

Scoping the Significance of Gender for Antibiotic Resistance



This report contains an overview of how sex and gender interacts with antibiotic resistance. You find four case studies that highlight these interactions.

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Foreword

This report explores the ways in which sex and gender interact with antibiotic resistance and makes the case for all actors engaged in addressing antibiotic resistance to undertake further work in this area. Given the current gap in data on both sex and gender in relation to antibiotic resistance, this is a necessary challenge which needs to be undertaken with sensitivity to local contexts and national development plans.

This report was developed as part of ReAct's work to mainstream considerations of sex and gender in all of our work. In devising ReAct's internal strategy - as for any organisations embarking on enhancing their understanding of sex and gender and incorporating it in their activities - a first step in gender mainstreaming involves a gender analysis of which this report was part of the process. This is a shortened and adapted version of the report for an external audience, and will hopefully be a contribution to the collection of literature on sex, gender and antibiotic resistance.

The report was jointly produced by all the staff of ReAct and the consultants Linda Waldman, Violet Barasa, Stella Odiase from the Institute of Development Studies (IDS) at Sussex University. The work was supported through a contract awarded to Triple Line Consulting Ltd by the Swedish International Development Cooperation Agency (Sida).



Action on Antibiotic Resistance



Introduction

Antibiotics cure bacterial infections and are cornerstones to modern day medicine. From the treatment of diseases like pneumonia and urinary tract infections (UTIs), to the care of patients undergoing advanced surgery or cancer treatment, antibiotics have become indispensable. They are thus central components of any health system. The use of these life-saving drugs, however, can result in antibiotic resistance among bacteria and consequently in treatment failures. With increasing prevalence of resistance, some bacterial diseases are now becoming incurable.

The consequences of antibiotic resistance include increased risk of death from infected wounds and common bacterial infections; fatal consequences for what are currently common and treatable childhood and maternal infections (including pneumonia and childbed fever); increased complications from sexually transmitted infections (like gonorrhoea); and increased risk associated with surgery, cancer therapy and organ transplants as infections cannot be prevented or controlled (van der Heijden *et al.*, 2019). Each year, already more than 750 000 people globally die as a consequence of drug-resistant bacteria¹.

Because antibiotics are also vital for livestock production and husbandry, antibiotic resistance also threatens food production at a global level and creates enhanced potential for zoonotic disease emergence or re-emergence. People working in healthcare, agriculture or food production will also become more vulnerable, as they are increasingly exposed to resistant bacteria in the animals and humans they interact with.

Antibiotic resistance is a global health issue that not only disrupts health and food systems but affects countries and communities on almost all levels. Antibiotic resistance is thus a threat to the Sustainable Development Goals (SDGs) which strive to ensure that all people can 'reach their potential in dignity and equality and in a healthy environ-

ment'. This includes multiple goals including SDG 1 – end poverty in all its forms everywhere, SDG 5 – achieve gender equality and empower women and girls, and SDG 10 – reduce inequality within and between countries.

Poor communities, especially in Low- and Middle-Income Countries (LMICs), are more susceptible to infection and are increasingly exposed to antibiotic resistant bacteria. Left unchecked, antibiotic resistance will lead to a rise in inequalities when good health becomes increasingly more difficult to sustain and more costly. People living in poverty will be less able to prevent or respond to antibiotic resistance and may be less able to sustain livestock agriculture and produce sufficient food. Thus, 'antibiotic resistance can breed poverty, while poverty feeds the problem of antibiotic resistance' (van der Heijden *et al.*, 2019: 6), creating a vicious cycle that undermines the development achievements of the past decades. Antibiotic resistance also has the potential to increase inequalities as already vulnerable and marginalised people (women and children, migrants, refugees, people of diverse sexual orientations) are increasingly unable to deal with resistant infections. This report explores one dimension of this complex phenomenon, namely how sex and gender relate to antibiotic resistance. There is, to date, very little detailed examination of the gendered effects of antibiotic resistance, both medically and sociologically. How does antibiotic resistance differentially affect the physical bodies of men, women, children and people of diverse sex in terms of diseases and treatments? And, how does gender affect people's behaviours and responses to disease, medical uptake and antibiotic resistance? A large barrier to action is that antibiotic resistance affects the most vulnerable and therefore puts the heaviest burden on their health and food systems on top of many other pressing development issues. Efforts to tackle antibiotic resistance must therefore be holistic and must be shaped by people's experiences and on-the-ground realities.

¹, A conservative estimate that includes resistance to antibiotics (also in tuberculosis), but which excludes drug resistant HIV, extrapolated from four data sources: Phumart, P. *et al.* Health and Economic Impacts of Antimicrobial Resistant Infections in Thailand: A Preliminary Study. *J. Health Sys. Res.* 6, 352–360 (2012). Centers for Disease Control and Prevention - CDC. Antibiotic resistance threats in the United States. (2013). European Centre for Disease Prevention and Control - ECDC, European Medicines Agency - EMA. The bacterial challenge: time to react. A call to narrow the gap between multidrug-resistant bacteria in the EU and development of new antibacterial agents Luxembourg: EUR-OP. (2009). World Health Organization - WHO. Global Tuberculosis report. (2007)

Sex and Gender as core components of Antibiotic Resistance

There is a dearth of literature which explicitly addresses sex, gender and antibiotic resistance. In 2018, the WHO recognised the need to 'take the first step towards better considering gender and equity issues' in countries' attempts to address antibiotic resistance and argued that it was necessary to 'understand and acknowledge how men and women, and different groups in society' were differently exposed to the risk of, or affected by, antibiotic resistance (WHO, 2018: 1). It pointed out that women's experiences associated with pregnancy and childbirth may put them at increased risk of antibiotic resistance, especially when combined with unsafe and unhygienic healthcare, inadequate water and sanitation, insufficient and/or unaffordable antimicrobials, and inadequate knowledge about appropriate medicine use. This recognition, that women and children might be particularly at risk of exposure to antibiotic resistance because of the processes associated with age and sex (biological factors) and because of gender (social factors) has become more widely recognised, with the classic example being that pregnancy, abortion and childbirth increase women's risk of exposure to antibiotic resistance, particularly within healthcare settings characterised by poor sanitary conditions (WHO, 2016; Jasovsky, *et al.*, 2016; Graham *et al.*, 2016; Pärnänen, *et al.*, 2018; WHO, 2018). Yet, such recognition often occurs without a corresponding analysis of how gender might reinforce these vulnerabilities.

