INTERSECTIONAL INDICATORS IN SURVEILLANCE OF ANTIMICROBIAL RESISTANCE AND USE

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WHY IS IT IMPORTANT?

Collecting and disaggregating data by sex, age, and other variables can provide essential insights into the drivers of health inequities. These indicators can make the inequitable burden of antimicrobial resistance (AMR) within and between groups visible and can inform the design of interventions that address the root causes of AMR.

Aggregated datasets (where there is no disaggregation of data) mask significant differences between groups. The Global Antimicrobial Resistance and Use Surveillance System (GLASS) now encourages the reporting of AMR data disaggregated by sex and age, yet many countries are still not reporting disaggregated data. There will be around 39 million deaths due to drug-resistant infections between 2025 and 2050. If we don't disaggregate data at the global level, we will not know who is most affected (Naghavi et al., 2024).

Data disaggregated by variables such as age, sex, and location are an essential first step of more in-depth intersectional gender analysis, but they are only a starting point in understanding intersectional health inequities (Batheja et al., 2025). For guidance on how to conduct an equity analysis using surveillance data see Gender, Equity, and Antimicrobial Resistance: Guidance on analysing bacteriology laboratory and antimicrobial use data.

Collecting variables that relate to multiple axes of inequity (including age, gender, disability status, ethnicity, and social class, for example) facilitates an **intersectional approach**, which investigates how different social inequities and power relations interact dynamically to create unique experiences (WHO, 2020).

Late night pharmacy, Kathmandu, Nepal. Credit R. Steege

BEFORE YOU BEGIN - A NOTE ON SEX AND GENDER

Sex and gender are two key concepts that you will come across in equity analysis. It is important to remember that sex and gender are not the same thing.

Although sex and gender are not the same, data disaggregated by sex can illuminate health inequities that come about due to gendered power relations and other social inequities that affect people in different ways. Importantly, data disaggregated by sex but not gender can conceal important inequities between cisgender and transgender people, among gender nonbinary people, and among people whose gender identity differs from the gender they were assigned at birth. Sex and gender should not be conflated in disease surveillance and these limitations are kept in mind when working with sex-disaggregated data.

Sex refers to the biological aspects of the bodies of male, female, and intersex people. Common stratifiers for sex are male, female, and intersex.

Gender refers to the socially constructed and culturally defined norms, roles, responsibilities, and power relations associated with a particular gender identity (Darmstadt et al., 2019). Gender is a social process.

Gender identity refers to an individual's personal sense of having a gender, such as being a woman/a man/a boy/a girl/non-binary. These are common indicators of gender identity but are not an exhaustive list. An individual's gender identity can be the same or different from one's sex assigned at birth.

HOW THIS DOCUMENT HAS BEEN DESIGNED

This document contains a list of human health data variables that can support equity analysis through the development of equity-related indicators. These variables have the potential to be collected at health facilities as part of routine health data collection. Table 1 identifies core variables that should be routinely collected. Table 2 proposes some additional variables that can facilitate further intersectional analysis. Some important caveats to this approach can be found at the end.

- **Variables** are the categories of data collected for each patient and specimen at the facility level. These can include sex, age, address, gender identity, occupation, disability status, etc. Each variable will have different **stratifiers**.

- **Equity indicators** are quantitative or qualitative measures of equity/inequity based on data collected using the variables above. Morgan et al. (2023) describe three different types of gender equity indicators:

    - **Sex-specific indicators** may only look at one sex to examine the inequalities that can exist within and among sex-specific groups

    - **Sex-disaggregated indicators** look at differences between sex groups

    - **Gender power relations and systems indicators** consider the ways in which gender power relations and systems manifest as inequities to affect differences in health and health system outcomes and experiences at all levels.

We hope to illustrate that the collection of a wide range of data variables can facilitate an equity analysis of surveillance data. Many of these indicators can be included as part of routine data collection in health facilities. However, we recognise the significant work involved. When it is not feasible to integrate these variables into routine surveillance systems, we recommend considering point prevalence surveys or further mixed methods research.

