Public health interventions for the COVID-19 response: research and innvations

Till Bärnighausen

Heidelberg Institute of Global Health (HIGH)
Heidelberg University Hospital and Faculty of Medicine, University of Heidelberg

8 July 2020

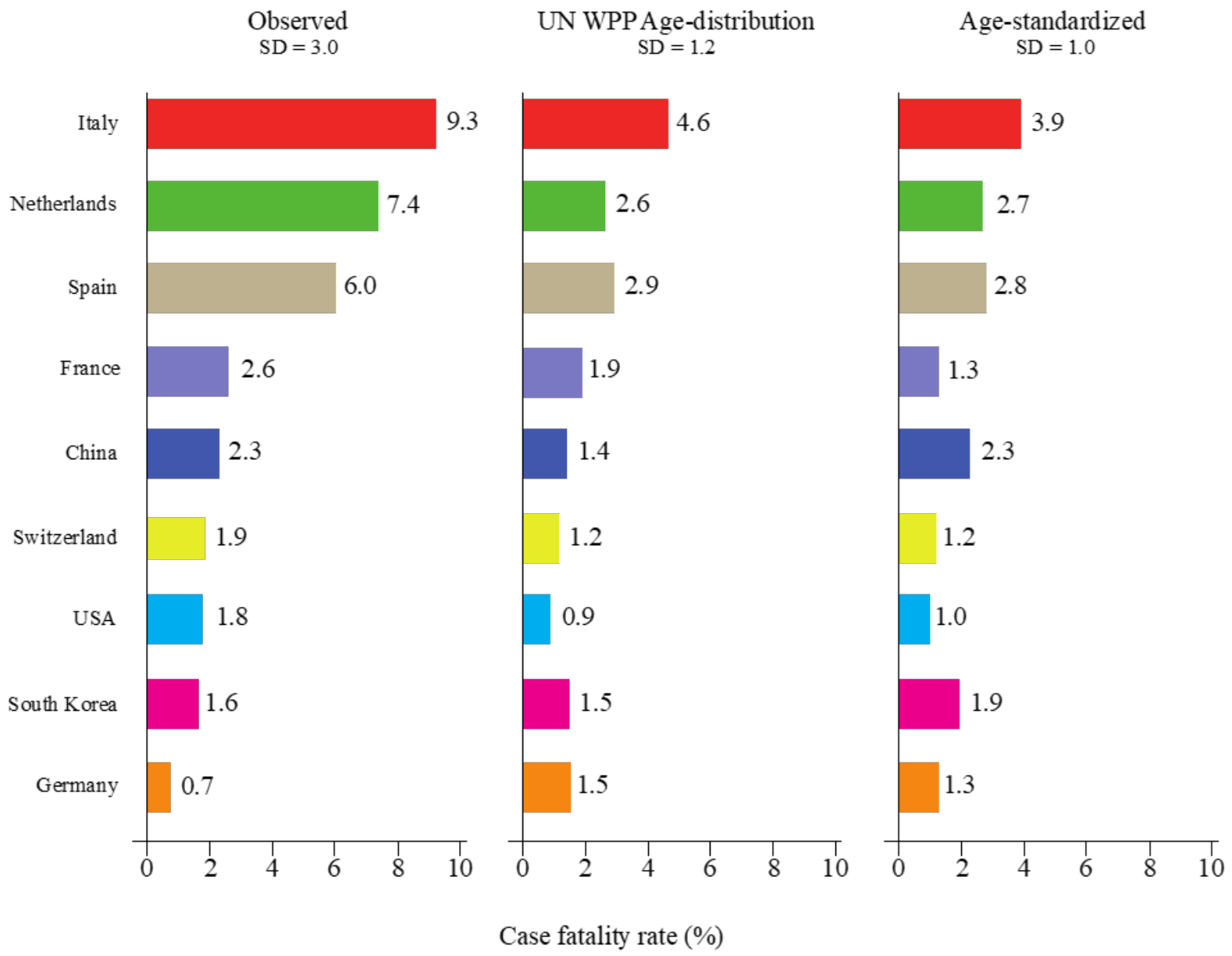
HEIDELBERG UNIVERSITY HOSPITAL

HEIDELBERG FACULTY OF MEDICINE

Alexander von Humboldt Stiftung/Foundation

Adjusting for the age distribution of the COVID-19 epidemic reduces the global gradient in case fatality rates

AGE-ADJUSTED COMPARISONS



Sudharsanan, Didzun, Bärnighausen, Geldsetzer *(under review)* 2020

COVID-19 research and innovations

- Isolation
- Detection
- Habits

COVID-19 research and innovations

- **Isolation**
- Detection
- Habits

New epidemics require new solutions

CONCEPT OF FANGCANG SHELTER HOSPITALS

Fangcang shelter hospitals: a novel concept for responding to public health emergencies

Simiao Chen, Zongjiu Zhang*, Juntao Yang, Jian Wang, Xiaohui Zhai, Till Bärnighausen†, Chen Wang†*

Fangcang shelter hospitals are a novel public health concept. They were implemented for the first time in China in February, 2020, to tackle the coronavirus disease 2019 (COVID-19) outbreak. The Fangcang shelter hospitals in China were large-scale, temporary hospitals, rapidly built by converting existing public venues, such as stadiums and exhibition centres, into health-care facilities. They served to isolate patients with mild to moderate COVID-19 from their families and communities, while providing medical care, disease monitoring, food, shelter, and social activities. We document the development of Fangcang shelter hospitals during the COVID-19 outbreak in China and explain their three key characteristics (rapid construction, massive scale, and low cost) and five essential functions (isolation, triage, basic medical care, frequent monitoring and rapid referral, and essential living and social engagement). Fangcang shelter hospitals could be powerful components of national responses to the COVID-19 pandemic, as well as future epidemics and public health emergencies.

