

Use of the Latent Tuberculosis Infection (LTBI) Care Cascade in the Tuberculosis Epidemiologic Studies Consortium-III (TBESC-III)

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TB Learning Collaborative

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Agenda

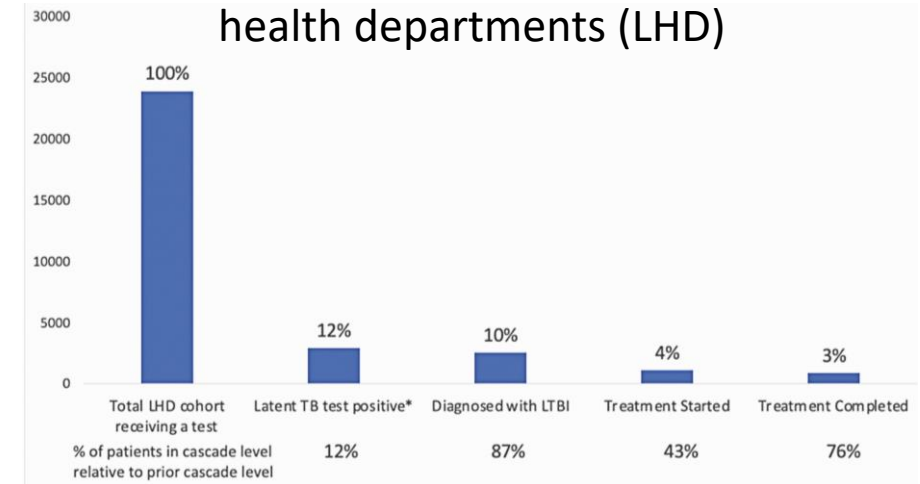
- What is a care cascade?
- Case study: TBESC-III
 - Introduction to TBESC-III
 - Defining the TBESC-III care cascade
- TBESC-III interventions to improve the LTBI care cascade in primary care settings

What is a care cascade?

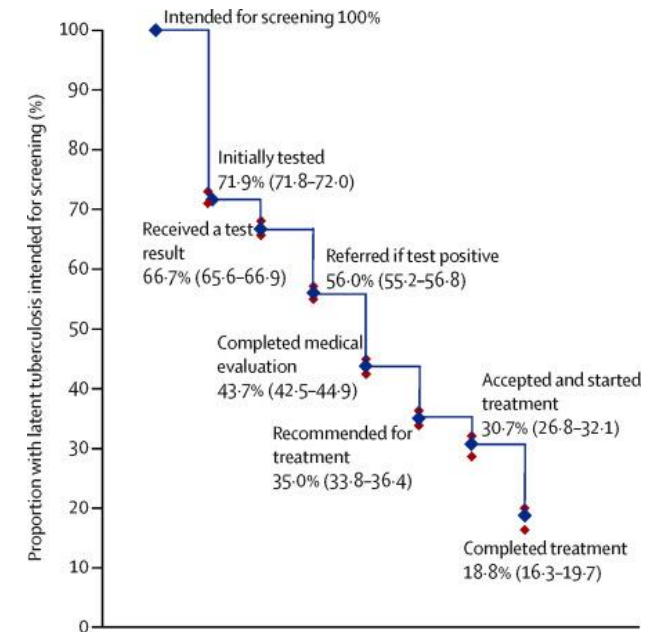
What is a care cascade?

- Health framework to monitor the progress of a **population** through testing and treatment
 - Used for many public health issues
- Usually a set of **sequential** steps (bars)
 - Patients have to go through the steps in order
 - Can measure number of patients or percentage (of total or of previous step)

Example LTBI care cascade from 15 local health departments (LHD)



