The Critical Importance of Expert Statistical Input in Managing Epidemics

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We thank the organisers of this workshop for the opportunity to present our thoughts,

and congratulate them on arranging a very timely discussion amongst a diverse group of scientists and other interested parties.

Agenda

1. Some vital questions relating to management of a pandemic
2. Our suggested response

A basic reference for our work:

N. I. Fisher & D. J. Trewin (2021), "A proposal to enhance national capability to manage epidemics: The critical importance of expert statistical input including official statistics". *Statistical Journal of the IAOS* **37**, 1 – 17. 2021. DOI: 10.3233/SJI-210808

Basic message

Clear, disinterested, informed and reasonable

professional statistical information needs to be resonating

at the highest level of governments around the world,

in response to current and future pandemics.

Vital questions: critical known unknowns

Ongoing availability of reliable, timely information
about several variables is essential
for efficient and effective management of a virus;
in particular, as input to predictive models,
and to understand key epidemiological aspects.

Vital questions: critical known unknowns

For example, what are the numbers of people who – *at this point in time* –

1. haven't contracted the virus
2. have the virus but are asymptomatic
3. have the symptoms but have not yet been tested
4. are suffering from COVID-19-related illnesses
5. have had the virus and recovered
6. have recovered and then been re-infected

and whom an infected person might infect (the *Reproduction co-efficient*);

and how do these vary with

- time?
- other interesting covariates – spatial, socio-economic, …?

Vital questions: critical known unknowns

- In most countries, there has been almost complete reliance of data from the tested population. This is not a representative population and the extent of representation is dependent on testing availability.
- After well over two years of governments being fully aware of the problems being posed by COVID-19, very few countries have started routine capture of the data required to answer some of these questions.

Vital questions: critical known unknowns

- In most countries, there has been almost complete reliance of data from the tested population. This is not a representative population and the extent of representation is dependent on testing availability.
- After well over two years of governments being fully aware of the problems being posed by COVID-19, very few countries have started routine capture of the data required to answer some of these questions.
- ***Indeed, in which countries are leading government officials even asking them?***

