Bangladesh Evaluation

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Objectives

- Review attributes of a surveillance system
- Discuss assessment for surveillance systems

Post Questions in the Chat!

(we will have breaks to answer these during the workshop)

Workshop Schedule

Time	Topics
2:00–2:10 pm	Background & Mini-Evaluation Outline
2:10–3:00 pm	Bangladesh Assessment
3:00–3:10 pm	Break
3:10–4:00 pm	Time Series & Forecasting

Mini Evaluations

Bangladesh Surveillance

Attributes of Surveillance Systems

Evaluation & Assessment

- Qualitative & quantitative approaches
- Identify gaps
- Make recommendations
- Ideally:
  - involve the stakeholders in performing the evaluation
  - adequate time & resources for validation of data

- collecting evidence
- quantitative: more data, analysis

Mini-Evaluations

1. Describe the surveillance program
   A. health condition/event
   B. purpose of surveillance
   C. operations of surveillance
   D. available resources/facilities
2. State the evaluation purpose (choose some attributes)
3. Present evidence of attributes
4. Make recommendations

Bangladesh: Cholera

Cholera

- Infection by *Vibrio cholerae* with two serotypes (O1 and O139) causing outbreaks
- Global Task Force on Cholera Control
  - reduce cholera deaths by 90% by 2030
  - eliminate cholera from 20/47 high-burden countries
- use of oral cholera vaccines

Cholera

- International Centre for Diarrhoeal Disease Research operating since the 1960s
- National enteric disease surveillance system in 2014
- National cholera control plan in 2019
  - reduce morbidity/mortality by 50% by 2025
  - reduce morbidity/mortality by 90% by 2030

Description

A. health condition/event

B. purpose of surveillance

surveillance

cholera

→ case definitions
- clinical
- lab confirmation

- intervention on source
- cases
  - treated
- communities
  - awareness
  - sanitation /hygiene
  - Oral Vaccinations! mass vaccination

→ - source

who?
- everyone in pop
- missing
- poor access

how serious?
- death
- high burden
- Global Task Force
- adults + children
- high epidemic potential