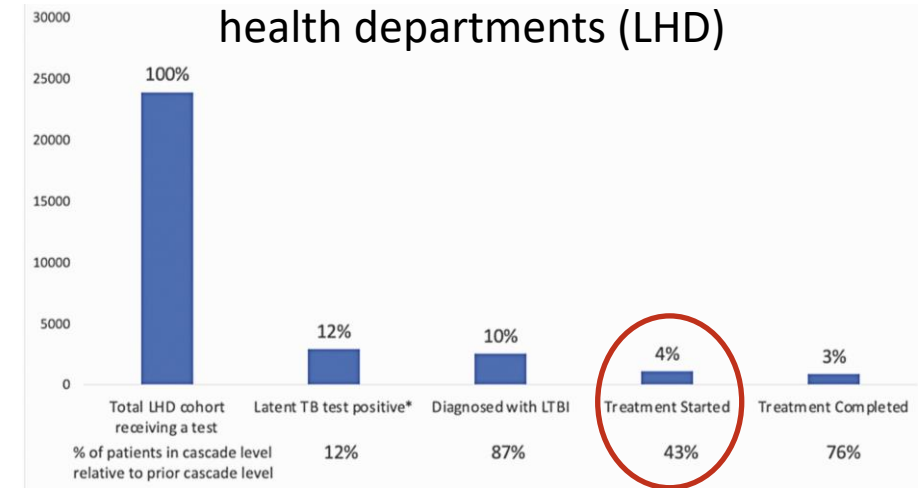
Losses and drop-outs at each stage of the care cascade from a meta-analysis



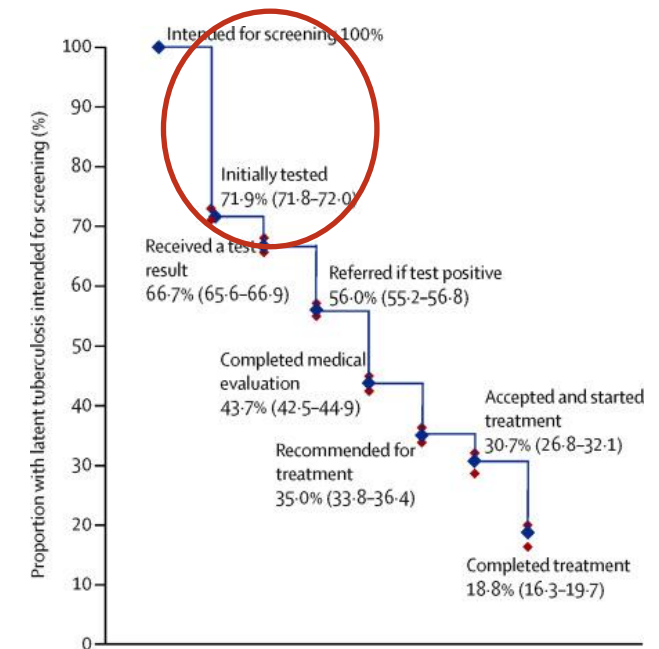
How can you use a care cascade?

- Can be built from available patient records
 - Example: electronic medical records (EMR)
- Identify where patients are **lost**
 - Interventions can be developed to address large drop-offs

Example LTBI care cascade from 15 local health departments (LHD)



