



# Training Guide for Journalists Reporting on Antimicrobial Resistance Issues

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## Aims and Objectives

This guide is intended to provide health journalists with essential background information on antimicrobial resistance - and urgent public health threat worldwide. After the completion of this guide, the journalist should be able to:

1. Describe the human pathogens responsible for high morbidity/high mortality infectious diseases in the developing world.
2. Describe how microbes become resistant to antimicrobial agents.
3. Describe why the threat of drug resistance is important to physicians, nurses, policymakers, and government officials.
4. Describe the impact caused by infectious diseases in the developing countries of Africa, Asia, and Latin America and the Caribbean.
5. Write a strong journalistic narrative while also translating medical information to the public.

## **Introduction: What is antimicrobial resistance? Why is it important for journalists to understand and convey this urgent public health threat?**

Compared to other regions of the world, developing nations are hardest hit by infectious diseases - from AIDS and tuberculosis to pneumonia, cholera and typhoid fever. At the same time, the drugs most essential in treating these infections are losing their power. Antimicrobial resistance - the natural evolutionary process that permits bacteria, viruses, and parasites to elude or defy medicine's front-line drugs - is one of the most urgent public health threats we face today. Yet antimicrobial resistance - or AMR, as it is known - rarely garners headlines. Because of the complexity and insidiousness of the problem - and because science reporting is being cut from many financially-strapped news gathering operations, especially in developing nations - citizens and policy-makers are not getting the message from the mainstream media.

Journalists can make a difference. By translating this issue into language all readers and listeners can comprehend, reporters can inform the public and enlighten policy-makers.

The developing world has witnessed the emergence and spread of microbes that are resistant to cheap and effective first-choice, or "first-line" drugs such as penicillin. The consequences can be catastrophic. Infections caused by resistant microbes fail to respond to treatment, resulting in prolonged illness and greater risk of death. Treatment failures also lead to longer periods of infectivity, which means that infected people moving in the community will expose the general population to the resistant strain.

When infections become resistant to first-line antimicrobials, treatment has to be switched to second- or third-line drugs, which are nearly always much more expensive and sometimes toxic as well. The drugs needed to treat multidrug-resistant forms of tuberculosis, for example, are

far more costly than the first-line drugs used to treat non-resistant forms. Similarly, it costs several times more to treat a resistant gonorrhea infection, or intestinal infection, or respiratory infection - all common afflictions in developing nations - than it does to treat a susceptible form. In many countries, the high cost of such replacement drugs is prohibitive; some diseases can no longer be treated in areas where resistance to first-line drugs is widespread. Moreover, organisms that are resistant to one drug are likely to become resistant to other antibiotics. Once resistance appears, it is likely to decline slowly, if at all. Most alarming are diseases where resistance is developing for virtually all current drugs, raising the specter of a post-antibiotic era.

Worldwide, the leading infectious disease killers are acute respiratory infections, AIDS, diarrheal diseases, TB, and malaria. These infections are especially prevalent in Africa, Latin America, and Asia - regions often set apart by poverty, geography, scarcity of antimicrobials, and lack of political will on the part of governments whose priorities may not be public health. Under such circumstances, infectious diseases - especially resistant infections - bring premature death and ongoing misery.

## Key AMR Issues in Developing Nations

- Poverty and social unrest.
- High rates of endemic infectious diseases, including AIDS and TB.
- Fragile public health infrastructure for medical care delivery and disease prevention.
- Spotty surveillance of antimicrobial resistance trends.
- Weak laboratory capacity for diagnosing infections and identifying drug-resistant pathogens.
- Poor access to physicians and other health care professionals.
- Insufficient supplies of high-quality drug therapies.
- Misinformed self-medication.
- Reliance on sub-standard or counterfeit drugs obtained over-the-counter or through unsanctioned vendors.
- Lack of consumer and physician awareness of AMR issues.

Antimicrobial resistance is not a purely medical issue. It is inextricably tied to larger cultural, economic, and political realities. In order to report on the issue thoughtfully, journalists need to know this wider background.

