, using a holistic One Health understanding of health and nature' and (ii) 'the integration of gender equity in leadership and the respects of the rights of nature, women and the most vulnerable, including minority ethnic groups and Indigenous People'.

Several One Health networks, such as One Health Central and Eastern Africa (OHCEA), now known as African One Health Network (AFROHUN),⁷ and HORN,^{8,9} have also recently developed gender modules for their training courses on infectious diseases surveillance, response and control (Bagnol *et al.*, 2015; Amuguni *et al.*, 2018; Friedson-Ridenour *et al.*, 2019). The One Health community now needs to adopt a gender-transformative approach systematically in its **policy** recommendations, research projects and programmes.



SEX refers to biological aspects (chromosomes, genitalia, hormones, reproductive functions).

These are the strictly biological, anatomical and physiological characteristics that differentiate individuals. There are fundamental biological differences between men and women at all levels (the body as a whole, the organs and organ systems, and the cells). These biological differences are complex and may confer different advantages on men or women including when it comes to risk of infection (depending on the infectious agent).

9.1.1 How do sex and gender interact?

Sex and gender are interacting variables¹⁰ and may be involved in the transmission and acquisition of diseases and in the success or failure of treatments or interventions. Hence the importance of taking them into account in research, with the aim of reducing inequalities linked to sex and gender in the management of health problems and improving the **wellbeing** of people, whatever their sex and gender. Sex and gender have an impact on exposure to environmental, infectious or other types of risks, and consequently on the susceptibility or resistance to infectious pathologies, and on the type and effectiveness of responses provided, particularly in healthcare interventions.



In 2001, the Institute of Medicine published 'Exploring the Biological Contributions to Human Health: Does Sex Matter?' The Committee on Understanding the Biology of Sex and Gender Differences examined biology from the cellular to the organismal and behavioural levels, and concluded that differences do occur and can have important consequences. They concluded that sex (being male or female) should be recognized as an important variable in research and increased knowledge in this area should be cultivated. The growth of knowledge has become a branch of science known as sex-based biology and has led to the differentiation between the terms 'sex' and 'gender' (Liu and Mager Dipietro, 2016).

Figure 9.2 shows how gender and sex interact. The incidence, duration and severity of disease (shown in the right-hand column) are influenced by both sex and gender in two different ways. On the one hand, sex and gender directly influence vulnerability, exposure to pathogens and response to disease, three key elements of the transmission model. These in turn help to determine incidence, duration and severity. On the other

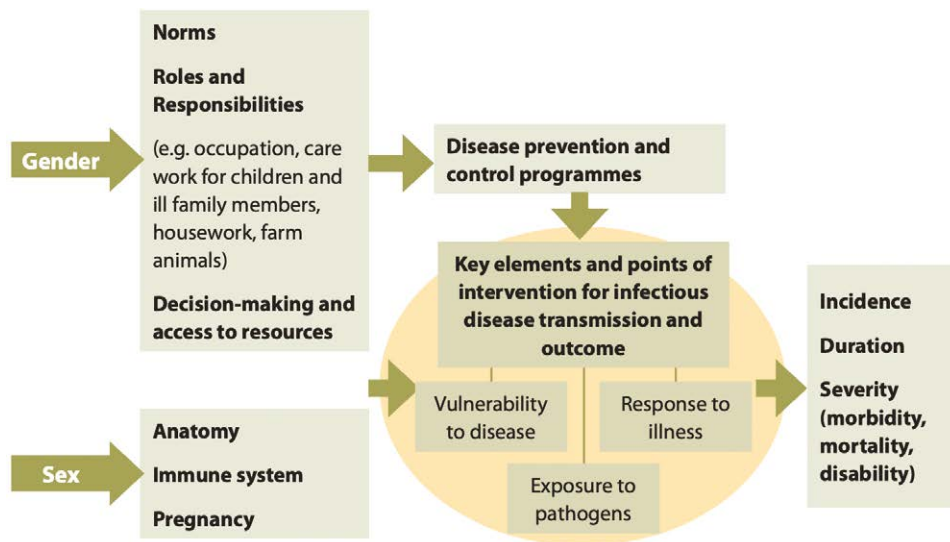


Fig. 9.2. Sex and gender in infectious diseases (WHO, 2013). Reproduced with permission from WHO.

hand, sex and gender indirectly influence incidence, duration and severity through interactions with health interventions that affect vulnerability, exposure and response to disease.

Because of the differences between men and women in many aspects of life in all societies, it is important to understand how they face illness at all stages (prevention, diagnosis, treatment and recovery).



Learning questions: For the context you live in, select an example of gender-typical roles and reflect on how they have evolved over the past decade. Think about the situation of your country and identify the steps, legislation and processes that allowed for the evolution of the situation, if any, in the past few decades.

Example answer 1: Roles in cheese production in the Swiss Alps. Please note that this example may differ substantially from what you will find in your context. What we found interesting about the example below is to see the evolution of the relation between men and women over time. Making cheese evolved from a women's reproductive task to a female productive task with more decision making, reward and recognition for women (Kindstedt, 2012).

Traditional gender roles in alpine livestock farming for cheese production in Switzerland have historically been characterized by distinct divisions of

labour based on traditional norms and societal expectations. In this context, men often assumed tasks such as tending to the larger animals, like cattle, and managing the physical demands of farming, such as ploughing fields and managing pastures. Women, on the other hand, typically took on responsibilities related to the household and dairy work, including milking cows, preserving food for the winter and making cheese, a reproductive role as cheese was used mainly for home consumption. Women's role in cheese production was particularly vital, as they were responsible for transforming milk into cheese using traditional methods, a skill that was often passed down through generations. Their expertise was central to maintaining the quality and distinct characteristics of local cheeses.

Advancements in agricultural technology have reduced physical demands, altering traditional gender-based divisions in alpine farming and cheese production. Economic shifts expanded cheese production beyond household consumption and women's roles beyond traditions, enabled by education and career opportunities. Evolving social norms challenged gender roles, fostering greater equality, including in farming. Tourism's fascination with tradition highlights women's roles in cheese production, promoting preservation and recognition. Government policies promoting gender equality bolster balanced labour distribution and acknowledge women's

contributions in farming, reshaping gender dynamics in this domain.

As a result of these shifts, there has been a gradual transformation of gender roles in alpine livestock farming for cheese production. Women have gained more visibility and recognition for their contributions beyond traditional domestic roles. They are now taking on leadership positions, participating in decision making, and being recognized as skilled contributors to the entire process of cheese production, from animal care to dairy work. These changes have not only promoted gender equality but have also diversified and strengthened the sustainability of cheese production in the Swiss Alps.

Example answer 2: Government roles in Mozambique. Please note that this example may differ substantially from what you will find in your context. What we found interesting about the example below is how political interventions such as the establishment of gender focal points and a policy on gender issues contributed to changes in the participation of women in the political sphere.

In Mozambique, for example, men used and sometimes still hold most positions of power as politicians, local leaders, businessmen and heads of Ministry, directorate and institutions at all levels (central to local). Gender Units responsible for ensuring the mainstreaming of gender issues in their sector were established in the Ministry of Agriculture in 1992 and in the Ministry of Education in 1994. In 2000, the Ministry of Women and Social Affairs Co-ordination¹¹ was established and by 2003, most of the Ministries had a Gender Unit and/or Gender focal points in most directorates. In 2001, a National Plan of Action for Women's Advancement (*Plano Nacional de Ação para o Avanço da Mulher 2002–2006*, PNAM) was elaborated including: Women, poverty and employment; Education and training of women and girls; Women, health and HIV/AIDS; Women in power in decision-making location and social communication; Women, environment and agriculture; Institutional mechanisms for the advancement of women. This process led to an increase of the representation of women in the public sphere with the percentage of seats held by women in the parliament reaching 39.6% in 2017¹² and 42% in 2020.¹³ However, the percentage of women in **governance** is not the same at provincial and municipality level.

9.1.2 Gender equality and equity and their role in the construction of scientific knowledge

In the past few decades, there has been increasing attention on a number of ways in which science, health professions and academic leadership are gender biased. Who is doing the research and who is participating in the research are important aspects to take into consideration as it can bias the hypothesis, the methodology, the analysis of the results and their presentation. According to Anderson (2012), 'dominant knowledge practices [have] disadvantage[d] women by (1) excluding them from inquiry, (2) denying them epistemic authority, (3) denigrating their "feminine" cognitive styles and modes of knowledge, (4) producing theories of women that represent them as inferior, deviant, or significant only in the ways they serve male interests, (5) producing theories of social phenomena that render women's activities and interests, or gendered power relations, invisible, and (6) producing knowledge (science and technology) that is not useful for people in subordinate positions, or that reinforces gender and other social hierarchies'. In other words, women's standpoints have been regarded as less authoritative in the elaboration of scientific knowledge (Boxes 9.1 and 9.2).

