Challenges of parameter extraction from diverse sources of evidence

Day 2 of the EpiParameter Collaboratory Workshop: Refining the GREP Database Schema. May 15, 2024

Context: the GREP database

Objective of GREP is to easily access “what parameter estimates exist" for a given disease parameter.

- And be able to answer the following questions:
  - How many studies estimate the parameter?
  - How much agreement is there across studies?
  - How good / poor are the estimates?

- Considerations
    - The data from the literature is variable.
    - Not all parameter estimates are useful.

Complexities of extracting parameters from the data

Types of study observational, descriptive, models, experiments

Inclusion/exclusion criteria

Minimum standards to be included in GREP

- E.g. exclude case reports and case series with <10 observations

Source of the study peer reviewed publications, reports (country/government), thesis, preprints

Plan, identify indexed publications and exclude preprints

What about reports? Do they have a role in GREP

Other grey literature?

EXCEPTION: dealing with an emergency/emerging epidemic disease we would include and manage preprints and other reports.

Type of diseases

Currently we have discussed diseases largely being transmitted from human to human.

Considerations for other types of diseases e.g. vectorborne diseases and what additional data would need to be captured (e.g. parameters related to vectors?)

Quality assessment and reporting

Formal risk of bias assessment vs. abbreviated.

Tools missing for some studies

Reporting attributes e.g. availability of the data used in the analysis, model code and other?

GREP management

How to manage the inclusion of articles

get community collaboration.

Find efficiencies to keep the data up to date

Models

Philos Trans R Soc Lond B Biol Sci. 2019 Jun 24; 374(1775): 20180268.
Published online 2019 May 6. doi: 10.1098/rstb.2018.0268
PMCID: PMC6553602
PMID: 31056054

Quantifying the seasonal drivers of transmission for Lassa fever in Nigeria

Andrei R. Akhmetzhanov, Yusuke Asai, and Hiroshi Nishiura

The **CFR** was estimated at 4.9% (CrI: 0–54.4; MLE: 8.9%) from surveillance-based incidence data of Lassa fever in Nigeria from 2016 to 2018. Two different (high- and low-)risk periods were modelled to fit the data and estimate CFR, under reporting of cases (as low as 40% was estimated) and explore the seasonality of Lassa.

- Also reported based on the best-fit gamma distribution from a reanalysis of a nosocomial outbreak in Jos, Nigeria, in 1970 [19]:
  - **incubation period** of mean 12.8 days (95% credible interval (CrI): 10.7–15.0) and a standard deviation of 4.6 days (CrI: 2.8–6.6)
  - **Time from illness to death** mean of 13.8 days (CrI: 10.8–17.0) and a standard deviation of 7.6 days (CrI: 5.0–10.6)

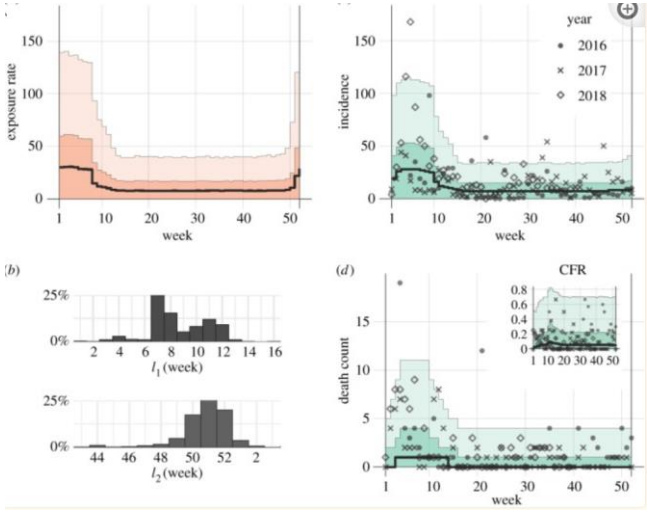

Figure: Temporal distribution of Lassa fever incidence in Nigeria, 2016–2018. (a) Fitted exposure rate as a function of the calendar week in a given year. (b) Posterior distribution for the time boundaries of high-/low-risk exposure periods. (c,d) Model fit to the observed data of new cases and fatal cases. Inset in (d) shows the expected case fatality risk (CFR). Solid black line indicates the median estimate, whereas light and dark shaded areas in (a,c,d) indicate 95 and 50% credible intervals for posterior estimates, respectively. (Online version in colour.)

Observational studies

Estimate will come from many different study designs and with different risk of bias.

To understand the source of the estimate what is the critical data?

- Study design? Prospective cohorts, retrospective cohorts, case control, outbreak investigations
- Sample population represents what?