Many factors spawn AMR in developing nations. Urbanization, with its associated overcrowding and poor sanitation, helps spread such diseases as typhoid, TB, respiratory infections, and pneumonia. Pollution, environmental degradation, and shifting weather patterns affect the incidence and distribution of insect-borne infections such as malaria. Meanwhile, the AIDS epidemic has greatly increased the population of immunocompromised patients at risk of numerous infections, particularly TB co-infection

Poverty and inadequate access to drugs continue to be major forces in the promotion of resistance. In many developing nations drugs are freely available - but only to those who can afford them. Many patients are forced to resort to poor quality counterfeit drugs, or treatment with sub-optimal doses that can lead to more rapid selection of resistant organisms. For many patients served in primary care health clinics, only a single dose of an antibiotic is obtainable or affordable. This minimum treatment allows resistant microbes to flourish - as has happened, most dramatically, in the treatment of tuberculosis.

In many areas, the majority of patients purchase antimicrobials and other drugs at a pharmacy without a prescription, or on the black market. Antibiotics can be purchased from street vendors, convenience stores, outdoor markets, fairs, etc. Unsanctioned providers often reach out to people with limited access to orthodox health care, and are commonly not trained to diagnose infections. Such drug dispensers are often under-educated and under-informed. A study of healthcare facilities in Ghana found that only 8 percent of drug dispensers had received formal training.

Self-medication contributes to resistance in many ways. Drugs that are self-administered are often unnecessary, inadequately dosed, and may not contain adequate amounts of active ingredients, especially if these drugs are counterfeit. Indeed, counterfeit medications may have no active ingredients at all. In many developing nations, antimicrobials are purchased in single doses and taken only until the patient feels better, which may occur before the pathogen has been eliminated. Physicians - overworked, underinformed, or pressured to overprescribe antibiotics - also contribute to the spread of resistance. Even when clinical presentations necessitate antibiotic prescription, doctors may prescribe broad-spectrum antibiotics instead of the appropriate narrow spectrum alternatives, or antibiotics in incorrect doses and/or treatment durations. A study by Paredes, *et al.* revealed that of 40 physicians in Lima, Peru who were questioned on the proper use of antibiotics to treat diarrhea, 36 correctly reported that most diarrheal disease is of viral origin, and antibiotics are not indicated. Yet 35 of these 36 doctors unnecessarily prescribed antibiotics for this condition. Although the physicians clearly understood appropriate prescribing practices, other factors - including patient demand, a patient's family's demands, and practitioner discretion - persuaded them to misprescribe.

## Part I: AMR: A Brief Lesson in Biology

Infectious diseases are caused by microbes - the collective term for bacteria, fungi, parasites, and viruses. Antimicrobial agents, such as penicillin, streptomycin, and more than 150 others, have been developed since the 1940s to combat the spread and severity of these afflictions. Resistance to antimicrobials is a natural biological phenomenon that can be amplified or accelerated by a variety of factors, including human practices. The use of an antimicrobial for any infection, real or feared, in any dose and over any time period, forces microbes to either adapt or die in a phenomenon known as "selective pressure." Those microbes which adapt and survive can mutate or carry genes for resistance, which can be passed on.

Bacteria adapt easily to the presence of antibiotics, not only because of their ability to multiply very rapidly but also because they can pass on their resistance genes in several ways. Indeed, bacteria can pass on resistance determinants (genes) to their progeny, to other related bacteria, even to microbes from different species. Plasmids - intracellular accessories that carry genes - can harbor one or multiple resistant determinants. Resistance to a single drug or to several medications can thus spread swiftly through a bacterial population. When antimicrobials are used incorrectly - at too low a dose, at inadequate potency, or for the wrong disease - it's more likely that bacteria and other microbes will adapt and replicate rather than be killed.

Total consumption of antimicrobials is the critical factor in selecting for resistance. But paradoxically, underuse in an individual - through lack of access, inadequate dosing, poor adherence, and substandard antimicrobials - may play as important a role as overuse. This is especially true in developing nations.

## Part II: Bugs and Drugs

The names of infectious agents and the drugs used to treat them are often tongue-twisters. Journalists who want to cover this topic need to be acquainted with these myriad names, which have life-and-death meanings.

Loss of effectiveness of commonly used, low-cost antimicrobials such as cotrimoxazole, tetracycline, ampicillin, chloramphenicol, and quinolones is found in most of developing countries.

The emergence of resistance varies from one organism to another, and depends mainly on the selective pressure wrought by use, overuse, misuse and underuse (poor drug quality). The table below shows the time between antibiotic discovery, introduction into clinical use, and development of resistance to front-line drugs.