The gender gap in terms of education at secondary and university level as well as in teaching career and position in the university and in research influence the possibility to advocate for more inclusive policy and financing of issues related to inclusion.

Overall, women, poor people, as well as people from minority groups are excluded from educational and academic institutions. Their needs and concerns are not taken into consideration and research related to issues of their interest are less likely to be financed (Figs 9.3 and 9.4).

Box 9.1. Social norms influence academic settings

Latin American women scientists, for example, can face inequity in a society where culturally ingrained masculine pride ('machismo') is normalized and deeply intertwined with the scientific endeavour. Dismissal of women's contributions, patronizing behaviour, and objectification of women's bodies are widely entrenched attitudes in Latin American societies, often extending into academic settings (Bernal *et al.*, 2019).

Box 9.2. Gender distribution in science

Data from UNESCO indicate that women represent 21.7 % of graduates in Africa, 24.3 % in Europe and Central Africa, and 25.6 % in East Asia and the Pacific region in 2015–2020 (UN, 2022). Often, women are at a disadvantage in terms of career path, accessing the position of Principal Investigator, obtaining funding, producing scientific publications because they take a maternity leave which then slows down their career path (Llorens *et al.*, 2021). They might encounter difficulties in returning to their job after the pause and might face difficulties in managing both family responsibilities and their job. Institutional bias in hiring and granting promotion as well as non-inclusiveness undermine the retention. In addition, cultural barriers such as gender stereotypes, work environments, and lack of positive female role models still prevent many women and girls from pursuing academic careers. Working closely with academic institutions to identify opportunities for the inclusion of women, especially mid-career, will create a much-needed opportunity or advancement.

Recommendation

All scientific research must be approved by an ethics committee and a selection committee. Ensuring that these committees are gender transformative by providing gender training is crucial. Committee members should be able to evaluate the gender aspects in protocols and to ensure that the research is gender transformative and inclusive. High-quality research protocols integrate gender analysis.

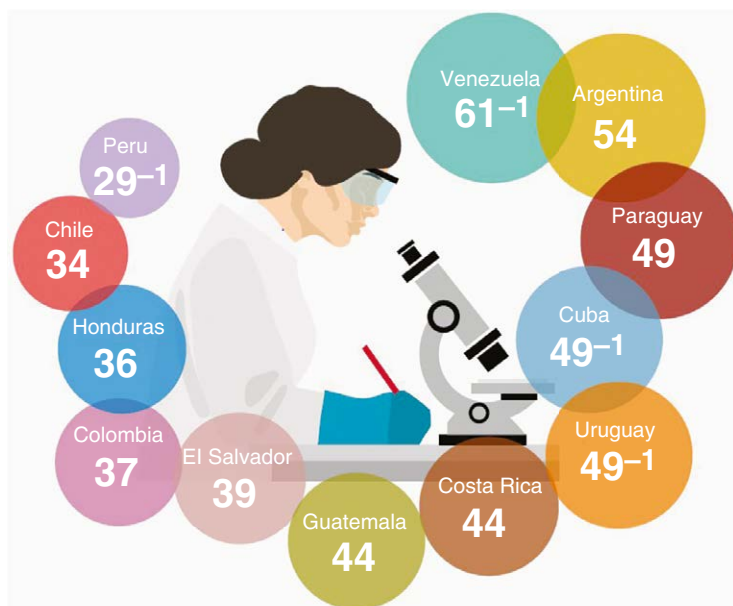


Fig. 9.3. Share (%) of female researchers (Head Count) in Latin America, 2017 or closest year; +n/-n: data refer to n years before or after reference year. From UNESCO (2021), unmodified (CC BY-SA 3.0 IGO: <https://creativecommons.org/licenses/by-sa/3.0/igo/>).

Knowledge is always situated. This means that researchers are embedded in a social, cultural, ethical, philosophical, religious and political context that defines most of their worldview and their **assumptions** about a specific reality or topic. The question we should ask ourselves is: What is the impact of the fact that most

research in science and specifically in Science, Technology, Engineering and Mathematics (STEM) is dominated by men? Is science neutral?

The answer is no. Science is not neutral (Alcoff and Potter, 1993); the question one can ask is how the question is formulated, to whom the question is asked,

and how the way the data are analysed will influence the results of the research. In most quantitative research in the past, people interviewed were men, as researchers considered them to be the 'head of the household' and the most appropriate persons to answer questions 'in the name of the household'. This led to a gender bias and to women's knowledge, opinion and needs being dismissed. Similarly, most clinical tests on new drugs were conducted on men, resulting in little knowledge of their impact on women (Fig. 9.5).



Learning questions: An important research question is **how can we develop and use effective vaccines against infectious agents?** Think about the research community as explained in the paragraph above and list at least three points from the perspective of scientific knowledge creators and users that could increase gender balance.

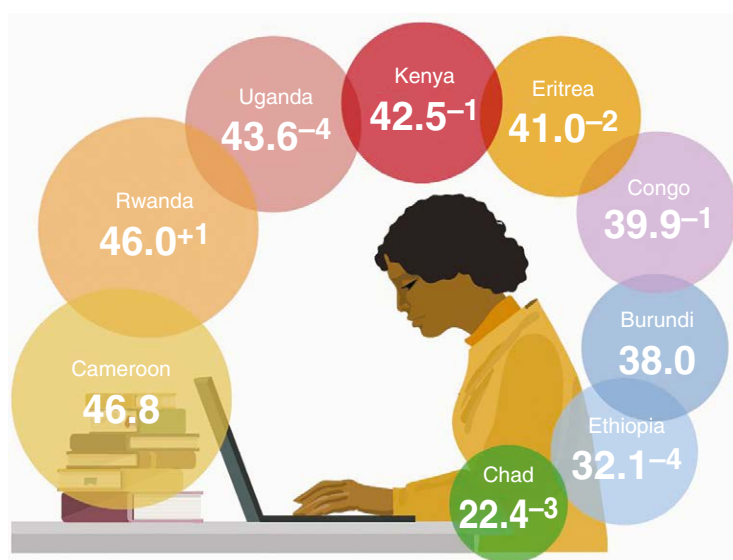


Fig. 9.4. Share (%) of female students enrolled at Central and East African universities, 2018 or closest year; +n/-n: data refer to n years before or after reference year. From UNESCO (2021), unmodified (CC BY-SA 3.0 IGO: <https://creativecommons.org/licenses/by-sa/3.0/igo/>).



Fig. 9.5. Challenging gender roles (photos by Brigitte Bagnol).

Example answer: You may have come up with similar points to below or addressed different perspectives. The important point here is that you consider aspects relating to both sex and gender.

- **Equitable funding allocation:** Ensure that research funding is distributed among diverse research projects equitably, including those led by individuals from underrepresented gender and minority groups. This supports a broader range of perspectives and research priorities.
- **Mentorship and training:** Establish mentorship and training programmes that specifically target women and marginalized individuals in the field of vaccine research. These programmes can provide support, guidance and opportunities for skill development, fostering a more inclusive pipeline of researchers.
- **Transparent research practices:** Implement transparency in research practices, including data collection, analysis and reporting. Make sure that sex and gender are understood and taken into consideration. Transparent practices help reduce potential biases and ensure that all research contributions are acknowledged and valued, regardless of gender.
- **Public engagement and outreach:** Encourage scientists, including women and underrepresented groups, to engage with the public and communicate their research findings. This promotes visibility, showcases diverse expertise and encourages young individuals from all backgrounds to pursue careers in vaccine research.
- **Collaborative networks:** Establish collaborative networks that bring together researchers, practitioners, policy makers and community members from various backgrounds. These networks can facilitate interdisciplinary and cross-sectoral collaboration, ensuring a holistic approach to vaccine research.
- **Policy advocacy:** Advocate for policies that promote gender equality and diversity in research institutions and funding agencies. These policies can encourage institutional changes that support the recruitment,

retention and advancement of women and marginalized groups in vaccine research.

- **Community engagement and participatory research:** Foster meaningful engagement with knowledge users, such as communities that are impacted by infectious diseases. Utilize participatory research approaches that involve community members in the research process, allowing them to contribute their knowledge, experiences and concerns. This ensures that the development and use of vaccines are informed by the needs and priorities of the communities they are intended to benefit.
- **Inclusive research teams:** Ensure that research teams working on vaccine development are diverse and inclusive, including a balanced representation of gender, race and other marginalized groups. This diversity can bring a variety of perspectives, experiences and expertise to the table, leading to more comprehensive and effective research outcomes.
- **Promote equal participation:** Encourage equal participation and engagement of all team members in research discussions, decision making and knowledge exchange. This includes creating an environment where individuals feel valued and comfortable sharing their viewpoints, regardless of their gender or background.
- **Address implicit bias:** Implement strategies to identify and address hidden biases and underlying assumptions in research methodologies and approaches. This involves making these biases explicit and considering how they might influence the research process and outcomes. This can lead to more accurate and unbiased results.