EXAMPLES OF EQUITY-RESPONSIVE INDICATORS

Table 1. Minimum recommended variables: Consider these for routine data collection.

VARIABLE	DESCRIPTIONS	EQUITY INDICATORS
Sex (assigned at birth)* Example stratifiers: Sex is a spectrum, but people may identify as male, female, or intersex	Sex refers to the biological aspects of the bodies of male, female, and intersex people. Sex can influence biological susceptibility to infection (for example, females have a higher chance of contracting urinary tract infections (UTIs) due to a shorter urethra), disease severity, and response to vaccination (Dias et al., 2022). Collection of sex variables offers an essential starting point for equity analysis. * We understand that 'sex' can be a problematic and reductive category and that many data collection processes may use exclusionary stratifiers. We take an inclusive approach, and stratifiers can be expanded to suit individuals and contexts.	• Proportion of blood cultures taken, by sex • Proportion of patients receiving antimicrobial treatment in line with prescribing guidelines, by sex • Prevalence of extended-spectrum beta-lactamase *E. coli* isolated, by sex • Mortality due to AMR infections, by sex
Age Example stratifiers of different age groups: 0-4 years, 5-10 years, 10-19 years, 20-59 years, and 60+ years	Age is an important factor that affects both susceptibility to infection through the impact of comorbidities (biological) and the use of antimicrobials, infection control practices, adherence to treatment, and access to health systems (social). It is also important to understand how gender intersects with age to affect experiences of AMR across the life course, e.g., females of reproductive age are at greater risk of UTIs due to poor access to WASH (water, sanitation, and hygiene) systems, but in some contexts, there is a higher prevalence of UTIs among elderly men. There also may be differences in the rates of culture samples taken between boys and girls, with a preference for boys (Mavi et al., 2024).	• Proportion of women of reproductive age who receive appropriate antimicrobial treatment for UTIs • Proportion of children who receive a culture sample for suspected infection (disaggregated by sex) • Proportion of older adults (60+) who receive treatment for AMR-related comorbidities (disaggregated by sex and age)
Location of patient For example, name of neighbourhood in which individual lives or GPS location, if available	Information on where a person lives can contribute to an overview of trends between different settings. Location can affect exposure to infection, access to WASH, animal husbandry practices, and distance to health facilities. Location can sometimes also serve as a proxy to determine socioeconomic status (see below). It may also indicate refugee status or whether someone lives in an informal settlement/slum or near a river or wastewater treatment site.	• Proportion of people with drug-resistant infection by neighbourhood or settlement • Proportion of people (disaggregated by sex) residing in different locations/parts of the country who receive antimicrobial treatment for certain endemic infectious diseases (for example, melioidosis and malaria)
Occupation Name of occupation or livelihood	Livelihood opportunities are often inequitable, and occupations can be highly gendered in many contexts. Specific occupations increase exposure to drug-resistant infections. For example, work in slaughterhouses may be carried out predominantly by men, whereas women are more likely to be frontline health workers (Boniol M, 2019). Sex work is also a risk for exposure to drug-resistant infections, particularly sexually transmitted infections. Migrant workers may face barriers to healthcare access, and migrant status can also impact travel and mobility. Animal husbandry practices can be highly gendered, which determines the exposure to microbes and the chances of getting infections. For example, in some contexts, men perform major roles in rearing and caring for livestock, and in other contexts this is carried out predominantly by women. In addition, it is important to consider caregiving roles and responsibilities that are unpaid and may traditionally not be considered labour.	• Proportion of people with drug-resistant infection by occupation, for example, those with high risk of exposure, such as frontline healthcare providers, livestock farmers, sex workers, etc.

