The Infectious Disease Eradication Toolbox

Epidemiology in Practice

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Terminology

Control

The reduction of disease incidence, prevalence, morbidity or mortality to a locally acceptable level as a result of deliberate efforts.

Elimination

Reduction to zero of the incidence of a specified disease in a defined geographical area as a result of deliberate efforts.

continued intervention measures required

intervention measures no longer needed

Eradication

Permanent reduction to zero of the worldwide incidence of infection caused by a specific agent as a result of deliberate efforts.

Extinction

The specific infectious agent no longer exists in nature or in the laboratory.

Extinct diseases

Diseases Officially Eradicated

- Smallpox (variola virus)
- Rinderpest virus

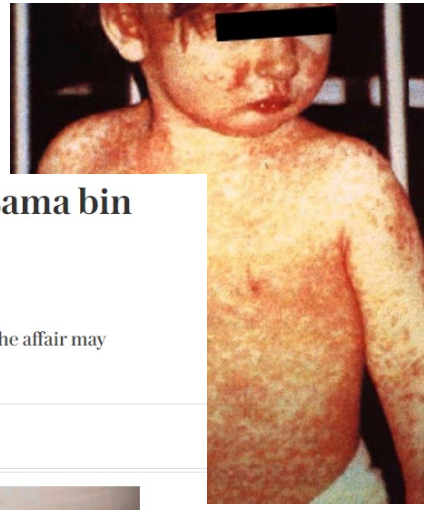
Smallpox blisters, National Museum of Health and Medicine.

Cows Killed by rinderpest in South Africa, 1896.

Human diseases targeted for eradication/elimination

Viruses

- Poliomyelitis/polio (“wild” poliovirus)
- Measles virus
- Multiple sclerosis (Epstein-Barr virus)?

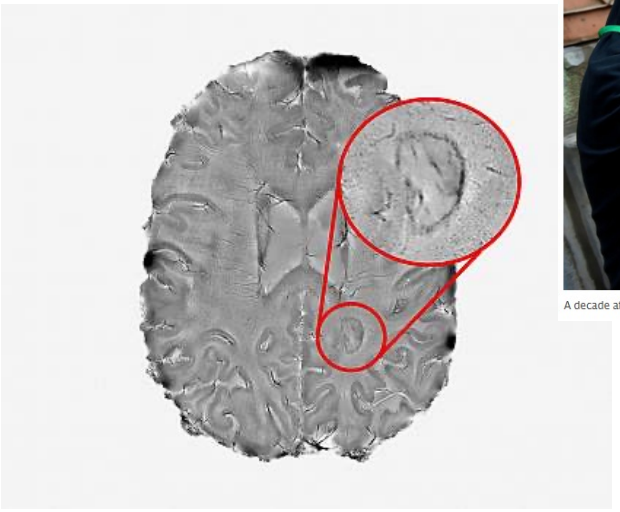


CIA’s fake vaccine campaign to find Osama bin Laden in Pakistan led to drop in child inoculations

Researchers' findings come amid concern that lingering suspicion from the affair may undermine a Covid-19 vaccine rollout