- pandemic/epidemic
- regular surveillance

Description

C. operations of surveillance

D. available resources/facilities

- outside funding
- lack of funding

- sociodemog
- clinical
- behaviors

laboratories
- samples tested centrally
- sentinel does RDT, epidata

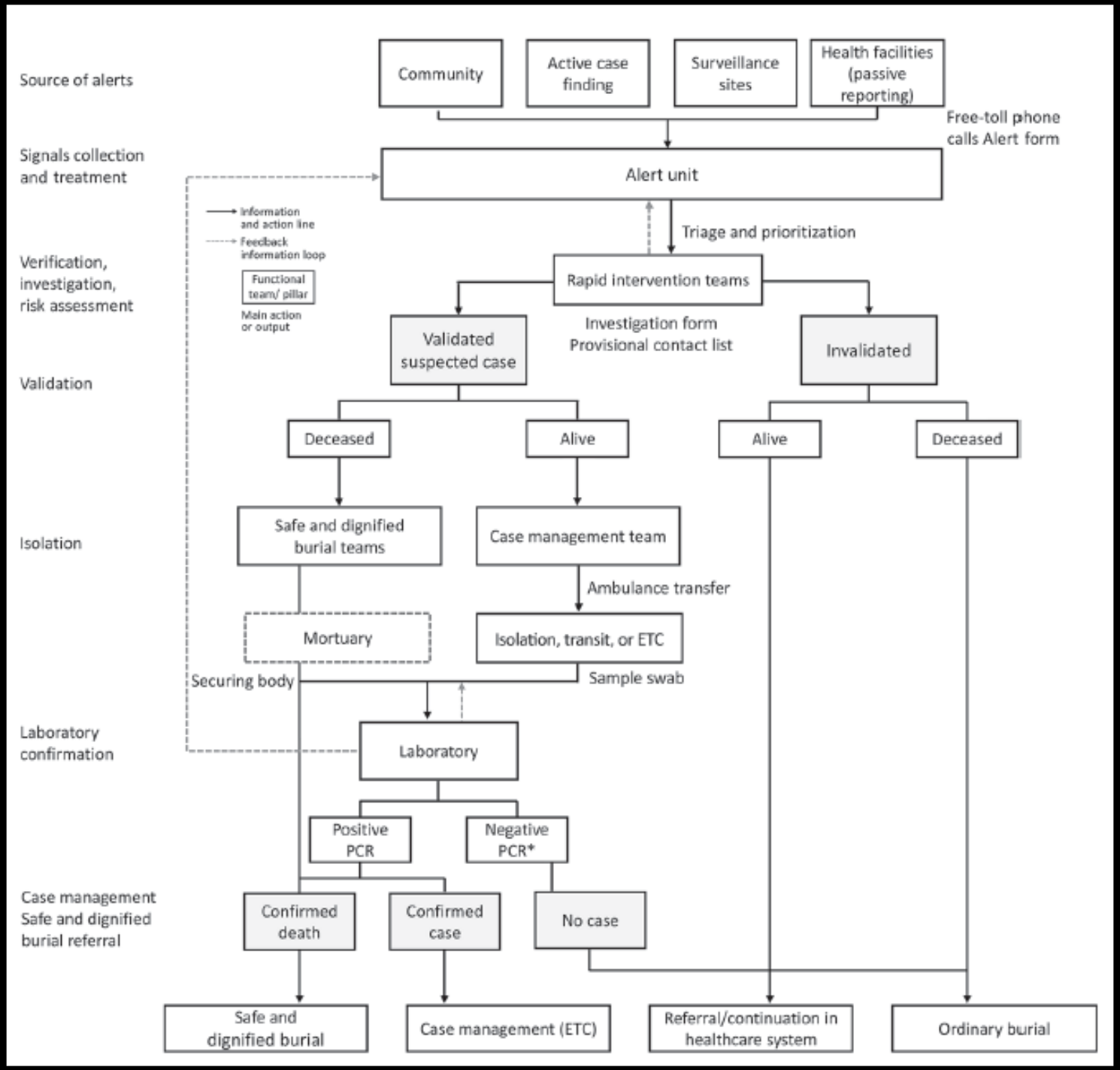
- location
- exposure hx
- anbx hx

- surveillance of diarrheal disease (incl. cholera)

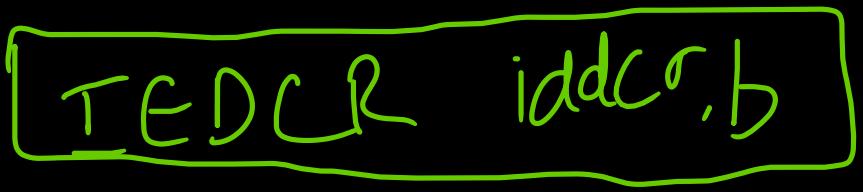
what type? → rota

- active surveillance
- sentinel sites
  - 64 districts
  - 10 sites @ start
  - now: 22 sites in 21 districts → (16 functional)
- admin of reports: IEDCR, icddr,b

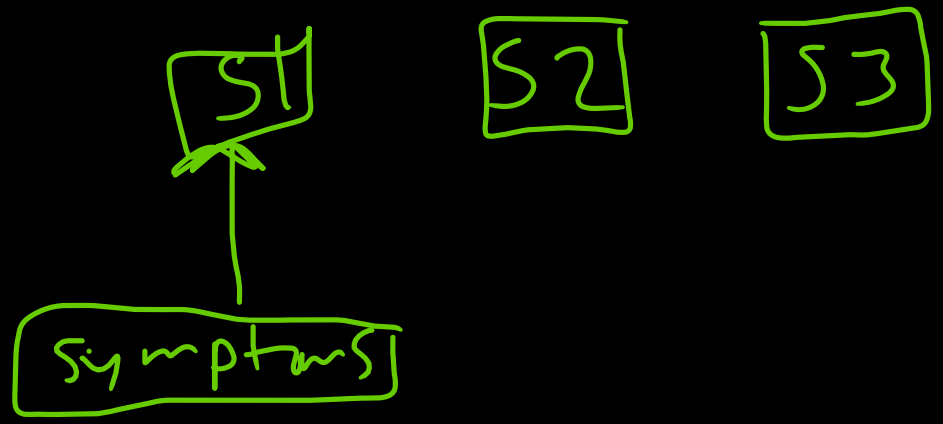
EWARS


Source of alerts
Community
Active case finding
Surveillance sites
Health facilities (passive reporting)
Free-toll phone calls Alert form
Signals collection and treatment
Alert unit
Information and action line
Feedback information loop
Functional team/ pillar
Main action or output
Verification, investigation, risk assessment
Triage and prioritization
Rapid intervention teams
Investigation form
Provisional contact list
Validation
Validated suspected case
Invalidated
Deceased
Alive
Alive
Deceased
Isolation
Safe and dignified burial teams
Case management team
Ambulance transfer
Mortuary
Isolation, transit, or ETC
Securing body
Sample swab
Laboratory confirmation
Laboratory
Positive PCR
Negative PCR*
Case management Safe and dignified burial referral
Confirmed death
Confirmed case
No case
Safe and dignified burial
Case management (ETC)
Referral/continuation in healthcare system
Ordinary burial

