28 April 2023

From spreadsheets to operational outputs

Case studies in enabling human, animal and environmental health intelligence

Dr Uli Muellner – Managing Director Epi-interactive



# What we'll cover...

- 1. Challenges: from data streams to intelligence
- 2. Dashboarding capabilities (R Shiny)
- 3. Case studies

Get inspired!





New Zealand FOOD SAFETY SCIENCE & RESEARCH CENTRE



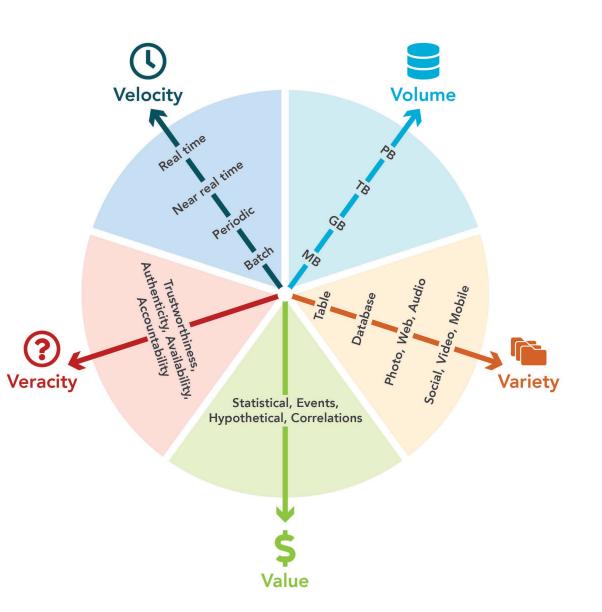
# From data streams to intelligence

# What has changed?

More and more data and we are struggling to use it well.

The Internet has changed the way we receive and process information.

From Surveillance to Intelligence to Decision Advantage



# The challenge

### **Surveillance** (CDC Definition)

The ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice.

### **Bridging the GAP**

### What decision makers are increasingly looking for:

### Intelligence

The ability to read and respond effectively to a situation'. It's all about how you can gather together data in order to make faster, clearer decisions.

### **Decision advantage**

Decision advantage when intelligence enables a decisionmaker to better understand and address an issue. Some comments...

"What is the best way to provide insights into my data?"

"Our data is not in the format right right now to produce meaningful insights"

"I'm not a data scientist or programmer – how easy is it to get started?"

"How long does it take to develop a dashboard?"



# Many tools!

### **Out-of-the box (point and click)**

• Tableau, PowerBI, Qlik

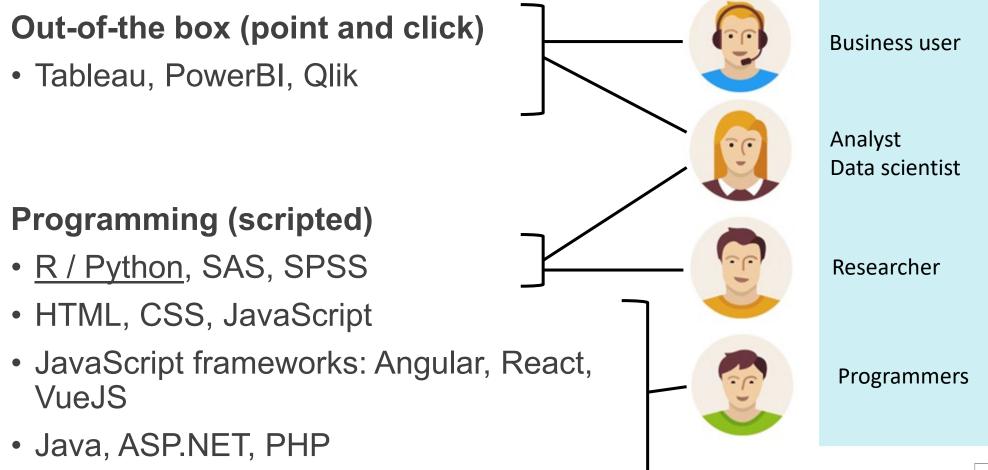
### **Programming (scripted)**

- R / Python (open-source), SAS, SPSS
- HTML, CSS, JavaScript
- JavaScript frameworks: Angular, React, VueJS
- Java, ASP.NET, PHP, C, C++





Who is using it?