Gender norms and attitudes can also influence the prescribing practices of healthcare providers towards male and female patients. A study by Tisler-Sala *et al.* (2017) showed that in Estonia, women were thrice more likely than men to be given a prescription that did not comply with international guidelines for urogenital gonorrhoea. In Tanzania, Leonard (2007) found that men were twice as likely as women to be prescribed antibiotics for non-specific febrile illness, because male patients attached significant healing power to antibiotics over other forms of treatment such as physiotherapy or painkillers. These examples illustrate the importance of both sex and gender factors in shaping the behaviours of men, women and people with diverse genders in relation to health and access to health services. These considerations, and understandings of gender, are critical to the safe and effective use of antibiotics as well as in the design and implementation of strategies to tackle antibiotic resistance.

The limited literature on gender and antibiotic resistance shows that gender informs how people use antibiotics, with men and women consuming different amounts of medication, with differential rates of non-compliance; being more or less inclined to adopt self-medication and having varied educational levels and knowledge about antibiotic use. The role of gender in antibiotic use, however, often varies by context. Portuguese men were, for example, twice as likely to self-medicate antibiotics as were women (Ramalhinho, 2014). A 2019 systematic review of self-medication in 15 LMICs, however, found women were more involved in these practices in the majority of the included studies (Torres, 2019). Gender also influences health service providers, as men and women doctors are likely to prioritise different aspects of treatment – with women doctors emphasising preventative medicine, prescribing fewer antibiotics and holding longer consultations; while men doctors focus on technical aspects like physical examinations, medical histories and prescriptions – and therefore provide different forms of treatment to men or women, despite having the same diseases (Bertakis, 2009; Eggermont *et al.*, 2018; WHO, 2018). A systematic review of antibiotic prescription, undertaken by Schröder and colleagues (2016) found that doctors in high-income countries were 27% more likely to prescribe antibiotics to women than to men over the course of their lives. This was particularly pronounced in parts of parts of the UK, where 'female patients received 67% more prescriptions than men' (Smith *et al.*, 2017: 1; also see Largo-Jansen, 2008). However, authors largely attributed this gender gap to women seeking health care more frequently, and earlier in the course of illness than men (Smith *et al.*, 2017). Sandhu and colleagues (2009) argue that these gender differences between men and women doctors also have implications for effective communication and policy.

Differences in how men and women experience infectious diseases (den Haijer, 2013) also account, in part, for differential access to and use of antimicrobials in terms of:

- forms of employment, or categories of people, who are exposed to antibiotic resistance
- socio-cultural and political contexts and
- health-seeking behaviour

These factors in turn have an impact on antibiotic resistance. For example, a study in Kolkota, India by Pandey and colleagues (2002) found that sex-based preferential treatment for male children meant that boys were more likely to be taken to qualified health professionals when ill and significantly sooner than girls. Although the study does not look at the treatment of girls, it could be taken further to explore whether girls are routinely treated at home, and with what medication, and this could provide clues to gendered exposure to antibiotic resistance in children in this and similar settings.

While little research explicitly correlates sex, gender and antibiotic resistance, a wealth of literature examines the relationships between gender, power relations, context, health and infectious disease and offers substantial depth of analysis which is highly relevant to debates on antibiotic resistance (Johnson *et al.*, 2009; Tolhurst, 2002; Anker, 2007; Sen and Östlin, 2007; WHO, 2011; Dzingirai, 2016). These articles point to the links between poverty and gender, to

women's poorer health outcomes and to gender as one of many influencing factors, or social determinants, of health. Sen and Östlin argue, for example, that 'Gender inequality damages the physical and mental health of millions of girls and women across the globe, and also of boys and men despite the many tangible benefits it gives men through resources, power, authority and control' (2007: viii). This facilitates the recognition that, for antibiotic resistance, it is not just sex differences which matter, rather gender roles and activities, access to and control over resources, gender norms and identities, service utilisation, decision-making power, employment and domestic work all shape men's and women's experiences of health and therefore people's use of medication, risk of, and responses to antimicrobials. Attention thus needs to be focussed on how differences in gender, power relations, sexual relationships, livestock production and livelihoods impact, and are impacted by, antibiotic resistance, particularly in LMICs.

In 2018, the WHO recognised the need to 'take the first step towards better considering gender and equity issues' in countries' attempts to address antibiotic resistance.

(WHO, 2018: 1)

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Sex and Gender as Academic Concepts

The World Health Organization defines sex as the biological and physiological factors that inform the state of being male or female (Anker, 2007). These complex factors may lead to differential susceptibility to infections depending on the pathogen in question. For example, females become pregnant while males do not, and the physiological changes to the immune system during pregnancy have been linked to severe outcomes of some infectious diseases such as Whooping Cough and Influenza (Wizemann and Pardue, 2001). Additionally, anatomical and hormonal differences can influence the course of infections.

Gender on the other hand, refers to the differences between men and woman as constructed by societies. These differences include socially-constructed roles and responsibilities, that is, the roles that men and women are expected to undertake in a given setting, such as care-giving and cleaning being defined as women's roles whereas hunting and driving might be seen as men's roles. Gender also includes behaviours, attributes and relationships that societies or cultures consider to be appropriate or acceptable (or not) for men and women, boys and girls and, on occasion, people of diverse genders. Gender therefore influences and shapes a very wide range of behaviours including: health-seeking behaviours for men and women, as well as access to resources for seeking medical care, exposure to risk of infection, access to antimicrobials, attitudes and prescribing practices of clinicians in healthcare settings.