Description: Information Flow

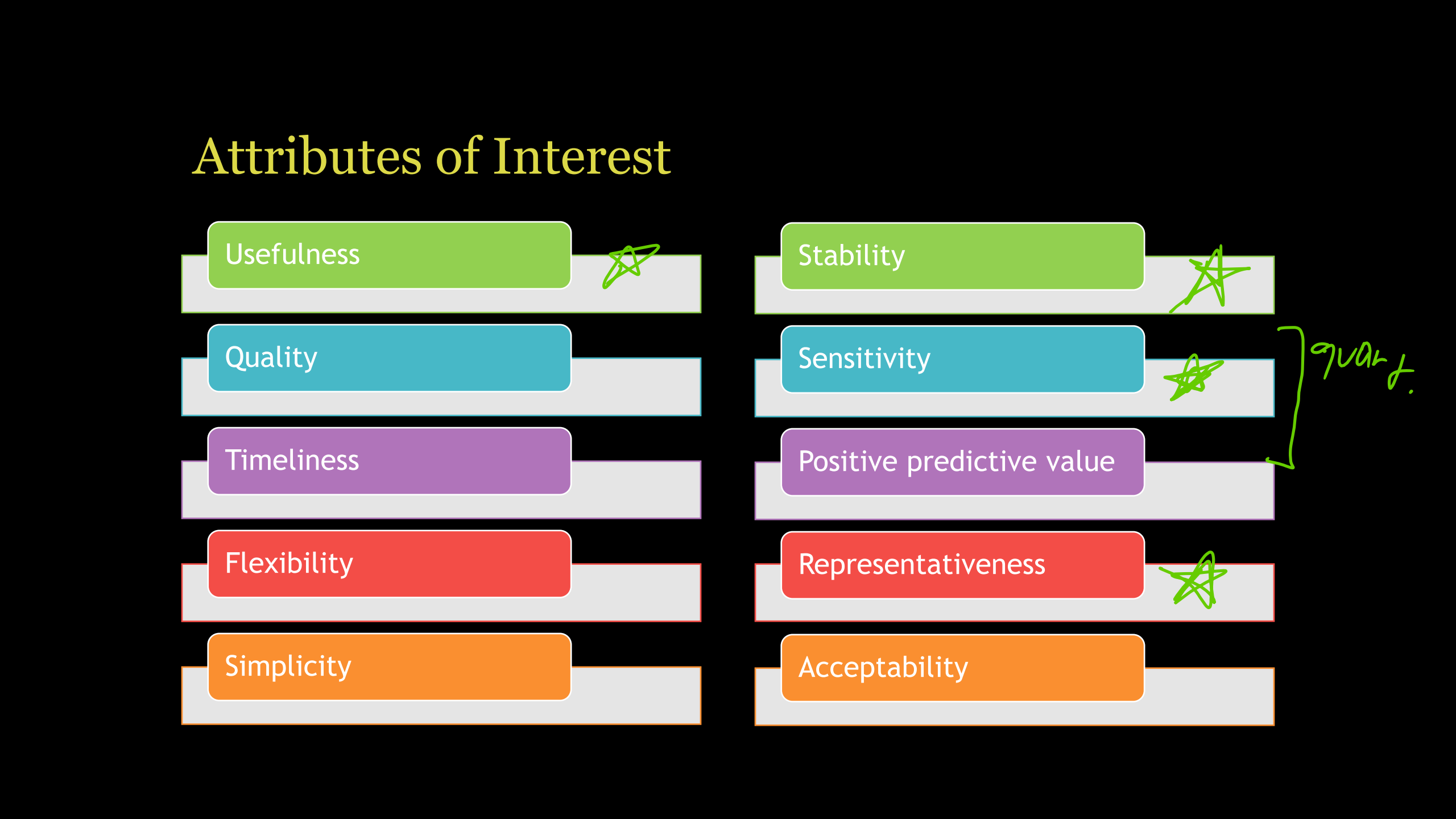


- where does the data go?



Attributes of Interest

- Usefulness
- Quality
- Timeliness
- Flexibility
- Simplicity
- Stability
- Sensitivity
- Positive predictive value
- Representativeness
- Acceptability



Attributes of Interest

- Purpose of evaluation:
- Evaluate the acceptability, usefulness, stability, representativeness, and sensitivity of the cholera surveillance program in Bangladesh

Evidence of Attributes

- # outbreaks detected
- # cases treated
- # cases prevented

quantitative?

surveys
- drs
- public

- check #s

Acceptability

- ease of use
- accessable
- are people willing to use the system?
- who?
  - analysts, epis, reporters, public

Usefulness

- value of system?
- how used to improve PH?
  - ↓ illness, ↓ deaths
  - inform control
  - monitor trends
  - improve
  - answer research ?s

Evidence of Attributes

Representativeness

- comparison with population demographics
- are people/popns being missed?