Published Online
April 2, 2020
https://doi.org/10.1016/S0140-6736(20)30744-3

*Co-first authors

†Co-senior authors

Heidelberg Institute of Global Health, Faculty of Medicine and University Hospital, Heidelberg University, Heidelberg, Germany (S Chen ScD, Prof T Bärnighausen MD); **Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China** (S Chen, Prof T Bärnighausen, Prof C Wang MD); **National Health Commission of the People's Republic of China, Beijing, China** (Z Zhang BS); **State Key Laboratory of Medical Molecular Biology, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China** (J Yang PhD); **National**

Introduction

Fangcang shelter hospitals were developed and used for the first time in China to tackle the coronavirus disease 2019 (COVID-19) outbreak.[1] The term Fangcang, which sounds similar to Noah's Ark in Chinese, was borrowed from military field hospitals,[2,3] but it refers to a novel concept: large, temporary hospitals built by converting public venues, such as stadiums and exhibition centres, into health-care facilities to isolate patients with mild to moderate symptoms of an infectious disease from their familes and communities, while providing medical care, disease monitoring, food, shelter, and social activities.

or critical disease.[5,6] Health workers at Fangcang shelter hospitals can transfer patients to higher-level hospitals for more complex treatment if their conditions worsen.[6] Fangcang shelter hospitals can also offer emotional and social support to help patients recover and thrive during an otherwise disruptive period in their lives.[6] In this report, we document the conception and development of Fangcang shelter hospitals during the COVID-19 outbreak in China, describe their key characteristics and essential functions, discuss critical issues for the success of Fangcang shelter hospitals, and consider applications of the concept as part of the COVID-19 public

New solutions can integrate ‘classic’ public health functions

CONCEPT OF FANGCANG SHELTER HOSPITALS

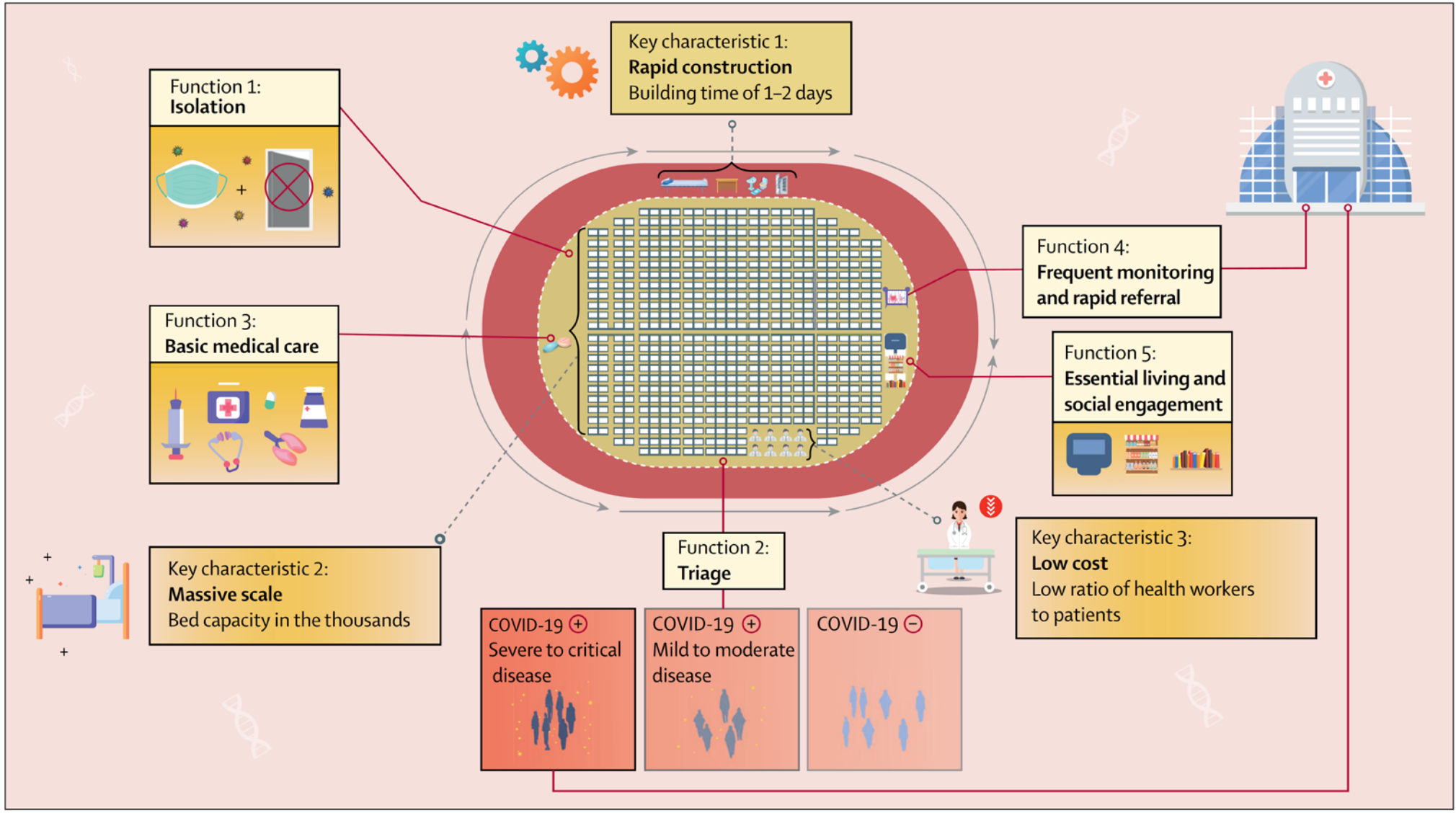


Figure 3: **Key characteristics and essential functions of Fangcang shelter hospitals**
COVID-19=coronavirus disease 2019.