In summary, reflections on gender-related issues strongly point out the impossibility of an 'innocent', 'from nowhere' and detached view of the world. All knowledge has a perspectival component. Therefore, One Health (and other) research initiatives need to include the perspective of the subjugated. On the one hand, the presence of minorities and outsiders is

to be acknowledged while revealing specific interests, assumptions and values; on the other hand, the goal is to integrate minorities into scientific communities and in communities who benefit from science and its progress, by promoting equality in knowledge development and knowledge sharing – such as in health-related matters.

9.1.3 Roots of gender inequality

Pervasive gaps persist with the gender transformative approach in order to realize the full spectrum of people's rights, including their access to, control over and benefits from resources, in unpaid work burden, health and safety, and political voice, among other interconnected issues (UNEP, 2021).

Chapter 8 provides an overview of the **social determinants of health**. Many of these determinants are also underlying causes of gender inequality, including:

- Institutional arrangements that create and reinforce gender-based constraints;
- The formal legal system that reinforces customs and practices giving women and minorities groups inferior legal status;
- Sociocultural attitudes as well as ethnic and class-based obligations that determine people's roles, responsibilities and decision-making functions;
- Religious beliefs and practices that limit women's mobility, social contact, access to resources and the types of activities they can pursue;
- Economic factors that limit women's and minorities groups' access to control and benefit from resources, services, activities and knowledge.

All these factors promote gender-based violence that exacerbates inequalities. When these factors are addressed positively and for example transformed into activities that are of value to women and their social networks, multiple benefits can be created, as illustrated in the example of the Tacana women in Bolivia in Fig. 9.6.



Fig. 9.6. The success of the Tacana women in Bolivia rehabilitating their weaving tradition is multifaceted. It encompasses the revival of cultural heritage, economic empowerment, formation of cooperatives, market access, skill development, community development, empowerment and leadership, and environmental sustainability. This holistic approach has not only improved the economic conditions of the Tacana women but also strengthened their cultural identity and allowed them to have more active roles in their communities. It shows how factors of gender inequality can be transformed into positive change for contemporary benefits, enhancing both individual and community wellbeing (Photo by Julie Garnier).

9.2 Methodology to Assess Gender Issues in the Context of One Health

9.2.1 Gender approaches

In order to analyse the type of (or even absence of) gender approach used in an intervention, an institution, a project and to guide various projects on how to integrate gender, the Interagency Gender Working Group (IGWG) has developed a conceptual framework known as the Gender Integration Continuum¹⁴ (Fig. 9.7).

The notion of a continuum evokes a scale or graduation in the consideration of gender aspects, which goes from a pole where approaches are said to be ‘blind’ to an opposite pole where approaches are said to be ‘transformative’. Among the so-called ‘sensitive’ interventions, we distinguish ‘exploitative’, ‘accommodating’ and finally ‘transformative’ interventions.

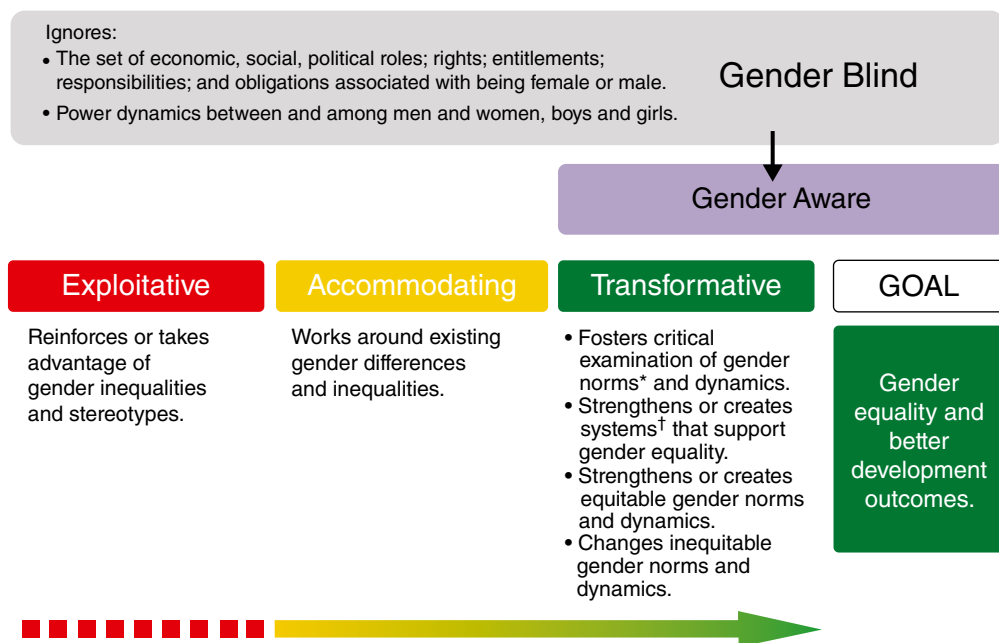
This framework categorizes approaches by how they treat **gender norms** and inequities in the design, implementation and evaluation of a programme or policy. The term **gender blind** refers to policies and programmes that

are designed without prior analysis of the culturally defined set of economic, social and political roles, responsibilities, rights, entitlements, obligations and power relations associated with being female and male, and the dynamics between and among men and women, boys and girls. Gender blind programmes or policies ignore gender considerations altogether. In contrast, **gender aware** programmes or policies deliberately examine and address the anticipated gender-related outcomes during both design and implementation. An important prerequisite for all gender-integrated interventions is to be gender aware.



The following definitions of the different gender approaches are adapted from: https://www.igwg.org/wp-content/uploads/2017/05/FG_GendrIntegrContinuum.pdf:

GENDER BLIND policies and programmes do not acknowledge any difference between men and women in any level of the intervention. They develop intervention as if people were facing exactly the same situation without taking into consideration social differences among gender in access, control and benefits over resources, in incidence, duration and severity of disease between men and women.



* Norms encompass attitudes and practices.

† A system consists of a set of interacting structures, practices, and relations.

Fig. 9.7. Gender continuum (IGWG, 2017), courtesy of Interagency Gender Working Group (IGWG).

GENDER AWARE policies and programmes take into consideration the set of economic, social and political roles, responsibilities, rights, entitlements, obligations and power relations associated with being female and male and the dynamics between and among genders. They also take into consideration how these factors intersect with other factors.

EXPLOITATIVE GENDER programmes or policies intentionally or unintentionally reinforce or take advantage of gender inequalities and stereotypes in pursuit of project outcomes. This approach is harmful to men, women and for society overall because it reinforces discriminations and inequalities.

ACCOMMODATING GENDER programmes or policies acknowledge gender issues but work around differences and inequalities to achieve project objectives. This approach does not attempt to reduce gender inequalities or address the gender systems that contribute to the differences and inequalities. It reinforces inequalities.

TRANSFORMATIVE GENDER programming includes policies and programmes that seek to transform the power relations between men and women and marginalized groups to promote equality and achieve the programme's objectives. This approach attempts to promote gender equality by: (i) fostering critical examination of inequalities and gender roles, norms and dynamics; (ii) recognizing and strengthening positive norms that support equality and an enabling environment; (iii) promoting the relative position of women, girls and marginalized groups; and (iv) transforming the underlying social structures, policies and broadly held social norms that perpetuate gender inequalities.

9.2.1.1 Empowerment



EMPOWERMENT is the ability to take charge of the course of one's life and to exercise one's 'power to act' on certain events, and implicitly refers to the notion of control. Thus, empowerment is the ability to control one's life through actions that promote change in the factors limiting the individual's ability to take charge of his or her own life. Empowerment refers to people's ability to better understand and exercise their power over the personal, social, economic and political forces that determine the quality of their lives, with the aim of taking action to improve it.



Fig. 9.8. Argan oil's success story in terms of women's empowerment lies in the combination of economic opportunities, cooperative support, skill development, social benefits, sustainable practices, fair trade and external support. These elements together have created a transformative impact on the lives of many women in Morocco (and by extension their children and other family members), making argan oil production a model for women's empowerment and sustainable development. By maintaining control over this sub-sector (often women have been in charge of the care of argan trees and the creation of argan oil), women can continue to benefit from the economic independence, empowerment and social status that they have achieved, while preserving cultural practices and ensuring fair and equitable treatment within their cooperatives (Photo by Julie Garnier).

Empowerment has a relational dimension (family, community, national context) and an individual dimension (age, ethnicity, class, education, etc.). It also occurs at three levels: individuals, organizations and communities. These levels are fundamentally linked. Empowerment is a process similar to a path or a journey, which develops over time. It therefore has a dynamic dimension (Fig. 9.8).