Stability

- interruptions
  - 16/22 sites functioning
  - early 2016 (funding gap)

- efficiency

Recommendations

- gaps:
  - part of the system integrated

diarrheal surveillan

cholera
- well integrated
- diarrheal network

lab testing
- multiple
- cholera

E. coli
Salmonella
cholera
:

- recommend:
  - stability
    - how to operate surveillance + COVID-19
  - better data management
    - electronic report mHealth
    - automated

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Time Series & Forecasting

Time Series

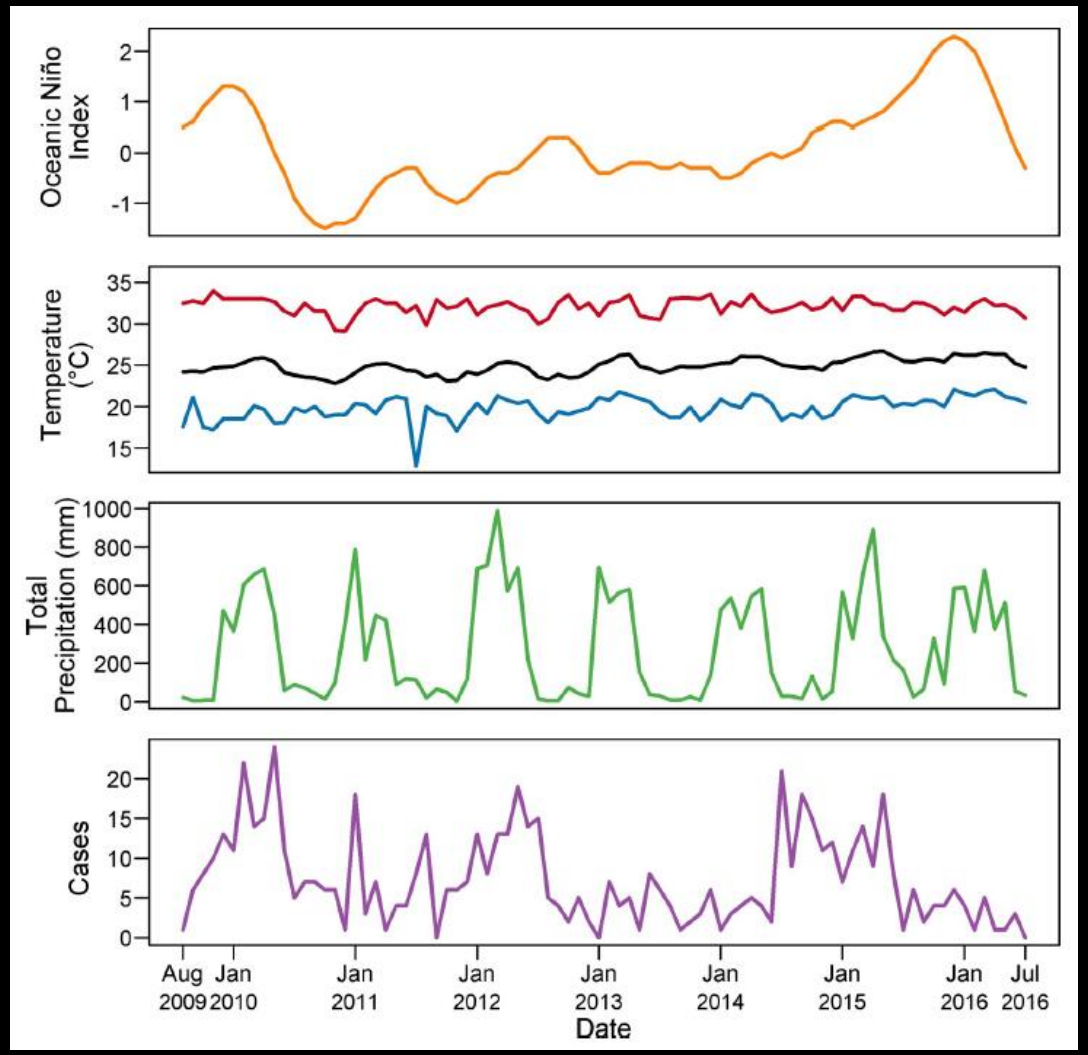
- common visualization for data that occur over regular intervals of time (e.g. daily, weekly)
- also a specific object type in R
  - ts object
  - date start
  - frequency
  - data

forecasting

ts()