Chen, Zhang, Yang, Wang, Zhai, Bärnighausen & Wang *Lancet* 2020

Wuhan city rapidly increased its hospitalization capacity

FANGCANG SHELTER HOSPITALS IN WUHAN

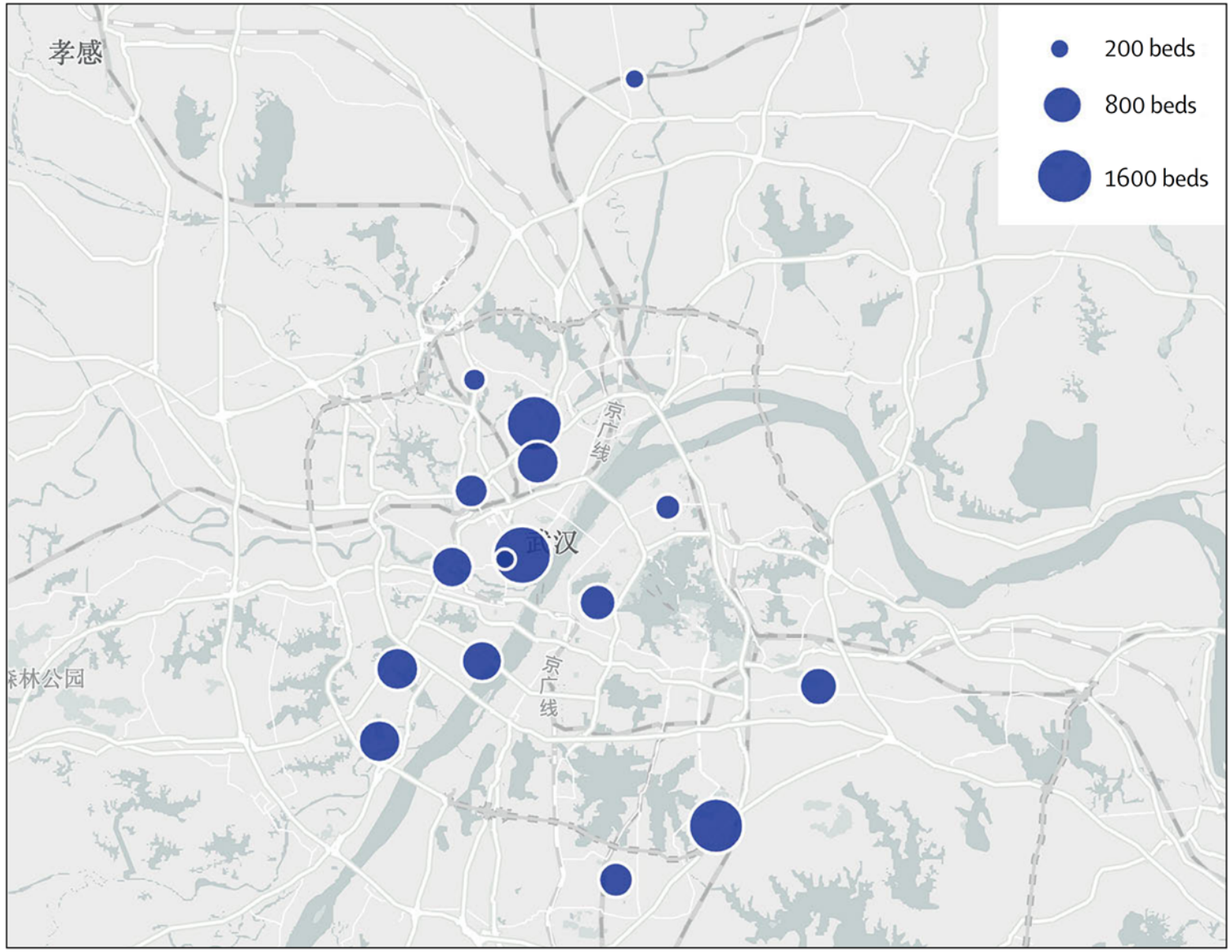


Figure 4: **Fangcang shelter hospital locations and capacities during the coronavirus disease 2019 outbreak in Wuhan, China**

Circle size is proportional to the number of hospital beds in each Fangcang shelter hospital.