Losses and drop-outs at each stage of the care cascade from a meta-analysis



Challenges

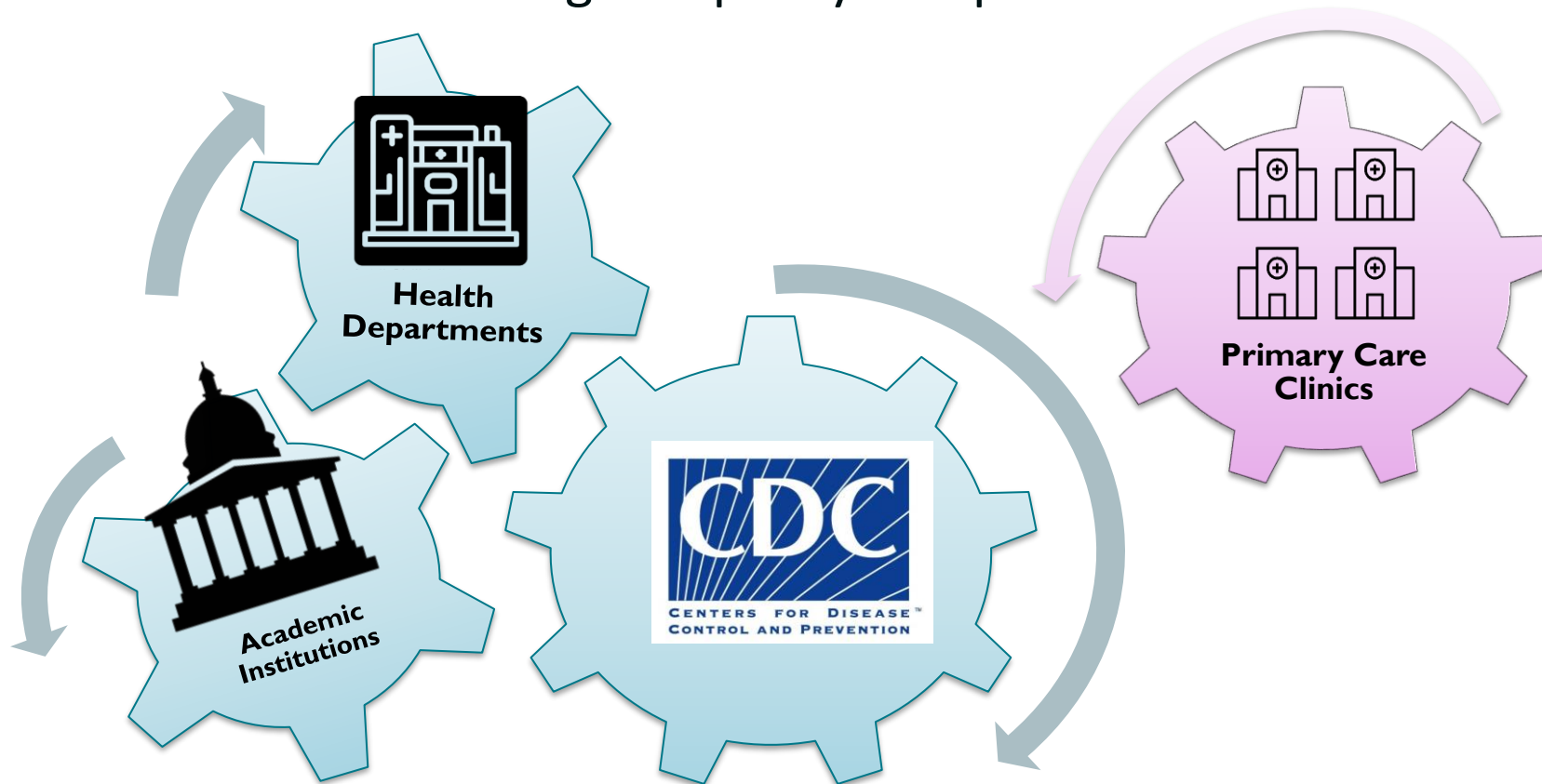
- No standard definition for care cascade
 - Which steps to include depend on goals
 - Typically include identifying people at risk for TB infection, testing, diagnosis, and treatment
 - Definitions behind those steps can vary
- Data generally not collected for this purpose
 - Can take a lot of work to define steps based on available data

Case Study: TBESC-III

Tuberculosis Epidemiologic Studies Consortium (TBESC)

Mission:

To assist TB Elimination efforts in the U.S. by designing and conducting epidemiological research studies to answer the most important questions to guide policy and practice.



TBESC-III
2021–2026



- Launched in October 2021
- 4.5-year contract

TBESC-III Specific Aims

1. Identify primary care settings serving non-U.S.–born persons at risk for LTBI
2. Collect retrospective and prospective EMR data
3. Design and implement clinical care-based interventions to improve performance measures across the LTBI care cascade
4. Monitor and evaluate intervention performance over time to identify efficient and effective strategies

