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

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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

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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.

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,²³ 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 families and communities, while providing medical care, disease monitoring, food, shelter, and social activities. Health workers at Fangcang shelter hospitals can transfer patients to higher-level hospitals for more complex treatment if their conditions worsen.⁴ Fangcang shelter hospitals can also offer emotional and social support to help patients recover and thrive during an otherwise disruptive period in their lives.⁵ 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 health response.
New solutions can integrate ‘classic’ public health functions.

**CONCEPT OF FANGCANG SHELTER HOSPITALS**

*Figure 3: Key characteristics and essential functions of Fangcang shelter hospitals*


Chen, Zhang, Yang, Wang, Zhai, Bärnighausen & Wang *Lancet* 2020
Wuhan city rapidly increased its hospitalization capacity

FANGCANG SHELTER HOSPITALS IN WUHAN

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

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.
... 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’

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.

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
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

Adam, Bärnighausen & McMahon Journal of Global Health 2020
We are currently testing the effects of COVID-19 E-E videos on knowledge and intent.

RANDOMIZED CONTROLLED TRIAL

Vandormael, Adam, Greuel and Bärnighausen *Trials* 2020

https://www.youtube.com/watch?v=9KcqPNpIFqI
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\textsuperscript{1,2*}, Maya Adam\textsuperscript{3}, Merlin Greuel\textsuperscript{1} and Till Bärnighausen\textsuperscript{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