Chen, Zhang, Yang, Wang, Zhai, Bärnighausen & Wang *Lancet* 2020

… and controlled the first phase of the epidemic

FANGCANG SHELTER HOSPITAL PATIENT FLOWS

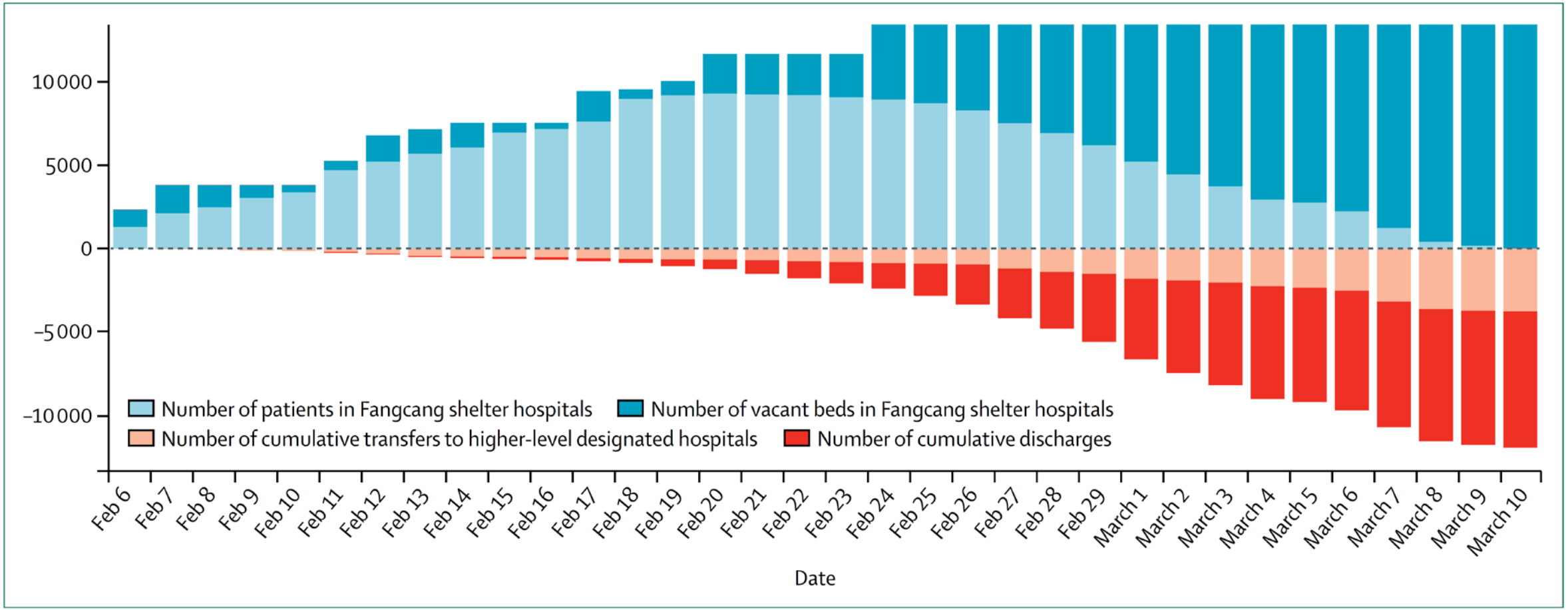
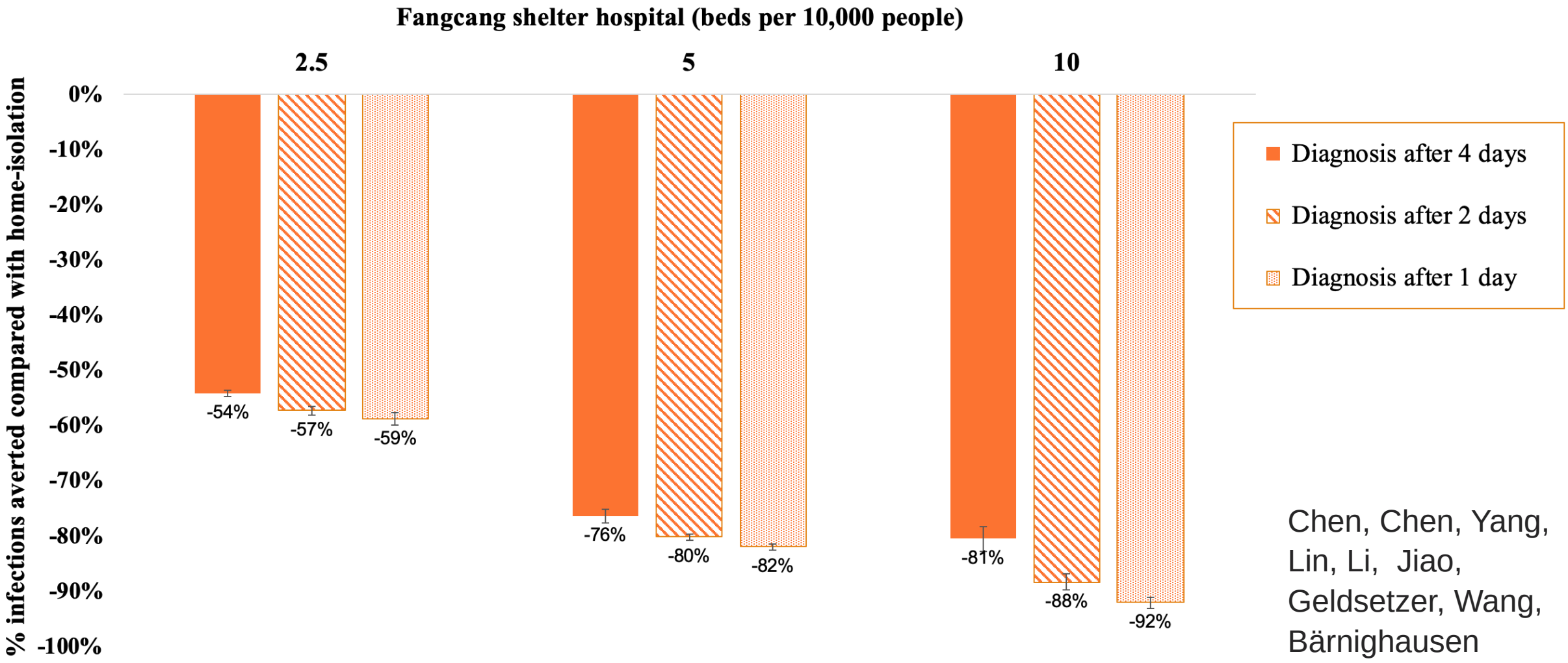


Figure 1: **Fangcang shelter hospital patient flows during the coronavirus disease 2019 outbreak in Wuhan, China**
All dates are in 2020.