#cases
temp
rate

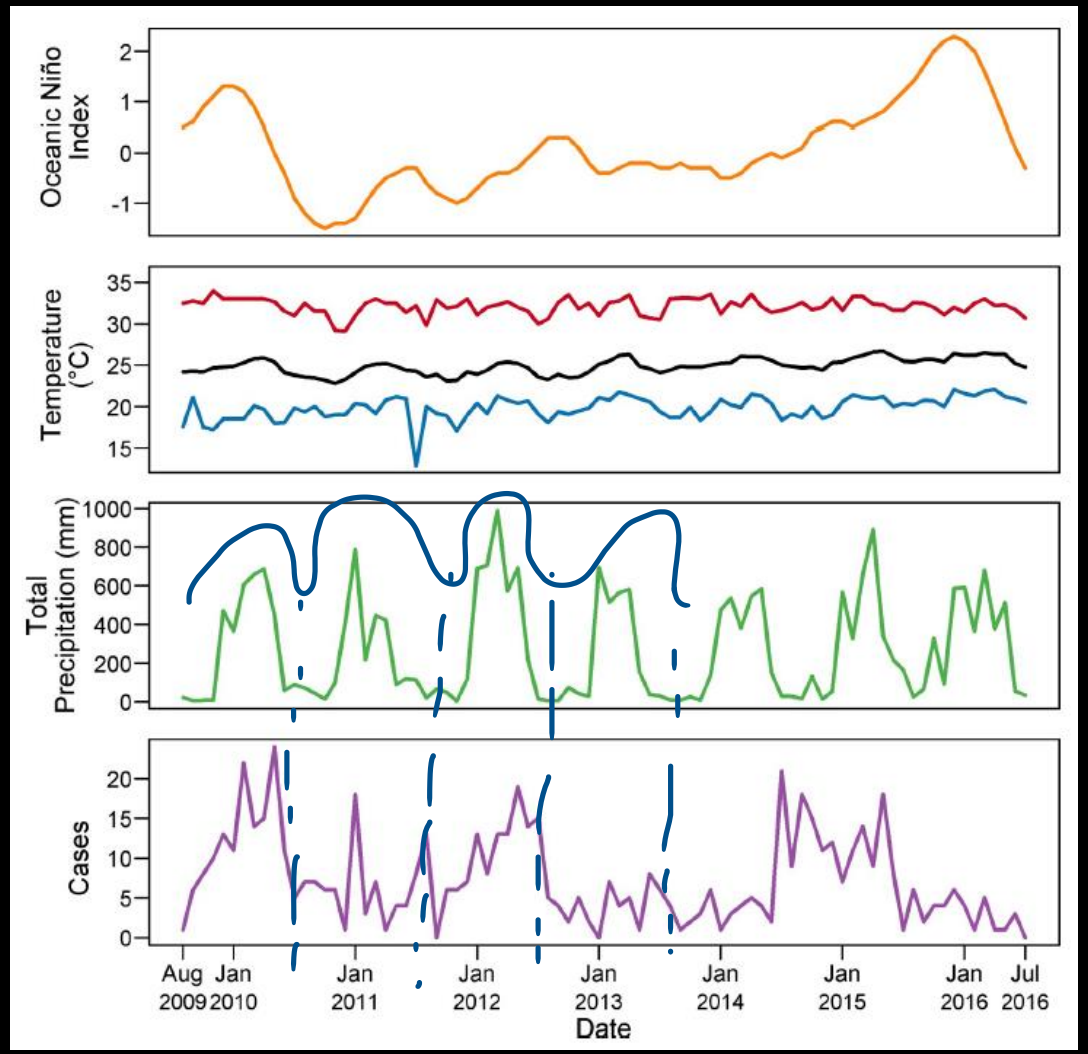
ts(data, 2018, 52)



