TB and Shelters

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Shelters and Public Health

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Disclosure

- No financial Conflicts of Interest or relevant disclosures

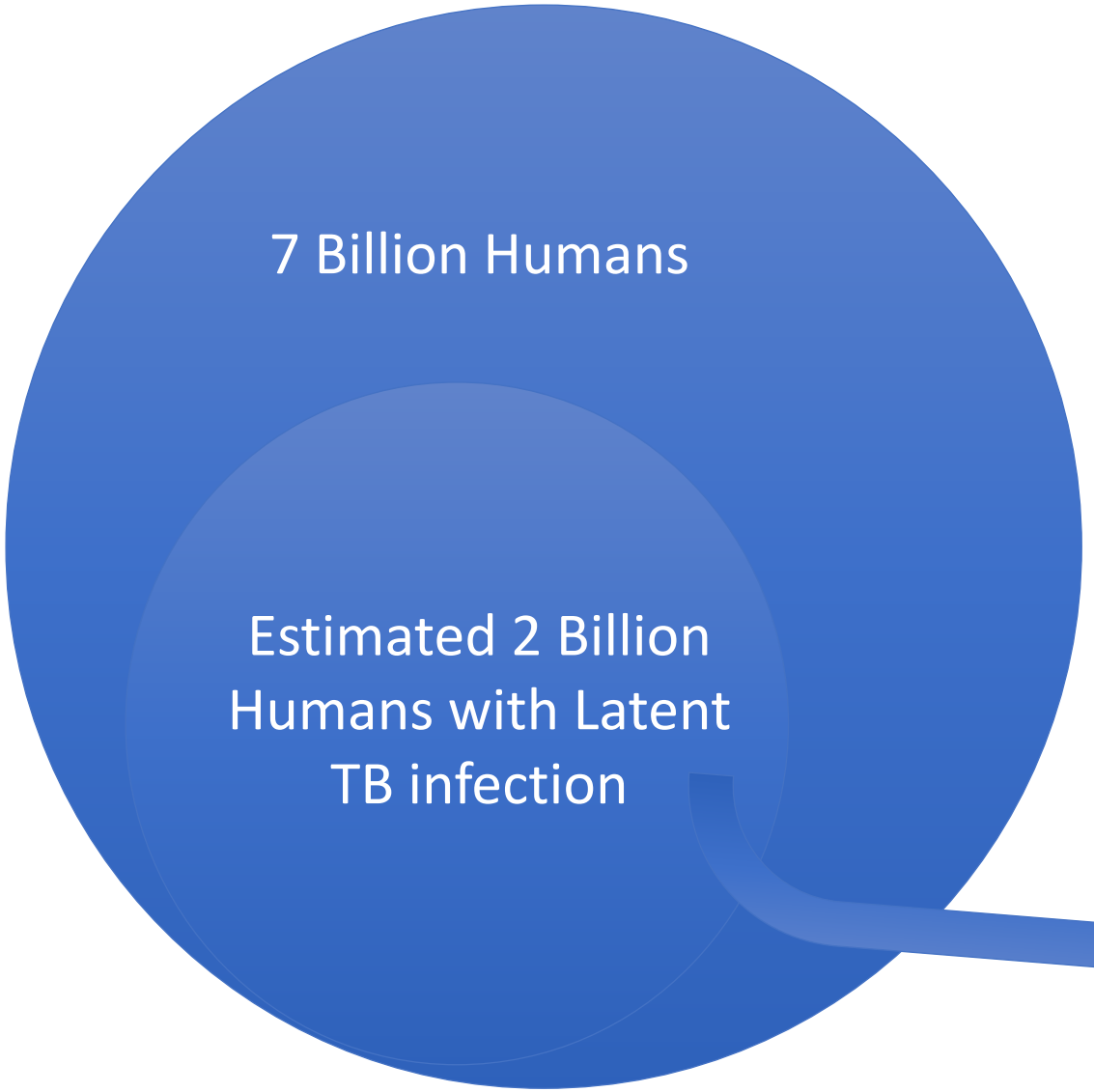
Objective

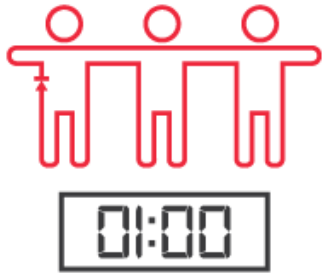
Using a case example, I plan to illustrate how lack of housing can lead to TB outbreaks.

I will share our experience in trying to mitigate a recent outbreak.

My hope is to then to generate discussion about how Public Health and Shelters can collaborate in the control of TB amongst the unstably housed.

TB Fun-damentals





TB kills 3 people in the World every minute

1.5 Million Deaths in 2018

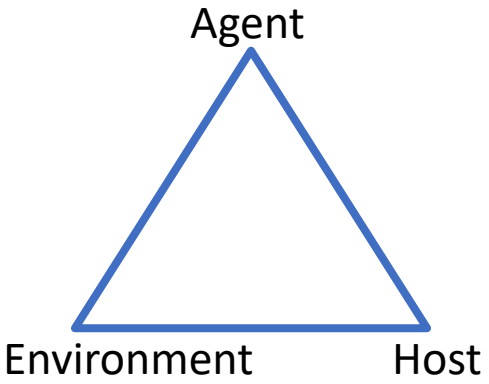
10 million progress to active TB in 2018

WHO Global Report 2019

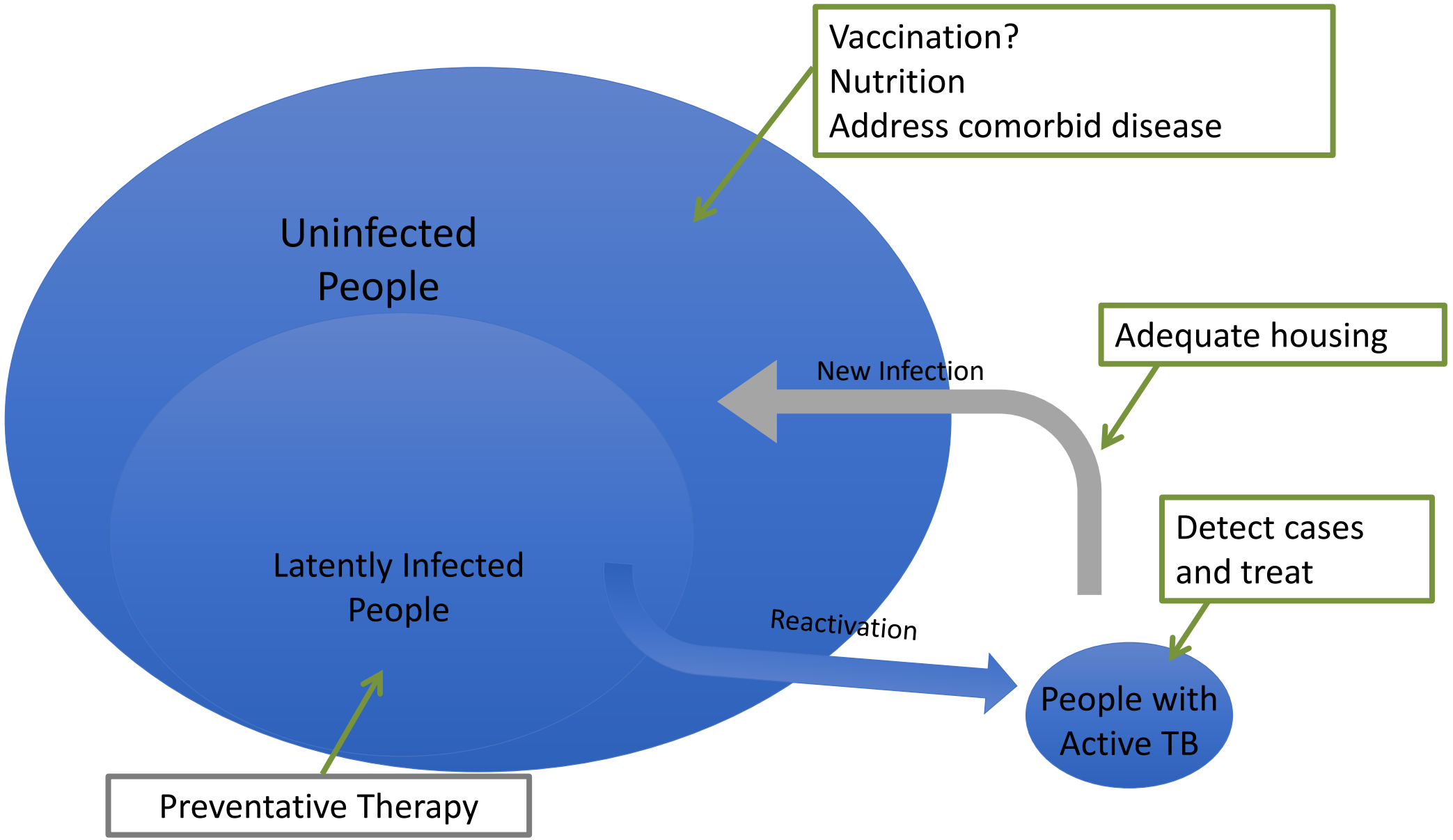
Risk of TB: Function of 2 events

1. Risk of exposure and subsequent infection
   - Crowding, ventilation, sunlight
   - Residence in area with high TB transmission