Chen, Zhang, Yang, Wang, Zhai, Bärnighausen & Wang *Lancet* 2020

Countries can learn from each other

IMPACT OF FANGCANG SHELTER HOSPITALS IN US, SIMULATION RESULTS



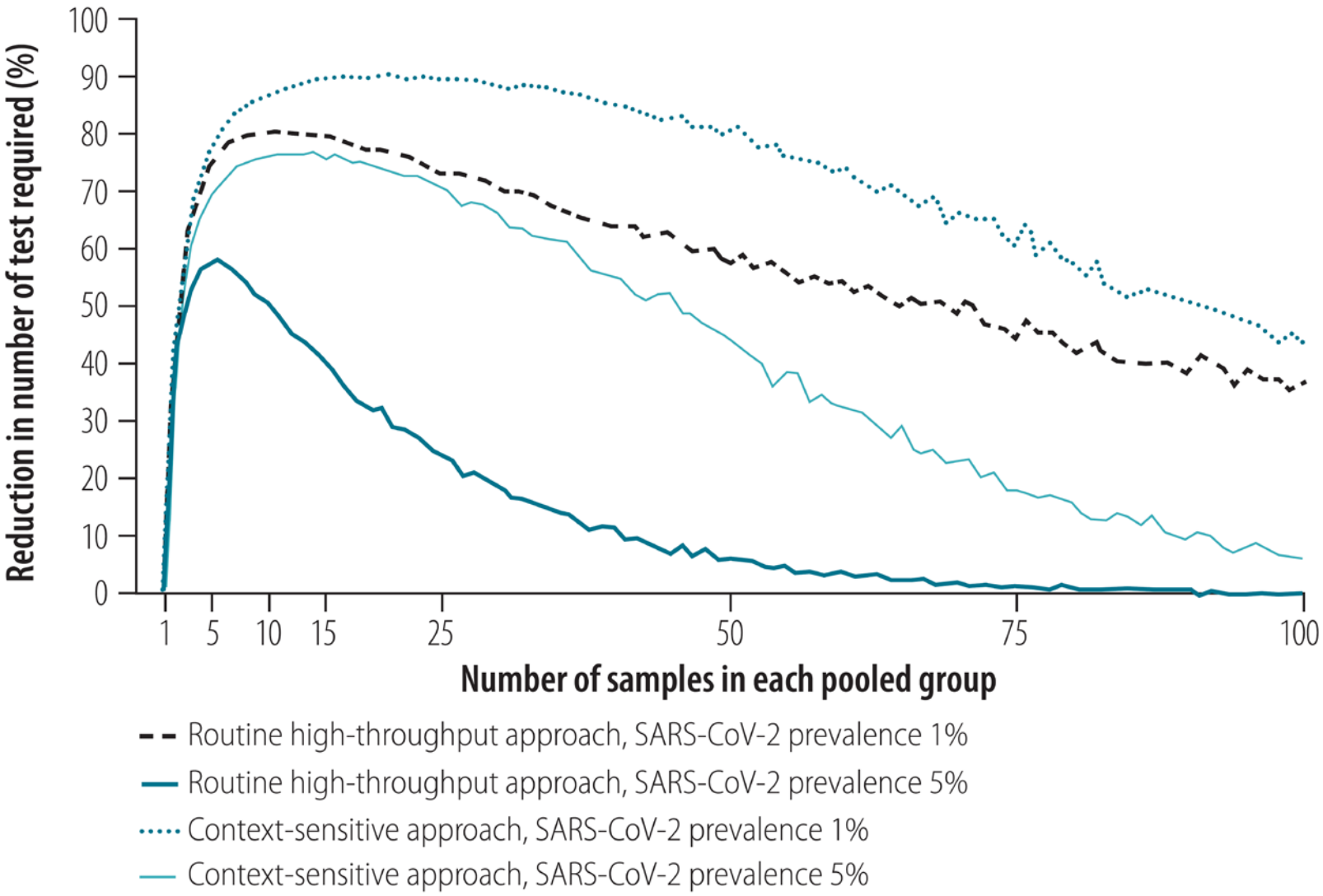
Chen, Chen, Yang, Lin, Li, Jiao, Geldsetzer, Wang, Bärnighausen *(submitted)* 2020

COVID-19 approaches and impact

- Isolation
- **Detection**
- Habits

We can leverage the pandemics spatial clustering for resource reduction

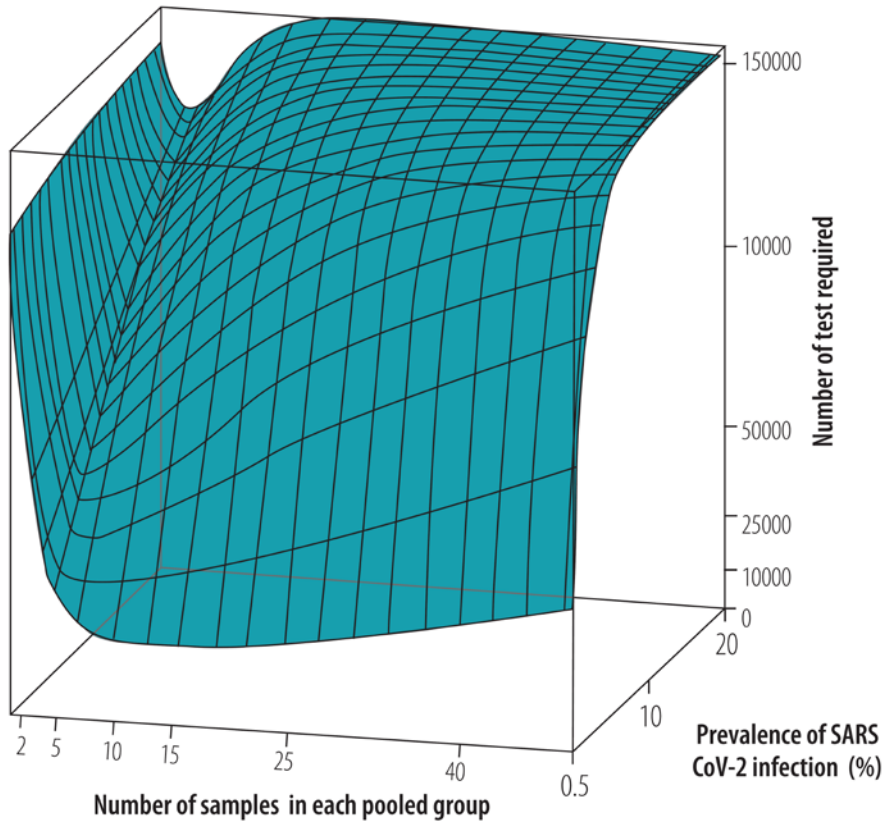
‘ROUTINE HIGH-THROUGHPUT SCREENING’ VS. ‘CONTEXT-SENSITIVE SCREENING’