weekly

Time Series

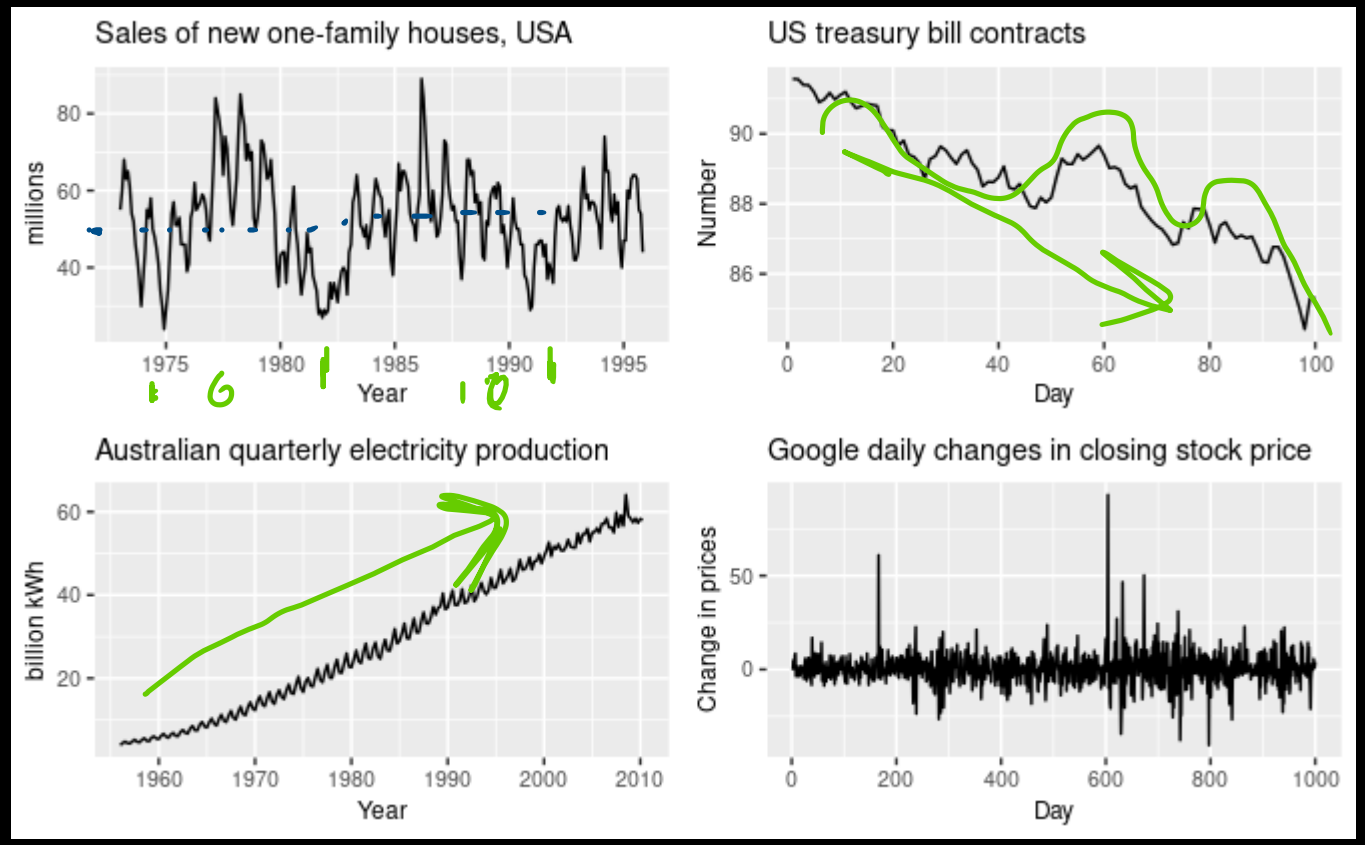
- time series data often contains patterns
  - trend: long term change
  - seasonal: affected by calendar, fixed and known frequency
  - cyclic: rises and falls in unfixed frequency
- time series may have all of these characteristics, some, or none
- goal of time series analyses is to capture these patterns in the data



what patterns are present?

cycle
↓ seasonal, annual
no trend

- trend
- season
- cycle



Time Series Patterns

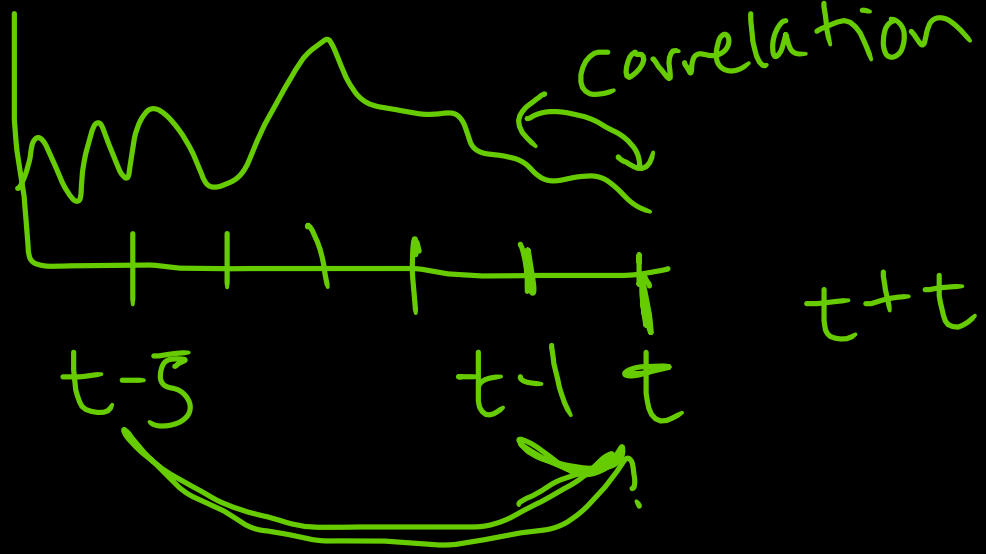
- decomposition: break the time series into its parts
- time series with no patterns show random fluctuations
  - white noise
  - no autocorrelation

strong increasing trend

Lags & Autocorrelation

correlation within data

- Assess the relationship between a data point and previous (lagged) data points
  - lag k
  - correlation between y_t and y_{t+k}