# Why we use open source

# Reproducibility

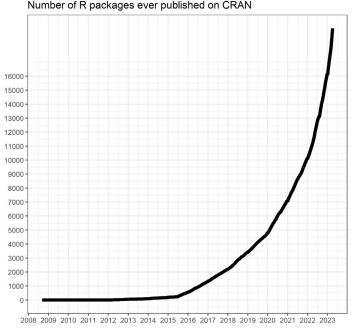
Validated environment

Resiliency No vendor lock-in

## **Participation**

Community vs single vendor

# Accessibility Free access for anybody



Number of R packages ever published on CRAN

Ε **EPI**-interactive

# The R toolset

## R

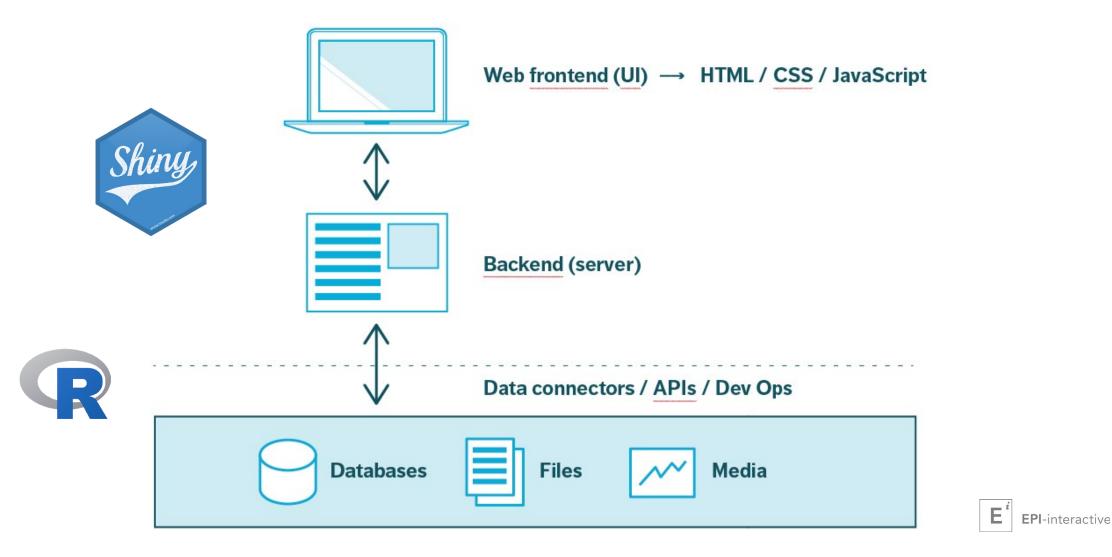
- ETL extract, transform, load
- Model creation, data analytics and science, data visualisation
- Base R, R packages

### **R** outputs

- Markdown, Quarto
- R Shiny for dashboards
- Data access: data connectors, Pins, RDS
- APIs: openCPU, Plumber