TBESC-III Awarded Sites



Cost effectiveness analysis:
RTI International
PI: Carolina Barbosa, PharmD, PhD



Denver Health and Hospital
Authority Primary Care
PI: Michelle Haas, MD



International Community
Health Services (ICHS)
PI: Masa Narita, MD

Center
for
Tuberculosis



North East Medical
Services (NEMS)
PI: Priya Shete, MD, MPH

University of California
San Francisco



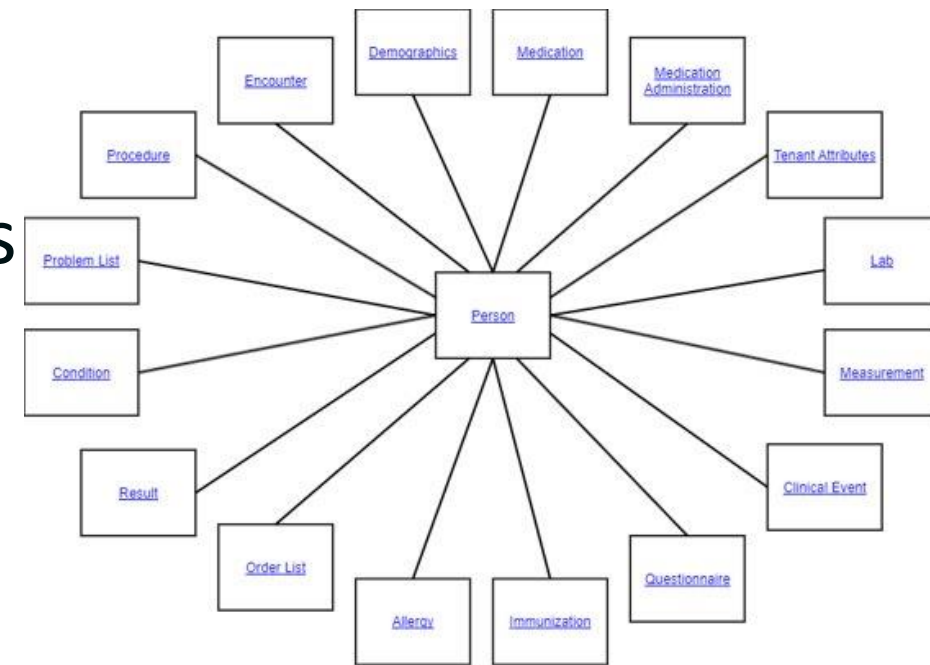
KAISER PERMANENTE®

Kaiser Permanente
Northern California
PI: Jacek Skarbinski, MD

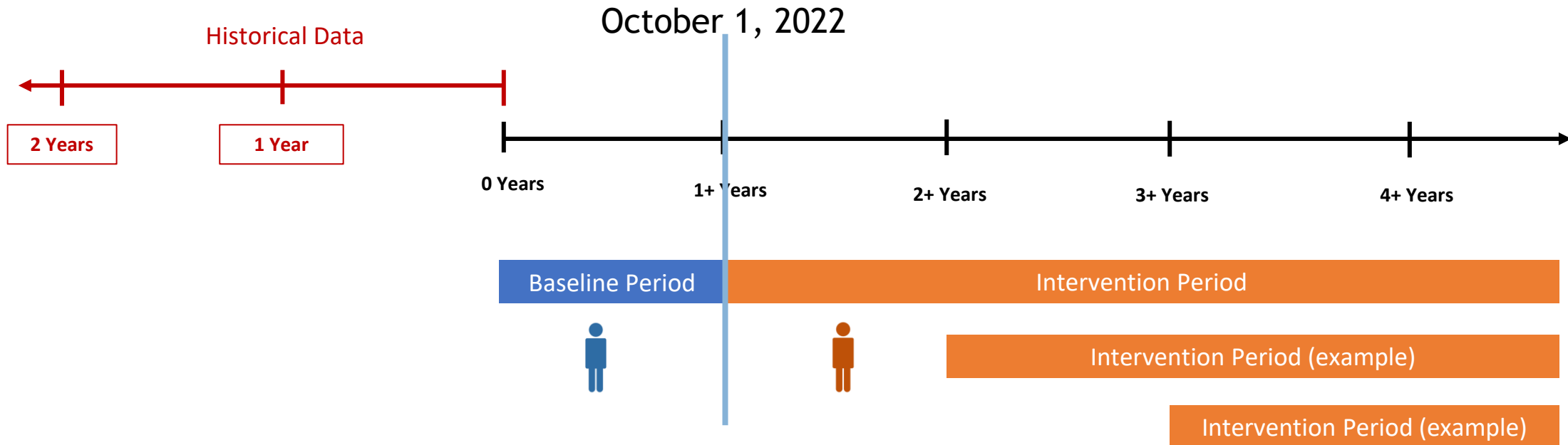
Defining the TBESC-III Care Cascade

Introduction to Electronic Medical Record (EMR) Data

- Digital medical information about a patient
 - Also called electronic health record (EHR) data
 - Increasingly being used by medical systems
 - Often consists of tables representing different sets of information on a patient
- Mix of structured data (defined set of values, such as race) and free text fields (written statements about a patient, such as visit notes)
 - Data contained in free text fields is challenging to use systematically