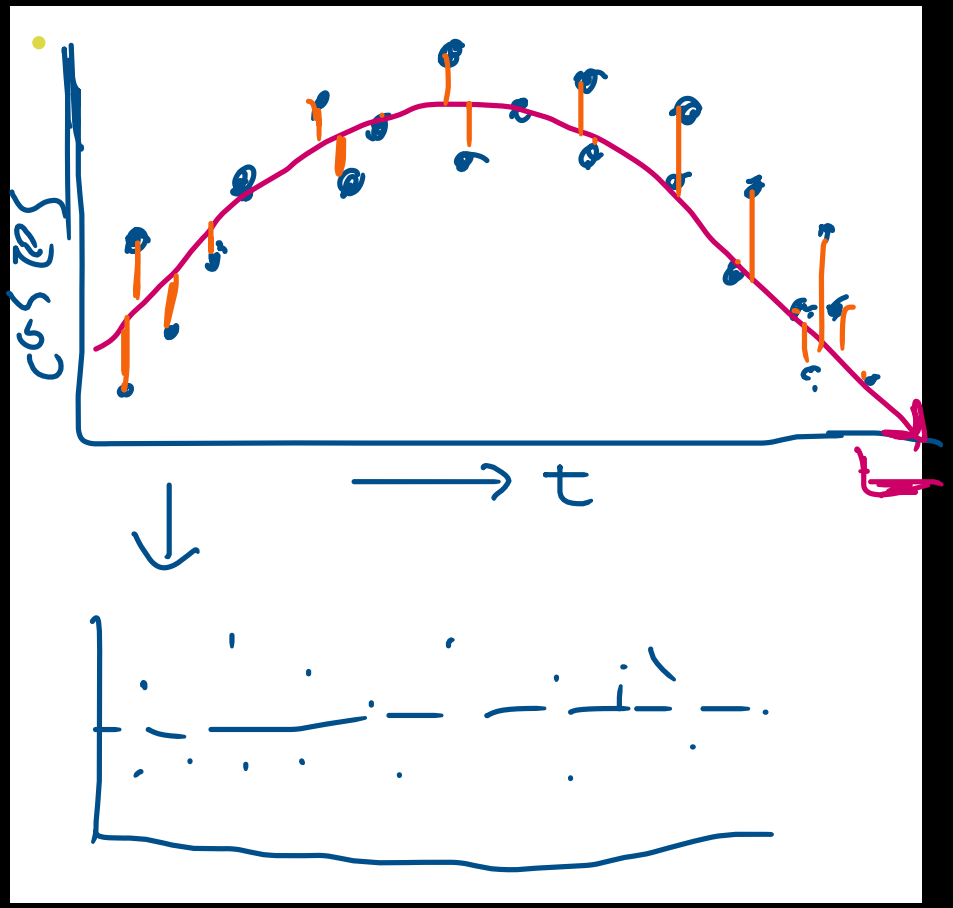
- If correlation exists between lags, this could potentially be used for forecasting
- Can reflect seasonality, other patterns in data
  - seasons: positive and negative autocorrelations for k related to frequency
  - trend: positive for small k