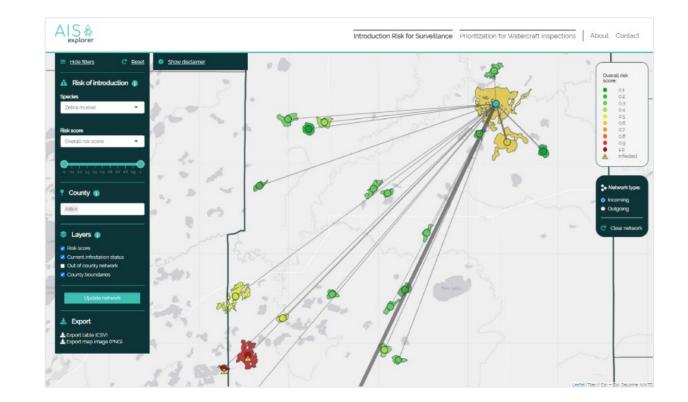
# R Shiny ecosystem



# R Shiny capabilities

# It empowers people!

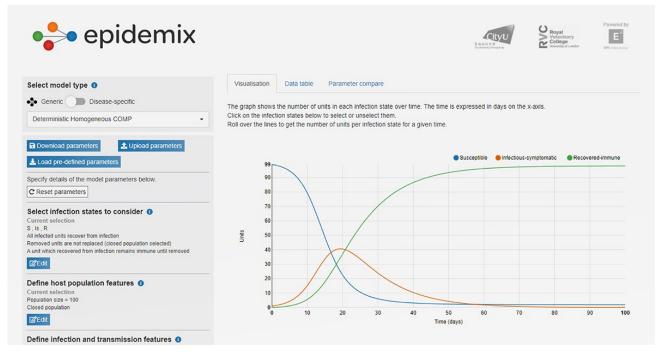
- Custom theming
- Extension with common web technologies
- It's accessible and easy to get started
- It's free





# From R to R Shiny

Natural transition from R to R Shiny!

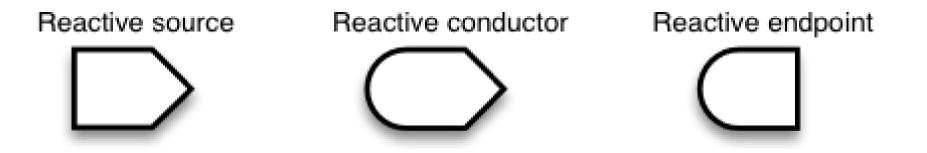


Epidemix.app



# Reactive programming

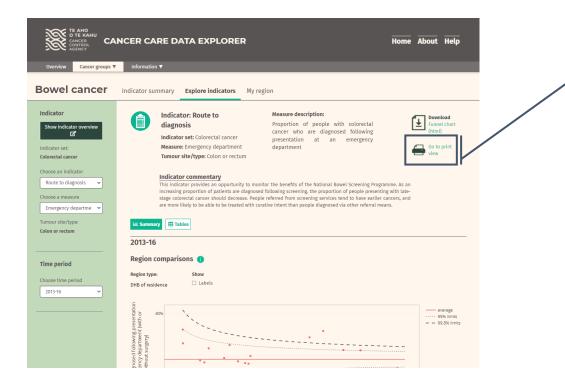
- R Shiny is purpose built for dashboards
- Use of reactive programming
- Isolate behaviour





# Automated reporting

### • Self-service PDF reporting

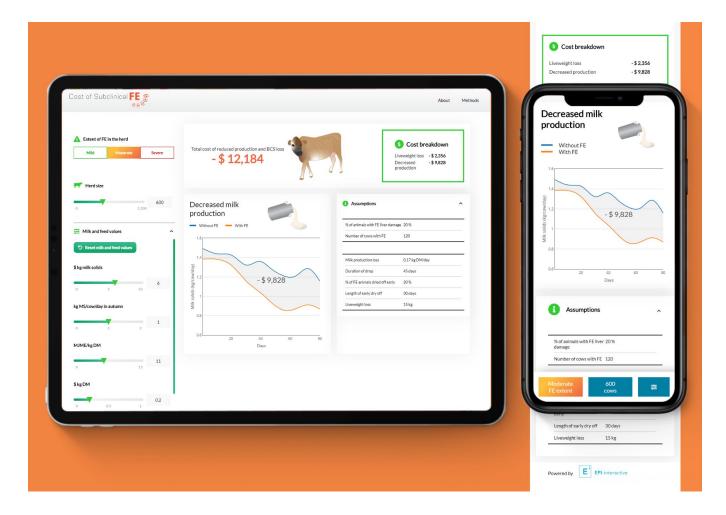


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# Mobile support

- In-built responsiveness
- Built with Bootstrap





# Case study: WHO GLASS

Insights into a global health issue

# The challenge

GLASS: Global antimicrobial resistance and surveillance system

Annual report https://www.who.int/publications/i/item/9789240062702

- 1. Standardised and reproducible way to generate GLASS visualisations for the report
- 2. Complimentary dashboard