Four definitions of power are now widely used (Munoz Boudet *et al.*, 2007) in gender studies. 'Power within' refers to a transformation of individual consciousness that leads to a new confidence to act. 'Power with' is the power that results from organizing and acting as a group to address common concerns (Gammage *et al.*, 2016). 'Power to' is the power to produce a result or resist change, the power to act. The fourth concept, 'power over', suggests a social relationship of domination or subordination between individuals. It has a negative dimension and is often excluded from areas of analysis.¹⁵

As defined by the European Institute for Gender Equality (EIGE), 'women's empowerment' comprises five components: women's sense of self-worth; their right to have and determine choices; their right to have access to opportunities and resources; their right to have the power to control their own lives, both inside and outside the home; and their ability to influence the direction of social change to create a more just social and economic order, both nationally and internationally'.¹⁶

9.2.2 Gender concepts



Gender norms are ideas about how men and women should be and act. These ideas are often learned and internalized as 'rules' early in life and underpin a life cycle of gender socialization and stereotyping. Social inclusion is linked to social exclusion, which refers to when individuals or groups are unable to participate in the economic, social, political and cultural life of their society. They can be economically excluded from or have restricted access to labour markets, land and livelihood opportunities; they can be politically excluded from or have restricted access to citizenship rights, the ability to organize, exercise voice, demand rights and influence decision making that affects their lives; and they can be socially excluded or have restricted access to infrastructure, basic services and amenities, social protection, public safety and social networks. Social inclusion thus refers to improving the ability, opportunity and dignity of people to take part in society.

Gender analysis identifies, analyses and informs action to address inequalities that arise from the different roles of women and men, the distribution of resources, opportunities and power between them, and the consequences of these inequalities on their lives.

Gender analysis seeks the perspectives of women and men, and then ensures that these meaningfully inform the development of policies, programmes and projects. It also involves acknowledging the historical and underlying causes of gender inequalities and discrimination in order to inform the setting of relevant and targeted objectives and measures to eliminate gender inequalities. It involves collecting and analysing relevant data to provide a picture of the gender equality situation in a given context; uncovering the underlying causes of gender inequalities; exploring the representation and participation of women and men in different policy sectors and at different levels; and providing evidence-based and credible recommendations for the policies, programmes and projects developed on the basis of it.

Gender planning is a planning that recognizes that because women and men play different roles in society, they often have different needs. Participation of women along with men in project planning enhances project efficiency. It increases project results, cost recovery and improves sustainability. Women's participation serves both practical and strategic needs.

Gender mainstreaming refers to the process of assessing the implications for women and men of any planned action, including legislation, policies or development programmes, in all areas and at all levels. Gender mainstreaming makes women's as well as men's voices, perspectives and expertise central to the design, implementation, monitoring and evaluation of policies and programmes so that women and men benefit equally, and inequality is not perpetuated. The ultimate goal is to achieve gender equality. Gender mainstreaming consists of but is not limited to: analysing gender disaggregated data and qualitative gender analysis data to identify key issues; ensuring the participation of both women and men in determining policy priorities; promoting and modelling gender equal social norms and ways of working as well as positive masculinities; and setting, monitoring and evaluating gender disaggregated policy and programming objectives linked to allocated budgets. Mainstreaming does not necessarily mean that targeted activities to support women are no longer necessary, but the aim is to incorporate the women's and minorities' perspective throughout every policy and programme, even if they are not targeted at women.



Gender roles: Gender planning recognizes that in most societies low-income women have a triple role: women undertake reproductive,

productive and community managing activities, while primarily men undertake productive and community politics activities.

- **Reproductive role:** Child-bearing/rearing responsibilities and domestic tasks often done by women, required to guarantee the maintenance and reproduction of the labour force. It includes not only biological reproduction, but also the care and maintenance of the workforce (male partner and the working children) and the future workforce (infants and school-going children).
- **Productive role:** Work done by both women and men for cash or kind. It includes both market production with an exchange value, and subsistence/home production with actual use-value, and also potential exchange-value. For women in agricultural production, this includes work as independent farmers, peasant wives and wage workers.
- **Community managing role:** Activities undertaken primarily by women at the community level, as an extension of their reproductive role, to ensure the provision and maintenance of scarce resources of collective consumption, such as water, healthcare and education. This is voluntary unpaid work, undertaken in 'free' time.
- **Community political role:** Activities undertaken primarily by men at the community level, organizing at the formal political level, often within the framework of national politics. This is usually paid work, either directly or indirectly, through status and power.



Differential access to and control over resources and benefits:

It is important to distinguish between access to resources and control over them when examining how resources (land, labour, credit, income, etc.) are allocated between women and men. How men and women benefit from the resources also should be analysed.

- **Access:** Gives a person the use of a resource, e.g. land to grow crops.
- **Control:** Allows a person to make decisions about who uses the resource or to dispose of the resource, e.g. sell land. Baseline data in a complete gender analysis establish whether there is any differential in men's and women's access to key categories of resources.

- **Benefit:** Allows the person to dispose of the resource in his/her interest.

Condition and position: Development projects generally aim to improve people's living conditions and quality of life. From a gender and development perspective, a distinction is made between the day-to-day condition of women's lives and their position in society. In addition to the specific conditions which women share with men, differential access means that women's position in relation to men must also be assessed when interventions are planned and implemented.

- **Condition:** This refers to the material state in which women and men live, and relates to their responsibilities and work. Improvements in women's and men's condition can be made, for example, by providing safe water, credit and seeds (practical gender needs).
- **Position:** Position refers to women's social and economic standing in society relative to men. This includes, for example, male/female disparities in wages and employment opportunities, unequal representation in the political process, unequal ownership of land and property, and vulnerability to violence (strategic gender needs/interests) (Fig. 9.9).

Gender needs: Women have particular needs that differ from those of men, not only because of their triple role, but also because of their subordinate position in terms of men. It is useful to distinguish two types of needs:

- **Practical gender needs (PGN)** are the needs women identify in their socially accepted roles in society. PGNs do not challenge gender division of labour and women's subordinate position in society. PGNs are a response to immediate perceived necessity. They are practical in nature and tend to concern inadequacies in living conditions such as access to healthcare, education or employment.
- **Strategic gender needs (SGN)** are needs women identify because of their subordinate position in society. They vary according to particular contexts, related to gender divisions of labour, power and control. They may include legal rights, domestic violence, equal wages, and women's control over their bodies. Meeting SGNs assists women to achieve greater equality and contribute to changing existing roles, thereby challenging women's subordinate position.

See also Chapter 13 for information on feminist **economics** that focuses on analysing and addressing gender-based inequalities within economic systems.



Fig. 9.9. Claudia Goldin won the Nobel Prize for Economics for her groundbreaking work on wage inequality between men and women. She is only the third woman to win the prize (Photo by Stephanie Mitchell / Harvard University with permission from Harvard Public Affairs and Communications).

9.2.3 What is gender analysis?



Gender analysis is the most commonly used tool to integrate a gender perspective into policies, programmes and projects. It is defined by the European Commission as the ‘**study of differences in the conditions, needs, participation rates, access to resources and development, control of assets, and decision-making powers between men and women in their assigned gender roles**’ (EIGE, 2018).

At its simplest, gender analysis is seeing what our eyes have been trained not to see. It is asking about the differences between activities, roles and resources associated with different gender to identify their development needs. Assessing these differences makes it possible to determine gender constraints and opportunities within a sector. Gender analysis can help ensure provision of services that different genders want and that are appropriate to their circumstances. This requires understanding gender roles in the sector by analysing quantitative and qualitative information about their activities, resources and constraints, and benefits and incentives.

The purpose of gender analysis is to identify, understand and explain gaps between individuals with different gender identities that exist in households, communities and countries by:

- Acknowledging differences associated with gender identities based on the unequal distribution of resources, opportunities, constraints and power;
- Ensuring that the different needs of individuals of different gender identities are clearly identified and addressed at all stages of the policy cycle;
- Recognizing that policies, programmes and projects can have different impacts on men and women and people belonging to marginalized/discriminated groups;
- Seeking the viewpoints of men, women, people who identify differently, people facing various forms of discriminations and making their contribution a critical part of developing policies, programmes and projects;
- Promoting all individuals’ engagement and participation in community, political and economic life regardless of their gender identity; and
- Promoting better informed, gender-responsive and effective interventions.

When promoting gender-responsive One Health, we need to have interventions and programmes that seek to transform gender relations to promote equality and achieve programmes' objectives (see also Chapter 10 on stakeholder selection and engagement). A good One Health initiative will help to move from an exploitative gender reality to a transformed gender one.

