

STANDARD DEVIATIONS: Calendar Challenges

Coming to you in 2019,

The World Health Organization (WHO) has released study findings of the top ten issues to impact global health in 2019. Our recognition and understanding of these issues makes us more reliable as providers of health care. I present them as WHO issues that we should regard with our communities and families in mind, and how they might impact your laboratory.

#1. Air pollution and climate change. 7 million deaths per year are considered premature fatalities resulting from disease associated with air pollution. Emissions from industry, transport, and agriculture are known factors in incidence of cancers, stroke, and heart and lung disease. If you haven't worried about the air along the Wasatch or in the Uintah Basin, stop reading.

#2. Noncommunicable diseases. Cancer, heart disease, and diabetes are collectively responsible for 70% of deaths worldwide (~41 million people). Fifteen million of those deaths occur prematurely, in ages 30-69. Mental illness and drug dependency are other considerations that may belong to this category; suicide is the second leading cause of death among 15-19 year olds. The opioid crisis has resulted in an exponential explosion of related fatalities. If your clinic lab work for these disease populations just keeps falling, stop reading.

#3. Global influenza pandemic. If ain't if, it's when. The big question is how severe the coming pandemic will be. 1918, 1957, 1968, 2009 mark influenza milestones of viral evolution.

20th and 21st century flu pandemics

Pandemic	Year	Influenza virus type	People infected (approximate)	Estimated deaths worldwide	Case fatality rate
Spanish flu	1918–1919	A/H1N1 ^[185]	33% (500 million) ^[186]	50–100 million ^{[187][188][189]}	2–3% ^[190]
Asian flu	1956–1958	A/H2N2 ^[185]	?	1-4 million ^[190]	<0.2% ^[190]
Hong Kong flu	1968–1969	A/H3N2 ^[185]	?	1-4 million ^[190]	<0.2% ^[190]
Swine flu	2009–2010	Pandemic H1N1/09	10-200 million ^[190]	18,500 (lab-confirmed; ^[1] WHO) ^[190] – 150,000+ (est. total) ^[191]	0.03% ^[192]
Seasonal flu ^[1,2]	Every year	mainly A/H3N2, A/H1N1, and B	5–15% (340 million – 1 billion) ^[193]	250,000–500,000 per year ^[178]	<0.1% ^[194]

Interestingly, emerging climate research implicates ocean temperatures as a driving force in avian flu genetics, affecting migratory birds and consequent, virulent flu strains.

If your BioFire, Allere, Cepheid Genexpert, or Liat analyzer is gathering dust, stop reading.

#4. Antimicrobial resistance. Our over-use of antimicrobials in humans, animals, and agriculture has resulted in the selection of super-bugs in a broad spectrum of infections such as tuberculosis, pneumonia, gonorrhea, and salmonellosis. If your hospital's infection control and lab is not concerned with this graphic,

Urgent Threats	Serious Threats	Concerning Threats
<ul style="list-style-type: none"> • <i>Clostridioides difficile</i> • Carbapenem-resistant Enterobacteriaceae (CRE) • Drug-resistant <i>Neisseria gonorrhoeae</i> 	<ul style="list-style-type: none"> • Multidrug-resistant <i>Acinetobacter</i> • Drug-resistant <i>Campylobacter</i> • Fluconazole-resistant <i>Candida</i> • Extended-spectrum Beta-lactamase producing Enterobacteriaceae • Vancomycin-resistant <i>Enterococcus</i> (VRE) • Multidrug-resistant <i>Pseudomonas aeruginosa</i> • Drug-resistant non-typhoidal <i>Salmonella</i> • Drug-resistant <i>Salmonella</i> Serotype Typhi • Drug-resistant <i>Shigella</i> • Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) • Drug-resistant <i>Streptococcus pneumoniae</i> • Drug-resistant Tuberculosis 	<ul style="list-style-type: none"> • Vancomycin-resistant <i>Staphylococcus aureus</i> (VRSA) • Erythromycin-Resistant Group A <i>Streptococcus</i> • Clindamycin-resistant Group B <i>Streptococcus</i>

go ahead, stop right now.

#5. Ebola and high-threat pathogens. Two Ebola outbreaks occurred in 2018 that spread to cities of >1 million people. The on-going tenth DRC outbreak is the second largest recorded and not expected to be contained any time soon. The connectedness of our world increases the probability that a high-consequence outbreak will be able to spread rapidly over great distances. Lassa fever, Nipah, Hendra, and MERS-CoV viruses are just some contagions ripe for border-busting events. If these aren't concerning to you, see #10.