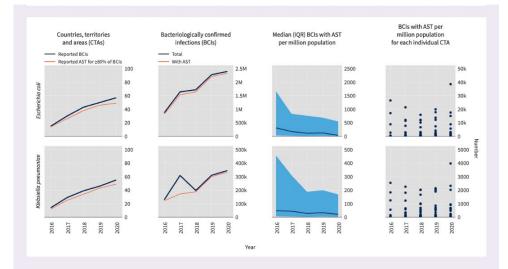
# GLASS Dashboard – AMC data

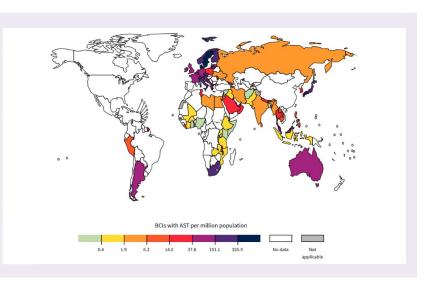
https://worldhealthorg.shinyapps.io/glass-dashboard/

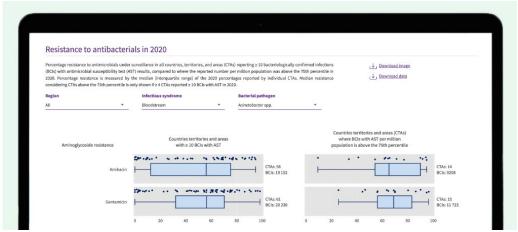


# GLASS Dashboard – AMR data

### https://worldhealthorg.shinyapps.io/glass-dashboard/









# GLASS Dashboard – Country profiles

World Health		
About the GLASS dashboard Global AMC data Global AMR data Country, larritory or area profiles		
GLASS dashboard  COUNTRY, territory or area profiles  The country, territory or area [CT4] filter, considers 216 CTAs. Selecting a CTA will display the envolment status up to 11 <sup>44</sup> . Pecember 2021 envoluted in CLASS up to end of 2021, the data contributed to the 2022 GLASS report is provided where available. You can choose to display AV related data in the filter provided at the bottom of this page.		
Cauntry, Territory or Area United States of America •		
	Country, Territory, Area: United States of America :	
	WHO Region: Region of the Americas	
	WHO Region: Region of the Americas Income group (June 2021, World Bank): High Income	
	WHO Region: Region of the Americas Income group (June 2021, World Bank): High Income GLASS-AMC enrollment year: Not enrolled	

Enhanced Gonococcal AMR surveillance programme (EGASP)

Special studies



# Case study: Climate Matching

Comparing current and future climates

# The challenge

Pest risk analysts frequently ask if the climate of a pest risk analysis area could be suitable for the establishment of an organism of concern.

- Important for biosecurity and border protection
- Builds on multi-year research effort by AgResearch

Dashboard available at: <a href="https://climate.b3nz.org.nz/">https://climate.b3nz.org.nz/</a>

- Collaboration with AgResearch and B3
- Funded by Ministry for Primary Industries





# Climate similarities NZ - World

### Мар

Maps CMI Cells Occurrences

#### Select climate

World 2070 High emissions, NZ 2... 🔻

#### Map view

Climate matching index (CMI)
 Köppen-Geiger climate
 Altitude

#### Show crop areas

Kauri

### Upload occurrences

The table needs to have longitude and latitude of occurrences. Download example for format