Although sex and gender are often presented as two separate concepts, they are actually inherently interrelated and do not exist independently of one another. This is because the state of being either biologically male or female (sex) determines what kind of roles, power, status and entitlements societies might bestow upon an individual (gender). Moreover, sex is not always as binary as societies believe and it is increasingly being recognised that some men and women have far more variable chromosomal compositions than XY and XX (WHO, nd).

Although sex is universal, gender is context specific. Every society and culture has norms and values, roles and responsibilities associated with men and women. Gender norms

shape who is exposed to and at risk of certain infections. For example, women are more responsible for household work, and in poor countries, tasks such as cooking involve use of solid fuel that exposes them to indoor air pollution, carrying greater risks of pneumonia and acute lower respiratory disease (WHO, 2006a). These gender norms, values, roles and responsibilities are dynamic and change with time and across places even within the same country, region or village. For instance, in many societies women are more likely than men to work as care-givers, both at home and in healthcare settings as community health workers, nurses, midwives etc. Yet research has shown that women work as community health workers when the work is voluntary. If there is a shift, and the work becomes formal, paid employment, then men tend to occupy these positions, displacing women from their conventional care-giving roles because assumptions about men's roles as breadwinners assume priority (Steege *et al.*, 2018). Gender notions are also subject to change over time, for example, notions of masculinity used to encourage men to smoke more than women. In addition to affecting norms, values, roles and responsibilities, gender also influences health-seeking behaviour and access to healthcare.

Women's lack of access to economic resources in LMICs has been found to be a barrier to prompt and effective healthcare-seeking. Similarly, a preference for boys over girls – or a general prioritising of men and boys in patriarchal societies – can lead to families prioritising prompt treatment for male children (Barasa, 2019). Different factors have been shown to affect parental attitudes towards antibiotic prescribing in children. For example, in their systematic review of the literature on parental attitudes towards antibiotic prescribing in children, Bosley *et al.*, (2017) showed that level of education, family income, access to insurance as well as time-saving were factors in parental demand for antibiotics, but this finding was not examined through a gender lens. Given mothers influential role as caregivers, adding a gender analysis lens to these findings provides an opportunity for future research to examine if mothers may be at a greater risk for potential loss of time at work (lost or reduced wages) or possibly more likely to engage in self-medication practices.

Practical and Strategic Gender Needs

Considerations of gender, and development initiatives which seek to promote gender, often distinguish between practical and strategic gender needs. Practical gender needs refer to those things (material or otherwise) that are essential for everyday living for men and women in a given context. Food, shelter, clothing, childcare, transport and security are all essential needs that are required by all people on a regular, if not daily, basis. Yet access to these needs is frequently shaped by gender. For women, the provision of these needs does not necessarily have an impact on power relationships between men and women, nor does it unsettle structural gender imbalances that may exist in a society because these are needed by everybody to survive. However, in some contexts, where a lack of these basic necessities affects certain categories of people more than others (for instance, lack of childcare may affect women more than men), providing practical gender needs can minimise obstacles or barriers to women's economic empowerment. When provided with affordable childcare, for example, women with small children can go out and work and earn an income to support themselves and their families. In contrast, strategic gender needs refer to those

actions or interventions that challenge unequal power relations in society and/or lead to structural shifts in society that address gender inequality. These may include interventions for legal rights against domestic violence, or equal pay for men and women, or promoting women's access to land, healthcare services, maternity and paternity services.

Practical and strategic gender needs are inter-related and intersect with each other in ways that make it difficult to achieve one without the other. Women often need practical gender needs to be addressed before they can begin engaging in activities relating to their strategic gender needs. Gender is however, only one of many social variables (ethnicity, education, marital status, sexual orientation and religion) that interact to produce different forms of power relations which lead to women experiencing a range of reinforcing inequalities. These inequalities are perhaps most pertinently experienced in the realm of health and access to health, where women's lack of power affects their ability to control their own bodies, determination of the need for formal health care and access to health services.



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Gender Mainstreaming

Gender mainstreaming is a strategy which is usually adopted to enable equal opportunities, access and choices for women, men, girls and boys. It involves bringing the perceptions, voices and experiences of women, girls, men and boys to bear in policy making and programming. The UN ECOSOC (1997) defines gender mainstreaming as 'a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated'. Reducing gender inequality is also a core aim of the WHO.

Gender mainstreaming makes the link between policies and programmes on the one hand and the target beneficiaries on the other. It begins with a recognition that target beneficiaries are not a homogenous bloc, are differently situated per sector and also experience sector challenges for different reasons and in different ways. Policy and

programme benefits are not automatically democratic and depend on the extent to which the differences within a beneficiary cluster are addressed during policy/programme planning and implementation. For instance, health programmes, approaches and services are not equally available, accessible, affordable and acceptable to all members of a population, even where there are legislative or policy provisions for universal coverage. Not all men, women and people of diverse genders are able to receive health care and access health services based on need; and this affects coverage and health outcomes in the longer term.

While mainstreaming gender is clearly essential for securing human rights and social justice for women as well as men, it also ensures the effective achievement of other social and economic goals. Gender mainstreaming poses questions such as: Are the benefits of healthcare appropriately distributed among men and women? What kinds of barriers (biological, social, cultural, political, economic) exist that might exclude certain categories of people from benefiting from healthcare, and how can these be addressed? How might an intervention or action, designed to enhance people's access to medical drugs, for example, differentially affect the men and women that are targeted? What sorts of unintended harm might result from implementing such an intervention, and how might these be minimised? Through these questions, gender mainstreaming can reveal a need for changes in goals, strategies and actions to ensure that both women and men can influence, participate in and benefit from development processes. This may lead to changes in organisations – structures, procedures and cultures – to create organisational environments which are conducive to the promotion of gender equality (UN DAW, 2002).