CFR 24% (95%CI 24 - 60) adjusted, hospital-based estimate (Okokhere, 2018).

- CFR 38% (95%CI 33 - 43) adjusted estimate, raw data 24/63, hospital-based estimate (Fraser 1974) .

Case reports and case series

- Descriptive studies.
- Parameter data? Yes
- Criteria for a minimum # of included observations? E.g. 10+
- Most have limited number of observations and thus would have high uncertainty around the estimates.

Case Report | Open Access
Volume 2016 | Article ID 1978461 | https://doi.org/10.1155/2016/1978461

Show citation

Aseptic Meningitis Caused by Lassa Virus: Case Series Report

Peter O. Okokhere, Idowu A. Bankole, Christopher O. Iruolagbe, Benard E. Muoebonam, Martha O. Okonofua, Simeon O. Dawodu, and George O. Akpede

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Scientific Research Publishing

Advances in Infectious Diseases, 2020, 10, 228-234
https://www.scirp.org/journal/aid
ISSN Online: 2164-2656
ISSN Print: 2164-2648

Lassa Fever Case Report: Challenges in Making Early Diagnosis

Peter Ekpunobi Chime, Ethel Nkechi Chime, Edmund Ndibuagu, Fintan Chinweike Ekochin, Sussan Arinze-Onyia, Bibiana Oti

Consider:

- Situation
  - E.g. the beginning of the outbreak may have different delays than later.
  - Who, When and Where tells us about available resources, likely surveillance capacity and population characteristics that can impact many parameters e.g. CFR, severity estimates

- Disaggregated data – how to deal with it?
  - We had discussed (in a previous workshop) flagging that subgroup data was available would only be a checkbox.
  - What do we do with a paper that only presents subgroups? Or a paper that is just focused on children (for example)

Do we include systematic reviews?

- Need an additional extraction module similar to models.
  - Extra data relate to search date of SR, how many studies are included in the parameter estimate (how many people does that represent?), is the study level data available.
- Summary estimates from meta-analyses will include many studies in GREP.
- Different criteria to assess quality
- Considerations for analysing this data vs. primary data

JOURNAL ARTICLE

Fifty years of imported Lassa fever: a systematic review of primary and secondary cases

Timo Wolf, Dr, Regina Ellwanger, Udo Goetsch, Dr, Nils Wetzstein, Dr, Rene Gottschalk, Prof Author Notes

Journal of Travel Medicine, Volume 27, Issue 4, May 2020, taaa035, https://doi.org/10.1093/jtm/taaa035

Lassa fever outbreaks, mathematical models, and disease parameters: a systematic review and meta-analysis

Patrick Doohan, David Jorgensen, Tristan M. Naidoo, Kelly McCain, Joseph T. Hicks, Ruth McCabe, Sangeeta Bhatia, Kelly Charniga, Gina Cuomo-Dannenburg, Arran Hamlet, Rebecca K. Nash, Dariya Nikitin, Thomas Rawson, Richard J. Sheppard, H. Juliette T. Unwin, Sabine van Elsland, Anne Cori, Christian Morgenstern, Natsuko Imai-Eaton the Pathogen Epidemiology Review Group

doi: https://doi.org/10.1101/2024.03.23.24304596

Systematic review and meta-analysis of the epidemiology of Lassa virus in humans, rodents and other mammals in sub-Saharan Africa

Sebastien Kenmoe, Serges Tchatchouang, Jean Thierry Ebogo-Belobo, Aude Christelle Ka'e, Gadji Mahamat, Raïssa Estelle Guiamdjo Simo, Arnol Bowo-Ngandji, Cynthia Paola Demeni Emoh, Emmanuel Che, Dimitri Tchami Ngongang, Marie Amougou-Atsama, Nathalie Diane Nzukui, Chris Andre Mbongue Mikangue, [...], Richard Njouom [view all]

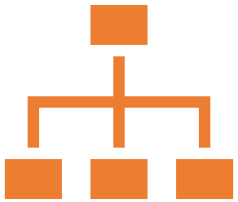
Version 2 Published: August 26, 2020 • https://doi.org/10.1371/journal.pntd.0008589

Clinical characterization of Lassa fever: A systematic review of clinical reports and research to inform clinical trial design

Laura Merson, Josephine Bourner, Sulaiman Jalloh, Astrid Erber, Alex Paddy Salam, Antoine Flahault, Piero L. Olliaro

Version 2 Published: September 21, 2021 • https://doi.org/10.1371/journal.pntd.0009788

GREP quality assurance



Structured / objective approach.

Guidelines and definitions for inclusion/ exclusion criteria, to use the GREP schema, to manage the GREP schema

Quality assurance – thoughts?