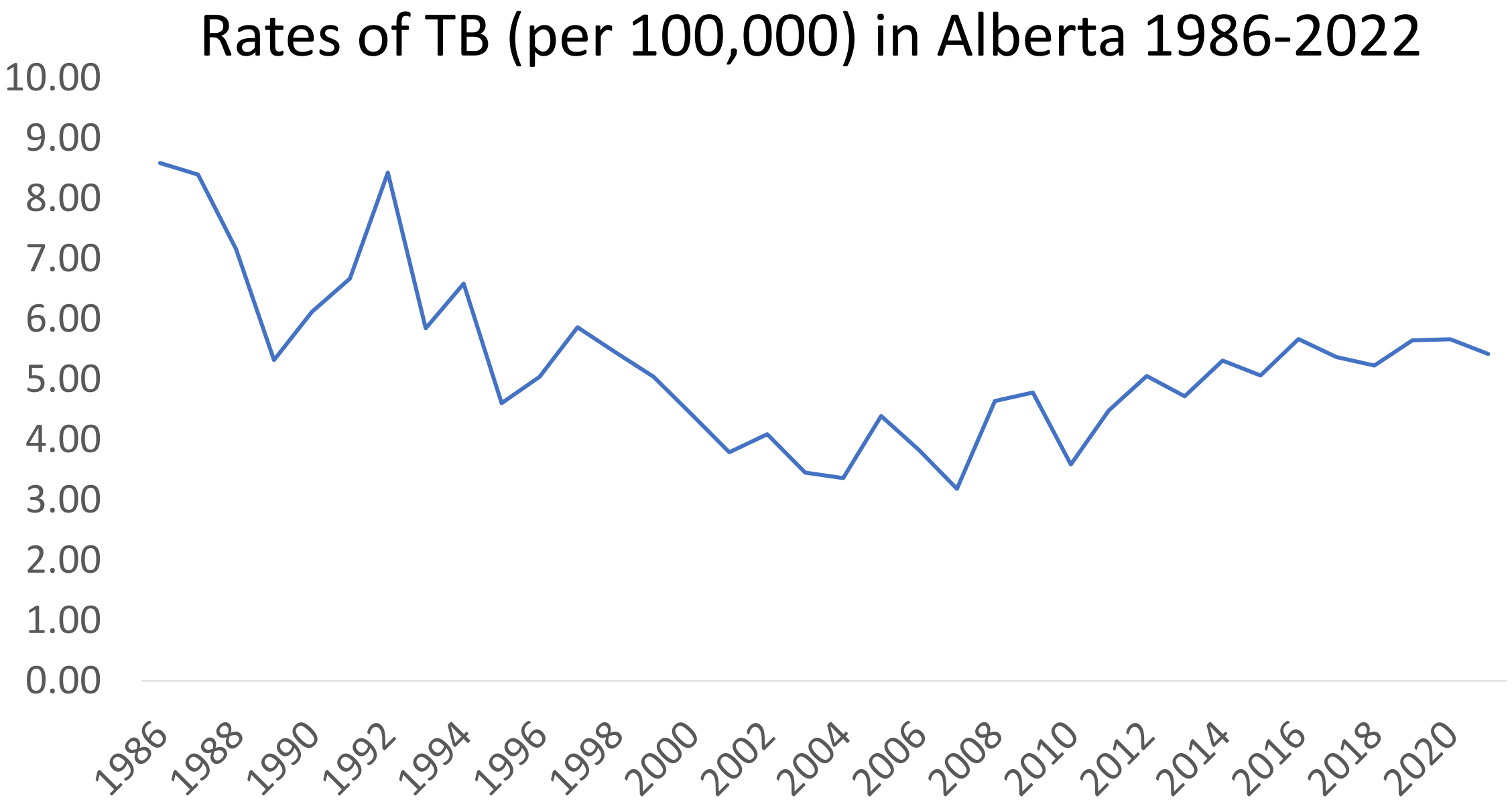
2. Risk of progression from infection to disease
   - Immune status
   - Nutritional status



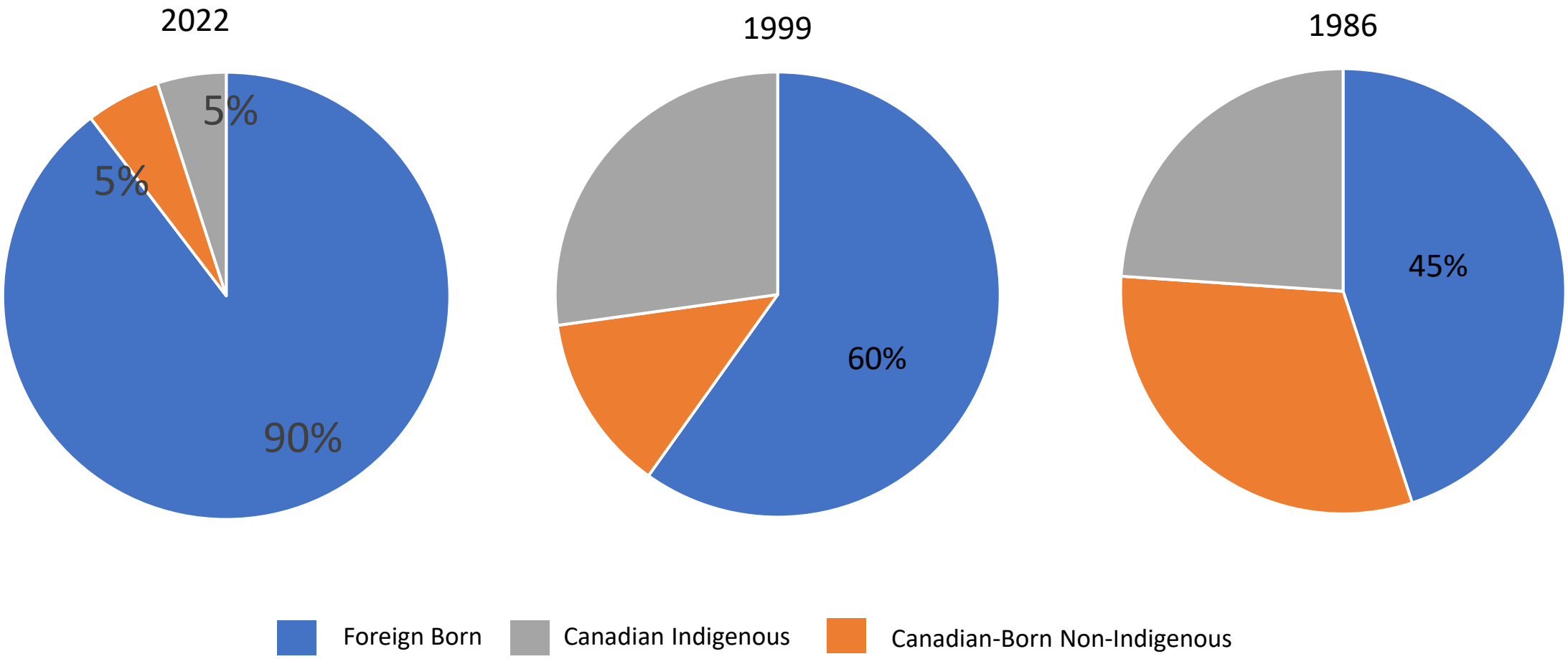
Strategies for TB Control and TB Elimination