By Ben Farmer IN ISLAMABAD
13 May 2021 • 4:10pm

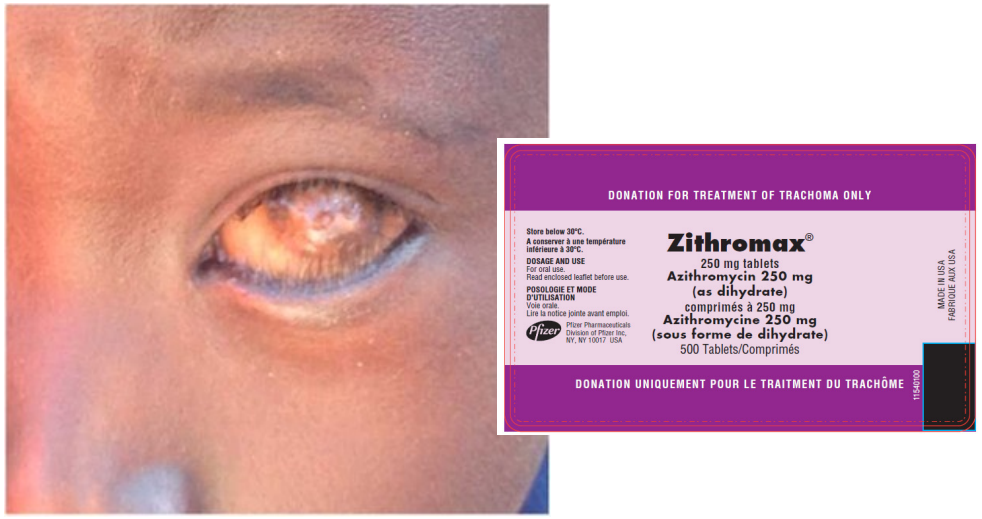
A decade after the raid, the country is still fighting a stubborn streak of anti-vaccination feeling | CREDIT: RIZWAN TABASSUM /AFP



Human diseases targeted for eradication/elimination

Bacteria

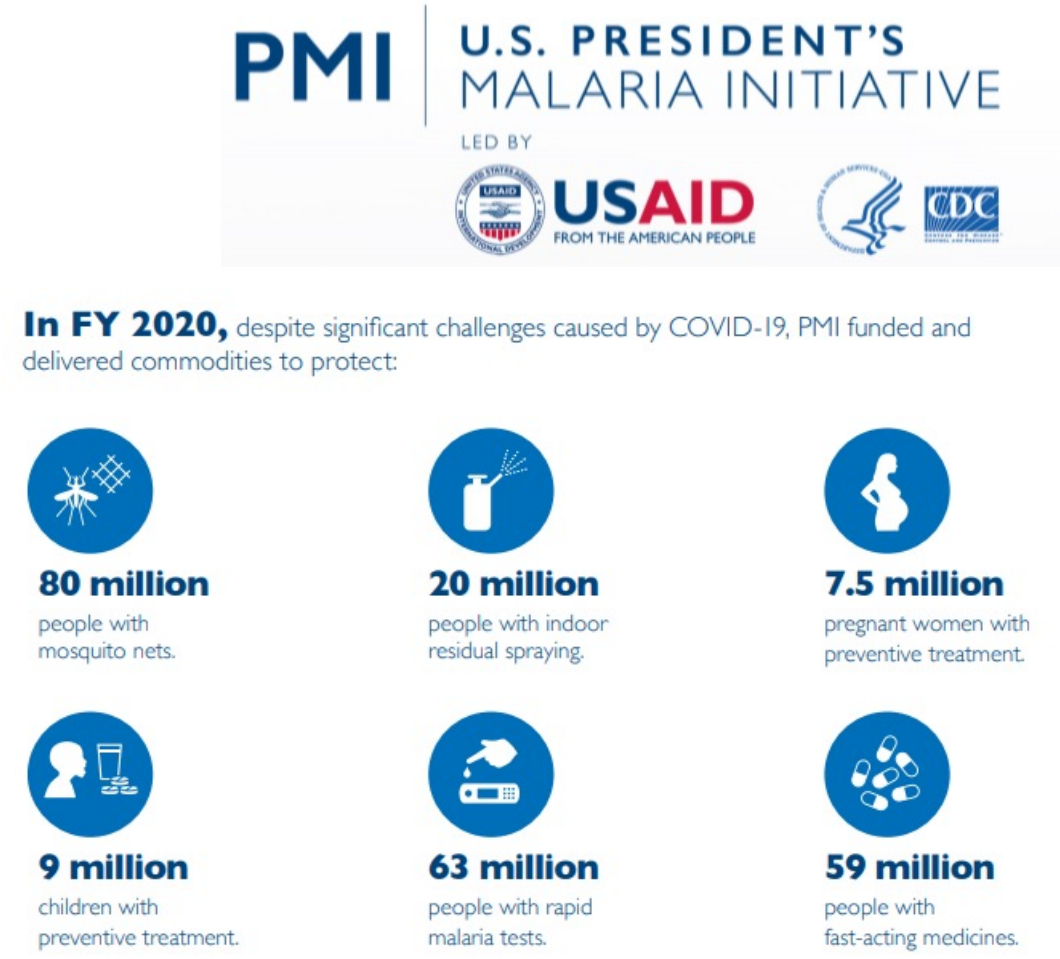
- Yaws (*Treponema pallidum* subsp. *pertenue*)
- Trachoma (*Chlamydia trachomatis*)