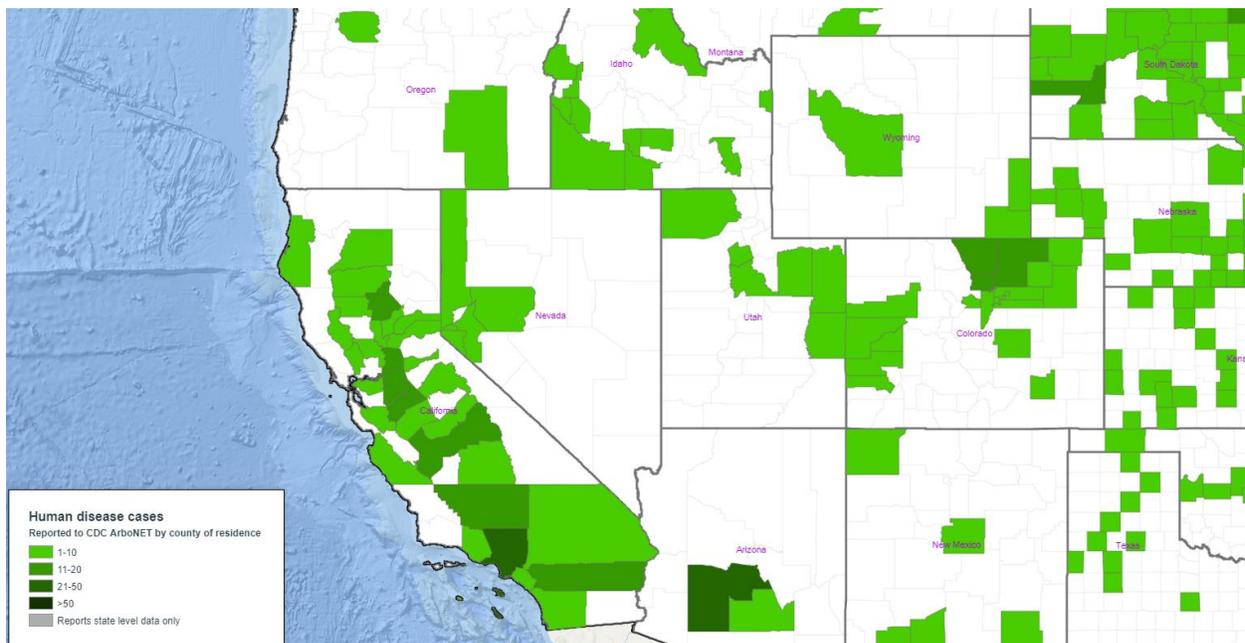
#6. Weak primary health care. Maybe the phone ringing causes you to think it's farfetched to imply a shortage of primary care physicians. The Association of American Medical Colleges (AAMC) released a report comparing the supply and demand for physicians. According to the projections, the US is expected to see a shortage of primary care physicians ranging from 14,800 to 49,300 by 2030. Globally, the issue is rampant, dire, and increasing. If you've never looked for a PCP accepting new patients....well, lucky you.

#7. Fragile and vulnerable settings. 22% of the world's population (>1.6 Billion) live in crisis. Drought, famine, conflict and displacement, along with weak health services leave them without access to basic care. Count your lucky stars. But consider this, uncompensated health care services provided to persons who lack health insurance for some or all of a year is roughly \$35 billion annually, about 2.8 percent of total national spending for personal health care services. Those costs factor into how your hospital operates and the cost you incur for health care.

#8. Vaccine hesitancy. Vaccines don't save lives; vaccination saves lives. According to the World Health Organization, during the recent decade, approximately 1 in 5 children each year globally did not receive routine lifesaving immunizations, and 1.5 million children died of diseases that could have been prevented by vaccines. This represents 17% of all deaths of children less than 5 years of age. Inadequate vaccination for Cholera, Yellow Fever, Typhoid and Diphtheria are world-wide problems. Not your problem? We are experiencing a "cultural epidemic" among US and European countries regarding vaccination. Outbreaks of vaccine-preventable disease such as Measles, Mumps, and Pertussis are occurring across the US. Somebody's seeing their testing numbers change.

#9. Dengue. Dengue has emerged as a worldwide problem only since the 1950s. Although dengue rarely occurs in the continental United States, it is endemic in Puerto Rico and in many popular tourist destinations in Latin America, Southeast Asia and the Pacific islands. The World Health Organization (WHO) estimates that 50 to 100

million infections occur yearly, including 500,000 DHF cases and 22,000 deaths, mostly among children. From a local perspective, we should consider that other mosquito-vector diseases are threats. Here's an ArboNET snapshot of 2018 West Nile cases:



Does it matter to Utah labs? In 2017, Utah recorded 37 neuroinvasive cases of WNV. There is no vaccine or specific antiviral treatment and around 10% die.

#10. **HIV.** If you're still with me, maybe this rings a bell. Since the beginning of the HIV epidemic, more than 70 million have contracted the virus infection, 35 million have died and 37 million live with HIV. Laboratorians work with bloodborne pathogens like HIV and hepatitis B & C; our vigilance for transmission is a constant in the profession. Because biosafety has become a standard in the laboratory workplace, occupational transmission of HIV is extremely rare. Only 58 cases of confirmed transmission to health care workers have occurred in the US. HIV will continue to be a global challenge for health care and laboratory testing, but if there were ever a silver lining, I would argue that our awareness and precautions have made the job safer and our laboratory practices more efficient.

Our awareness of the global health picture makes us a better prepared work force for responding to these concerns. It also illustrates the partnership of the clinical lab and the public health lab standing together as sentinel and support.

Have a great week and be safe,

Bryan

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