TB in Alberta


Rates of TB (per 100,000) in Alberta 1986-2022
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020

Active TB in Alberta by Demographic Group Over Time



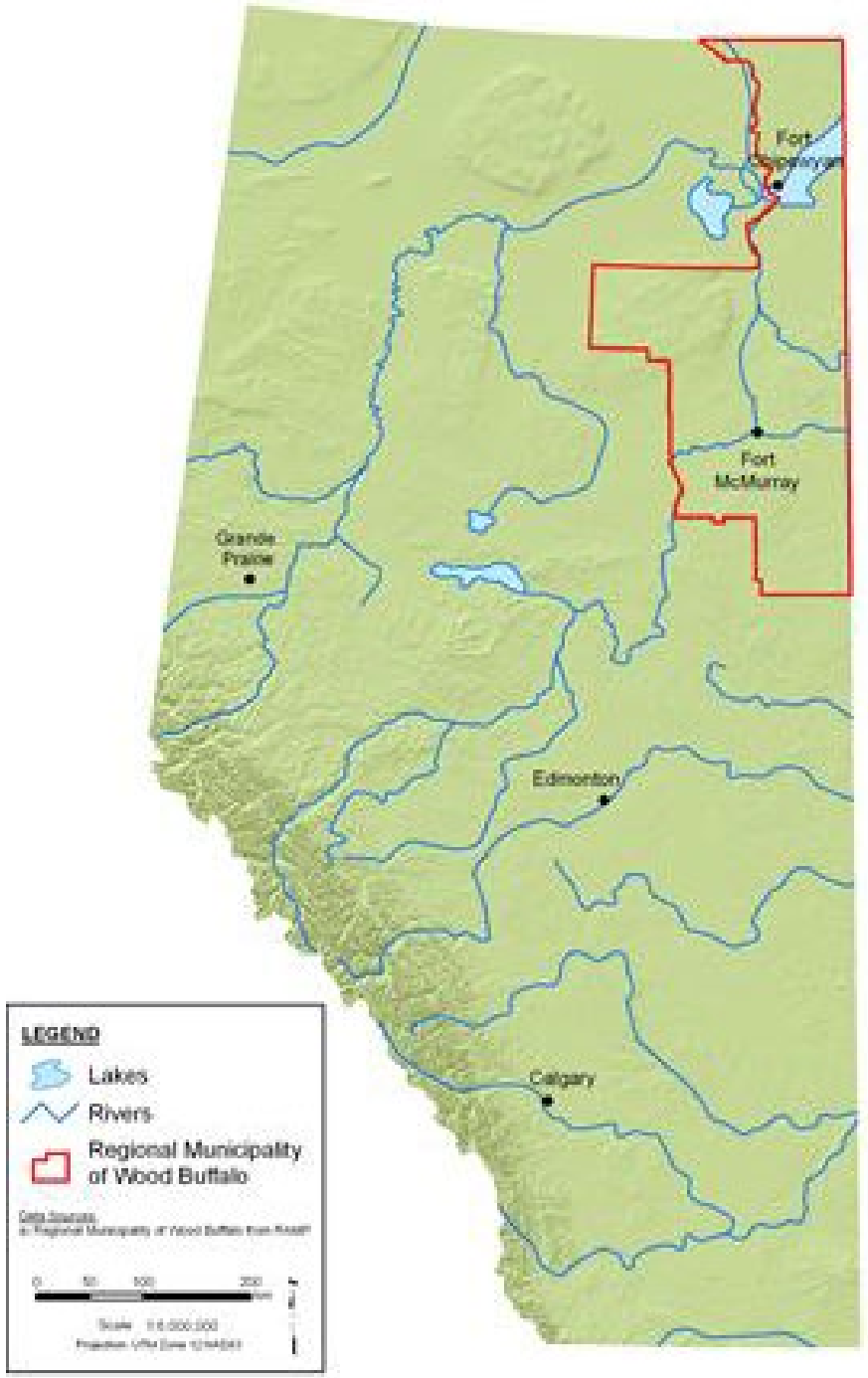
Story Time

Once upon a time in the City of Fort McMurray

Fort McMurray 75,615 people in 2018

Homeless count in 2018 estimated ~200 people were experiencing homelessness in the city (of these, about 60% were described as chronically unhoused)

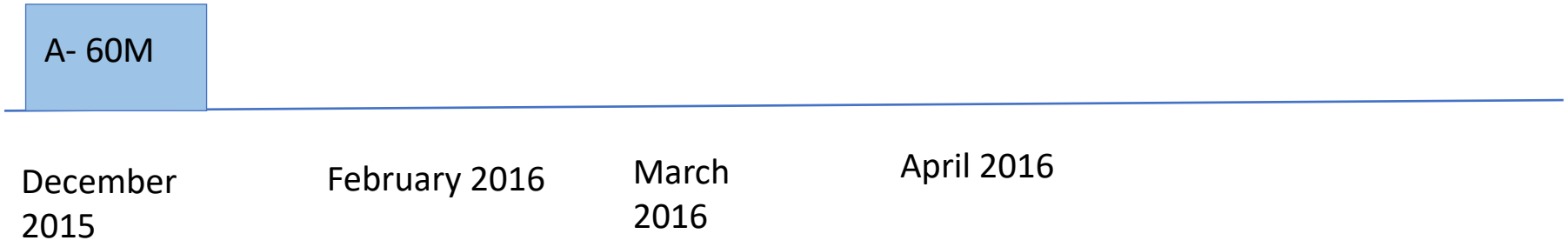
From Amber Heyd, RN MSc



TB is more common in Fort McMurray (about 13 per 100,000 or 10 cases per year) than other parts of Alberta

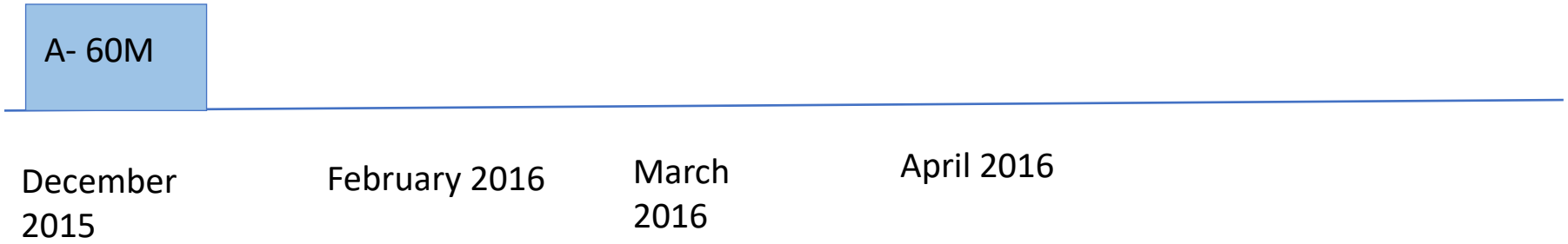
About 25% of TB cases in Fort McMurray occur in people experiencing homelessness (compared to about 3% for Edmonton)*