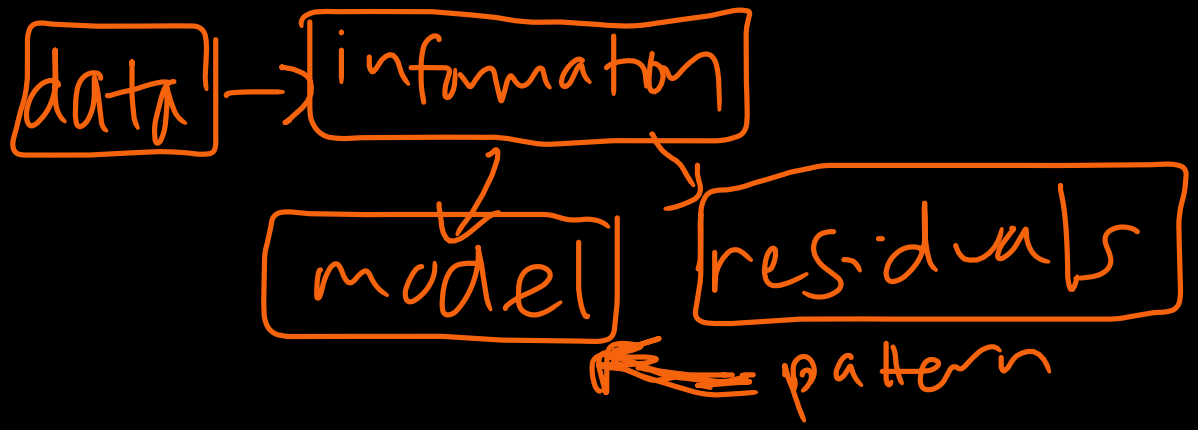
t+t-1 > t+t-5

(shorter time)

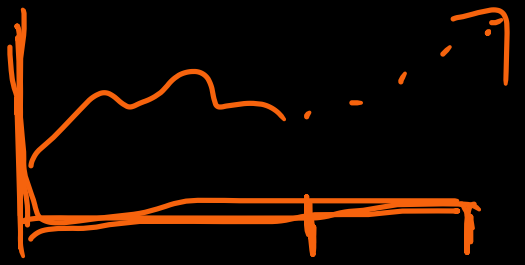
Residuals

- Any time we fit a model to data, there will be residuals
- Looking for patterns in the residuals can tell us if our model is appropriate or adequate
  - residuals with patterns mean there is information in the data that are not in the model!

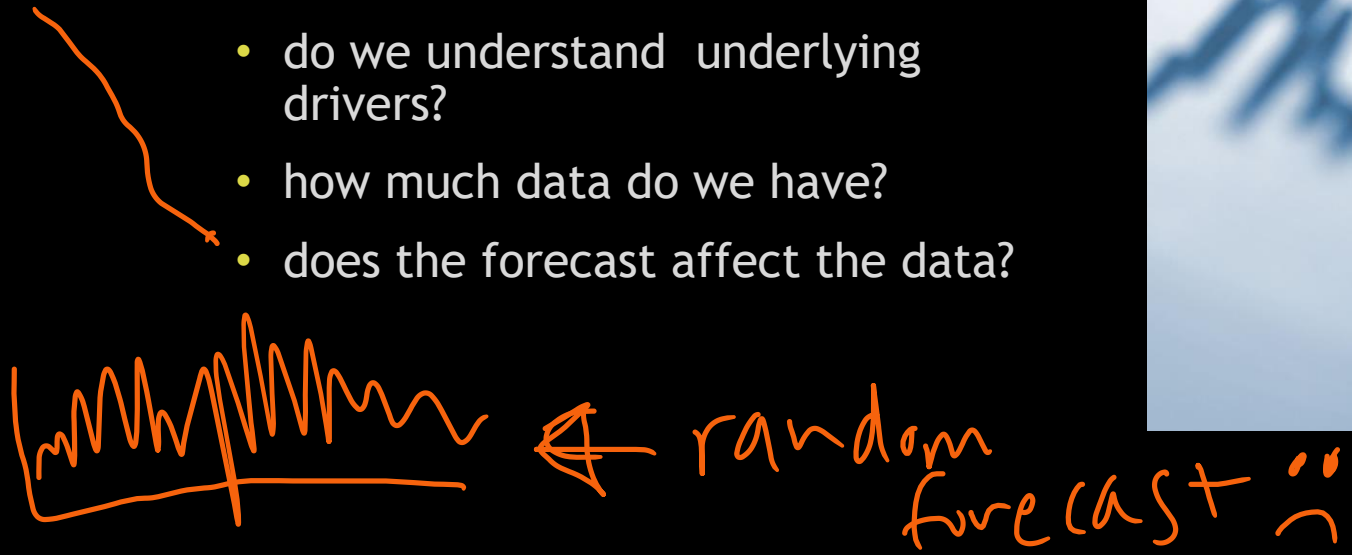




Forecasting



- Help to make decisions about the future
  - short-term — next week
  - medium-term — 6 months
  - long-term — next year
- Some things are easier to forecast
  - do we understand underlying drivers?
  - how much data do we have?
  - does the forecast affect the data?



Forecasting

- What to forecast?
  - geographic area
  - cases vs rates
  - endemic vs epidemic
  - horizon
  - frequency
- Methods
  - time series
  - predictor variables

adjusted to population + population changes

how far into future?

patterns in data

regression

epidemics somewhat random

Simple Forecasting (Time Series)

- average — average of all points
- naïve — value of most recent point
- seasonal naïve — value of point previous season
- drift — trend line