Almost all microorganisms have acquired resistance to one or more antimicrobial agents. Examples can be seen below:

## Microorganisms and Development of Resistance

<u>Microorganism</u>	<u>Resistant to antimicrobial</u>
<u><i>E. faecalis</i></u> <sup>§</sup>	<u>Vancomicina+streptomycin/gentamicin, PCN</u>
<u><i>E. faecium</i></u> <sup>§</sup>	<u>Vancomicina+streptomycin /gentamicin, linezolid, quinupristin/dalfopristin</u>
<u><i>S. aureus</i></u> <sup>v,§</sup>	<u>Oxacillin, vancomicina, linezolid?</u>
<u><i>S. epidermidis</i></u> <sup>v</sup>	<u>Oxacillin, glycopeptides</u>
<u><i>H. influenzae</i></u> <sup>v</sup>	<u>Chloramphenicol, ampicillin, TMP-SMX</u>
<u><i>N. meningitidis</i></u> <sup>v</sup>	<u>PCN, chloramphenicol</u>
<u><i>N. gonorrhoeae</i></u> <sup>v</sup>	<u>PCN, spectinomycin, gentamicin</u>
<u><i>S. pneumoniae</i></u> <sup>v</sup>	<u>PCN, PCN + other</u>
<u><i>A. baumannii</i></u> <sup>§</sup>	<u>Carbapenems, cephalosporins, fluoroquinolones</u>
<u><i>Shigella sp</i></u>	<u>Chloramphenicol, ampicillin, Cotrimoxazole</u>
<u><i>Salmonella spp</i></u>	<u>TMP-SMX, chloramphenicol, tetracycline, gentamicin</u>
<u><i>C. jejuni</i></u> <sup>v</sup>	<u>Fluoroquinolones</u>
<u><i>E. coli</i></u>	<u>Ampicillin, ciprofloxacin, aztreonam</u>
<u><i>K..pneumoniae</i></u> <sup>§</sup>	<u>Ceftazidime, aztreonam</u>
<u><i>P. aeruginosa</i></u> <sup>§</sup>	<u>Imipenem, meropenem</u>
<u><i>M..tuberculosis</i></u>	<u>Isoniazid, rifampicin, streptomycin, ethambutol</u>
<u><i>P. falciparum</i></u> <sup>v</sup>	<u>Chloroquine, pyrimethamine, sulphadoxine, mefloquine</u>

The “bugs and drugs” most important from a public health standpoint in the developing world include:

### ACQUIRED IMMUNODEFICIENCY SYNDROME (AIDS):

Because drugs used to treat HIV have not yet been widely used in developing nations, the virus that causes AIDS has not yet become widely resistant where the disease has hit hardest. But in affluent countries where antiretrovirals have been used for years, the virus has demonstrated resistance to all currently marketed agents, such as nucleosides reverse transcriptase inhibitors, non-nucleosides reverse transcriptase inhibitors, protease inhibitors and fusion inhibitors.

Combinations of HIV drugs are known as HAART: highly active antiretroviral therapy. Mixes or cocktails of these drugs have allowed patients with HIV and AIDS to live longer and more productive lives.

Unfortunately, because these drugs are expensive, they have not yet become widely available in developing countries.

The World Health Organization has announced a policy of treating three million people with antiretroviral drugs by 2005. With increased access to antiretrovirals, however, increased drug resistance in developing nations is sure to follow. Broad-scale treatment and resulting drug resistance will also push up the cost of improving patients' quality of life.

### TUBERCULOSIS (TB):

Multidrug-resistant strains of *Mycobacterium tuberculosis*, the TB bacillus, are resistant to the two most powerful anti-TB treatments: isoniazid and rifampin. To ensure cure and minimize additional resistance, multidrug-resistant TB, (MDR-TB) treatment requires combinations of several second-line agents for 18-24 months. These second-line regimens, however, lead to greater toxicity and lower cure rates.

## MALARIA:

Resistance to chloroquine, the former treatment of choice, is now widespread in Africa, where malaria is a major killer. Globally, chloroquine resistance in *Plasmodium falciparum*, the parasite that causes the most severe form of malaria, has emerged in 81 of 92 malaria-endemic nations. The impact of resistant strains has been especially severe in young children. As replacements, sulfadoxine/pyrimethamine and artemisinin derivatives (the key ingredient obtained from *Artemisia annua* or "sweet wormwood" a Chinese herb dating from 168 BC) are now widely marketed and will be available at progressively lower prices in the future. The World Health Organization (WHO) "strongly recommends" artemisinin even at the prices drug companies offer to the poorest countries; cocktails that use it cost \$1 to \$2.50 per adult treatment.