VARIABLE	DESCRIPTIONS	EQUITY INDICATORS
Gender identity Gender is a spectrum, but common stratifiers may include woman/man/boy/girl/non-binary	Gender identity refers to an individual's psychological sense of being (one or more of) a woman/man/boy/girl/non-binary/transgender/cisgender. These are common stratifiers of gender identity but are not an exhaustive list. An individual's gender identity can be the same or different from one's sex assigned at birth. As a social process, gender has a profound influence over how people access health resources and services (including antimicrobials) and the conditions in which people live that affect their likelihood of getting an infection.	• Prevalence of drug-resistant infection by gender identity • Antimicrobial use (AMU) disaggregated by gender identity
Disability Status Example variables for data collection include The Washington Group Short Set on Functioning, which is comprised of six questions and identifies persons 5 years of age or older with disabilities (see annex 1)	Disability (broadly defined) may affect the ability to access healthcare or may put people at risk of infection through frequent healthcare visits or longer-term hospital setting exposure. It can also be stigmatising; this is particularly true for women with disabilities. The use of aids like hearing devices or wheelchairs may influence the risk of infection. Disability can affect social support and access to healthcare.	• Prevalence of drug-resistant infection by disability status • Prevalence of antibiotic prescriptions by disability status

Table 2. Variables recommended for advanced equity analysis and intersectional analysis.
These can be collected in routine surveillance data but may be more suited to surveys or qualitative research.
Some indicators may require additional data collection.

VARIABLE	DESCRIPTIONS	EQUITY INDICATORS
Socioeconomic status (SES) Example variables often used: Household income, household wealth index, access to clean water/toilet, level of education, employment status, hunger/food insecurity, and access to health services. Please include questions that are specific to the local context.	SES refers to combined economic and social status within society that influences access to healthcare services and exposure to drivers of AMR. Some indicators of SES incorporate variables such as education status and the keeping of livestock, which we include as additional variables below. Collecting SES information can give insights into whether there are differences in AMR infection rates amongst different wealth quintiles and how these intersect with other factors such as gender. This might be stratified to include proxies such as level of education, type of housing, asset index, and access to clean water/toilet.	• Differences in AMR infection rates amongst different wealth quintiles • Differences in AMU prevalence amongst different wealth quintiles • Differences in AMR infection rates amongst different wealth quintiles further disaggregated by sex, gender, occupation, disability, etc.

VARIABLE	DESCRIPTIONS	EQUITY INDICATORS
Education status Variables may include the highest level of formal education completed. For example, stratifiers may include no formal schooling, primary, secondary, college/vocational, or postgraduate, or may be categorised by schooling years/grade or other categories.	Research suggests that low educational attainment can lead to the entrenchment of unequal power structures as well as discriminatory gender norms and attitudes at the individual or household level.	• Differences in AMR infection rates amongst people with different levels of education • Difference in knowledge of AMR and recommended antibiotic use among people with different levels of education • Access to health and diagnostic services for women of different education levels • Proportion of AMR infections among individuals with different levels of education, disaggregated by sex • Ratio of infection rates between individuals with the highest and lowest levels of education, disaggregated by sex • Proportion of people (disaggregated by sex and education) who have accessed health services and have been prescribed antibiotics or have taken antibiotics without prescription
Keeping of livestock Example stratifiers: Poultry, cattle, none, etc. Ideally, it would be good to know the numbers and types of livestock (including chickens/fowl) and whether they are kept in or around the home.	Many people, particularly in rural areas, keep livestock, and this might not be picked up through asking about occupation. This measurement may offer a clearer indication of infection and AMR risks, alongside information on the kinds of animals present.	• Rates of drug-resistant infections among livestock keepers by gender • Proportions of drug-resistant infections between those who keep and don't keep livestock, disaggregated by sex • Distance to healthcare facilities for livestock owners stratified by livestock type
Health insurance status This variable may relate to level of insurance coverage, type of insurance, and name of insurance policy. Stratifiers will be context specific. In contexts where health insurance is less prevalent, social security enrolment may serve as an indicator of healthcare access.	Coverage and access to health insurance or any other social protection scheme may impact access to care/antimicrobials.	• Proportions of culture testing among patients with suspected infections between those with insurance coverage and those without insurance coverage • Antibiotic use by households of different health insurance coverage
Number of financial dependents Example variables: Total number of financial dependents, children under 15 years, elderly dependents 60+	The number of financial dependents (whether children or elderly relatives) may limit access to healthcare and increase reliance on informal antibiotics or, conversely, may increase exposure through increasing time spent in healthcare environments.	• Rates of AMR by number of financial dependents • Access to healthcare for infection treatment by number of dependents • Non-prescription antibiotic use by number of dependents