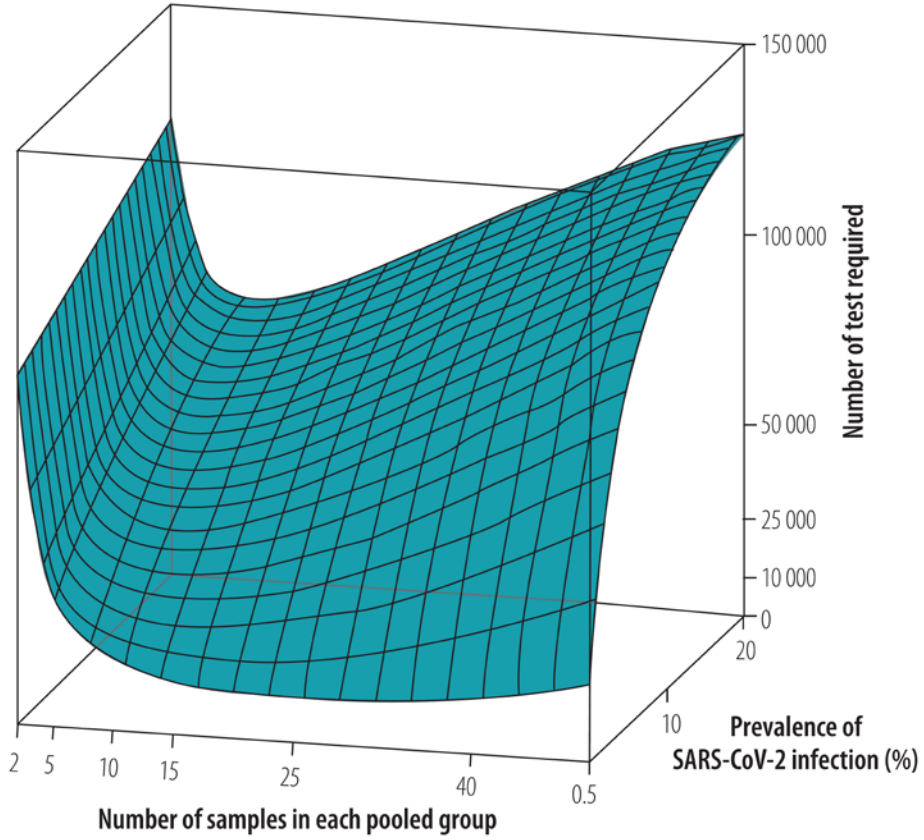
Deckert, Bärnighausen, Kyei *Bulletin of the World Health Organization* 2020

Exploiting clustering, robust resource minima emerge

‘ROUTINE HIGH-THROUGHPUT SCREENING’ VS. ‘CONTEXT-SENSITIVE SCREENING’



SARS-CoV-2: severe acute respiratory syndrome coronavirus 2.
Notes: The routine high-throughput approach involved analysing pooled samples from heterogeneous groups of people of a defined size for real-time polymerase chain reaction testing for SARS-CoV-2. Our simulation considered a population of 150 000. Although the figure shows a continuous variation in tests required, in the simulation both prevalence and group size were varied in discrete steps.



SARS-CoV-2: severe acute respiratory syndrome coronavirus 2.
Notes: The context-sensitive approach involved analysing pooled samples from groups of similar people of a defined size for real-time polymerase chain reaction testing for SARS-CoV-2. Our simulation considered a population of 150 000. Although the figure shows a continuous variation in tests required, in the simulation both prevalence and group size were varied in discrete steps.

Deckert, Bärnighausen, Kyei *Bulletin of the World Health Organization* 2020

“Determining the epidemiological parameters of COVID-19 through sero-surveillance with Dried Plasma Spots and nested household transmission studies in rural Kenya and South Africa”