## PNEUMONIA:

According to the WHO, pneumonia is the leading cause of death in children worldwide, killing approximately four million each year. Most of these deaths occur in developing countries. *Streptococcus pneumoniae*, the primary bacterial cause of pneumonia, has become increasingly resistant to antibiotics. In South Africa and Mexico, more than half of all *S. pneumoniae* strains are partially resistant to penicillin and its derivatives. *Haemophilus influenzae*, another common cause of community-acquired respiratory infections, has also grown increasingly resistant to an important front-line drug, trimethoprim-sulfamethoxazole (TMP-SMX, also known as Cotrimoxazole).

According to the WHO, only 20 percent of respiratory infections require antibiotic treatment. It is difficult for health care providers and patients to recognize which respiratory infections should be treated with antibiotics. Because of this challenge, overtreatment often occurs in settings where antibiotics are available and affordable.

## DIARRHEAL INFECTIONS:

Multidrug resistance is common in bacteria that cause diarrheal diseases. One such agent, *Shigella dysenteriae*, is a highly virulent microbe resistant to almost every available drug - killing adults and children alike. This growing crisis was illustrated in the wake of the 1994 civil war in Rwanda, when the bacterium spread through vulnerable refugee populations already traumatized by war and loss.

Fifteen years ago, a *Shigella* epidemic could be easily controlled with Cotrimoxazole, a drug cheaply available in generic form. Today, nearly all *Shigella* strains are unaffected by the drug, while resistance to ciprofloxacin - the only viable medication left - appears to be just around the corner. In *E. coli* and *Shigella*, resistance to commonly used antimicrobials such as TMP-SMX, ampicillin, tetracycline, and chloramphenicol has increased over the past 15 years.

The bacteria that cause cholera and typhoid are also acquiring resistance. In treating cholera patients, antibiotics such as tetracycline help curtail epidemics. But *Salmonella typhi*, like *Shigella*, has produced strains that can evade not only tetracycline, but most first-line, second-line, and third-line drugs.

## GONORRHEA & SEXUALLY TRANSMITTED DISEASES (STDs)

Doctors treating *Neisseria gonorrhoea* can no longer rely on penicillin or ampicillin for empiric treatment. Gonococcal resistance to affordable alternatives, such as tetracycline, thiamphenicol, and spectinomycin, continues to rise. Resistance to fluoroquinolones, broad-spectrum drugs of last resort, has also emerged.

## HOSPITAL INFECTIONS

Hospital strains of *Staphylococcus aureus* - the most common hospital-acquired infectious agent - are resistant to a wide variety of antibiotics. While originally a problem of the affluent world, such

resistance has begun to emerge in developing nations such as Guatemala. The development of a vancomycin-resistant *Staphylococcus aureus* strain, for example, appears to have resulted from the transfer of a vancomycin resistance gene called *vanA* from enterococci to staphylococci. Another important hospital pathogen in intensive care units, *Acinetobacter baumannii*, has acquired resistance to carbapenems, cephalosporins, and fluoroquinolones.

## Parasitic Infections

The protozoa *Giardia duodenalis*, *Entamoeba histolytica*, and *Trichomonas vaginalis* infect up to one billion people each year. *G. duodenalis* causes diarrhea that may be persistent, and *E. histolytica* causes dysentery and sometimes liver abscess. *T. vaginalis* is sexually transmitted and causes genital tract irritation that is diagnosed as vaginitis in women and urethritis and prostatitis in men. The primary drug used to treat all of these protozoal infections is metronidazole. Resistance to metronidazole occasionally has been detected in all three protozoal pathogens and has the potential to become a significant problem.

Currently, one-third of the urban population in developing countries lives in slums and shanty towns. By 2025, about 57% of the population in developing countries will be in urban areas. Poor urban dwellers, many of whom migrated from rural settings, are likely to be colonized or infected by intestinal parasites, including *E. histolytica*, *G. intestinalis*, and nematodes such as *Ascaris lumbricoides* and *Trichuris trichiura*. Albendazole and mebendazole are the two drugs now used widely in large-scale treatment programs for intestinal nematode infections. Resistance problems have occurred when albendazole and mebendazole were used for mass treatment of intestinal nematodes in animals, and it is possible that resistance problems will emerge in human nematodes as increasing numbers of patients receive treatment.