VARIABLE	DESCRIPTIONS	EQUITY INDICATORS
Marital status Example stratifiers: Married, single, cohabiting, separated, widowed, polygamous.	Marital status, in combination with data on gender identity, can offer insights about gendered household decision-making. In many societies, men may have more decision-making power over household access to medication and other resources. Single- or female-headed households can face challenges with access to healthcare due to work and care burdens. Widowed and divorced/separated status may impact social and economic status with implications for health and access to healthcare.	• Rates of AMR by marital status • Use of antibiotics by marital status • Knowledge of AMR and recommended antibiotic use by marital status and gender identity • Access to healthcare when experiencing symptoms of infection by marital status
Ethnicity Example stratifiers could include different ethnicities and self-identified ethnicities, which would be highly context dependent. Please note that asking about ethnicity may not be appropriate in some contexts, and it is critical to consider local relevance, sensitivity, and legal/ethical constraints.	Ethnicity intersects with gender to influence livelihood opportunities, socioeconomic status, access to healthcare services, discrimination, and stigma, influencing the exposure to resistant infections. In many regions, specific ethnic groups, such as nomadic populations, might face distinct challenges in accessing healthcare.	• Proportions of drug-resistant infection by ethnicity • Proportion of individuals from different ethnic groups who report experiencing discrimination or stigma when accessing healthcare services (barriers could include language, culture, etc.) • Proportion of individuals from different ethnic groups living in neighbourhoods with significant AMR drivers (e.g., poor WASH, proximity to industrial agriculture, distance from healthcare facilities), further disaggregated by sex • Proportions of AMU by ethnicity
Religion Example stratifiers would include self-identified religion, including no religion.	Religion intersects significantly with ethnicity and socioeconomic status. Certain religious practices, such as those relating to food, may impact upon exposure to resistant infections.	• Rates of AMR by religion • Rates of AMR disaggregated by neighbourhood and religion • Proportions of individuals refusing certain antibiotic treatment by religion
Refugee status Example stratifiers: Refugee/non-refugee, defined as a person who "owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group, or political opinion, is outside the country of [their] nationality and is unable or, owing to such fear, is unwilling to avail [themself] of the protection of that country" (Refugee Convention).	Refugee communities may face exposure to AMR infections due to poor living conditions and limited access to WASH and healthcare.	• Prevalence of resistant infection by migrant or refugee status • Proportion of people (disaggregated by sex) with refugee status who have accessed primary healthcare services in the past 12 months • Proportions of AMU by migrant or refugee status • Proportion of people (disaggregated by sex) with refugee status who have received treatment for specific infections or drug-resistant infections (e.g., UTIs, pneumonia, etc.)

VARIABLE	DESCRIPTIONS	EQUITY INDICATORS
Gender identity Gender is a spectrum, but common stratifiers may include woman/man/boy/girl/non-binary	Gender identity refers to an individual's psychological sense of being (one or more of) a woman/man/boy/girl/non-binary/transgender/cisgender. These are common stratifiers of gender identity but are not an exhaustive list. An individual's gender identity can be the same or different from one's sex assigned at birth.	• Prevalence of AMR by gender identity • AMU disaggregated by gender identity
Sexual orientation Example stratifiers: Gay, straight, bisexual, lesbian, asexual	Sexual orientation refers to an individual's sexual and/or romantic attraction to particular genders. Sexual orientation can influence exposure to sexually transmitted infections and can also affect stigma that influences access to healthcare.	• Rates of AMR by sexual orientation and gender identity • Rates of AMR diagnostics by sexual orientation • Prevalence of antibiotic-resistant STIs by sexual orientation and gender identity
Cis/transgender identity Example stratifiers: Transgender, cisgender	An umbrella term for persons whose gender identity differs from the sex to which they were assigned at birth. For example, transgender people are particularly marginalised and may experience discrimination while seeking healthcare.	• Similar to gender identity • Percentage of cis/transgender people who have accessed AMR diagnostics in the past 12 months
Pre-existing health conditions	Pre-existing and chronic health conditions can influence biological susceptibility to infection and exposure to AMR through increased time spent in healthcare settings.	• Proportions of drug-resistant infection among people with multiple comorbidities compared to the general population • Proportions of culture testing for suspected infection diagnosis among those with two or more comorbidities
Indigeneity Example stratifiers depend on self-identification as belonging to a specific Indigenous community or nation. Broader stratifiers include Indigenous, non-Indigenous, and settler.	Rates of AMR are observed to be higher in Indigenous communities who may live in rural and remote regions or deprived urban communities. This is understood to be due to a range of factors, including limited access to health services and exposure to pollution and contaminated water.	• Rates of AMR in Indigenous communities compared to the average across the general population