Human diseases targeted for eradication/elimination

Parasites

- Malaria (*Plasmodium* sp.)
- Guinea worm disease/Dracunculiasis (*Dracunculus medinensis)*



worldhistory.org (Nina Aldin Thune)

Asclepius
God of medicine, healing, rejuvenation and physicians

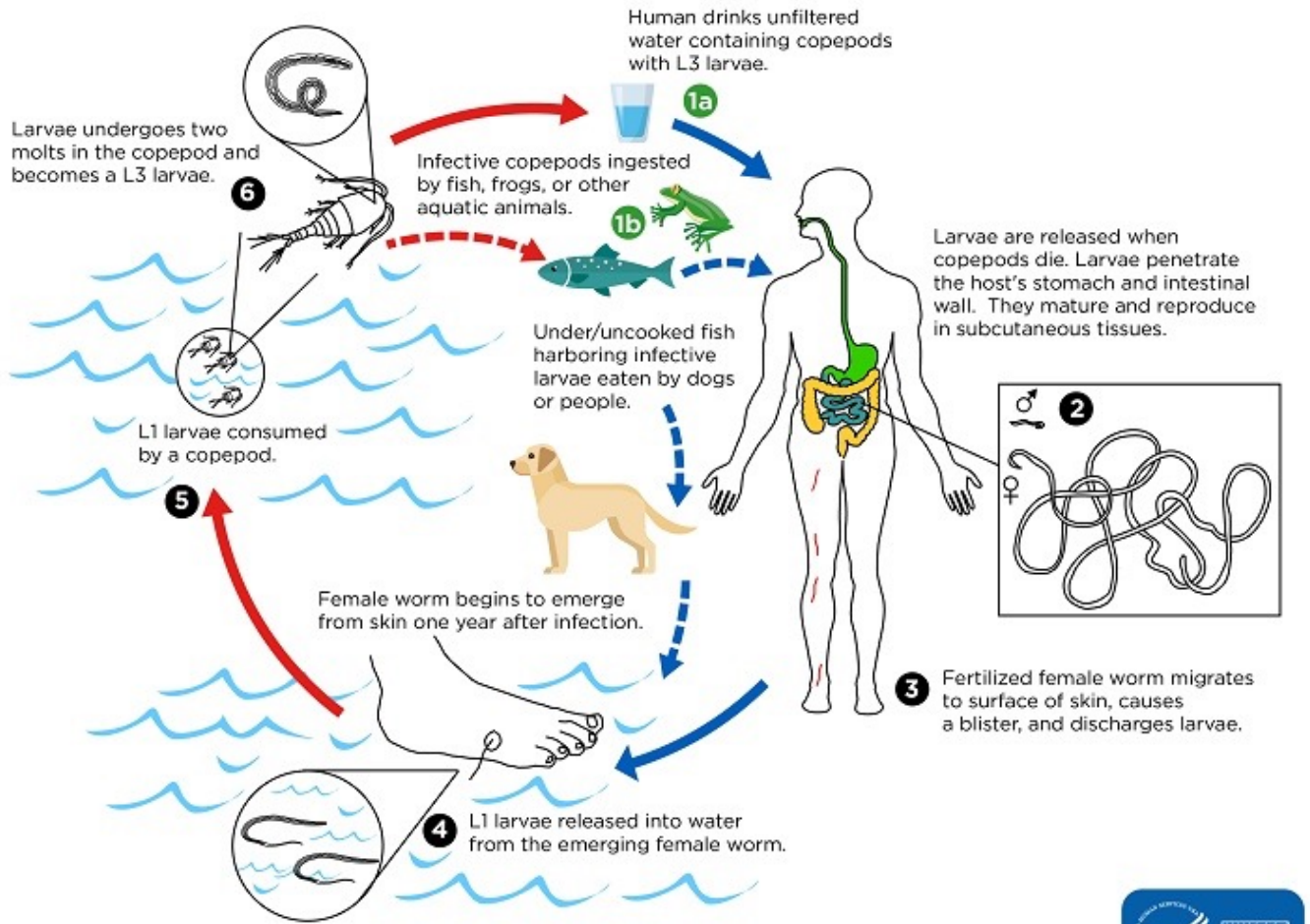
World Health Organization

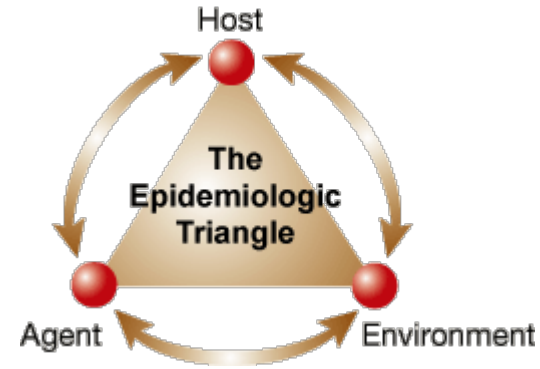
AMA

Guinea Worm Disease (Dracunculiasis)

https://www.youtube.com/watch?v=oCB1A2gFvuU

Dracunculus medinensis biology





ARTICLES | VOLUME 3, ISSUE 2, E105-E112, FEBRUARY 01, 2022

Epidemiological and molecular investigations of a point-source outbreak of *Dracunculus medinensis* infecting humans and dogs in Chad: a cross-sectional study

Sarah Anne J Guagliardo, PhD • Elizabeth Thiele, PhD • Karmen Unterwegner, MPH • Ndoyengar Narcisse Nanguita, MPH • Laurès Dossou, MPH • Philip Tchindebet Ouakou, MD • et al. Show all authors

NO treatment
NO vaccine
NO diagnostic test

Ongoing active and passive surveillance

Vector control

Community education

Outbreak investigation (cross-sectional field study)

- household case searches
- informal group interviews
- mapping
- genetic analysis of worms

https://www.thelancet.com/journals/lanmic/article/PIIS2666-5247(21)00209-3/fulltext