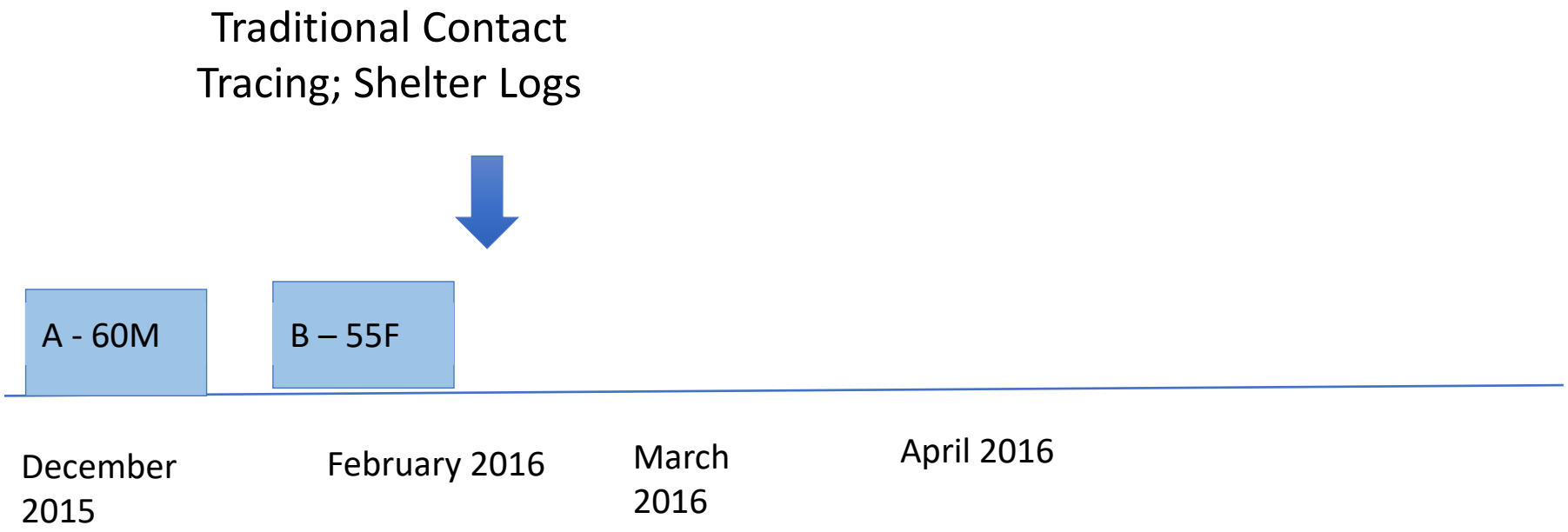
From Amber Heyd, RN MSc (Using 2008-2018 data)



- Mr. A diagnosed in ED with smear-positive PTB
- Had attended 6 times in the 4 months preceding diagnosis
- Mr. A mostly lived in tent outside of town but sometimes stayed at overnight shelter

Traditional Contact Tracing
Notification of Shelter and review of shelter logs, bed maps





- Ms. B from Fort McMurray also smear positive PTB
- She was also unstably housed, sometimes stayed at same shelter as case A but neither were on the other's list of contacts, didn't stay at shelter at the same time (per log, bed map)

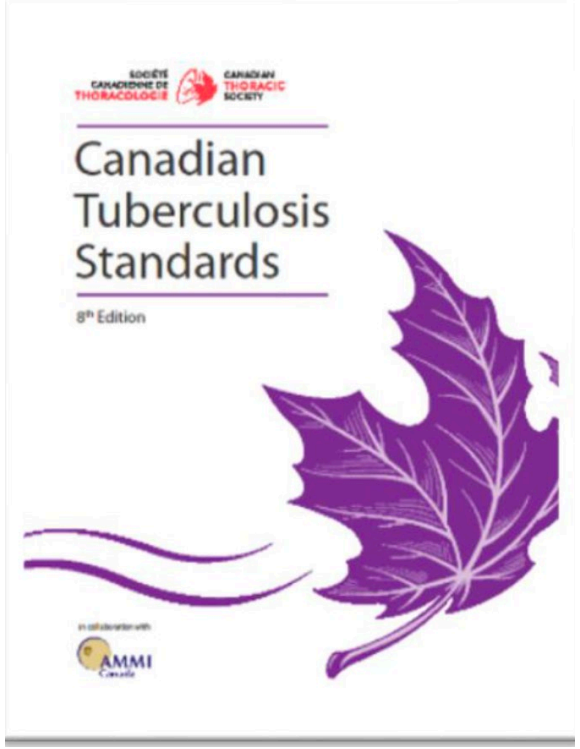
TB in Fort McMurray Area 2016

Two TB cases within one month of each other; neither was a named contact of the other but both reported unstable housing and both stayed at same homeless shelter

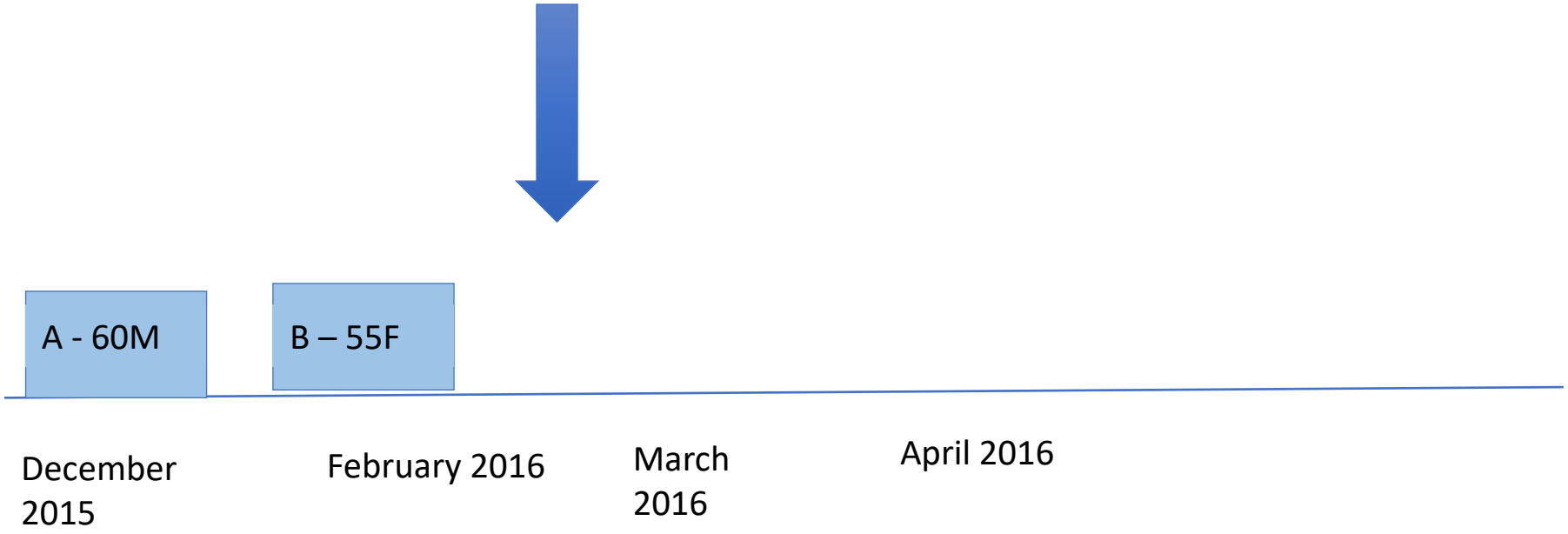
Triggered further investigation:
potential outbreak

TB Outbreak Definition:

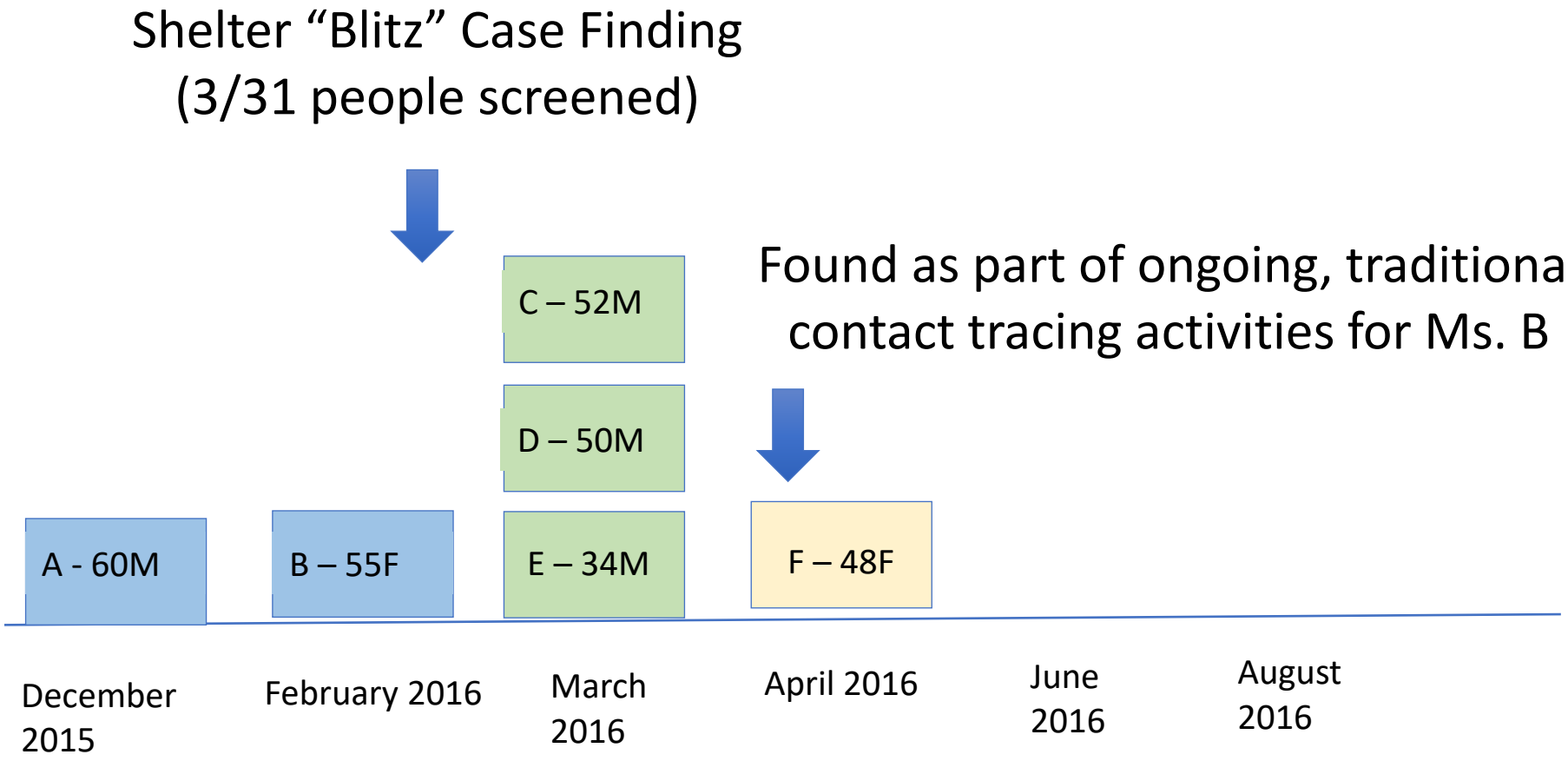
- Two or more secondary cases identified on contact investigation or
- Any 2 or more cases in TB patients occurring within 1 year of each other are discovered to be epidemiologically or genotypically linked, but the linkage is recognized outside of a direct contact investigation



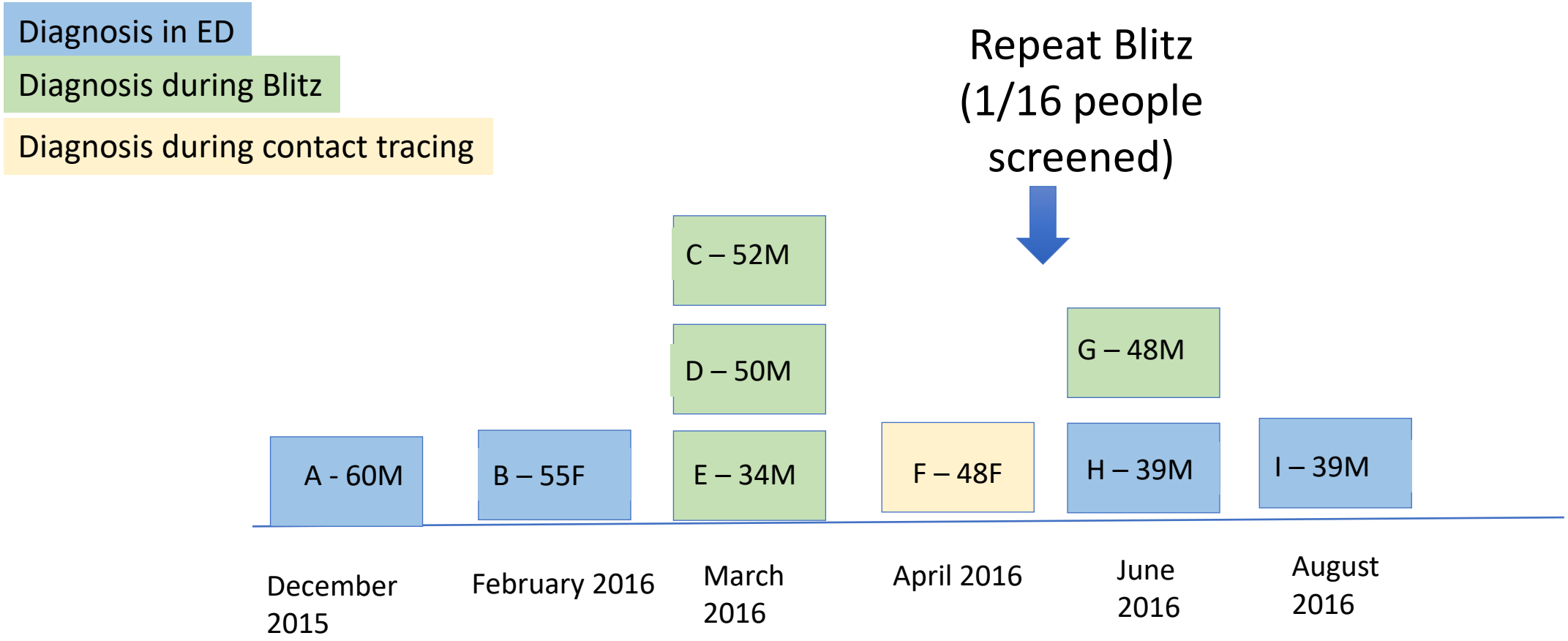
Shelter “Blitz” Case Finding



- In collaboration with Shelter, Public Health Nurses conducted active case finding on-site
- This was done in evening
- People with cough invited to submit sputum on site and given requisition for chest radiograph



- C and E and F were mostly asymptomatic with minimal disease (found early!)
- F was a named contact of B



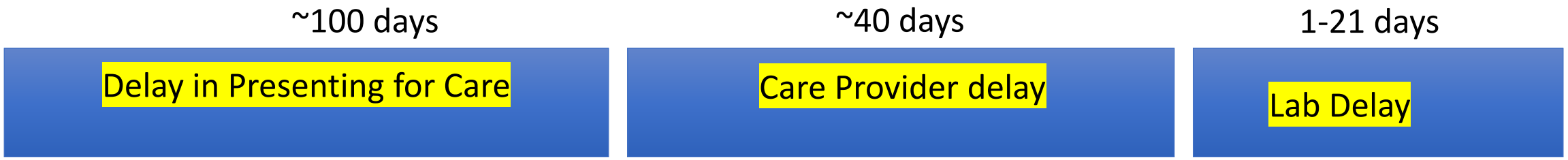
- A repeat night of active surveillance was conducted at the Shelter, finding case G
- Perhaps because of educational activities for ED and Shelter Staff, cases H and I were identified by the Emergency Room staff after presenting with persistent cough

Diagnostic Delay

Mr. I diagnosed in August 2016 with 4+ cavitary disease) by ED physician

However, a CXRAY from November 2013 (depicted here) is classic for TB

Components of TB Diagnostic Delay



Late Care Seeking
Limited Access to Health Care
Indolent disease; still function
Poverty
Rural/Remote location
Substance use/Mental Illness
Competing priorities

Low index of suspicion
Low incidence setting
Improper sample collection
Poor access to CXRAY
Other Lung Diseases (e.g. COPD)