HORIZON 2020 EDCTP GRANT

European Commission

HORIZON 2020

EDCTP

COVID-19 approaches and impact

- Isolation
- Detection
- **Habits**

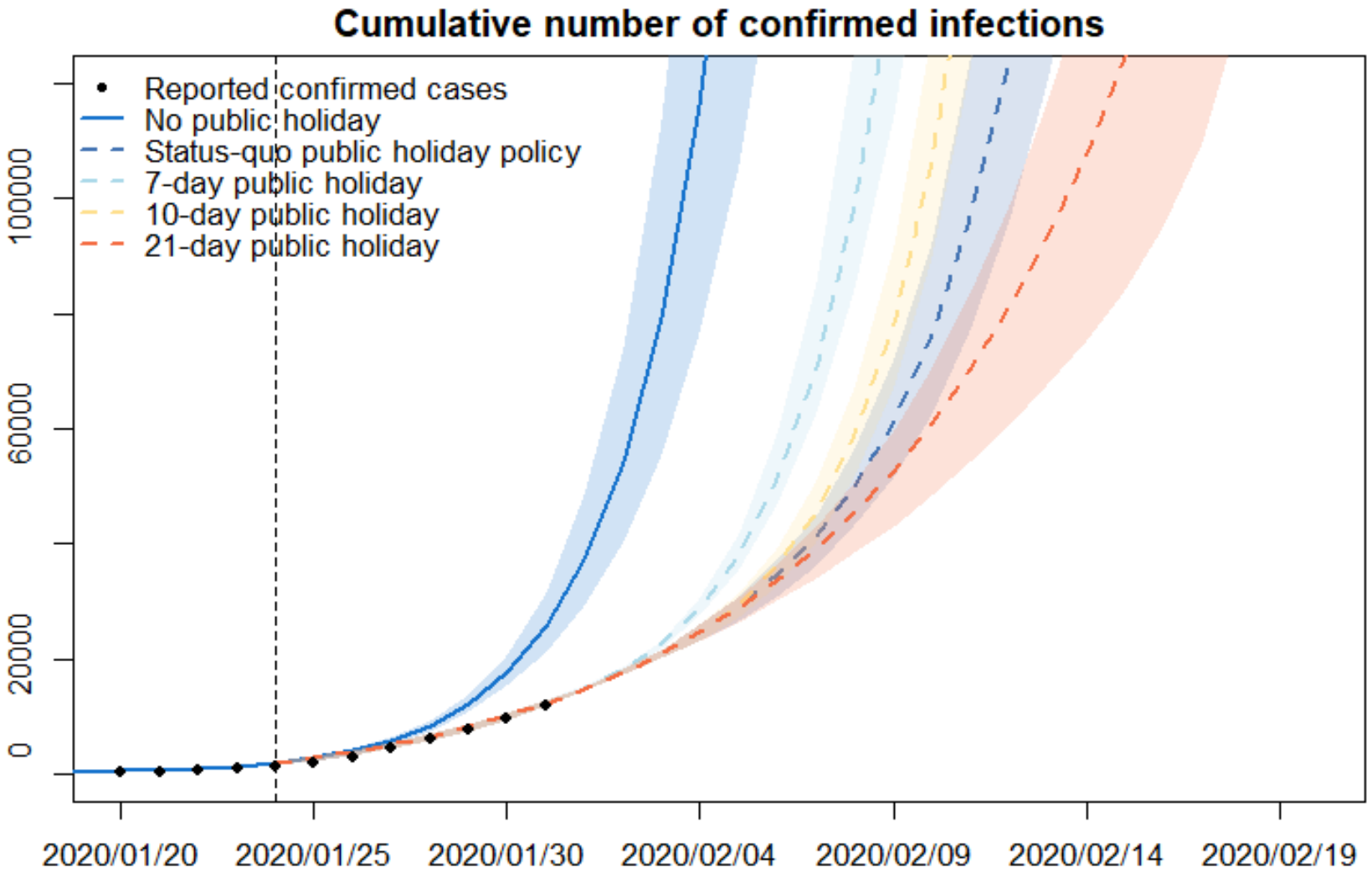
New epidemics may require new policies

CHINA'S LOCKDOWN

Chen, Yang, Zhang, Wang & Bärnighausen *Lancet* 2020

China's geographical lockdown bought time

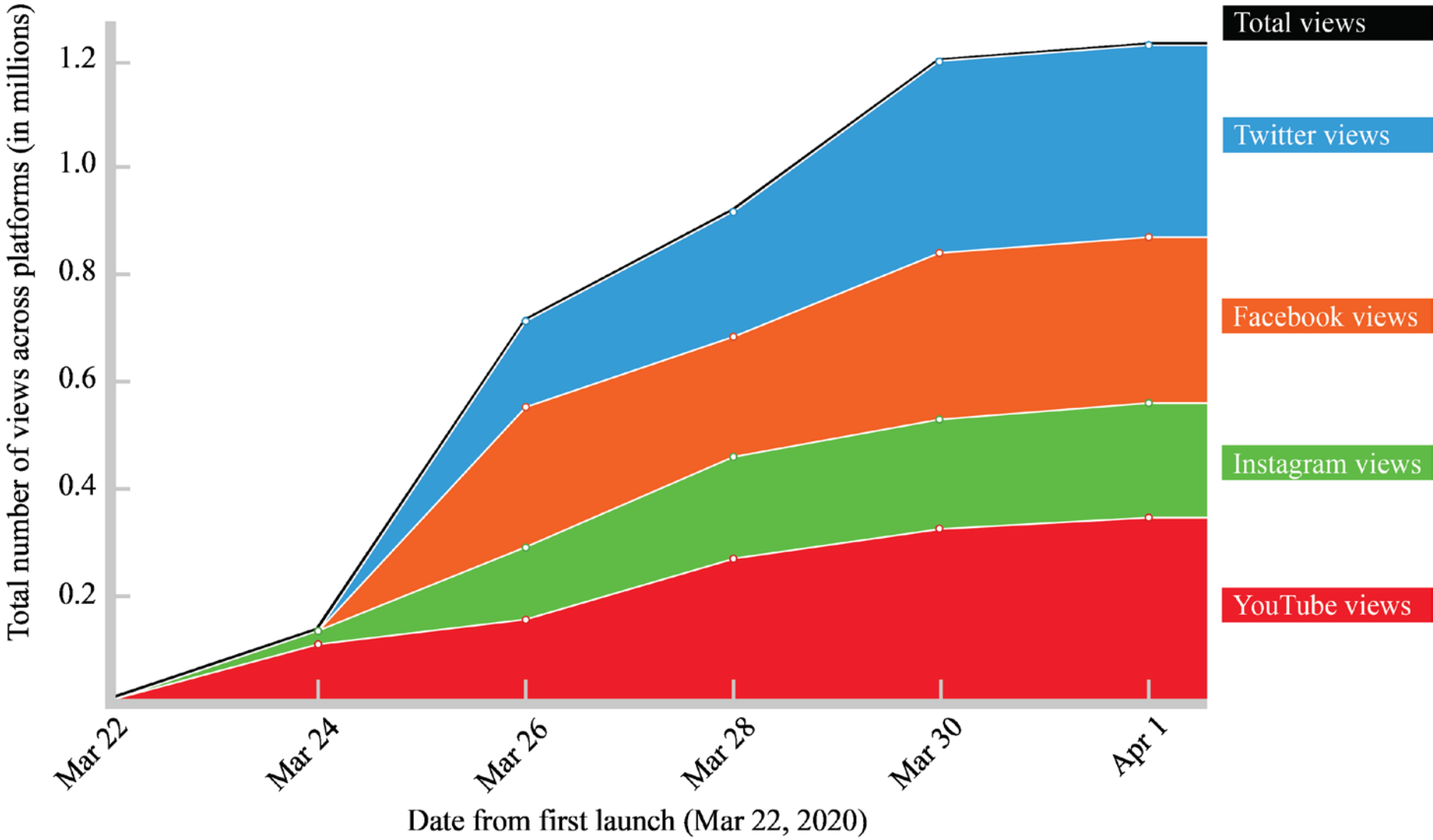
SIMULATION RESULTS



Chen, Chen, Yang, Xue, Liu, Yang, Wang, Bärnighausen
Engineering (forthcoming)