Gender mainstreaming entails ensuring that, in all areas and at all levels before any decisions are taken and throughout a project, men's and women's concerns and experiences form an integral part of the design, implementation, monitoring and learning, with the goal of promoting gender equality.



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Gender mainstreaming: to bring perceptions, voices and experiences of women, girls, men and boys to bear in policy making and programming.

Gender Mainstreaming for Antibiotic Resistance

A gender mainstreaming approach can help answer crucial questions about how men, women and people with diverse genders might be differently at risk of disease and/or impacted by antibiotic resistance. It can also inform the design and implementation of programmes to address antibiotic resistance and identify the multi-sectoral linkages that should form part of intervention designs. Gender mainstreaming may present opportunities for sharing programme costs, enable more holistic perspectives and lead to programme results that can be sustained over a longer term.

A gender analysis – which brings out the nuances in groups of men and women, boys and girls in society who may be at risk of antibiotic resistance-related exposures, provides an examination of how this occurs and investigates the associated clinical, economic and social impacts – can help achieve more targeted interventions and better understanding of how to ensure the provision of essential drugs to those that need them while also guarding against antibiotic resistance. Manderson argues that gendered power relations are an important factor influencing women's health, particularly as 'despite differences in social, cultural and economic contexts, women everywhere are subordinate to men to some degree' (Manderson, 1999). Gendered power relations often mean that men control women's sexuality, linking women's value to their reproductive functions (childbirth, domestic roles and childcare). Because women's bodies are laden with sexual symbolism, their ability to seek health information and treatment is limited if/when ailments have sexual overtones and even if the biological condition is not in any way sexual. In such contexts, illness and disease might be interpreted as evidence of women's poor moral quality, sexual misdemeanours and other deviant behaviours (Manderson, 1999).

Women's reluctance to seek healthcare for conditions which might be construed as sexual is reinforced by the treatment they receive from health service providers, and often from providers much younger than them or of the opposite gender. A lack of privacy, service providers' dismissive attitudes, acute embarrassment at revealing their bodies to strangers, and overtones that they are dirty or promiscuous can negatively impact on women's health-seeking behaviour. Issues of age, trust, identity and education further undermine women's willingness to seek formal

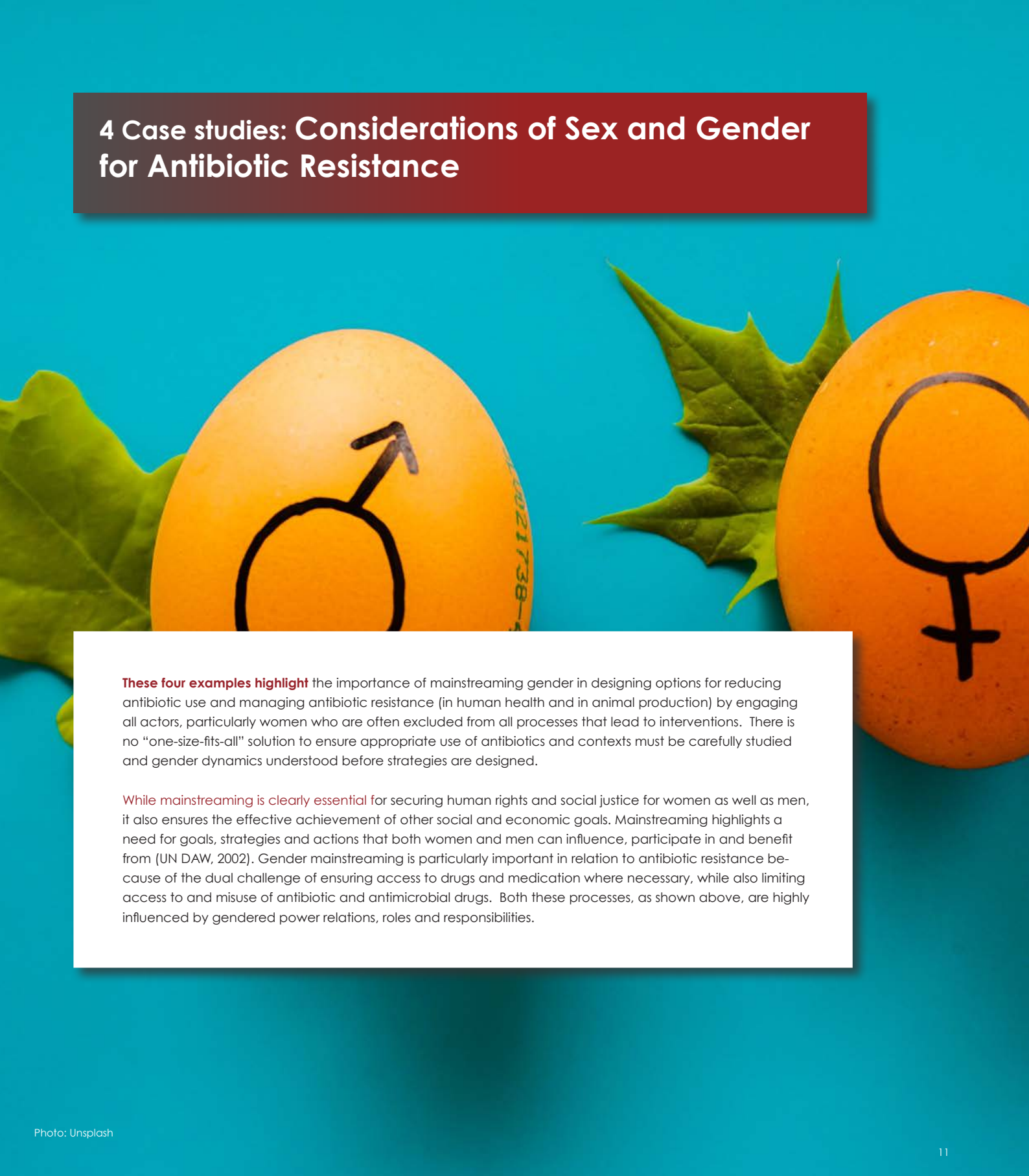
healthcare. As a consequence, women self-treat for sexual health and urinary problems (see for example, WHO, 2013; 2017; Braveman, 2014).