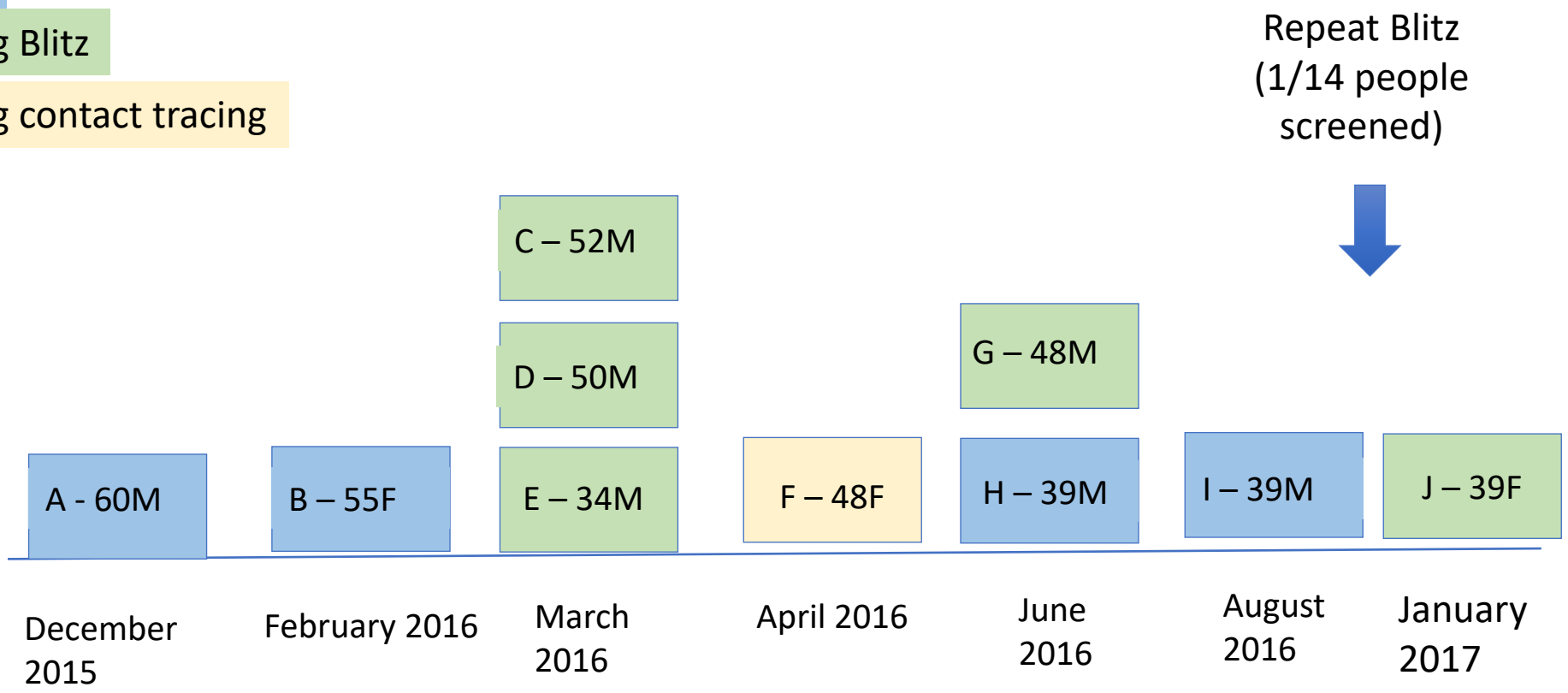
MTBC grows slowly
Smear insensitive
No GenXpert on SN

Storla BMC Public Health 2008
Sreeramareddy BMC ID 2009

Diagnosis in ED

Diagnosis during Blitz

Diagnosis during contact tracing



A third Shelter Blitz was conducted in January (after realizing that the shelters had much fewer clients in the summer)

Commonalities found in the 10 people with TB identified in this outbreak (1)

- All reported more than 40g/day alcohol use
- All had a history of unstable housing
  - Although 4 were housed at the time of diagnosis
- Many stayed at same inner-city shelter (one of two in the city)
- All frequented an inner-city day program held in a retrofitted bungalow

Commonalities found in the 10 people with TB identified in this outbreak (2)

- Little primary care; most health contact via ED
- Early in the outbreak, delayed diagnosis was the rule, most with several ED visits prior to achieving a diagnosis
- As the outbreak progressed, cases seemed to be better recognized, detected earlier in disease course

Commonalities found in the 10 people with TB identified in this outbreak (3)

- Many reported indigenous ethnicity; none were residing on reserve at time of diagnosis
- Most offered few close contacts on interview
- 9/10 socialized in the same location

The first 10 people in the Inner-City Outbreak 2016

	Strain	MIRU Pattern
60M	A	233325153325341544222372
55F	A	233325153325341544222372
50M	A	233325153325341544222372
35M	A	233325153325341544222372
50M	A	233325153325341544222372
50F	A	233325153325341544222372
50M	A	233325153325341544222372
40M	B	226425133533324264223374
40M	A	233325153325341544222372
40F	A	233325153325341544222372

Ongoing TB Prevention Activities over 2016-2020

Treatment

- Identify people with active TB and treat
  - Remains fundamental component of TB control
  - Must monitor to promptly identify adverse effects
  - Treatment adherence is important to prevent relapse and to prevent development of drug-resistance

TasP - Benefits the person with TB and their community and yet all of the risk/burden is borne by the person with TB

Treatment

- All cases here were treated with DOT (Direct Observed Therapy)
  - Daily visits by outreach public health nurse who would come to them
  - Nurse well known in the community, good rapport
  - Informal incentives and enablers used
  - 100% of cases who survived completed treatment
  - No Public Health Warrants used

Case Finding

- Contact tracing:
  - Named contacts
  - Shelter contacts
  - Employees annual screening
- Enhanced Active Case finding – Periodic “Blitz” at shelter using symptom inquiry/sputum sampling
  - June 2017 0/6 tested cases were positive
- Passive Case Finding: Awareness building – Health Care providers and Shelters

Environmental Modifications

- What about the ventilation at the shelters?

Shelter Ventilation: Environmental Health Officer Assessment

- Day Program Site (retrofitted bungalow)
  - CO2 1215ppm during day
  - Forced air furnace, unclear quality
- Night shelter allowing visibly intoxicated people
  - CO2 535ppm during day
  - New Ventilation/air-exchanger installed 2011, judged adequate, exhaust out roof, away from entrance
- Night shelter and transitional housing complex
  - Adequate ventilation, exhaust away from entrance
  - CO2 345ppm during day

Peak CO2 <1000ppm is thought compatible with >12 AEH
TB Experts consider <1500ppm to be adequate
Robin Wood PLOSone 2014

Preventative Therapy

- All contacts without active disease were offered testing for latent TB infection and treatment

Preventative Therapy

- We also introduced routine latent TB infection screening at day program site
  - Conducted by Nurse Practitioner who worked three days a week on site
  - All those with unstable housing eligible
  - Offered testing with IGRA (one blood draw)
  - Those who tested positive would then be offered preventative treatment with 12 weekly doses of TB medications under outreach DOT (3HP) with Public Health Nurse

Preventative Treatment at Day Shelter

- 42 individuals were screened from 2017-2018
  - All were unstably housed in past year
  - 12 (21.4%) were diagnosed with latent infection on IGRA
  - Of these, 5 completed treatment for LTBI with 3HP
  - 7 waiting for assessment and/or to start treatment
  - Barriers: Need for lab and radiology
  - Facilitators: Incentives