## Part III: AMR in Developing Countries

Antimicrobial resistance is a global phenomenon - an inevitable result of Darwinian selection. But developing regions of the world are especially vulnerable, because of an array of deep-rooted social and economic problems.

Many of these nations have at least one city growing at explosive rates, outpacing proper sewage disposal, water treatment, and other public health necessities. Crowded havens of urban migrants are breeding grounds for resistance, fueling the exchange of drug-resistant organisms between people and the transfer of resistance genes among bacteria. Crucial antibiotics are often in short supply, and the cost of medical care - even subsidized treatment - is out of reach for many patients. In many facilities, hospital infection control is rudimentary. Well-trained health workers have dwindled in number, especially in rural areas - part of the "brain drain" seen, for example, in African countries.

The very fabric of life in poor regions also makes rational antibiotic use elusive. Some experts contend that antibiotics are too freely prescribed for acute infant diarrhea and childhood viral respiratory infections. But when patients travel long distances for treatment and are unlikely to return for follow-up visits, the alternative can be even more harrowing. AIDS and malaria further drive antimicrobial resistance. That's because patients who are HIV-positive take antibiotics almost continuously, creating selection pressure on a variety of bacterial organisms.

The custom of self-prescribing antibiotics further raises the risk of resistance, largely because most self-prescribers do not buy or consume full courses of antibiotics - a practice that selects for resistant bacterial strains. Casual vendors are more likely to dole out poor quality, expired, or illicitly obtained antibiotics, misdiagnose a patient's condition, and mix batches and brands of drugs. Worst of all, they are usually oblivious to the long-term effects of antibiotic misuse.

In affluent countries, the chief means of tracking disease and drug susceptibility patterns is through high-quality labs and robust national surveillance. In poverty-stricken nations, labs and surveillance networks are luxuries. Most primary and secondary prescribers, and even many tertiary care facilities, cannot obtain the bacterial cultures and sensitivity tests needed. They lack equipment, experienced lab workers, basic materials such as enzymes for molecular analysis, even culture media. Such material deprivations have discouraged scientists from embarking on basic research, the kind of studies desperately needed to map the true dimensions of antibiotic resistance.

Meanwhile, health clinics and hospitals are beset by less-than-antiseptic conditions. Overworked doctors and nurses must take several jobs to make ends meet - and in doing so, themselves ferry resistant organisms from one workplace to another. Doctors often prescribe wide-spectrum antibiotics for patients they assume cannot wait for a full diagnosis or are unlikely to return because of transportation or costs. If doctors do not prescribe a drug, the patient will likely resort to self-medication, buying cheaper over-the-counter drugs that are often substandard or insufficient for complete treatment.

### **Vaccines and the Developing World:**

Acute respiratory infections are the leading infectious killers worldwide. The WHO has estimated that 1.2 million children under 5 die annually as a result of pneumococcal disease. Vaccines may offer the best hope in combating resistance in respiratory organisms by reducing the number of infected individuals and thereby minimizing transmission, infection, and the need for treatment. Vaccines to prevent pneumococcal disease are designed to protect against a mix of the most common serotypes.

There are two types of pneumococcal vaccines; one, the pneumococcal polysaccharide vaccine (PPV), was developed in 1983 and contains purified protein from 23 types of pneumococcal bacteria. The

other type is the pneumococcal conjugate vaccine (PCV), for use in preventing pneumococcal disease in infants and toddlers.

While more work needs to be done to bring existing life-saving immunizations to impoverished populations, hopeful developments exist right now. A 2003 study of young children in Soweto, South Africa, for example, found that a pneumococcal vaccine reduced the incidence of pneumonia in fully vaccinated children by 25 percent - and significantly cut the risk of invasive pneumococcal disease caused by antibiotic-resistant strains.

Worldwide, pneumococcal conjugate vaccines could control the global spread of antibiotic-resistant strains and incidence of pneumococcal infections among persons with HIV in Africa. The first conjugate vaccine (Prevnar®) was approved for the prevention of North American invasive pneumococcal disease in infants and young children. Yet in addition to being expensive (around US\$250 for three doses per patient), it does not provide protection against the most common forms of the disease in some developing countries. Against this backdrop, the antibacterial market has also lost its appeal to Big Pharma. Market size has remained flat, generics are increasing, and pressures against unnecessary use are curtailing prescribing. The past few years have seen major pharmaceutical companies such as Aventis, Bristol-Myers-Squibb, Eli Lilly, Glaxo-SmithKline, and Wyeth greatly diminish their research into new antibacterial drugs.