It is well known that gender inequality contributes to the spread of infectious disease. For example, women and girls comprise more than 59% of the Eastern and Southern African population living with HIV (UNAIDS, 2016). In the face of competing demands for global attention and resources, this situation calls for action that is targeted to those demographic groups most vulnerable to mortality resulting from antibiotic resistance, while also addressing the underlying nuances behind these figures. Other important questions highlighted by the WHO include:

'Do any groups in society face greater or different risks of exposure to AMR [antimicrobial resistance] or more challenges in accessing, using and benefiting from the information, services and solutions to tackle AMR? If yes, who, why and what can be done about it? (WHO, 2018: iii)

This emphasis on risk of exposure pertains to workplaces, occupations and livelihoods, all of which are likely to shape – in conjunction with gender norms and roles, social relationships and social stratifiers such as education and place of residence – men's and women's, or specific groups of people's exposure to antibiotic resistance (WHO, 2018: 3). A focus on how sex and gender in antibiotic resistance work, understanding how men and women are differentially exposed to risk, what symptoms men and women experience, and how they seek to address these symptoms, can result in value-addition to improve the uptake of services and appropriate use of medicine and in so doing, minimise the likelihood of antibiotic resistance. It is also important to 'unpack' the social and human impact of antibiotic resistance and not only from a disease or epidemiological perspective. This is especially significant when these events take place in healthcare settings without safe or hygienic conditions as these can promote disease transmission particularly for frontline healthcare workers such as nursing staff, who in many contexts, are mostly women.

4 Case studies: Considerations of Sex and Gender for Antibiotic Resistance



These four examples highlight the importance of mainstreaming gender in designing options for reducing antibiotic use and managing antibiotic resistance (in human health and in animal production) by engaging all actors, particularly women who are often excluded from all processes that lead to interventions. There is no “one-size-fits-all” solution to ensure appropriate use of antibiotics and contexts must be carefully studied and gender dynamics understood before strategies are designed.

While **mainstreaming is clearly essential** for securing human rights and social justice for women as well as men, it also ensures the effective achievement of other social and economic goals. Mainstreaming highlights a need for goals, strategies and actions that both women and men can influence, participate in and benefit from (UN DAW, 2002). Gender mainstreaming is particularly important in relation to antibiotic resistance because of the dual challenge of ensuring access to drugs and medication where necessary, while also limiting access to and misuse of antibiotic and antimicrobial drugs. Both these processes, as shown above, are highly influenced by gendered power relations, roles and responsibilities.

Case 1: Urinary Tract Infections (UTIs)

UTI is the third most common infectious condition (after respiratory and gastro-intestinal infections) in human beings, but treatment has become more complicated as a consequence of increased antibiotic resistance. UTIs occur more often in females than in males, at a ratio of 8:1. UTIs in adult males is very uncommon (Ingersoll, 2017). The prevalence of bacteriuria (bacteria in urine) is also much higher in adult women: approximately 10% versus 0.1% in men (Harper and Fowles, 2007). Although females have a higher prevalence of community-acquired UTI than do males, both overall and amongst younger-age females; healthcare-associated UTI is more prevalent in older males (WHO, 2018; Smith *et al.*, 2017).

The reason for the higher incidence of UTI – coupled with increased possibility of sepsis and inpatient mortality – in women is mainly attributed to anatomical differences between males and females, including urethra length and sex-based variation in the levels of testosterone or oestrogen (Fabbian *et al.*, 2015). Research in the Netherlands shows differences in antimicrobial susceptibility with a 'more heterogeneous population of uropathogens' causing infections in men (der Heijden *et al.*, 2013: 4).

In addition to anatomical and physiological factors, cultural and behavioural aspects affect the prevalence of UTI and recurrence of UTIs. Antibiotic treatment for UTIs is strongly influenced by patients' gender. In the Netherlands, men aged 70 and above were more likely to receive antibiotic treatment, than were young men. This was, in part, because health providers responded to the knowledge that 'UTI incidence increases with age, and especially in men, due to the higher frequency of prostatic hypertrophy' (der Heijden *et al.*, 2013: 4). Smith and colleagues show that, in other high-income countries (New Zealand, Spain, Sweden, Belgium, Italy, Israel, Denmark, Germany, England and Wales), gender influences on UTI antibiotic prescription meant that women were more likely to receive antibiotics than were men, with the exception of those over the age of 75 (Schröder *et al.*, 2016; Smith *et al.*, 2018). In high-income countries, the experience of UTI is further influenced by cultural factors such as frequency of sexual intercourse,

sexual intercourse with more than one partner, anal sex, use of barrier contraceptives containing spermicides, and delayed postcoital micturition. In contrast, in LMICs, factors such as lack of clean water and sanitation for personal hygiene during menstrual cycles and the lack of sanitised menstrual products also contribute to UTIs (Mishra *et al.* 2016).

Cultural and gendered norms and practices shape both how diseases are experienced and treatment, and potentially reinforce the scope for antibiotic resistance to develop. For example, female genital cutting can increase women's experience of UTIs with long-term physical and health consequences, including possible sexual and psychological complications, infertility and high rates of maternal mortality (Lane and Cibula, 2009). Another example, from Tanzanian agro-pastoralists, involves UTIs being seen as the consequence of untreated 'serious fever' rather than a disease in its own right. As such, people's decisions of which treatment pathways to follow (healthcare provision, informal health care, or self-medication) were informed by who was ill. Children and boy herders were, in particular, likely to be taken to clinics for treatment, because children could not articulate how the illness was affecting them and in part, because boy herders were prioritised for treatment due to their central role in everyday herding chores, and because taking time out due to illness had serious economic consequences for the families (Barasa, 2019). Women were less likely to receive treatment for UTI mainly due to stigma as UTIs, particularly in older women, were regarded as a sexually transmitted infection, although this was not perceived to be the case for men and children. As such, women with suspect UTI infections either self-medicated at home using antibiotics or they misled health providers about their symptoms leading to mis-prescription that could have consequences for antibiotic resistance (ibid).