A comprehensive gender analysis will therefore not only provide information to assess and understand gender relations and inequalities in a given context, but it will also explore the causes and effects of gender disparities between groups of people with different power in society. This in turn will allow for developing gender-responsive objectives and measures in order to eliminate gender inequalities in programmes and policies. Ideally, gender analysis is conducted at the design stage, i.e. before a One Health initiative is implemented. Findings of a gender analysis provide the basis for developing gender-responsive indicators, which can be used to monitor trends in gender disparities in One Health decision making, resource control and leadership.

9.2.4 How to undertake a gender analysis

Conducting a gender analysis involves systematically examining how gender roles, norms and power dynamics influence a particular situation, policy, programme or project. The common steps of gender analysis include:

1. Defining the scope and objectives of the gender analysis. Determine in which aspects of a situation or issue you are examining a gender perspective is relevant and why.
2. Collecting relevant data on gender-related aspects, including demographic information, roles, responsibilities, decision-making power, access to resources and societal norms.
3. Identifying data gaps and providing a picture of differences between genders, identifying where further data are needed and what interventions are needed to transform the situation.

Gender-sensitive participatory processes are crucial at all levels, by involving key decision makers along with the groups who will benefit from the policy and projects. Participatory processes will allow for the voices of underrepresented women and men to be heard and to be included in decision-making processes. A number of tools are available to collect relevant data in a participatory

manner, such as individual interviews, focus group discussions and resource mapping.

Data collected can be qualitative or quantitative. Qualitative data refer to a broad range of textual or visual information derived from interviews, observations, documents or records. These data are often associated with methods that require 'intensive, often repeated encounters with small numbers of people in their natural environment', often called 'contextual' methods because they attempt to understand human behaviour within the social, cultural, economic and political environment of a locality (FAO, 2014). Quantitative data may derive from official statistics (such as land records or censuses) and surveys. Survey-based methods involve structured interviews of a representative household sample to obtain information on a range of questions, and preformulated, closed-ended and codifiable questions are usually asked to one household member (often the head) during one or two visits, although modifications of the standard interview approach can be used to get more detailed information on gender relations (FAO, 2014).

Data analysis:

- Identify gender roles and norms: identify prevailing gender roles, expectations and norms within the context. Understand how these norms shape the division of labour, decision making and access to resources between genders.
- Assess power dynamics: analyse power dynamics between genders and within different groups. Identify who holds decision-making authority, who has access to resources, and who benefits from existing structures.
- Examine gendered impacts: evaluate how the situation or issue disproportionately affects different genders. Consider both positive and negative impacts, including implications for all genders.
- Analyse access to resources: investigate access to and control over resources such as education, healthcare, land, credit and employment opportunities. Identify whether there are disparities between genders.
- Identify barriers: identify barriers that limit opportunities and participation for specific genders. This could include legal, institutional, cultural and economic barriers.
- Recognize agency: acknowledge the agency and capacities of individuals within different genders. Recognize their contributions, skills and potential for change.

Informing policies, programmes and projects and monitoring, evaluation and learning:

- Develop recommendations: based on the analysis, develop recommendations for promoting gender equality and addressing gender-related disparities. These recommendations can inform policies, programmes and interventions.
- Engage stakeholders: involve stakeholders, including affected communities and gender experts, in the analysis process. Their insights can enhance the accuracy and relevance of the analysis.
- Monitor, evaluate and learn: continuously monitor and evaluate the outcomes of gender-responsive interventions. Adjust strategies based on feedback and evolving gender dynamics.

While these steps will help to ensure that policies, programmes and projects are developed on the basis of sound and accurate information, commitment is needed from all involved to make sure that gender equality and women's empowerment objectives, activities and indicators are embedded systematically into programmes and policies. This also requires ensuring that training programmes on gender and One Health are delivered at all levels, from communities to academic institutions and policy makers.

9.2.5 Gender analysis tools

Most gender analysis frameworks involve collecting quantitative and qualitative information on a set of issues, for which questions must be adapted depending on the project's context and focus areas (Box 9.3).

9.3 Case Studies

In this section, a series of examples are presented for you to work through. They serve the purpose of helping you acquire more awareness of gender domains in One Health. These five examples have been selected to cover different aspects of One Health challenges. For each example, read the description of the issue and the relationship with One Health and think about why it is important to take gender issues into account. Our viewpoints are also given for each example. Please note that these are not exhaustive and that you may have noticed other points that we did not cover.

9.3.1 Endocrine disruptor chemicals

Endocrine disruptor chemicals (EDCs) are substances in the environment (air, soil or water supply), food sources, personal care products and manufactured products that interfere with the normal function of your body's endocrine system.¹⁷ These EDCs have negative consequences for animal health, wildlife health, human health and the environment (Hood, 2005). Some of these compounds are persistent in the environment and can accumulate both in the environment and in the fat of mammals with subsequent release, for example during pregnancy or lactation, with possible harm to fetal or neonatal susceptible body organs (Lehmann *et al.*, 2018). One such hazard is bisphenol A (BPA), which is used in polycarbonate plastics that are widely used in various everyday items, including food and beverage containers, baby bottles and nipples, or canned food linings. Its use is now banned in several countries worldwide, in particular for baby-related products (Santonicola *et al.*, 2018). Other compounds modify the reproductive organs and avoid normal reproduction in wildlife, such as Atrazine, which is a common herbicide now banned in some countries (Hayes *et al.*, 2011). They can also have consequences in human reproductive organs and present neurotoxicity (Stradtman and Freeman, 2021).



Think about why it is important to take gender issues into account.

Example answer: The most gender- and sex-relevant aspect is that EDCs act on reproductive organs and interfere with hormones (Kumar *et al.*, 2020). Gender should be considered because there are different risks and consequences from being exposed to EDCs¹⁸ (e.g. for human occupational specific exposure, Ribeiro *et al.*, 2017). Furthermore, sex organs in wildlife and humans can have important modifications (e.g. fish and amphibians' feminization; Harris *et al.*, 2011), phase of life (puberty, fertility), pregnancy (in particular along fetus development), menopause, andropause in humans). Recent research also highlights socio-economic status as a relevant factor for exposure and consequences for human health, wildlife and sustainability (Street *et al.*, 2018).

9.3.2 COVID-19

The COVID-19 pandemic started in 2020 was caused by a novel coronavirus, SARS-CoV-2, which has been

Box 9.3. Tools used for gender analysis

Tools	Description	Example
USAID 5 domains of analysis	Laws, policies and regulations Cultural norms and beliefs Access to and control over assets and resources Gender roles, responsibilities and time use Power and decision making	Are women treated equally in legislation related to land rights, employment etc.? Do cultural beliefs hinder women in accessing some opportunities relating to the project? Do men and women have equal access to resources, communication networks, technologies etc.? What are the responsibilities of men and women regarding productive and reproductive activities? Do women hold the power to make decisions and, if so, at what level?
Analysis of 5 forms of capital	Discussing human, social, physical, personal and financial capital, men and women define their access and control over it in the same sex group and give a value between 0 and 10. A comparison between men and women can be done using a radar diagram and discussion on the causes and consequences of the situation can be discussed.	— Access — Control Financial capital (Income) Human capital (Skills) Social capital (Social groups) Physical capital (House) Personal capital (Self-confidence) From Opondoh <i>et al.</i> (2023) with permission.
Stakeholders analysis	Specific attention to stakeholders demonstrates that different groups have different concerns, capacities and interests, which need to be explicitly understood for problem identification, objective setting and strategy selection.	Stakeholder analysis matrix, SWOT analysis, Venn diagrams or Spider diagrams.

Continued

Box 9.3. Continued.

Tools	Description	Example						
Harvard tool Activity profile	Table identifying the different roles that men and women fulfil in the context of your specific work. The example provided here involved rural communities keeping livestock and aimed at identifying the different roles in small livestock production (chickens and goats) during their life cycle.	Activities	Male adults	Female adults	Boys	Girls	Old men	Old women
		Caring for small species (poultry, goats)						
		Giving food to these animals						
		Giving them water						
		Preparing the chicken house or barn						
		Preparing where the animal is going to brood or give birth						
		Cleaning the chicken house or barn						
		Receiving information on breeding small livestock (poultry, goats)						
		Caring for sick poultry and goats						
		Preparing meat from small animals (poultry and goats) for meals						
Harvard tool Access, control and benefits	Table listing resources in relation to the intervention. It also specifies activities carried out by gender and often age. The example provided here involved rural communities engaged in agricultural production.	RESOURCES						
		LAND (List different land types and status of degradation) WATER CROPS (List subsistence and cash crops) TREES (List important trees) LIVESTOCK - Chickens - Goats and Sheep - Cows LABOUR - Own - Family - Hired INPUTS (Purchased or produced on the farm) - Fertilizer - Pesticides CAPITAL GOODS - Implements - Fencing CASH - Credit INFORMATION MARKET/TRANSPORT EDUCATION	WHO HAS ACCESS?	WHO HAS CONTROL?	WHO BENEFITS?	WHAT ARE THE IMPLICATIONS?		

