Focus

188
Melding old
and new

192
Street
smarts

Image not
available for
online use.

193
Creating a
new image

BIOTERRORISM

New Look at Old Data Irks Smallpox-Eradication Experts

For the past 9 months, Yale University mathematician Edward Kaplan has been a thorn in the side of architects of the U.S. bioterrorism policy, arguing that they are placing too much faith in a strategy called ring vaccination to contain a smallpox epidemic. Now, Kaplan has published a paper that he says deals another blow to that strategy—further raising the ire of his opponents, some of whom are veterans of the global smallpox-eradication effort in which the strategy was introduced and tested. "Kaplan doesn't understand what he's talking about," fumes Donald A. Henderson, who led the eradication campaign and is now a top adviser to the Bush Administration.

The aim of ring vaccination is to stamp out an epidemic by isolating smallpox victims and then rapidly immunizing everyone they've come in contact with. In the January issue of *Epidemiology*, Kaplan and his colleague Lawrence Wein pick apart a widely cited graph, published in scientific papers in 1971 and 1975, that demonstrates the success of this approach. The duo claims that close analysis of the underlying data, gathered in West and Central Africa, reveals that ring vaccination didn't help much at all.

William Foege, the first author on both of the earlier papers and now a consultant to the Bill and Melinda Gates Foundation, stands by the figure. Henderson, a co-author on the 1975 paper, does concede that "I've always had difficulty with that graph myself," asserting that it was deliberately drawn to make ring vaccination look good and win support for the strategy. But even though Henderson grants Kaplan that much, he, like Foege, accuses Kaplan of ignoring an abundance of evidence that ring vaccination does indeed work. Jeffrey Koplan, a former director of the Centers for Disease Control and Prevention (CDC) who is now at Emory University in Atlanta, agrees. Kaplan's paper is "very simplistic," he says, calling it "Epidemiology Lite."

So far, the debate about how to handle a smallpox attack has been overshadowed by the issue of preemptive vaccination, which the

Bush Administration resolved for now with last month's decision to vaccinate up to 11 million people (*Science*, 20 December 2002, p. 2312). The postattack game plan is still evolving, but the current version, published on CDC's Web site, calls for ring vaccination at the first sign of an outbreak. But CDC has also asked states to file plans on how they would vaccinate their entire populations within 10 days, if necessary. (The government has not specified just how "bad" an outbreak would have to be for this strategy to be implemented.)

Last June, Kaplan's team published a computer model in the *Proceedings of the National Academy of Sciences* showing that,

Now you see it ... Ring vaccination seemed to have a dramatic effect in a graph published in 1971 and 1975 (*top*)—but not in Edward Kaplan's new analysis (*bottom*).

under most scenarios, mass immunization would quell a smallpox outbreak much faster, and with fewer deaths, than ring vaccination would. Henderson and others dismiss Kaplan's model as exaggerating the speed at which the disease would spread. Moreover, mass vaccination alone would never have eradicated the disease globally, they assert. Indeed, the disputed figure, which a CDC offi-

cial presented at several key policy meetings last year, seems to show that the number of new cases dropped steeply only after ring vaccination was introduced in 20 countries in West and Central Africa in September 1968.
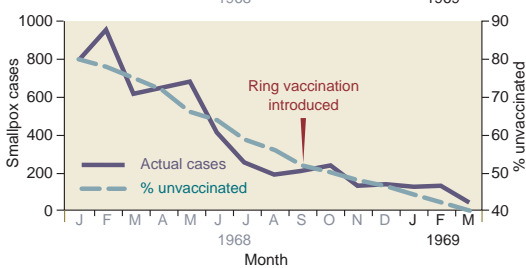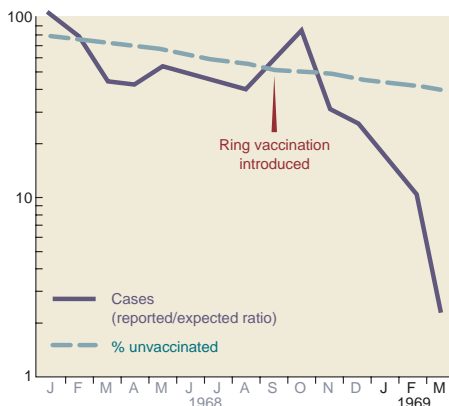
But Kaplan says the figure uses tricks to make its case. By inappropriately using a logarithmic scale on the Y axis, he says, the authors portrayed gains in overall vaccination coverage (expressed as a decreasing percentage of unvaccinated people) between January 1968 and March 1969 as unremarkable. In fact, says Kaplan, the vaccination rate tripled during that time. The same log scale also exaggerates the plunge in smallpox incidence, he says. So does the fact that the graph presents the ratio of reported to "expected" cases based on the years before 1968—a time when vaccination coverage was much lower.

When Kaplan reanalyzed the data and plotted the actual number of cases and the percentage of unvaccinated people over time on an arithmetic scale, the two measurements appeared to decline in lockstep; nothing notable happened shortly after ring vaccination began. Success was due to continuing mass vaccination, he concludes, and ring vaccination made a marginal contribution at best.

Foege strongly disputes that claim, arguing that logarithmic plots are perfectly acceptable in epidemiological graphs. But more important, he says, by March 1969, no more than 60% of the population in West and Central Africa had been immunized—which, under normal conditions, would never suffice to wipe out smallpox. Even in India, where coverage reached more than 90%, he says, the scourge kept festering in some areas. Once ring vaccination was introduced, it was gone within a year.

Henderson adds that even if the figure is misleading, it served a worthy political goal: persuading reluctant governments in developing countries to adopt ring vaccination. "We used pretty much anything we could lay our hands on" to convince them, Henderson recalls.

Henderson says he doesn't want to debate the issue with Kaplan any longer. But Kaplan says he's now crunching the numbers from the eradication battle in India, and they seem to support his point of view. And, he adds, there are others in the Bush Administration who are interested in his results. **–MARTIN ENSERINK**