UTIs have a lot of consequences in society, particularly for women. Not only does this result in physical discomfort, illness and financial expenditure, but it also results in the consumption of more antibiotics (both for treatment and prophylactic purposes) resulting in the development of anti-



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microbial resistance. There is increasing recognition that UTIs are not just a health problem, and that a broader development approach – which recognises the importance of context and of the socio-economic constraints experienced by poor people – is required. Addressing UTIs thus requires the involvement not only of health sector officials, but also of government actors from sectors such as environment, water, agriculture, education and youth affairs. These gendered, cross-sectoral, cultural and contextual factors are significant because they shape people's use of antibiotics, expectations and use of healthcare provision and, ultimately, people's exposure to antibiotic resistance. They also form the cultural contexts that shape people's interpretations of any interventions seeking to minimise drug resistance.

UTIs are the third most common infection:

- Which are 8 times more common for women.
- What gender you have influences what antibiotic treatment you get.

UTIs have a lot of consequences in society, particularly for women. Not only does this result in physical discomfort, illness and financial expenditure, but it also results in the consumption of more antibiotics (both for treatment and prophylactic purposes) resulting in the development of antimicrobial resistance.

Case 2: Livestock Production

It has been estimated that antimicrobial consumption in food animal production will increase by two thirds worldwide by 2030 (Van Boeckel *et al.*, 2015). Improving the management of antimicrobial use in farmed animals is therefore a critical component of dealing with antibiotic resistance and optimising production in the livestock sector. Nevertheless, the variety of contexts of antimicrobial use in the livestock sector is a major challenge to managing antibiotic resistance as strategies must be contextually developed. For example, strategies used to address gender and combat antibiotic resistance in zero-grazed dairy livestock systems in a Kenyan urban context such as Kiambu dairy farms near Nairobi, would be impossible to adopt and adapt to rural, extensive, free-roaming pastoralist livestock systems in northern Tanzania. Even in India, there is a large difference in the way dairy farming is done in pastoralist communities and other rural populations.

Gender is central to the division of labour for animal production in rural livestock-keeping contexts in Africa and South Asia. Studies have shown that of the 900 million smallholder livestock keepers globally, around 60% are women who manage small ruminants such as sheep, goats and poultry (Grace *et al.*, 2017). Across the world's varied production systems, women are often the principal actors managing poultry and small ruminants, and generally have responsibility for supporting small animal health and welfare through prevention and health-promotion actions such as breeding, feeding, biosecurity and housing (Njuki and Sanginga, 2013). Men, on the other hand, are mostly responsible for large ruminant livestock. In pastoralist systems in northern Tanzania, for example, women frequently prepare a mix of medicinal solutions including paracetamol and antibiotics which they feed to their sick stock (small ruminants and poultry) at home and often without expert advice. These drugs are obtained from unlicensed peddlers in the villages or from drug stores in bigger markets, and in both cases, medicines are unlabelled, and dosages only estimated (Barasa, 2019). Women may even be the decision-makers on making minor investments which can improve the biosecurity measures in smallholder farms. In India, the hygiene measures undertaken in backyard or smallholder farms is entirely the responsibility of the women

of the families. They do so without any access to knowledge or capital.

Men, generally responsible for cattle and other large ruminants, manage animal health by taking preventive and curative measures to reduce disease occurrence. Male herd owners stock a variety of antibiotics at home, mainly oxytetracycline, which they share between herds and neighbours during episodes of animal illness (Barasa, 2019; also see Wieland *et al.*, 2016). These practices can promote antibiotic resistance especially in poor contexts where animal extension services are limited and use of at-home treatment in animal and human health is the only available option. Yet men and women source and use medication differently and, it may be that in these contexts, access to in-date, appropriately-prescribed and measured dosages for livestock are exclusively available to men as, even where livestock extension services are available, officials tend to be men, working mainly with large livestock, and dispensing only limited veterinary products to the most economically disadvantaged (Hrynick *et al.*, 2019). In the few instances where field extension officers offer farmers training in animal health and perhaps prudent antibiotic use, men are most likely to be invited because they own the herds and make decisions regarding herd health. Women's contributions are largely ignored which results in gender gaps of both knowledge and awareness regarding antibiotic resistance (Barasa, 2019).

Another major issue concerns the consumption of livestock products from infected animals, with poor households disproportionately affected by such practices. For example, a study by Caudell and colleagues (2017) in Tanzania found poor agro-pastoralist households overwhelmingly consumed milk (and/or meat) products from cows and goats that were undergoing treatment with antibiotics, despite packaging instructions warning withdrawal from these products until at least seven days after the course of treatment was complete. It is women who are most likely to be affected because of their role in milking and processing dairy products, preparing and distributing food to family members, as well as caring for sick small livestock, including sharing sleeping quarters with these diseased animals (Barasa, 2019).



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Gender is central in division of labour for animal production:

- Gender roles do not just affect who works with, and cares for livestock. It also affects the health of those tending livestock.
- Of the 900 million smallholder livestock keepers globally, around 60% are women who manage small ruminants such as sheep, goats and poultry.

Gender plays a key role in shaping men's and women's interactions with livestock, their own health status, their exposure to antimicrobials and animal disease and their own patterns of health-seeking.