NOTES OF CAUTION

The examples of equity indicators above may not necessarily apply to all contexts. They are intended to be flexible and adaptable. Be mindful that some equity variables can be sensitive, so consideration of privacy, power imbalances, confidentiality, and safeguarding is essential in the collection of this data.

AMR and AMU data collected at the healthcare facility level also have some limitations. Data may be significantly skewed by differences in barriers to healthcare access or preferences around care seeking across groups. Many infections may never be detected in facilities due to these barriers, which drive informal antibiotic use. Interpreting sex-specific or sex-disaggregated data collected at the facility level therefore requires caution.

FURTHER AVENUES FOR RESEARCH

Additional research that builds on the collection of the variables above can provide deeper understanding of equity issues in AMR. This may require further data collected through, for example, surveys or interviews. Examples of these research questions are listed below.

QUESTION	POTENTIAL DATA COLLECTION APPROACHES
Do AMR rates differ among those that live further from primary healthcare facilities?	*Mapping processes and GIS methods*
Do sex, gender or age affect people's perceived ability to access healthcare for resistant infections?	*Qualitative interviews*
Is there higher AMR prevalence among low-income communities and those living in poverty?	*Surveys that collect information on socioeconomic status*
Are certain communities exposed to higher levels of antibiotics in the environment due to e.g. agriculture or pollution?	*Environmental sampling and GIS methods*
How does perceived engagement in AMR policy and decision-making vary between communities or groups?	*Qualitative interviews and focus groups*
Do experiences of discrimination while healthcare-seeking for specific resistant infections differ between groups, e.g. between cisgender and transgender people?	*Qualitative in-depth interviews*
Percentage of cisgender and transgender people who report delays in diagnosis or treatment for AMR-related infections	*Semi-structured interviews and review of medical records*
Financial burden of resistant infections between different groups, including by gender, those with disabilities, those of low socioeconomic status, etc.	*Semi-structured interviews and/or socioeconomic data surveys*
Proportion of healthcare workers who have received training on gender-sensitive care for AMR infections	*Semi-structured interviews*

This resource is a living document, and if you have any suggestions or additions, please email us at gear.up.amr@gmail.com

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ANNEX 1

Washington group questions as a proxy for disability status, as different activity limitations would likely intersect with AMR differently.

Note answers should not be dichotomous, as disability is dynamic:

1. Do you have difficulty seeing, even if wearing glasses? (1. No difficulty 2. Some difficulty 3. A lot of difficulty 4. Cannot do at all)
2. Do you have difficulty hearing, even if using a hearing aid?
3. Do you have difficulty walking or climbing steps?
4. Do you have difficulty remembering or concentrating?
5. Do you have difficulty with self-care, such as washing all over or dressing?
6. Using your usual (customary) language, do you have difficulty communicating, for example, understanding or being understood?

These do not capture mental health, so these may be added as additional questions.

The Department of Health and Social Care (DHSC)'s Fleming Fund is a UK aid programme supporting up to 25 countries across Africa and Asia to tackle antimicrobial resistance (AMR), a leading contributor to deaths from infectious diseases worldwide. GEAR UP is funded by the Department of Health and Social Care (DHSC)'s Fleming Fund using UK aid. The views expressed in this publication are those of the authors and not necessarily those of the UK DHSC or its Management Agent, Mott MacDonald.