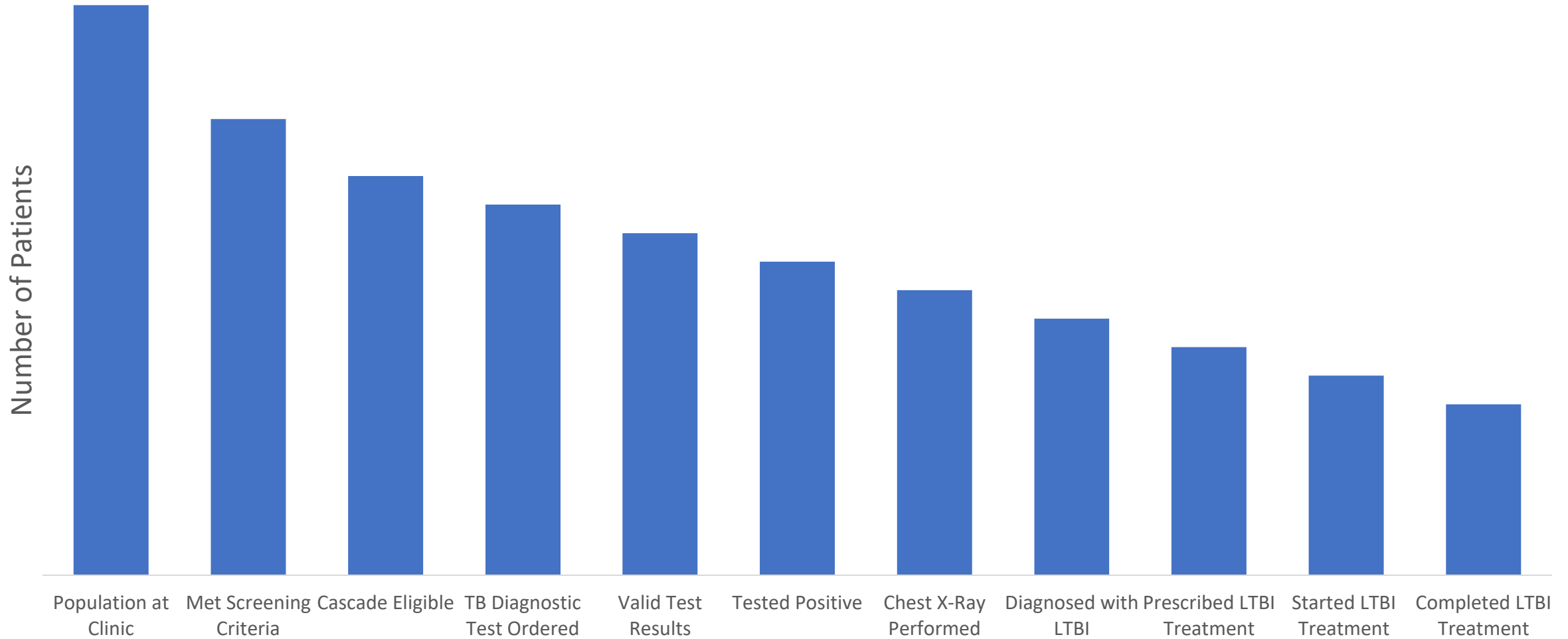


EMR Data Collection Plan

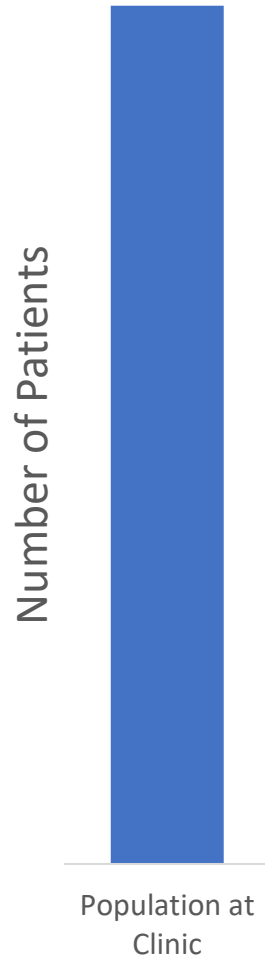


- **Baseline Period** – minimum of 12 months before intervention(s) are implemented
 - Baseline cohort – anyone who seeks care at a participating clinic during the baseline period
 - All sites implemented their first intervention by October 2022
 - Will close out the baseline period in October 2023 to allow time for all baseline patients to complete treatment
- **Intervention Period** – time after intervention(s) are implemented at the clinic
 - Intervention cohort- anyone who seeks care at a participating clinic during the intervention period

Defining the TBESC-III LTBI Care Cascade: Hypothetical Baseline Care Cascade

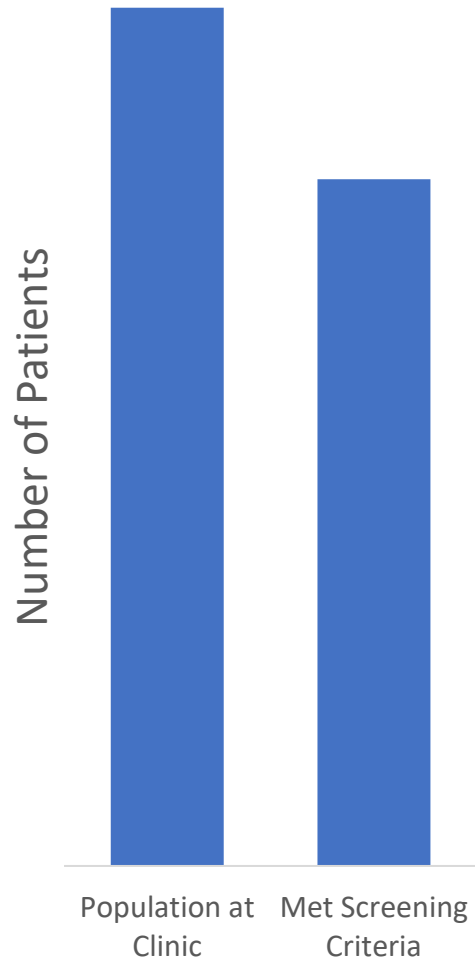


Population at Clinic



- Total population of interest
 - Based on time and location
- For TBESC-III, this is all patients who had a primary care visit during the baseline period
 - All steps have time restrictions

Met Screening Criteria



- All patients who should be screened for LTBI
- Several groups have screening recommendations:
 - California Adult TB Risk Assessment
 - U.S. Preventative Services Task Force
 - CDC supports these recommendations
- May use International Classification of Disease (ICD) codes and demographics
 - ICD codes are standardized codes used to capture medical diagnoses and procedure information

TB Screening Recommendations

Source

Screening Recommendation

EMR variables

Birth not in US, Canada, Australia, New Zealand or Western or Northern Europe

- Country of birth (U.S.-born vs non-U.S.—born)
- If country of birth unavailable, non-English language preference

California Adult TB Risk Assessment

Immunosuppression, current or planned, due to HIV infection, organ transplant, or treatment with a TNF-alpha antagonists, steroids or other immunosuppressive medication

- HIV – ICD codes
- Organ transplant – ICD codes
- Aftercare following organ transplant – ICD codes
- Immunosuppressive drugs prescribed