Our suggested response

Develop and implement a Pandemic Information Plan

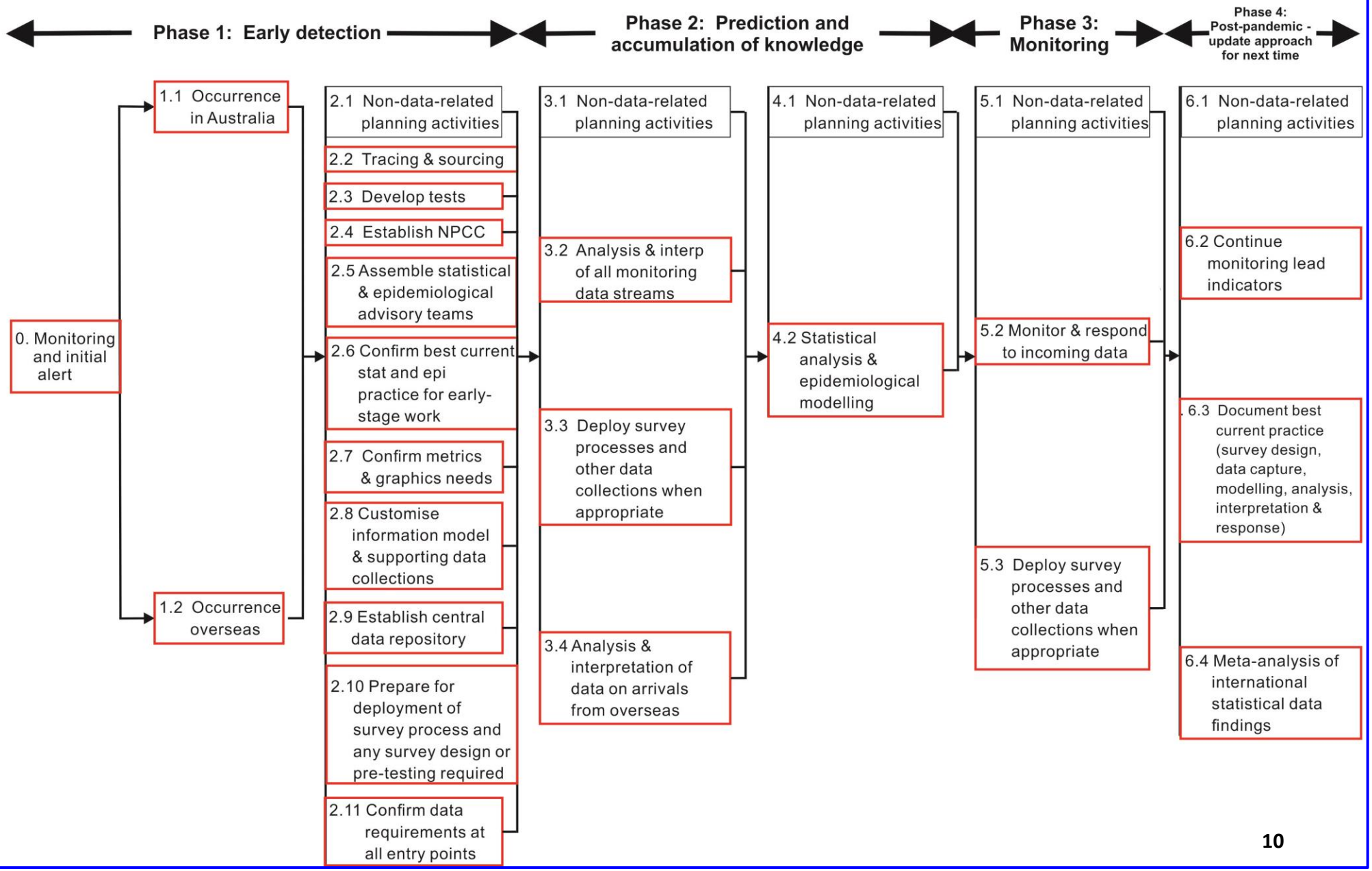
- anticipate rather than react
- involve the right sorts of people at the right time
- *at the beginning of a likely pandemic, design and launch ongoing processes to capture timely and actionable data*

We had (and have!) in mind, something like the following:

Pandemic Management Process

emphasizing tasks requiring statistical expertise

(See Fisher & Trewin 2021)



Key aspects of such a plan

Distinguish the main phases:

1. Early detection
2. Prediction of progress and accumulation of knowledge
3. Monitoring
4. Post-pandemic planning

Phase 1

The main phases:

1. **Early detection**
2. Prediction of progress and accumulation of knowledge
3. Monitoring
4. Post-pandemic planning

Early detection: activities include

- Assembling statistical, epidemiological and health care teams
- Establishing a central data repository
- Confirming data requirements at “entry” points (overseas and arrival)
- Preparing for deployment of survey and other sampling processes
- Confirming metrics and graphics needs
- Customising the information model and supporting data collections

Phases 2 & 3

The main phases:

1. Early detection
2. **Prediction of progress and accumulation of knowledge**
3. **Monitoring**
4. Post-pandemic planning

Prediction of progress, accumulation of knowledge, and monitoring:

- Analysing and interpreting all monitoring streams, including arrivals data
- Statistical analysis and ongoing modelling
- Ongoing communications in non-technical language

and especially,

- Designing and deploying a national continuous probability survey process and other sampling processes (*e.g.* waste water sampling)

Phase 4

The main phases:

1. Early detection
2. Prediction of progress and accumulation of knowledge
3. Monitoring
4. **Post-pandemic planning**

Post-pandemic planning

- Update plan for next time
- Document best current practice (survey design, data capture, analysis, modelling, interpretation, response, …)
- Meta-analysis of international statistical findings
- …

Critical success factors

1. Professional statisticians involved at the highest level of decision-making.
2. National random continuous survey process* and complementary data capture processes to monitor prevalence and learn about the virus
3. Collaborative teams (data scientists, epidemiologists, health care professionals, …) and modelling intercomparisons
4. Timely and responsible** communications
5. **Emphasis on prediction and prevention, not reaction**

* Content may change over time, *e.g.* to capture vaccination status

* * Appropriate quantification of uncertainty, in plain language

We believe that this is

“Science for Resilience” in action.

Questions and comments