#### Select csv file

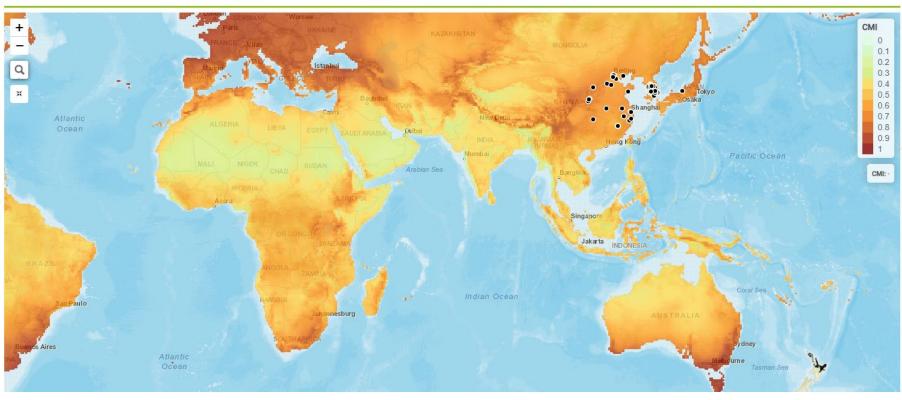
Browse lycorma\_delicatula.csv

### ▲ Download example file

### NZ - World similarities

This map shows the climate similarities between New Zealand and the world.

### Climate similarities between New Zealand and the world



# CMI of uploaded locations

Мар	Maps CMI Cells Occurrences						
Select climate World 2070 High emissions, NZ 2 💌	This feature can be used when uploading occurrences. This graph represents the frequency of climate matching index cells overlapping with unique occurrences. (i.e. if multiple occurrences coincided with a CMI cell, they were counted only once). This graph can be used when the user wants to eliminate the effects of spatial correlation/sampling bias on						
Map view  Climate matching index (CMI)  Köppen-Geiger climate  Altitude	occurrences. Barplot of CMI cells						
Annude	Selected map is all NZ. The occurrences coincided with 51 CMI cells. The proportion of the 51 cells with CMIs >= 0.7 is 47.1%.	📩 Download zip file of results					
Show crop areas Kauri	47.170.	Zip file will contain the barplot (cmi_plot.png), its caption in a separate text file (cmi_caption.txt) and the plotted data (cmi_data.csv). In this dataset the uploaded occurrences will be filtered to one per climate cell.					
Upload occurrences The table needs to have longitude and latitude of occurrences. Download example for format Select csv file Ivcorma_delicatula.csv Upload complete Download example file	25 20 15 10 5 0						
	0.6 0.7 0.8						
	CMI						

# Compare individual climate stations

# Select weather station and climate Region: Asia Country: Hong Kong Station: Hongkong (HKG) Climate: 1985 Select comparison climate Climate: 2070 - High emissions Map View

Default map
 Köppen-Geiger climate
 Altitude
 Show crop areas

None

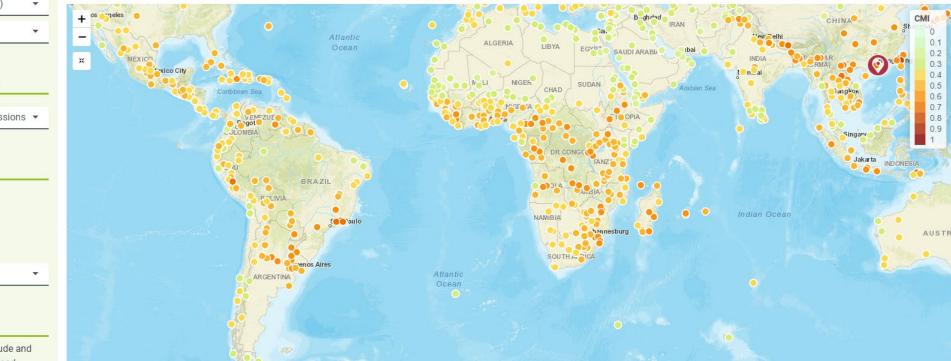
### Upload occurrences

The table needs to have longitude and

### **Choose locations - Map**

This map allows user to compare a weather station's climate against the rest of weather stations.