### The Long View:

With so many challenges, will the developing world ever manage to turn the tide of antimicrobial resistance? Some observers believe it is possible - but only if the rest of the world mobilizes now, with funding and expertise. Among the most urgent interventions: improved public sanitation and hygiene; more laboratories for culturing bacterial specimens, surveillance of resistance pathogens, and monitoring antibiotic quality;

upgraded infection control; training for health workers both in the cities and countryside; education for both consumers and drug providers (including the unsanctioned providers who interact daily with so many Africans); policy and regulations, and strong prescription guidelines. Just as important are incentives to encourage pharmaceutical companies to discover and develop new compounds, and intensify research into dosage regimens that will minimize the likelihood of selecting for resistance.

## Part V: Putting the Story Together

Reporting on antimicrobial resistance trends clearly requires not only a familiarity with biology and epidemiology, but also an appreciation of how this pervasive health threat is intertwined with poverty, social attitudes, politics, and global economics. To fully convey the story, journalists must pay attention both to the science and the context of AMR. And they must find creative and engaging ways of expressing information that is often dense and complicated.

### Conveying the Science:

One of the challenges of writing about AMR is translating the technical jargon of doctors, scientists, and epidemiologists into simple terms the lay public can comprehend. Clarity and precision are the hallmarks of good medical writing. Make sure your facts are accurate. If necessary, check with your sources before writing the story to make sure your interpretation of the material is correct. Later, when in doubt, check back. Don't be afraid to ask the "dumb" question - if you don't understand a concept, neither will your readers. It often helps to ask scientists or health officials to explain something as they would explain it to their child, or to a stranger at a dinner party.

Compile a dictionary of medical and public health terms. Work with researchers and health officials to hammer out accurate definitions or synonyms that the average person will understand.

When reporting statistics, make sure you understand precisely what the numbers mean. Ask researchers about the source of their statistics; the reliability; how current the numbers are; and whether the results could be interpreted in some other way. Following the template of scientific inquiry - Problem/Hypothesis; Methods; Results; Discussion - will also help frame your own questions about a medical or public health intervention.

One of the best ways to get a grounding in public health principles is by going to international scientific conferences, which often hold sessions for journalists on how to interpret medical evidence and published studies. Another excellent (but highly competitive) training route is the Knight Public Health Journalism Fellowship Program at the U.S. Centers for Disease Control and Prevention (CDC) in Atlanta, a three-month stint where reporters follow CDC epidemiologists on infectious disease outbreak investigations. The Knight Public Health Journalism Bootcamp at CDC is a separate, intensive ten-day immersion in the subject.

Finally, in reporting an AMR story, talk to patients, parents, children, doctors, nurses, clinic workers, scientists, pharmacists, unlicensed drug vendors, pharmaceutical executives, and everyone else you can find who has a role in the story. How do they regard the problem of rising antimicrobial resistance? What are their biggest worries or fears? How would they solve the problem? Do they consider other health threats more pressing?

### Conveying the Context:

Try always to place the story or research findings in a larger context. What are the real-life health implications of a new drug discovery, a revised health care regimen, or an ominous trend in antimicrobial resistance? How will the average citizen be affected? Who is most likely to suffer? What are the political or economic forces driving resistance?

When writing about resistant infections in hospitals, inquire about working conditions; infection control policies; the quality of patient care; hospital finances; the persuasive sales tactics of pharmaceutical company representatives; how other institutions – either nearby or in other nations – have solved a particular resistance problem, and whether the same interventions would work here.

If you're writing about a resistant infection spreading through a community, find out what human actions or environmental conditions are promoting the disease; whether overuse or underuse of antibiotics is to blame; what personal or cultural beliefs are driving people's actions; whether or how local healers could be enlisted in a solution; what interventions have worked elsewhere; whether governments or citizen groups or NGOs have addressed the problem; what information consumers most need to know to protect themselves.

### Telling the Story:

Once you've got the basics down, think about creative ways to make this often abstract and knotty topic come alive. Part of the challenge is technical. Use strong verbs, precise and evocative metaphors. Draw on compelling quotes and anecdotes.

It helps immensely to tell somebody's story - someone whose personal drama captures the complexity of the topic. If you're portraying a scientist on a quest, try to depict the false starts, blind alleys, and misguided efforts. Don't neglect to describe the exhaustion and tedium of lab or field research. Show how public health and medical research are actually done. Ask your subject: What compelled you to enter this field? Who were your sources of inspiration? What do you hope to achieve? What accomplishment are you most proud of? What important goal has still eluded you? What price did you pay for your scientific or humanitarian mission?

