Possible Sources for Presentations

Mathematics 747, Fall 2020

September 22, 2020

This is by no means an exhaustive list. You are welcome to suggest other papers etc.

Classic papers

Daniel Bernoulli's analysis of smallpox mortality and variolation (1766)

Original paper:
D. Bernoulli. Essai d'une nouvelle analyse de la mortalité causée par la petite vérole et des advantages de l'inoculation pour la prévenir. *Mém Mathematical Physics Academy Royal Science Paris*, pages 1–45, 1766

English translation and commentary:
S. Blower and D. Bernoulli. An attempt at a new analysis of the mortality caused by smallpox and of the advantages of inoculation to prevent it. 1766. *Reviews in Medical Virology*, 14: 275–288, 2004. doi: 10.1002/rmv.443. URL http://doi.org/10.1002/rmv.443

Updated analysis:
K. Dietz and J. A. P. Heesterbeek. Daniel bernoulli's epidemiological model revisited. *Mathematical Biosciences*, 180(1-2):1–21, 2002

The SIR model: Kermack and McKendrick (1927)

Original paper:
W. O. Kermack and A. G. McKendrick. A contribution to the mathematical theory of epidemics. *Proceedings of the Royal Society of London Series A*, 115:700–721, 1927

Commentary:
Odo Diekmann, Johan Andre Peter Heesterbeek, and Johan A J Metz. The legacy of Kermack and McKendrick. *Publications of the Newton Institute*, 5:95–115, 1995

Nonlinear incidence

Original proposal of $\beta S^h I$ models:
Edwin B Wilson and Jane Worcester. The law of mass action in epidemiology. *Proceedings of the National Academy of Sciences*, 31(1):24–34, 1945

Analysis via bifurcation theory:
W. M. Liu, H. W. Hethcote, and S. A. Levin. Dynamical behavior of epidemiological models with nonlinear incidence rates. *Journal of Mathematical Biology*, 25(4):359–380, 1987

Reviews

Vaccines

"History of Vaccines" web site by the College of Physicians of Philadelphia.

Infectious disease dynamics

Major review:
Hans Heesterbeek, Roy M Anderson, Viggo Andreasen, Shweta Bansal, Daniela De Angelis, Chris Dye, Ken TD Eames, W John Edmunds, Simon DW Frost, Sebastian Funk, et al. Modeling infectious disease dynamics in the complex landscape of global health. *Science*, 347(6227), 2015. URL https://science.sciencemag.org/content/347/6227/aaa4339/

Commentary during COVID-19 pandemic:
C Jessica E Metcalf, Dylan H Morris, and Sang Woo Park. Mathematical models to guide pandemic response. *Science*, 369(6502):368–369, 2020. URL https://science.sciencemag.org/content/369/6502/368

Online lectures

Science communication in relation to epidemics

"Misinfodemic 2020": Carl Bergstrom's plenary talk at the Society for Mathematical Biology (SMB) 2020 annual meeting.

Estimating the initial epidemic growth rate r

J. Ma, J. Dushoff, B. M. Bolker, and D. J. D. Earn. Estimating initial epidemic growth rates. *Bulletin of Mathematical Biology*, 76(1):245–260, 2014. doi: 10.1007/s11538-013-9918-2. URL https://davidearn.mcmaster.ca/publications/MaEtAl2014

David J. D. Earn, Junling Ma, Hendrik Poinar, Jonathan Dushoff, and Benjamin M. Bolker. Acceleration of plague outbreaks in the second pandemic. *PNAS – Proceedings of the National Academy of Sciences of the U.S.A.*, xx(xx):accepted 24 Aug 2020, 2020. doi: 10.1073/pnas.2004904. URL https://doi.org/10.1073/pnas.2004904

Estimating the basic reproduction number $\mathcal{R}_0$

Finding formulae for $\mathcal{R}_0$ from ODE models:
P. van den Driessche and J. Watmough. Reproduction numbers and sub-threshold endemic equilibria for compartmental models of disease transmission. *Mathematical Biosciences*, 180 (Sp. Iss.):29–48, 2002