Continued

Box 9.3. Continued.

Tools	Description	Example																																																																																																																													
Time use	This is a 24-hour table where we identify who does what and when. It specifies activities carried out by gender and often age, including sleep, rest, labour, productive, reproductive, community and community politics roles. It shows who works more and who has more resting time.	<table><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td></tr><tr><td>sleep</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	sleep																																																																																																			
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designated a **zoonotic disease** by WHO and has an animal origin in an evolutionary sense, being very similar to a coronavirus isolated from bats. However, the exact animal source remains unknown (Haider *et al.*, 2020). The complexity of zoonotic diseases' epidemiology and drivers, including an increasing demand for protein, changing food value chains and biodiversity loss associated with land-use changes, clearly requires an interdisciplinary One Health approach. A survey conducted in four European countries on successful cases of implementing a collaborative, inter-disciplinary and coordinated One Health approach in the context of COVID-19 has been described by Häsler *et al.* (2020). The benefits of nature on people's health, both physical and mental, were also established early in the pandemic by the Gender Working Group of the Network for Eco-health and One Health who surveyed 345 people in four European countries and found that walking in the countryside was a great help during confinement periods (NEOH Gender WG, unpublished).



Think about why it is important to take gender issues into account.

Example answer: Men and women experience the pandemic differently due to sex and gender differences. In most countries, men have been most affected in terms of fatalities with male to female case fatality ratio ranging up to 3.5 in some cases (Delhingia and Raj, 2021). Sex (biological) factors are likely to be involved because differences in immune systems between men and women are known to contribute to infectious diseases responses (Klein and Flanagan, 2016). Gendered differences associated with risky behaviours (smoking tobacco, drinking alcohol) and co-morbidity including hypertension,

cardiovascular disease and some chronic lung diseases might also be associated with adverse outcomes in COVID-19 (Purdie *et al.*, 2020). Nevertheless, women have been disproportionately impacted by COVID-19 (losses of jobs and livelihoods, increase in unpaid care, surge in violence against women and girls) by being at the forefront of the COVID-19 response and through gender roles and responsibilities. As a result, the crisis is threatening to erase decades of progress for women and girls (UN Women, 2021).

9.3.3 Antimicrobial resistance

Antimicrobial drugs, such as antibiotics that are used to treat bacterial infections in humans and animals, allowed improvement in health and survival of animals and humans. But, currently, antimicrobial resistance (AMR) is one of the greatest health threats of our time and is considered a priority challenge for the human and animal health **sectors** (Antimicrobial Resistance Collaborators, 2022). Antibiotics can spill into the soil and the water and resistant strains of bacteria can thus emerge in the environment. These bacteria that are resistant to antibiotics can infect animals including wildlife and humans.

Uncontrolled and irresponsible use in animals and humans, infections from hospital settings, poor monitoring and enforcement, empirical treatment and self-medication are the main causes of AMR. The development of AMR stems in part from the decisions of patients, practitioners, farmers and veterinarians. Identifying who makes decisions about antimicrobial use (antibacterials, antivirals, antiparasitics and antifungals) will allow interventions to be targeted more effectively.

Antimicrobial resistance covers resistance to drugs used for bacterial infections (e.g. urinary tract infections,

pneumonia, bloodstream infections) and infections caused by microorganisms, such as parasites (e.g. malaria or helminths), viruses (e.g. HIV) or fungi (e.g. *Candida*). The direct consequences of human infections with resistant microorganisms are severe and include longer duration of illness, increased mortality, prolonged hospitalization, reduced protection during surgery and other medical procedures, and increased healthcare costs (WHO, 2023). Antimicrobial resistance threatens the successes achieved against tuberculosis, malaria, HIV and other sexually transmitted infections and contributes to the emergence and re-emergence of infectious diseases. By example, the direct consequences of animal infections of antibiotic-resistant diseases such as salmonella, *E. coli* and *Campylobacter* infections in poultry lead to limited growth and a higher level of mortality (Magnusson *et al.*, 2021).



Think about why it is important to take gender issues into account.

Example answer: Those most infected and affected by infectious diseases are most at risk for the consequences of AMR. For example, in 2016, in Senegal, communicable diseases were the cause of death for 35.6 % of men between 15 and 34 years of age and 59.6 % of women in the same age group.¹⁹ In the 15–24 age group, HIV prevalence is twice as high among women (0.02 %) as among men (0.01 %). Therefore, in the age groups mentioned, men and women will not be impacted in the same way by AMR.

Some other points that may be considered:

- **Gendered roles in healthcare and agriculture:** women often play significant roles in healthcare and agriculture, including as caregivers, healthcare workers and farmers. Their responsibilities can influence the use of antimicrobials in both human and animal health sectors.
- **Access to healthcare:** gender disparities in access to healthcare can affect the use of antimicrobials. Women's access to appropriate medical care, diagnostic services and prescription medications may be limited in some regions, which could lead to ineffective treatment practices and contribute to AMR.

- **Self-medication and empirical treatment:** women, especially in regions with limited access to healthcare, may resort to self-medication practices or administer antimicrobials empirically to themselves or their families. This can lead to inappropriate and ineffective use of these medications, contributing to AMR.
- **Gender norms and decision making:** gender norms can influence decision making related to healthcare and livestock management. In some cases, women's voices and knowledge might be excluded from decisions about antimicrobial use, despite their crucial roles in caregiving and animal husbandry.
- **Occupational exposure:** women working in healthcare settings, particularly as nurses or healthcare support staff, may have increased exposure to infections and antimicrobials.
- **Livelihood and economic impact:** in rural communities, where women often manage household livestock and poultry, their decisions about animal health practices can impact the spread of AMR.

9.3.4 Brucellosis

Brucellosis is a zoonotic infectious disease meaning it can be transmitted from animals to humans. The causative agent is a bacteria of *Brucella* spp. Infected female animals most frequently show reproductive problems, including abortions, stillbirths and malformations of the fetus. In male animals, changes in testes can be found. In humans the disease starts with a fever, but after a few weeks it develops into non-specific signs including tiredness, fatigue, headaches and stomach pain which after a few months can evolve into spondylitis, arthritis and endocarditis. In pregnant women there can also be abortions or intra-uterine fetal death (Bosilkovski *et al.*, 2020). The most exposed population are people professionally connected with animals like veterinarians, farm workers, breeders and people in the milk or meat industry. People can get infected after direct contact with sick animals or by using milk products from a sick animal, such as raw milk or cheese that is not heat treated (Shakir, 2021).



Think about why it is important to take gender issues into account.

Example answer: Gender needs to be considered because of the gendered nature of work on farms and in the milk industry. Most workers dealing with and manipulating animals in households or small dairy farms in countries where brucellosis is the most prevalent are women. Even in big industrial farms with intensive production women are more often employed for taking care of the animals or milking the animals. This is complicated further by commonly gender-biased access to information, such as livestock management advice and knowledge. The role of the woman in the production and supply chains as well as gender differences in dietary intake of (raw) milk and dairy products is an essential factor. Also, the effects that the infection can have on reproduction is an important element to consider. Pregnant women who contract brucellosis may experience complications, and there can be risks of transmission to the unborn child. Further, women often take on caregiving roles within households, caring for sick family members, including those affected by brucellosis. This can take away their time from other tasks and constitute a burden and potentially loss of income. And yet, gender issues related to brucellosis are commonly addressed in the scientific literature in terms of sex differences. Very rarely is it mentioned that increased presence of women in milking, breeding and caring for the animals can be associated with the transmission of brucellosis and can endanger women more than men (Garnier *et al.*, 2020).

9.3.5 Climate change

Climate change is a global phenomenon that affects natural and managed systems and ecosystems such as water resources, agriculture and food production systems, forestry, coastal-marine areas, and society health in general. Even if rising temperatures can be kept within 1.5°C of pre-industrial levels (and currently we are on course for 2.7°C), the world can expect a future characterized by worsening global food crises, biodiversity loss and more frequent extreme weather events. Fresh water will become scarcer, and disease and malnutrition

will rise, contributing to displacement and conflict. Negative impacts will be significant at the local level, especially in those areas or regions where the socio-economic vulnerability is greater (Gonda, 2014). Besides, the global south is not adequately prepared for climate change, mainly due to its high population density in more vulnerable areas, and limited access to resources and poor infrastructure for adequate coping strategies (Roy, 2018). The adverse impacts of climate change are already obvious on agricultural productivity and food security in response to worsening droughts, increasingly vulnerable biodiversity and ecosystems, stressed water resources, human health problems such as infectious diseases spread across newer territories and settlements, migration patterns, energy, transport and industry (Roy, 2018).