Gender roles do not just affect who works with, and cares for livestock. It also affects the health of those tending livestock. The availability of high-quality protein has always been an issue in some LMICs and in countries like India. Much of this has been due to food subsidy programmes which traditionally focused on cereals (Minocha, *et al.*, 2017). When there is a degree of household food insecurity, women in India restrict their intake of highly-valued foods, which are also mostly items rich in high-quality proteins (Pradhan, *et al.*, 2013). In the face of mounting rural distress and falling real incomes of agro-pastoralist households, women suffer the most due to the lower quality of their nutrition. This can increase

the likelihood of contracting infections, downgrading their nutritional status further. In many developing countries of Asia and Africa, women who lead the primary production processes in agriculture, also suffer from malnourishment and gender is a driver for this predicament. Thus, gender plays a key role in shaping men's and women's interactions with livestock, their own health status, their exposure to antimicrobials and animal disease and their own patterns of health-seeking (Pradhan, *et al.*, 2013; Barasa, 2019; Grace *et al.*, 2017).

Case 3: Gonorrhea

With close to 80 million new cases every year, gonorrhea is one of the most common sexually transmitted diseases. *Neisseria gonorrhoea*, the bacterium that causes the disease, has over time developed resistance to each of the antibiotics used for treatment and we now see close to, or untreatable cases of gonorrhea. "Without serious attention, multiresistant gonorrhoea will spread globally, causing increased rates of pelvic inflammatory disease and urethritis. Worse, it will promote antibiotic resistance in nongonococcal microbes by direct gene transfer and other mechanisms as it travels around the world. As a result, life-threatening infections may become untreatable" (MacDonald, *et al.*, 2011: 1567).

Gonorrhea provides a good example of how both sex and gender affect people's exposure to, and experience of, treatment-seeking and health outcomes. Gonorrhea differs by sex: although males and females have "similar antibiotic resistant genotypes", "the genotype in men was 4 percent higher than in women", there is "a notable difference between the gene expression profiles" (Laboratory Equipment, 2019) and it tends to be more asymptomatic in females than in males (MacDonald, *et al.*, 2011). Gonorrhea also differs by gender, with factors such as sexual preference, sexual networks, occupation and ethnic/racial identity affecting exposure. Risk factors for men and women can differ substantially. In Alaska, for example, risk factors for women include exchanging sexual favours for money or drugs, an American Indian or Alaska native identity, and perceptions of homelessness. In contrast, the risk factors for Alaskan men are cocaine and/or amphetamine use, being black and engaging in illegal activities (Paschane *et al.*, 1998).

In general, gonorrhea is more commonly reported in men who have sex with men and this group has been found to be at a higher risk of contracting drug-resistant gonorrhea than other groups (Abraha *et al.*, 2018; WHO, 2018). However, women in the military have been found to experience gonorrhea more commonly than men soldiers deployed in war zones (Aldous *et al.*, 2011). In countries as diverse as the Netherlands and the Philippines, commercial sex workers and their clients are also at increased risk of exposure

to gonorrhea (Abraha *et al.*, 2018). Because women's experience of gonorrhea may be as asymptomatic, this can lead to delays in treatment-seeking, or they may present with mild and non-specific symptoms which clinicians can easily mistake for bladder or vaginal infections (WHO, 2018). Even when symptoms exist, many women may find it difficult to talk about their condition due to stigma surrounding women and STIs in many communities. Stigma also affects men who may fail to seek treatment at health facilities, particularly for men who have sex with men, due to a host of factors including facility-based barriers (healthcare-provider attitudes, lack of privacy etc.) and therefore such men may prefer to self-medicate with unprescribed antibiotics.

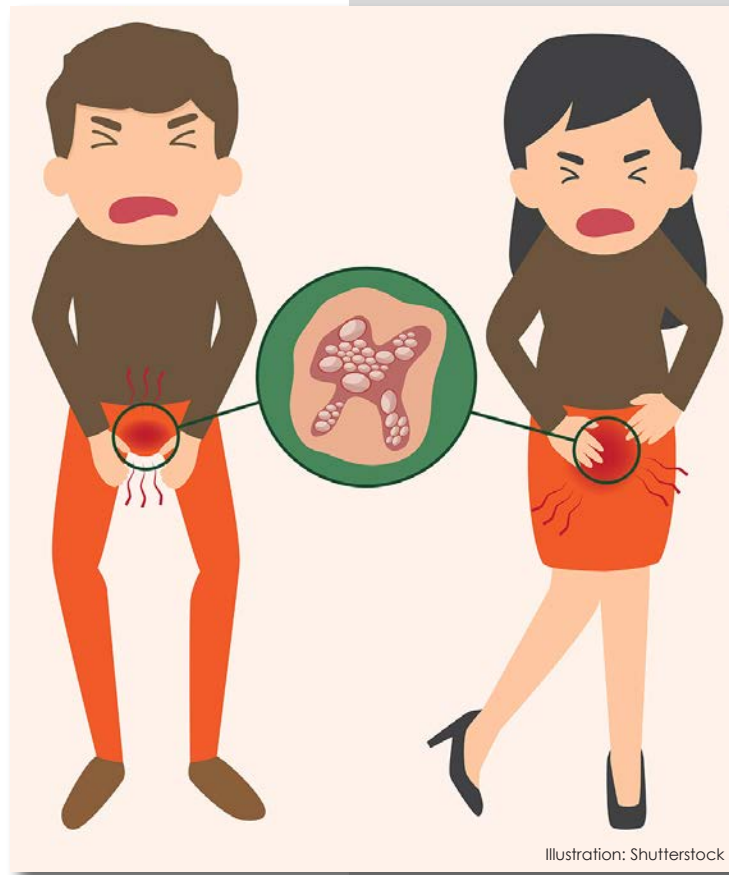
In addition, different groups may opt for, and receive, different medical therapy and advice. As mentioned above, Tisler-Sala *et al.* (2017) found that Estonian women were more likely to be given a prescription non-compliant with international guidelines for urogenital gonorrhea than men. In the Philippines and Thailand, sex workers and their clients used antibiotics prophylactically in order to avoid STIs (Nichter, 2001). This is not, however, simply because of the medicinal and curative power of antibiotics. Rather, the prophylactic use of antibiotic is a reflection, and consequence of, gendered power relations. Women sex workers, not trusting their partners to use condoms appropriately, or in cases where men insist on only paying for sex without use of condoms, may take prescription-only medication including antibiotics as a precautionary measure. The capacity of women sex workers to negotiate condom use and healthcare standards is often eroded by the fact that often are, and they see themselves as, less powerful than their male clients due to pre-existing perceptions of masculinity and femininity as well as extreme poverty (Nichter, 2001). Their frequency of antibiotic use was therefore determined by the (in)ability to negotiate with partners about appropriate sexual behaviours, by factors such as individual notions of vulnerability (including trust in partners not to have unprotected sex with others) and responsibility (a desire to remain healthy) and broader societal events, such as media articles on disease, friends becoming ill and local perceptions of disease (Nichter, 2001).