Amber Heyd Msc Thesis 2018

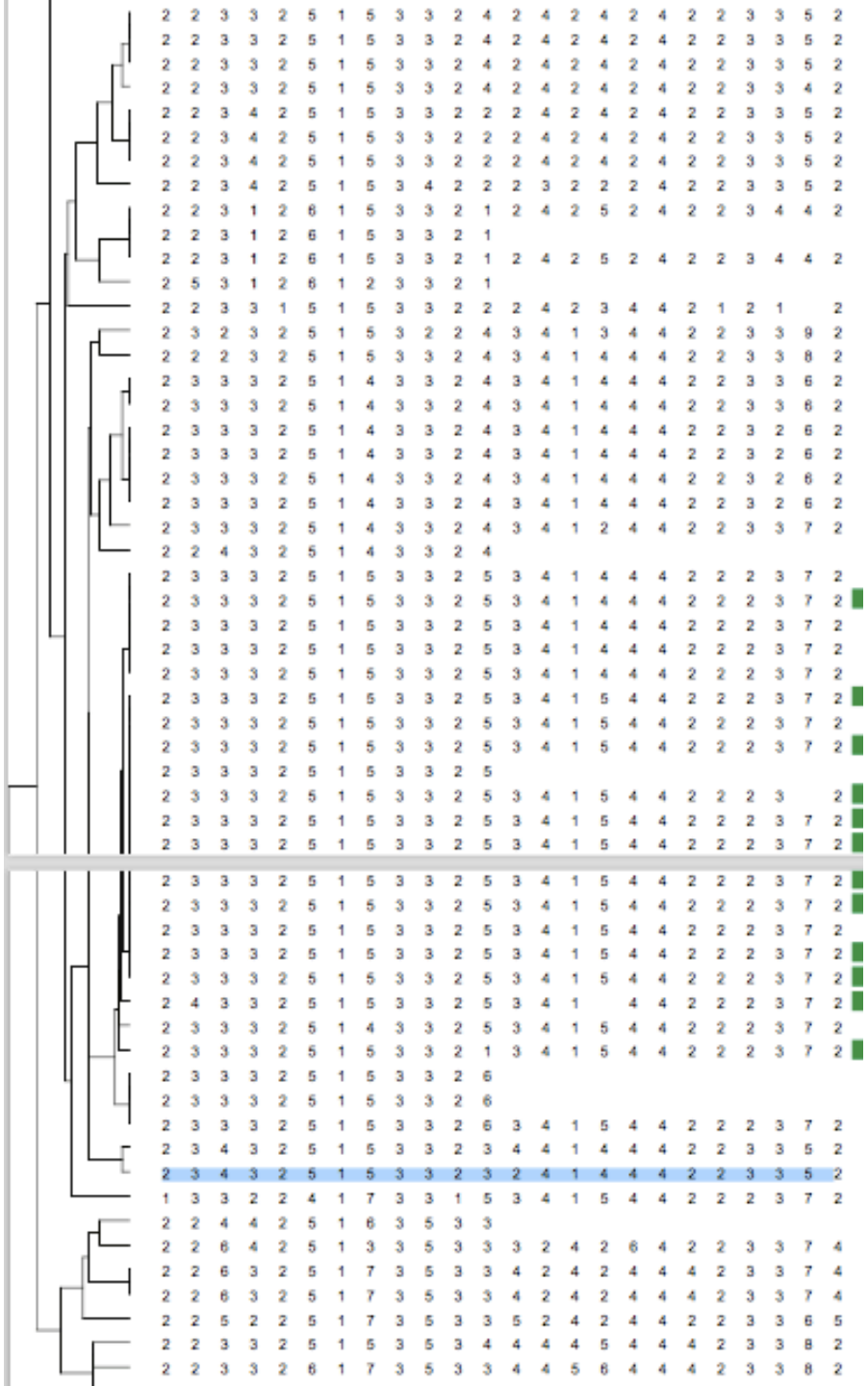
Lessons Learned

Lessons Learned

- Recognition of TB is hard – it's rare and clinicians may not think TB
- On-site active case finding and site-based contact tracing were helpful – must work with shelters and inner-city agencies
- Treatment completion for those with active TB was excellent; supporting people with TB and tailoring treatment plans with their input works; incentives should be mandatory
- Outbreaks grab attention – chronic, endemic issues less so; better recording of the "housing" variable in PHAC datasets might be helpful

Epilogue

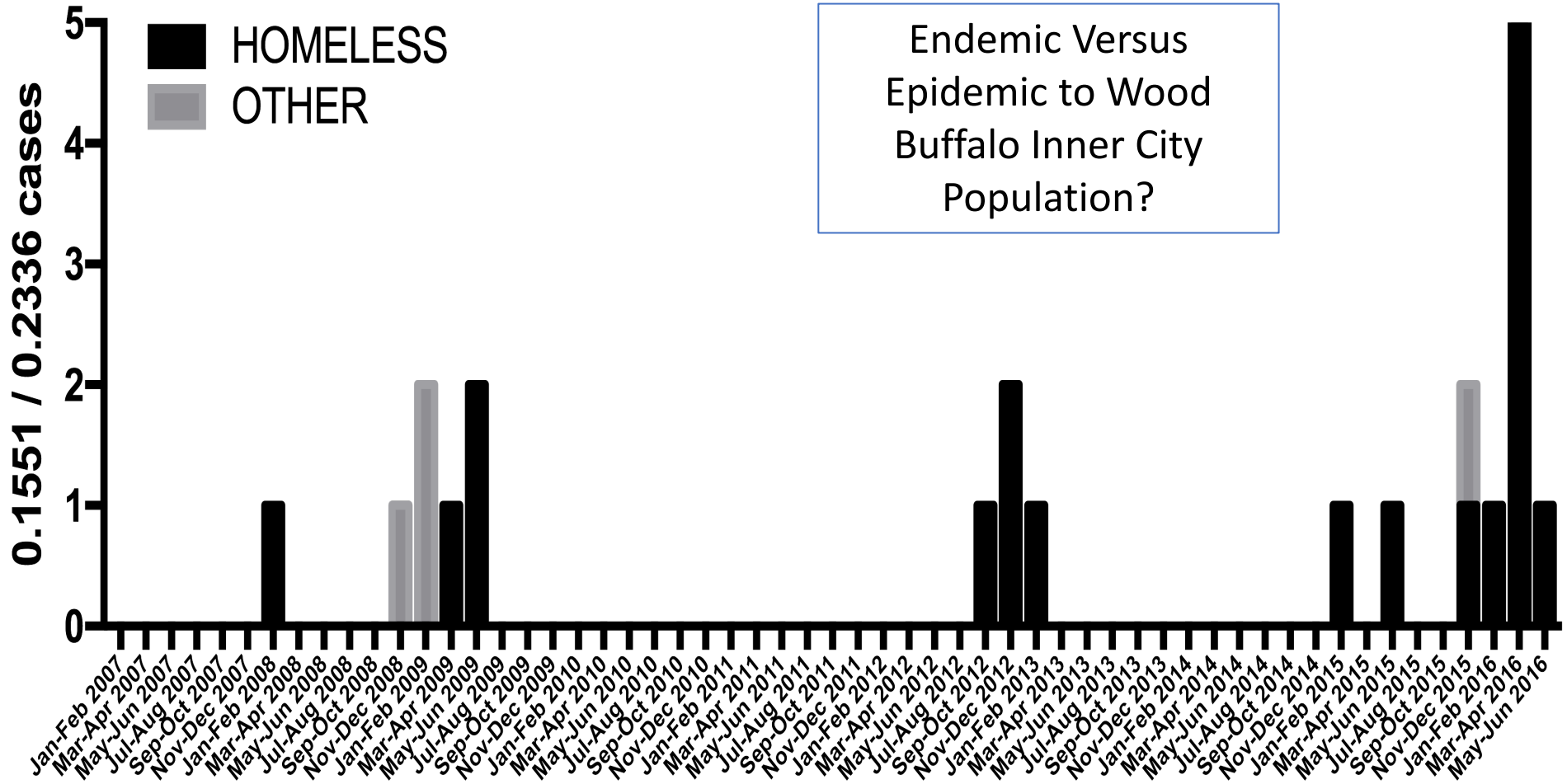
Endemic versus Epidemic



Genotyping analysis suggests that the strain in this outbreak had probably been circulating in this community for awhile -
22 cases from 2012-2018

Bohdan Savaryn, Vincent Li,
Linda Chiu 2016 and 2018

Looking backward: The “outbreak strain(s)”