Think about why it is important to take gender issues into account.

Example answer: On average, rural women account for nearly half the agricultural workforce in developing countries. Despite their crucial roles in household food security, they face discrimination and limited bargaining power. Patriarchal norms create disadvantages for women farmers, specifically in land rights (small plots, difficulties obtaining ownership, discriminatory inheritance rights), productive resources (no access to credit, extension services or inputs), unpaid work, insecure employment and exclusion from decision making and political representation. Within the household, because of a weaker bargaining position, they frequently eat last, least and least well.

Because gender inequity remains high in the agricultural sector, women farmers who control resources generally have better-quality diets. Women and children bear much of the brunt of climate change, being 14 times more likely than men to die during a disaster. They constitute 70% of people living in poverty in low-income countries who are the most vulnerable to climate change and least able to adapt. Women are also often at greatest risk of displacement: the United Nations Development Program estimates that 80% of climate-displaced people are women, because women are considered to be a weak part of the society and are displaced first in order to be protected (Williamson *et al.*, 2021).



Fig. 9.10. The relationship between Michelle and Barack Obama is widely portrayed and perceived as positive and contributes to promoting respect between men and women (Photo: Courtesy Barack Obama Presidential Library).

9.4 Conclusions

- The gender dimension has started to be acknowledged in the One Health domain but still needs systematic operationalization.
- Integration of gender issues in One Health activities is crucial.
- Elements such as health, equity, environmental and climate crises affect men, women and people who identify differently, most often to the detriment of women.
- Gender analysis provides a tool for allowing the integration of a gender perspective into policies, programmes and projects.
- Presented case studies (endocrine disruptors, COVID-19, AMR, climate change and brucellosis) require a One Health approach with a gender perspective.
- We must move from gender awareness to a gender transformative paradigm to build more resilient and equitable societies (Fig. 9.10).

Notes

¹ We acknowledge that there are gender diverse people who may not identify as men and women and who may be impacted in specific ways by gender issues, but our main focus in this chapter is on the relations between men and women rather than gender identity.

² https://www.unfpa.org/sites/default/files/resource-pdf/COVID-19_A_Gender_Lens_Guidance_Note.pdf

³ We acknowledge that gender identities are not limited to the binary categories of men and women. While our chapter may mention men and women, we recognize and respect the identities of all gender-diverse people who do not identify within these categories.

⁴ https://ec.europa.eu/world/avian_influenza/docs/gender_study_0608_en.pdf

⁵ <https://www.unenvironment.org/news-and-stories/story/why-gender-important-biodiversity-conservation>

⁶ <https://www.iucn.org/resources/issues-briefs/gender-and-climate-change>

⁷ <https://afrohun.org/wp-content/uploads/2021/01/GENDER-ONE-HEALTH-AND-INFECTIOUS-DISEASE-TRAINING-GUIDE-.pdf>

⁸ <https://onehealthhorn.net/>

⁹ <https://www.ecohealthinternational.org/one-health-and-gender-wg/>

¹⁰ <https://www.inserm.fr/information-en-sante/dossiers-information/genre-et-sante>

¹¹ Ministério da Mulher e Coordenação da Acção Social.

¹² USAID. 2019. Gender Assessment for USAID/Mozambique Country Development Cooperation Strategy. Maputo: USAID. https://pdf.usaid.gov/pdf_docs/PA00WGW3.pdf

¹³ <https://data.worldbank.org/indicator/SG.GEN.PARL.ZS?locations=MZ>

¹⁴ https://www.igwg.org/wp-content/uploads/2017/05/FG_GendrIntegrContinuum.pdf

¹⁵ Such as WEIA and PRO-WEIA, developed by the International Food Policy Research Institute (IFPRI).

¹⁶ <https://eige.europa.eu/thesaurus/terms/1102>

¹⁷ <https://www.endocrine.org/patient-engagement/endocrine-library/edcs>

¹⁸ Source of Exposure to EDC : Front. Public Health, 24 September 2020 | <https://doi.org/10.3389/fpubh.2020.553850>

¹⁹ <https://databank.worldbank.org/source/gender-statistics>

References

- Alcoff, L. and Potter, E. (1993) Introduction. When feminists intersect epistemology. In: Alcoff, L. and Potter, E. (eds) *Feminist Epistemologies*. Routledge, London, pp. 1–14.
- Amuguni, J.H., Mugisha, A., Kyewalabye, E., Bagnol, B., Tal-mage, R. et al. (2018) EnGENDERing One Health and addressing gender gaps in infectious disease control and response: Developing a gender, One Health and emerging pandemics threat short course for the public health workforce in Africa. *Advances in Social Sciences Research Journal* 5(5), 467–479. DOI: 10.14738/assrj.55.4640.
- Anderson, E. (2012) Feminist epistemology and philosophy of science. In: Zalta, E.N. (ed) *The Stanford Encyclopedia of Philosophy*. Available at: <https://plato.stanford.edu/entries/feminism-epistemology/> (accessed 2 August 2024).
- Antimicrobial Resistance Collaborators (2022) Global burden of bacterial antimicrobial resistance in 2019: A systematic analysis. *Lancet* 399, 629–655.
- Bagnol, B., Alders, R. and McConchie, R. (2015) Gender issues in human, animal and plant health using an ecohealth perspective. *Environment Natural Resources Research* 5(1), 62–76. DOI: 10.5539/enr.v5n1p62.
- Bernal, X.E., Rojas, B., Pinto-E, M.A., Mendoza-Henao, A.M., Herrera-Montes, A. et al. (2019) Empowering latina scientists. *Science* 363(6429), 825–826. DOI: 10.1126/science.aaw6.
- Betron, M., Bourgeault, I., Manzoor, M., Paulino, E., Steege, R. et al. (2019) Time for gender-transformative change in the health workforce. *Lancet* 393(10171): e25–26. DOI: 10.1016/S0140-6736(19)30208-9.
- Bosilkovski, M., Arapović, J. and Keramat, F. (2020) Human brucellosis in pregnancy – an overview. *Bosnia Journal Basic Medical Science* 20(4), 415–422. DOI: 10.17305/bjbm.2019.4499.
- Delhingia, N. and Raj, A. (2021) Sex differences in COVID-19 case fatality: Do we know enough? *The Lancet Global*.
- EIGE (2018) Gender Mainstreaming: Gender Analysis. Available at: <https://eige.europa.eu/gender-mainstreaming/methods-tools/gender-analysis> (accessed 2 August 2024).
- FAO (2014) *Gender in Agriculture. Closing the Knowledge Gap*. Springer, Dordrecht. DOI: 10.1007/978-94-017-8616-4.
- FAO, OIE and WHO (2019) A Tripartite Guide to Addressing Zoonotic Diseases in Countries. Available at: <https://www.who.int/initiatives/tripartite-zoonosis-guide> (accessed 24 August 2024).
- Friedson-Ridenour, S., Dutcher, T.V., Calderon, C., Brown, L.D.P. and Olsen, C.W. (2019) Gender analysis for one health: Theoretical perspectives and recommendations for practice. *Ecohealth* 16(2), 306–316. DOI: 10.1007/s10393-019-01410-w.
- Gammage, S., Kabeer, N. and van der Meulen Rodgers, Y. (2016) Voice and agency: Where are we now? *Feminist Economics* 22, 1–29. DOI: 10.1080/13545701.2015.1101308.
- Garnier, J., Savić, S., Boriani, E., Bagnol, B., Häslér, B. and Kock, R. (2020) Helping to heal nature and ourselves through human-rights-based and gender-responsive One Health. *One Health Outlook* 2(1), 22. DOI: 10.1186/s42522-020-00029-0.
- Garnier, J., Savić, S., Cediél, N., Barato, P., Boriani, E., Bagnol, B. and Kock, R.A. (2022) Mainstreaming gender-responsive One Health: Now is the time. *Frontiers in Public Health* 10, 845866. DOI: 10.3389/fpubh.2022.845866.
- Gonda, N. (2014) Género y Adaptación al Cambio Climático: Puesta en común y sistematización de experiencias sobre la integración de la perspectiva de género en la adaptación al cambio climático en el ámbito rural en Nicaragua. Agrónomos y Veterinarios sin Fronteras con el apoyo del Programa de Naciones Unidas para el Desarrollo. Available at: https://www.researchgate.net/publication/320799391_Genero_y_Adaptacion_al_Cambio_Climatico_Puesta_en_comun_y_sistematizacion_de_experiencias_sobre_la_integracion_de_la_perspectiva_de_genero_en_la_adaptacion_al_cambio_climatico_en_el_ambito_rural_en_Ni (accessed 24 August 2024).
- Haider, N., Rothman-Ostrow, P., Osman, A.Y., Arruda, L.B., Macfarlane-Berry, L. et al. (2020) COVID-19: Zoonosis or Emerging Infectious Disease? *Frontiers in Public Health* 8, 596944. DOI: 10.3389/fpubh.2020.596944.
- Harris, C.A., Hamilton, P.B., Runnalls, T.J., Vinciotti, V., Henshaw, A. et al. (2011) The consequences of feminization in breeding groups of wild fish. *Environmental Health Perspectives* 119(3), 306–311.
- Häslér, B., Bazeyo, W., Byrne, A.W., Hernandez-Jover, M., More, S.J. et al. (2020) Reflecting on One Health in action during the COVID-19 response. *Frontiers in Veterinary Science* 7, 578649. DOI: 10.3389/fvets.2020.578649.
- Hayes, T.B., Anderson, L.L., Beasley, V.R., de Solla, S.R., Iguchi, T. et al. (2011) Demasculinization and feminization of male gonads by atrazine: Consistent effects across vertebrate classes. *Journal of Steroid Biochemistry and Molecular Biology* 127(1–2), 64–73. DOI: 10.1016/j.jsbmb.2011.03.015.
- Health 9(1), E14–E15. DOI: 10.1016/S2214-109X(20)30464-2.
- Hood, E. (2005) Are EDCs blurring issues of gender? *Environmental Health Perspectives* 113(10), A670–A677. DOI: 10.1289/ehp.113-a670.
- Interagency Gender Working Group (IGWG) (2017) The Gender Integration Continuum Training Session User’s Guide. Population Reference Bureau. Available at: https://www.igwg.org/wp-content/uploads/2017/12/17-418-Gender-ContTraining-2017-12-12-1633_FINAL.pdf (accessed 5 August 2024).
- Kindstedt, P. (2012) *Cheese and Culture: A History of Cheese and its Place in Western Civilization*. Chelsea Green Publishing, Vermont, USA.