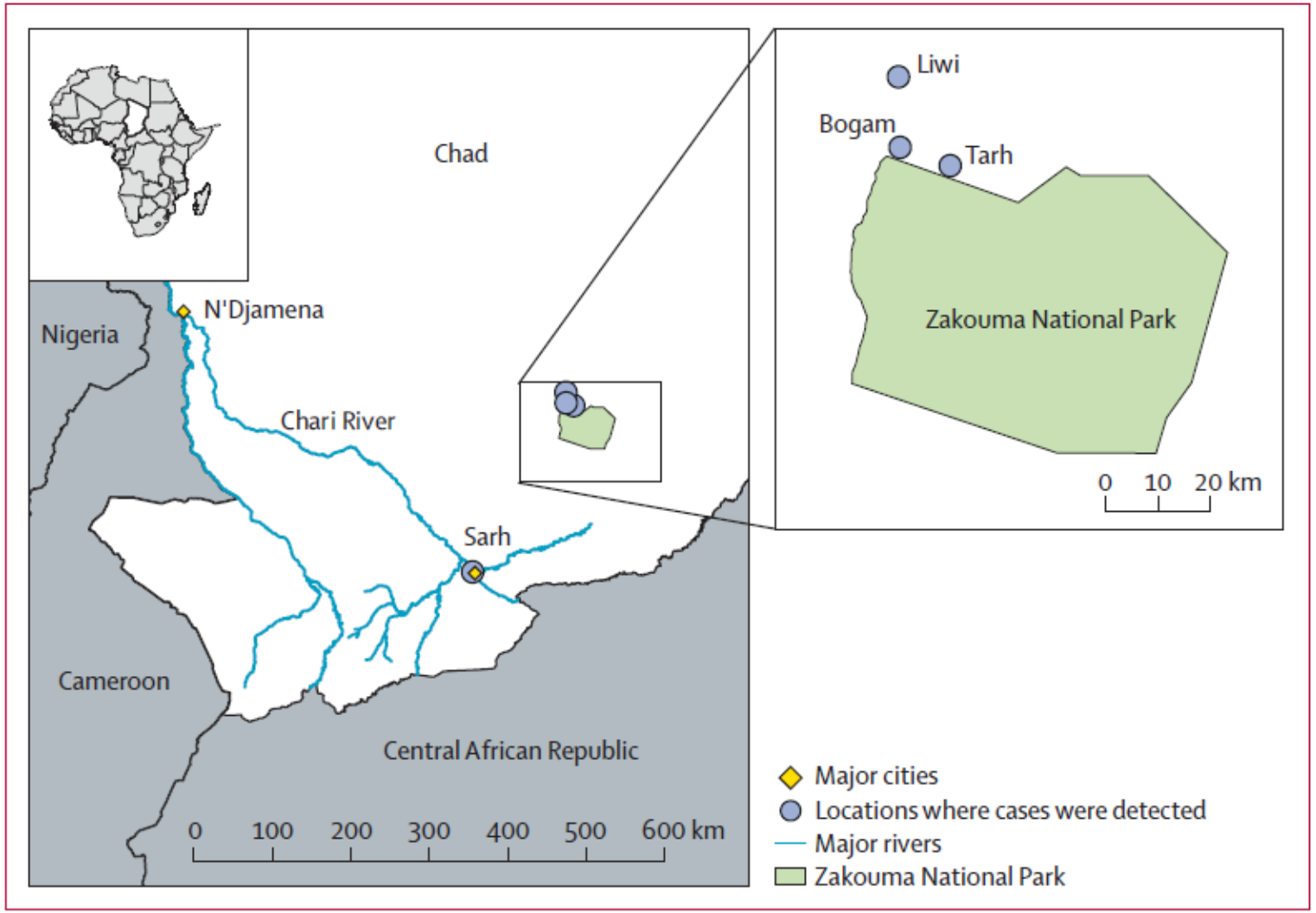
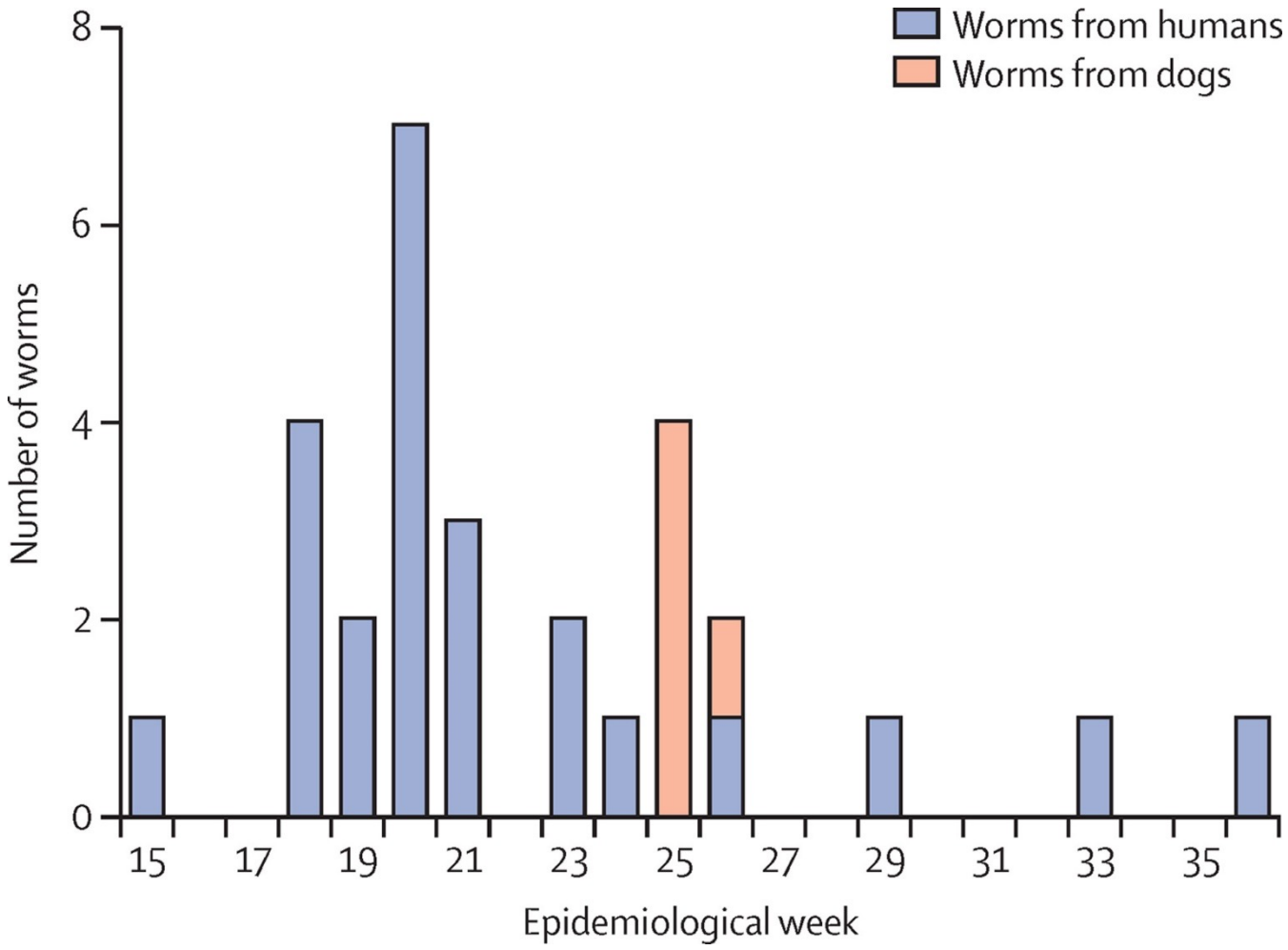


Figure 1: **Detected cases in Chad**

Human and canine cases were detected in Bogam, Liwi, Tar, and Sarh. The case-patient detected in Sarh (case-patient number 20) was identified via routine surveillance. This individual had been in Bogam during the period of infection and later travelled to Sarh.



- What was the <u>case definition</u>?
- What <u>type of outbreak</u> does this curve suggest?
- Why were these axis labels chosen and what do they mean?

Molecular Epidemiology findings

Figure 3: **Principal coordinates analysis of microsatellite genotype data**
Analysis of all currently available genotype samples from Chad during 2013–19 (inset graph) and a focused analysis of a cluster of samples including the Bogam-associated worms (main graph, analysed cluster is shown by the light grey shaded oval in the inset graph). Each point represents a single *Dracunculus medinensis* sample. Point shape and colour reflect mitochondrial haplotype of the sample. The red ellipse (larger graph) and dark grey oval (inset graph) show the samples that, based on kinship analysis, form a probable family cluster and are linked to Bogam village by epidemiological data.

Take home points

- An integrated One Health approach can overcome lack of other basic tools
- Data science benefits field efforts
- Clear, measurable, and universal goals are needed
- Community education and trust in science is critical