Likewise, if you are focusing on patients, ask: How did they become ill? How has this resistant infection changed their life? What would they be doing now if they weren't ill? How might their infection have been prevented? Do they feel angry? Hopeless? Betrayed? How do they want health officials or government leaders to solve the problem? If they could change the conditions that fostered this infection, how would they change them? What do they know now that they wish they had known before?

## AMR in Nigeria: A Journalist's Practice Session

Compared to other African nations, Nigeria has been especially hard-hit by antimicrobial resistance. To get a sense of the problem - and of potential story angles - let's hear from Iruka Okeke, Ph.D., a young AMR researcher.

"For an individual in Africa, in many cases infection is a life-or-death situation," says Okeke. "If a mother has to take her child with diarrhea on a three-hour journey to the hospital, she is not likely to come back the next day. Sometimes, her prescriber wants to know the mother has everything to insure that the child will get well. Very often, children and even adults with diarrhea or malaria will receive an antibiotic 'just in case.' And they end up taking it." *One possible AMR story would follow such a mother as she was forced to find treatment for her sick child - and the medical consequences of embarking on that journey.*

In Africa, the custom of casually self-prescribing antibiotics further raises the risk of resistance. Ready access to these drugs is a fact of life. One study showed that in pharmacy shops in southwestern Nigeria, 31 percent of the drugs sold were to self-prescribers. "That figure sounds strange to people in the U.S., but to anybody in Nigeria it sounds pretty normal," says Okeke. "You learn to cook from your mother and you also learn what to do when you have diarrhea: buy tetracycline capsules." In one study, Okeke found that university students entitled to free medical treatment - no less than isolated rural citizens - were treating their own infections. *Another story about the forces behind antimicrobial resistance could depict both university students and rural dwellers through personal interviews, with the aim of describing how both self-treat their infections and raise the risk of drug resistance.*

A study in southwest Nigeria found that only 15 percent of antibiotic consumers purchased bought full treatment regimens, in many cases because they could not afford it. "People buy their medication in bits," Okeke says. "They will take it until they feel better, then stop and save what's left for next time. Or they will keep buying a daily dose until they're better, then stop."

Unsanctioned providers often supply these self-administered drugs. In Africa as in many parts of the developing world, antibiotics are available on demand not only from hospitals and pharmacies, but also from patent medical salesmen, roadside hawkers, even such unlikely sources as purveyors of clothes, candy, cosmetics, and motorcycle parts. In rural areas, where the majority of Africans live, unsanctioned dealers dispense both oral and injectable antibiotics, and outnumber authorized providers. According to Okeke, the advantage of buying from unsanctioned providers is that their goods are cheaper, they are more accessible to residents of remote areas, and they are more likely to accept traditional beliefs about disease causation. *A reporter could illustrate the causes of AMR by spending several days with an unlicensed vendor of antibiotics, interviewing both the seller and buyers of these widely-misused medications.*

Whether purchased from sanctioned or unsanctioned providers, a large portion of antibiotics in Africa are below formulary standards - and thus more likely to engender resistance. Drugs may sit for weeks in tropical ports. In Nigeria, Okeke has observed that hawkers and small traders often display their pharmaceutical wares in large glass jars, which amplify the degrading effects of harsh sunlight and soaring temperatures. Legitimate pharmacies, while required to be air-conditioned, often suffer from power cuts or turn off the cool air after closing hours. Antibiotics are especially vulnerable to tropical conditions, because high humidity distorts capsule shells and exposes the active medication to air and moisture. And in Africa,

a flood of counterfeit drugs, often of unknown provenance and dubious medical value, compounds the resistance problem. In a study of eight batches of tetracycline capsules in Nigeria, Okeke discovered that only the batch procured directly from the manufacturer contained active drug levels within formulary limits. *To shed light on the risks posed by substandard drugs, a reporter could interview pharmacists, drug company officials, and casual vendors, tracking exactly how antimicrobials are made - and what happens to them after they leave the factory.*