From r to $\mathcal{R}_0$:
J. Wallinga and M. Lipsitch. How generation intervals shape the relationship between growth rates and reproductive numbers. *Proceedings of the Royal Society B: Biological Sciences*, 274: 599–604, 2007

Understanding generation intervals, which are needed to go from r to $\mathcal{R}_0$:
David Champredon and Jonathan Dushoff. Intrinsic and realized generation intervals in infectious-disease transmission. *Proceedings of the Royal Society B: Biological Sciences*, 282 (1821):20152026, 2015

On COVID-19 $\mathcal{R}_0$ estimation:
Sang Woo Park, Benjamin M. Bolker, David Champredon, David J. D. Earn, Michael Li, Joshua S. Weitz, Bryan T. Grenfell, and Jonathan Dushoff. Reconciling early-outbreak estimates of the basic reproductive number and its uncertainty: framework and applications to the novel coronavirus (SARS-CoV-2) outbreak. *Journal of the Royal Society of London, Interface*, 17:20200144, 2020. doi: 10.1098/rsif.2020.0144. URL http://dx.doi.org/10.1098/rsif.2020.0144

Review of COVID-19 $\mathcal{R}$ and r estimation for the UK:
Roy Anderson, Christl Donnelly, Deirdre Hollingsworth, Matt Keeling, Carolin Vegvari, Rebecca Baggaley, and Rosie Maddren. Reproduction number (R) and growth rate (r) of the COVID-19 epidemic in the UK: methods of estimation, data sources, causes of heterogeneity, and use as a guide in policy formulation. *Royal Society Special Report*, 2020. URL https://royalsociety.org/news/2020/09/set-c-covid-r-rate/

Estimating the effective reproduction number $\mathcal{R}_t$

J. Wallinga and P. Teunis. Different epidemic curves for severe acute respiratory syndrome reveal similar impacts of control measures. *American Journal of Epidemiology*, 160(6):509–516, 2004

E. Goldstein, J. Dushoff, J. Ma, J. Plotkin, D. J. D. Earn, and M. Lipsitch. Reconstructing influenza incidence by deconvolution of daily mortality time series. *PNAS – Proceedings of the National Academy of Sciences of the U.S.A.*, 106(51):21825–21829, 2009. doi: 10.1073/pnas.0902958106

Anne Cori, Neil M Ferguson, Christophe Fraser, and Simon Cauchemez. A new framework and software to estimate time-varying reproduction numbers during epidemics. *American Journal of Epidemiology*, 178(9):1505–1512, 2013

COVID-19 $\mathcal{R}_t$ estimations

An Pan, Li Liu, Chaolong Wang, Huan Guo, Xingjie Hao, Qi Wang, Jiao Huang, Na He, Hongjie Yu, Xihong Lin, et al. Association of public health interventions with the epidemiology of the covid-19 outbreak in Wuhan, China. *JAMA*, 323(19):1915–1923, 2020

Lipsitch *et al.* comment on Pan *et al.* JAMA paper
- notes that Pan *et al.* would not share their data, so they digitized the graph
- Cori *et al.* (`EpiEstim`) does not use WT method

Data camp on estimating $\mathcal{R}_t$ for COVID-19.

Michael Höhle. Effective reproduction number estimation.

COVID-19 papers and resources

Qun Li, Xuhua Guan, Peng Wu, Xiaoye Wang, Lei Zhou, Yeqing Tong, Ruiqi Ren, Kathy SM Leung, Eric HY Lau, Jessica Y Wong, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. *New England Journal of Medicine*, 382:1199–1207, 2020. doi: 10.1056/NEJMoa2001316

Anthony S Fauci, H Clifford Lane, and Robert R Redfield. Covid-19 – navigating the uncharted. *New England Journal of Medicine*, 382:1268–1269, 2020. doi: 10.1056/NEJMe2002387

Richard OJH Stutt, Renata Retkute, Michael Bradley, Christopher A Gilligan, and John Colvin. A modelling framework to assess the likely effectiveness of facemasks in combination

with 'lock-down' in managing the COVID-19 pandemic. *Proceedings of the Royal Society A*, 476(2238):20200376, 2020

DE's COVID links page