Weather stations' climate similarities (CMI)





# Compare multiple weather stations



# Case study: Epidemix

Comparing current and future climates

# Connecting science and policy



Professor Dirk Pfeiffer Tierarzt, Dr.med.vet., PhD, MANZCVSc, DipECVPH, FHEA

**City University of Hong Kong** Chow Tak Fung Chair Professor of One Health



•

NZCVSC, DIPECVPH, Hong Kong air Professor







Royal Veterinary College

Cityu

E

Dr Guillaume Fournié

Epidemix https://www.epidemix.app/



Select model type 🕕

- Generic Disease-specific

Deterministic Homogeneous COMP

Download parameters	1 Upload parameters
Ł Load pre-defined parameters	
Specify details of the model parame	eters below.

C Reset parameters

#### Select infection states to consider () Current selection

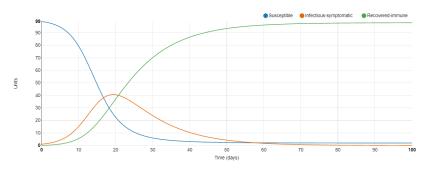
S , Is , R All infected units recover from infection Removed units are not replaced (dosed population selected) A unit which recovered from infection remains immune until removed **CECH** 

Define host population features () Current selection Population size = 100 Closed population

**C**Edit

Visualisation Data Table Parameter compare

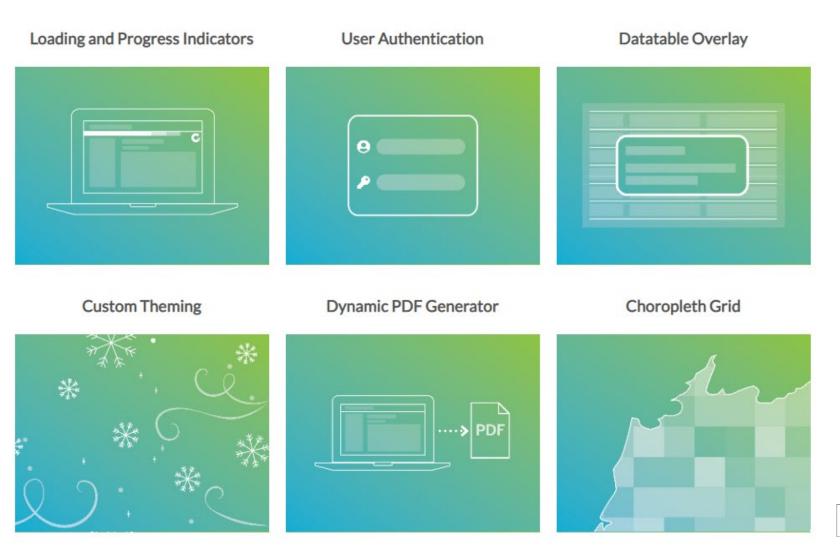
The graph shows the number of units in each infection state over time. The time is expressed in days on the x-axis. Click on the infection states below to select or unselect them. Roll over the lines to get the number of units per infection state for a given time.





# Epi-interactive GitHub

### epi-interactive.github.io



**E**<sup>*i*</sup> **EPI**-interactive

# R Exchange 2023

Our NZ event for R users is back!

For the third year running, we're supporting a local opportunity to connect with other users of R and related open-source software tools. Come and join us at this event to learn how to make the most of R in your work and your organisation.

Learn more and register at <u>epi-interactive.com/events/r-exchange-2023</u>



Friday, 5 May 2023

Wellington, New Zealand



# **Questions?**

- What are your challenges?
- What is your experience with dashboarding tools?
- Any stories to share?

# **Keep in touch**

### Follow us

LinkedIn: linkedin.com/company/epi-interactive Newsletter: Sign up on our website – epi-interactive.com

### Have a project idea?

Email us on info@epi-interactive.com



Posit Full Service Certified Partner



Uli Muellner uli@epi-interactive.com