“When I was in Nairobi,” says Okeke, “the cost of a single bottle of nutrient agar was more than a technician’s annual salary.” So dire are the shortages, she adds, that some lab workers have tried to fashion their own antibiotic disks from local blotting papers - a well-intended tactic that produces unreliable test results. For doctors, good labs are the key to properly treating infections and thereby containing drug resistance. *To illustrate how a fragile public health system contributes to antimicrobial resistance, a reporter can compare the salaries and working conditions of lab technicians in developing nations and affluent countries, and show what this disparity means in the global battle against AMR.*

## Part VI: Sources and Resources

### Organizations

World Health Organization (WHO) [www.who.int](http://www.who.int)

(WHO 2001 Global Strategy for Containment of Antimicrobial Resistance  
[http://www.who.int/crs/drugresist/WHO\\_Global\\_Strategy\\_English.pdf](http://www.who.int/crs/drugresist/WHO_Global_Strategy_English.pdf))

National Institute of Allergy and Infectious Diseases (NIAID)

[www.niaid.nih.gov](http://www.niaid.nih.gov)

Pan American Health Organization (PAHO) [www.paho.org](http://www.paho.org)

United States Agency for International Development [www.usaid.gov](http://www.usaid.gov)

U.S. Centers for Disease Control and Prevention: [www.cdc.gov](http://www.cdc.gov)

Alliance for the Prudent Use of Antibiotics [www.apua.org](http://www.apua.org)

Infectious Diseases Society of America [www.idsociety.org](http://www.idsociety.org)

The Global Fund to Fight AIDS, TB and Malaria [www.theglobalfund.org](http://www.theglobalfund.org)

The Malaria Consortium [www.liv.ac.uk/Istm/malaria](http://www.liv.ac.uk/Istm/malaria)

Malaria Foundation International [www.malaria.org](http://www.malaria.org)

UNAIDS [www.unaids.org](http://www.unaids.org)

### Internet Sites

All the Virology on the WWW [www.virology.net](http://www.virology.net)

BioMed Central [www.biomedcentral.com](http://www.biomedcentral.com)

BUBL LINK/5:15 Catalogue of Internet Resources - Infectious Diseases:

<http://bubl.ac.uk/link/i/infectiousdiseases.htm>

Datelinehealth-Africa.net <http://www.datelinehealth-africa.net>

Johns Hopkins Infectious Diseases Antibiotic Guide [www.hopkins-abxguide.org](http://www.hopkins-abxguide.org)

Medscape [www.medscape.com](http://www.medscape.com)

The Stanford Health Library [www-med.stanford.edu/healthlibrary](http://www-med.stanford.edu/healthlibrary)

## Science Journalism Organizations

National Association of Science Writers [www.nasw.org](http://www.nasw.org)

Southern African Science Communications Network (SASCON)

[www.fest.gov.za/sascon](http://www.fest.gov.za/sascon)

## Publications

*A Field Guide for Science Writers*, edited by Deborah Blum and Mary Knudson, (Oxford University Press, 1997). The official guide of the American Association for the Advancement of Science.

*The Antibiotic Paradox: How the Misuse of Antibiotics Destroys their Curative Powers* by Stuart B. Levy, M.D. (Perseus, 2002)

*Secret Agents: The Menace of Emerging Infections* by Madeline Drexler (Penguin, 2003)

## Journals

Science

Journal of the American Medical Association

New England Journal of Medicine

## Part VII: Recommended Stories on AMR

*FDA Consumer* September 1995 “The Rise of Antibiotic-Resistant Infections”

*Perspectives in Health* (The Magazine of the Pan American Health Organization) Volume 7, No.1 2002 “Antibiotics: Are We Killing the Cures?”

**END**

### Alliance for the Prudent Use of Antibiotics

Founded as a non-profit global organization in 1981, APUA’s goal is to strengthen society’s defenses against infectious disease by promoting appropriate antimicrobial access and use and controlling antimicrobial resistance. APUA’s mission is to improve antimicrobial policy and practice so as to increase cure rates and reduce antimicrobial resistance in the treatment of acute bacterial infections, tuberculosis, AIDS, and malaria. With affiliated chapters in over 50 countries, APUA stands as the world’s leading global organization conducting antimicrobial healthcare leaders conducting research, education, and advocacy concerning antimicrobial resistance. The organization has experience managing and administering large projects for USAID, the WHO, PAHO, and numerous domestic health research, education, and advocacy at the global and grassroots level. Country chapters are local grassroots organizations comprised of qualified local institutions such as NIH and NIAID. APUA headquarters does the screening, due diligence, and technical assistance needed to ensure quality programming at the local level.