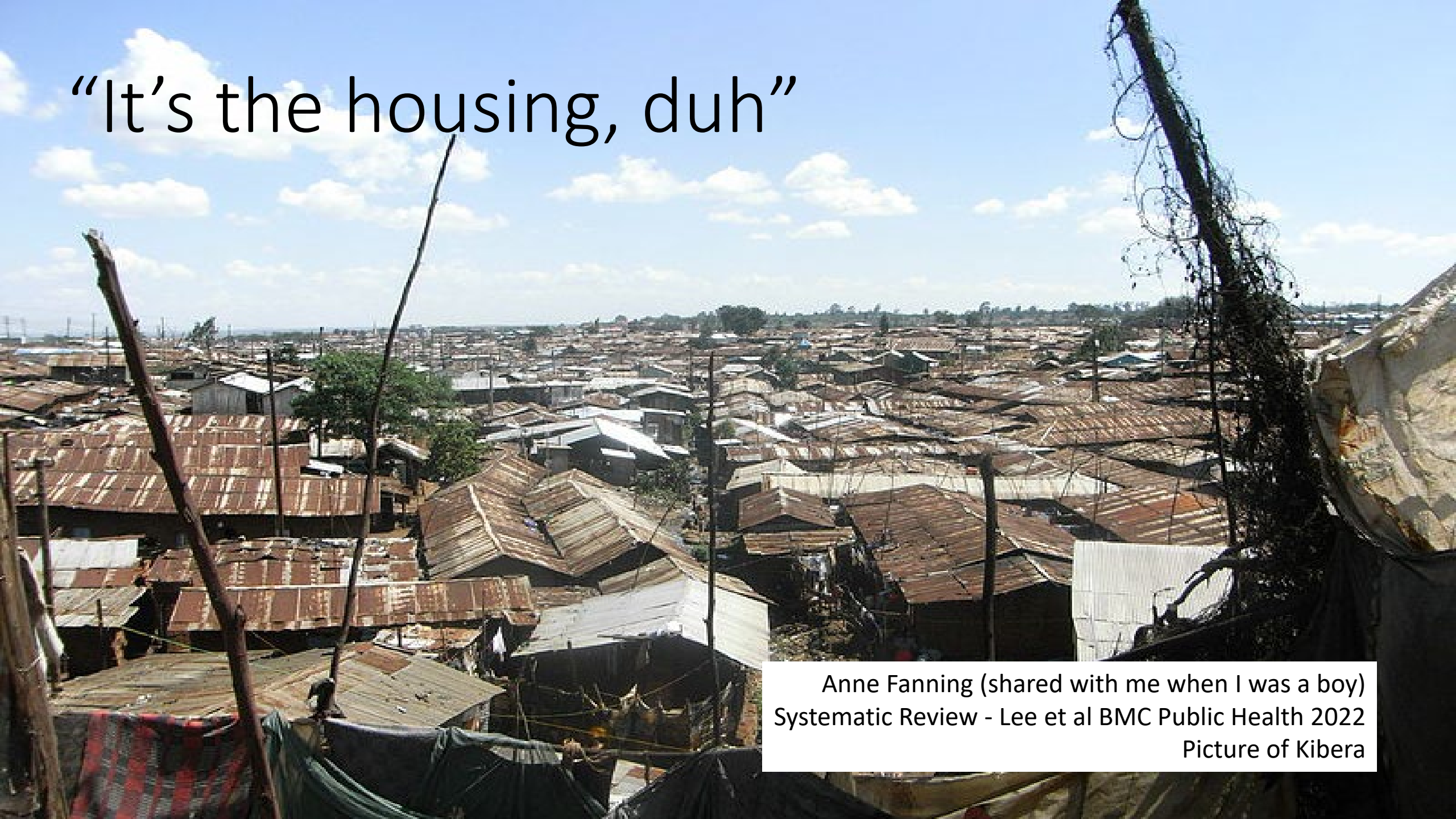
N=23 cases [out of 97) in NE zone during 2007-2016
share the outbreak strain types]

Peter Warrington 2016

Epilogue

- After the protracted outbreak in 2016-2018, things were quiet 2019-2020…
- Then…6 more cases in inner-city Fort McMurray with the same strain type over 2021-2022

“It’s the housing, duh”



Anne Fanning (shared with me when I was a boy)
Systematic Review - Lee et al BMC Public Health 2022
Picture of Kibera

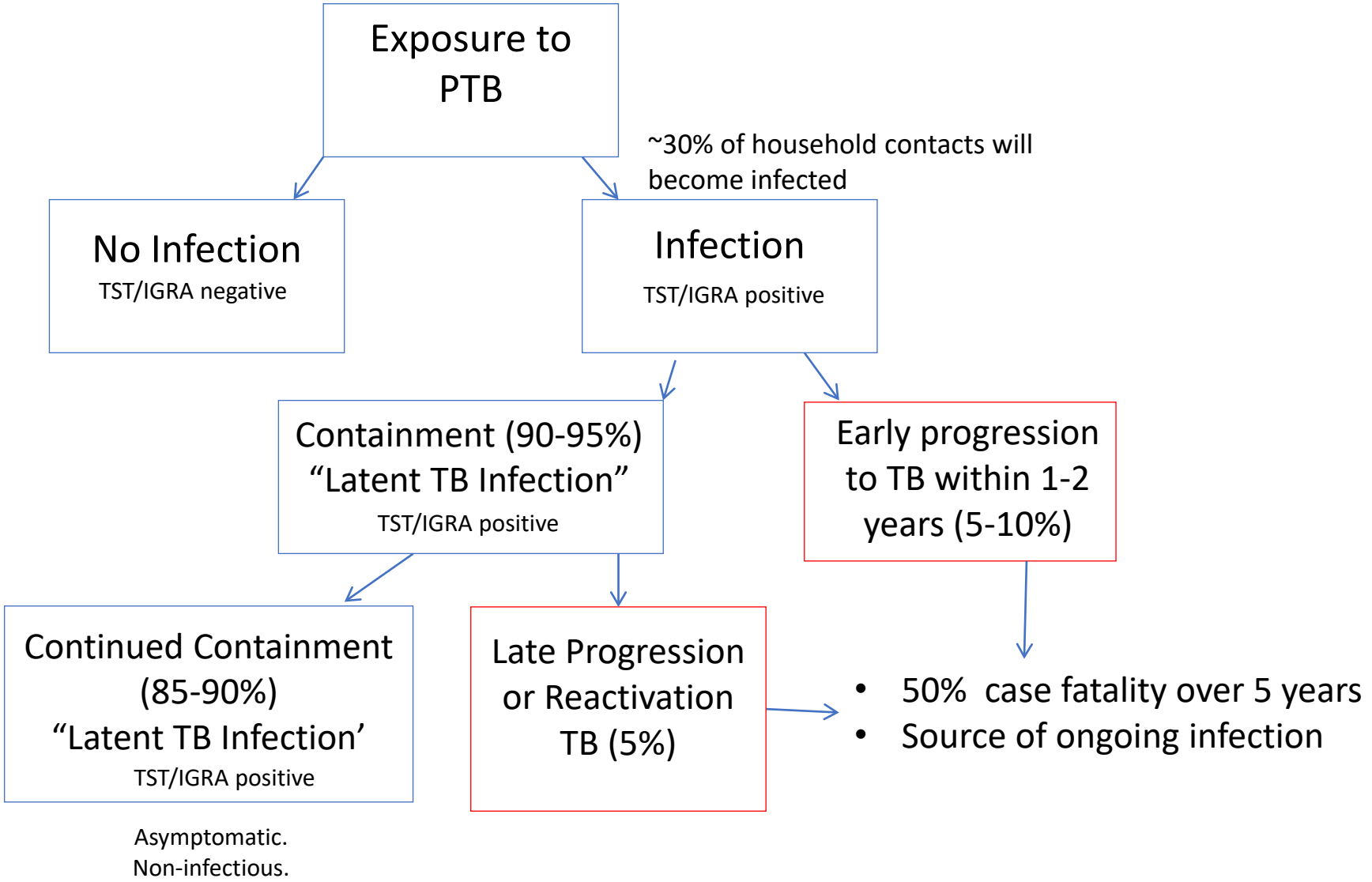
Thanks

Questions, comments:
rdcooper@ualberta.ca

Acknowledgements:

- Dr. Richard Long and the Pathways Team
- Amber Heyd
- Peter Warrington
- Dr. Elizabeth Rae
- Fort McMurray Public Health Nurses

The Natural History of TB:



Cooper R and Doucette K, Fishman's Pulmonary Disease 5th Edition 2015

TB and Alcohol Dependence

- Alcohol use more than 40g/d increases risk of TB by 3-fold
- Alcohol long appreciated factor in TB epidemiology
  - Prominent amongst social determinants in low-incidence countries
- Several important factors probably contribute:
  - Lots of close, crowded social contact and houselessness
  - Micronutrient deficiencies
  - Direct EtoH toxicity → Immune suppression
  - Smoking also increases risk of TB by about 2-fold
- Alcohol dependence also associated with diagnostic delay

Lonnroth BMC 2008 Olin CMAJ 1996 PDO Davies BMC 2005
Haddad JAMA 2005 Storla BMC PH 2008

Diagnostic delay and repeat ED visits common in low TB incidence settings

- 50% of all cases of PTB in Alberta present to ED before eventually receiving TB diagnosis
- Most cases had more than 2 visits to ED prior to diagnosis and many admitted under incorrect diagnosis
- Smear positive cases even more likely to have at least one ED visit prior to diagnosis
- Alberta: ~3.5 months from onset of illness to diagnosis of TB

Long et al. IJTLD 2002