- Klein, S.L. and Flanagan, K.L. (2016) Sex differences in immune responses. *Nature Reviews Immunology* 16(10), 626–638. DOI: 10.1038/nri.2016.90.
- Kumar, M., Sarma, D.K., Shubham, S., Kumawat, M., Verma, V., Prakash, A. and Tiwari, R. (2020) Environmental endocrine-disrupting chemical exposure: Role in non-communicable diseases. *Frontiers in Public Health* 8, 553850. DOI: 10.3389/fpubh.2020.553850.
- Lehmann, G.M., LaKind, J.S., Davis, M.H., Hines, E.P., Marchitti, S.A., Alcalá, C. and Lorber, M. (2018) Environmental chemicals in breast milk and formula: Exposure and risk assessment implications. *Environmental Health Perspectives* 126(9), 96001. DOI: 10.1289/EHP1953.
- Liu, A.K. and Mager Dipietro, A. (2016) Women's involvement in clinical trials: Historical perspective and future implications. *Journal of Pharmacy Practice (Granada)* 14(1), 708.
- Llorens, A., Tzovara, A., Bellier, L., Bhaya-Grossman, I., Bidet-Caulet, A. et al. (2021) Gender bias in academia: A lifetime problem that needs solutions. *Neuron* 109(13), 2047–2074. DOI: 10.1016/j.neuron.2021.06.002.
- Magnusson, U., Moodley, A. and Osbjør, K. (2021) Antimicrobial resistance at the livestock-human interface: Implications for Veterinary Services. *Revue Scientifique et Technique – Office International des Épidémiologies* 40 (2). Available at: <https://www.woah.org/app/uploads/2021/05/402-12-magnusson.pdf> (accessed 2 August 2024).
- Munoz Boudet, A.M., Petesch, P. and Turk, C. (2007) Power and empowerment. In: VeneKlasen, L. and Miller, V. (eds) *A New Weave of Power, People and Politics*. Practical Action Publishing, Washington DC. Available at: <https://justassociates.org/en/resources/new-weave-power-people-politics-action-guide-advocacy-and-citizen-participation> (accessed 2 August 2024).
- Oponдох, A.A., Muga, G., Kaluwa, C., Oduma, J., Bagnol, B. et al. (2023) Women's access to and control over the 5 forms of capital in Machakos Town Sub-County, Kenya. *International Journal of Science and Research* 12, 7. <https://www.ijsr.net/archive/v12i7/SR23625065717.pdf> (accessed 2 August 2024).
- Purdie, A., Hawkes, S., Buse, K. et al. (2020) Sex, gender and COVID-19: Disaggregated data and health disparities. Blog *BMJ Global Health* 2020. Available at: <https://blogs.bmj.com/bmjgh/2020/03/24/sex-gender-and-covid-19-disaggregated-data-and-health-disparities/> (accessed 2 August 2024).
- Ribeiro, E., Ladeira, C. and Viegas, S. (2017) Occupational exposure to Bisphenol A (BPA): A reality that still needs to be unveiled. *Toxics* 5(3), 22. DOI: 10.3390/toxics5030022.
- Roy, S. (ed.) (2018) *Linking Gender to Climate Change Impacts in the Global South*. Springer. ISBN 978-3-319-75776-6 ISBN 978-3-319-75777-3 (eBook) DOI: 10.1007/978-3-319-75777-3.
- Santonicola, S., Ferrante, M.C., Leo, G.D., Murru, N., Anastasio, A. and Mercogliano, R. (2018) Study on endocrine disruptors levels in raw milk from cow's farms: Risk assessment. *Italian Journal of Food Safety* 7(3), 7668. DOI: 10.4081/ijfs.2018.7668.
- Scott, W.J. (1988) Gender: A useful category of historical gender analysis. In: *Gender and the Politics of History*. Columbia University Press, New York, pp. 28–50.
- Shakir, R. (2021) Brucellosis. *Journal of the Neurological Sciences* 420, 117280. DOI: 10.1016/j.jns.2020.117280.
- Stradtman, S.C. and Freeman, J.L. (2021) Mechanisms of neurotoxicity associated with exposure to the herbicide atrazine. *Toxics* 9(9), 207. DOI: 10.3390/toxics9090207.
- Street, M.E., Angelini, S., Bernasconi, S., Burgio, E., Cassio, A. et al. (2018) Current knowledge on endocrine disrupting chemicals (EDCs) from animal biology to humans, from pregnancy to adulthood: Highlights from a national Italian meeting. *International Journal of Molecular Sciences* 19(6), 1647. DOI: 10.3390/ijms19061647.
- UN Women (2021) Report on the UN Women Global Response to COVID-19. <https://www.unwomen.org/en/digital-library/publications/2021/02/report-on-the-un-women-global-response-to-covid-19> (accessed 2 August 2024).
- UN (2022) *Policy Brief STEM Education and Inequalities in Africa*. UN, New York. Available at: https://www.un.org/osaa/sites/www.un.org.osaa/files/un_brand_report_web_august_2020_v36928.pdf (accessed 2 August 2024).
- UNEP (2021) Gender and the environment: A preliminary analysis of gaps and opportunities in Latin America and the Caribbean. *United Nations Environment Programme*. PNUMA, Panama City. Available at: <https://www.unep.org/events/unep-event/xxii-forum-ministers-environment-latin-america-and-caribbean> (accessed 27 August 2024).
- UNESCO (2021) Science report 2021. The race against time for smarter development. In: UNESCO, Schneegans, S., Straza, T. and Lewis, J. (eds). UNESCO Publishing, Paris. Available at: https://www.unesco.org/reports/science/2021/en/report-series?TSPD_101_R0=080713870fab2000cdf3904f746e9ac27ccad75921949cc60c76a664f3a26075f2b82bb236bc5a108358dfc3614300073a52731cc4325dac9e0c9ae2be141a7c98faaac9285503b96cad4cf88c597078425c6154e4162c445bcd6c1f7a7008 (accessed 2 August 2024).
- WHO (2013) Taking sex and gender into account in emerging infectious disease programmes. *An Analytical Framework*. WHO Western Pacific. Available at: <https://www.who.int/publications/i/item/9789290615323> (accessed 2 August 2024).
- WHO (2019) *The Thirteenth General Programme of Work, 2019–2023: Promote Health Keep the World Safe Serve the Vulnerable*. <https://iris.who.int/bitstream/handle/10665/324775/WHO-PRP-18.1-eng.pdf?sequence=1>
- WHO (2023) Antimicrobial resistance. Available at: <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance> (accessed 2 August 2024).
- Williamson, D., Munro, K. and Carlot, M. (2021) Climate Change: A Hunger Crisis in the Making. Available at: https://www.actionagainsthunger.org/sites/default/files/publications/ActionAgainstHunger_Climate_Change_Hunger_Crisis_Report.pdf (accessed 2 August 2024).