Education-entertainment videos can rapidly reach people in virtual spaces

COVID VIDEO VIEWS

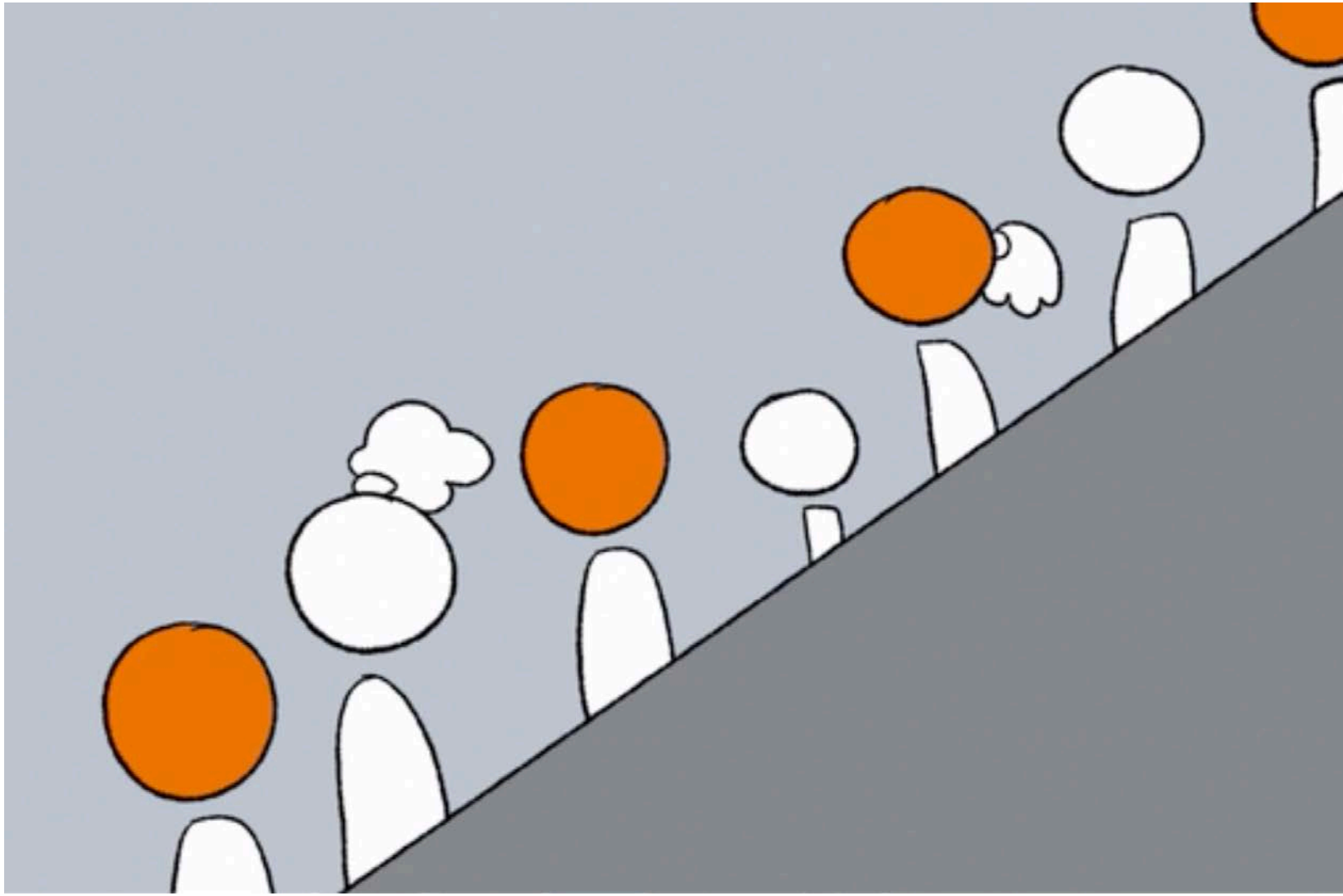


Adam, Bärnighausen & McMahon *Journal of Global Health* 2020

We are currently testing the effects of COVID-19 E-E videos on knowledge and intent

https://www.youtube.com/watch?v=9KcqPNplFqI

RANDOMIZED CONTROLLED TRIAL



Vandormael, Adam, Greuel and Bärnighausen *Trials* 2020

Vandormael *et al. Trials* (2020) 21:469
https://doi.org/10.1186/s13063-020-04449-1

Trials

LETTER Open Access

A short, animated video to improve good COVID-19 hygiene practices: a structured summary of a study protocol for a randomized controlled trial

Alain Vandormael[1,2*], Maya Adam[3], Merlin Greuel[1] and Till Bärnighausen[1,4,5]

Abstract

Objectives: Entertainment-education (E-E) media can improve behavioral intent toward health-related practices. In the era of COVID-19, millions of people can be reached by E-E media without requiring any physical contact. We have designed a short, wordless, animated video about COVID-19 hygiene practices—such as social distancing and frequent hand washing—that can be rapidly distributed through social media channels to a global audience. The E-E video's effectiveness, however, remains unclear.
The study aims to achieve the following objectives. To:

1. Quantify people's interest in watching a short, animated video about COVID-19 hygiene (abbreviated to CoVideo).
2. Establish the CoVideo's effectiveness in increasing behavioural intent toward COVID-19 hygiene.
3. Establish the CoVideo's effectiveness in improving COVID-19 hygiene knowledge.

COVID-19 induces public health research and innovations

DISCUSSION

- Novel conceptions of space
- New public health functions
  - Isolation
  - Detection
  - Distancing
- Future innovation need for the medium and long terms

World Health Organization