These examples demonstrate how exposure to gonorrhea is often a reflection of sex (biological factors such as sex, physiology) and gender and power relationships (such as social structure, behaviours and social vulnerability) which shape the differential ways in which men and women are at risk of this sexual disease, as well as influencing their responses, exposure to drugs and risk of antibiotic resistance.

Gonorrhea is one of the most common sexually transmitted diseases:

- Gonorrhea provides a good example of how both sex and gender affect people's exposure to, and experience of, treatment-seeking and health outcomes.
- Risk factors for men and women can differ substantially.

Gonorrhea differs by sex: although males and females have 'similar antibiotic resistant genotypes', 'the genotype in men was 4 percent higher than in women'. (Laboratory Equipment, 2019)



Case 4: Tuberculosis

With more than 400 000 estimated cases of multidrug-resistant Tuberculosis (MDR-TB) in 2018, and extensively drug-resistant Tuberculosis (TB) being reported by 131 countries, antibiotic resistance is a major threat to efforts to reduce the impact of TB worldwide (WHO, 2019). Contracting resistant TB increases the risk of fatal outcome/treatment failure. Approximately two thirds of the TB patients are men. These numbers are related to risk factors such as smoking, alcohol abuse, poor nutrition and occupational exposure to silica dust and other pollutants. The risk of contracting MDR-TB is also greater in men as well as patients coinfecting with HIV. However, there is a dearth of standardised data on the gendered distribution of drug-resistant TB, with some studies – for example by Liu *et al.* (2013) on China which is ranked 2nd among the world's 22 countries with high burden TB – showing that being a woman is a risk factor for MDR-TB, while other studies – such as that conducted in Belarus by Surkova *et al.* (2012) – demonstrating that men of all ages are significantly more likely to have MDR-TB than women.

While the mechanism behind the association of HIV infection with TB risk is well established (Nhamoyebonde and Leslie, 2014), the relationship between gender and TB risk is less clear and is likely to involve complex nuances that require further investigation. For instance, although major disparities are often accounted for by the epidemiological differences between males and females, both in exposure to infection and susceptibility to disease rather than differential access to healthcare (Borgdorff, 2000), these links

need to be investigated further to ascertain prevalence and antibiotic use among men and women, particularly in the African context where this data limited, and where available, is very dated (*ibid*). This is especially because infections rarely affect men and women equally and TB is no exception.

Arguably, male bias in reporting prevalence for MDR-TB could be associated with sex-based exposure to infection and gendered differences in the health-seeking behaviours of men and women including that men travel more than women and have more social contacts in environments that may be conducive for TB transmission such as bars, minefields etc. Other risk factors such as shared household contact and HIV infection are also not gender neutral, and therefore ought to be investigated further. Although studies on the health-seeking behaviours for MDR-TB are scant, stigma is also a component of the TB burden, affecting both men and women and increasing with drug resistant TB. The stigma can lead to exclusion from families and communities and forms a barrier for seeking diagnosis and treatment even if national programs provide these free of charge. In addition, and as noted by Surkova *et al.* (2012) in the Belarus study, lack of access to diagnostic facilities particularly for women, often, due to gender power relations that affect access to resources necessary for early presentation at health facilities, could be a factor in why, in many contexts, more men are diagnosed by MDR-TB than women.

Concluding remarks

Both 'sex' (as a physical dimension) and 'gender' (as a psycho-social dimension), and the interaction between them, play a significant role in antibiotic resistance. Gender is fundamentally about power relations which shape men's and women's access to resources, behaviours, and practices in a dynamic process, which provides opportunities for people to situate themselves in relation to expected gender norms and behaviours.

Sex and gender is important to consider in enhancing the understanding of the 'human face' of antibiotic resistance and antibiotic use, and how it affects a variety of people in different ways throughout their daily lives. Sex and gender are important factors in the exposure to and transmission of disease risk and antibiotic resistant risk because:

- **Addressing gender in relation to health and disease, and creating greater opportunities for inclusion and participation, is an important way of tackling inequality and inequity in society.**
- **Men's and women's bodies are biologically and physiologically different, so they experience disease differently.**

- **Men's and women's different biological make-up means they respond to medication differently.**
- **Gender plays a role in determining who has access to and control over resources and whether these can be used for prevention and treatment.**
- **Gender affects people's exposure to animals and the risk of zoonotic infection or enhanced exposure to antibiotic resistance.**
- **Gender affects the kinds of employment and work that people do, thereby increasing some people's exposure to risky activities and products.**
- **Gender influences who has access to health care and shapes healthcare encounters, the nature of medication prescribed and the risk of infection in these settings.**

A greater understanding of these interconnections can help when designing effective strategies, to ensure that those most affected by disease have access to medication, but also that adequate precautions are taken against misuse of antibiotics and increasing resistance to these.

Sex and gender is important to consider in enhancing the understanding of the 'human face' of antibiotic resistance and antibiotic use.



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