Close contacts to infectious TB cases

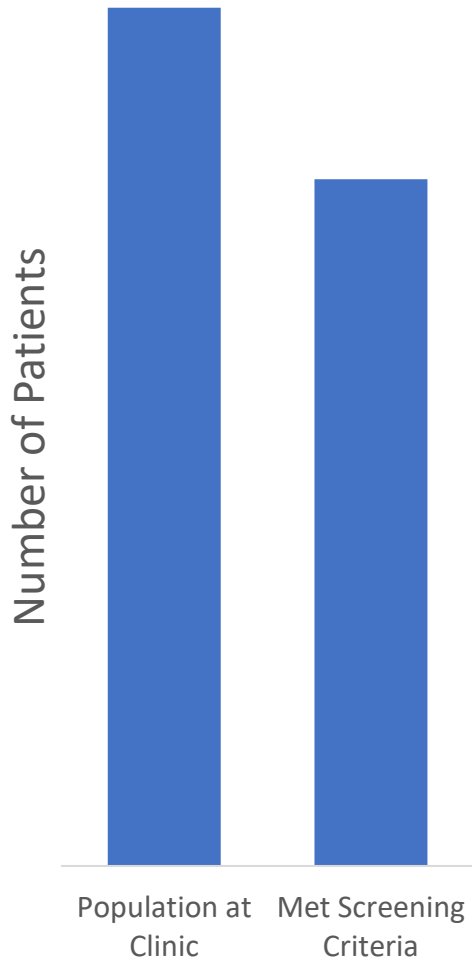
- ICD codes

U.S. Preventative Services Task Force

Persons who live in, or have lived in, high-risk congregate settings

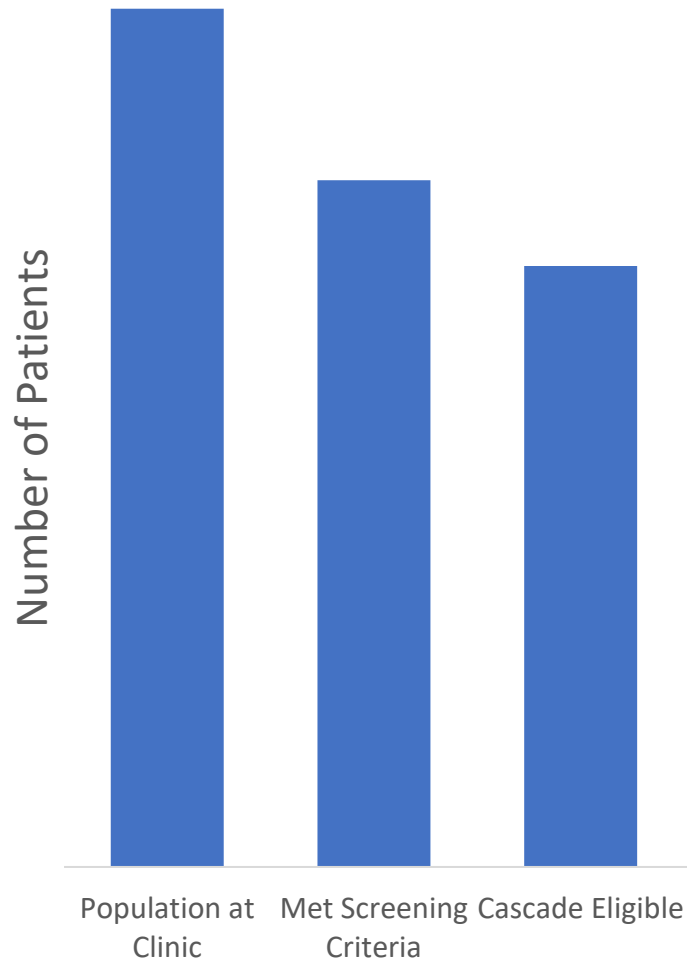
- Currently or ever homeless – Registration variable, ICD codes
- Ever had an encounter that occurred in correctional facility

Met Screening Criteria, Continued



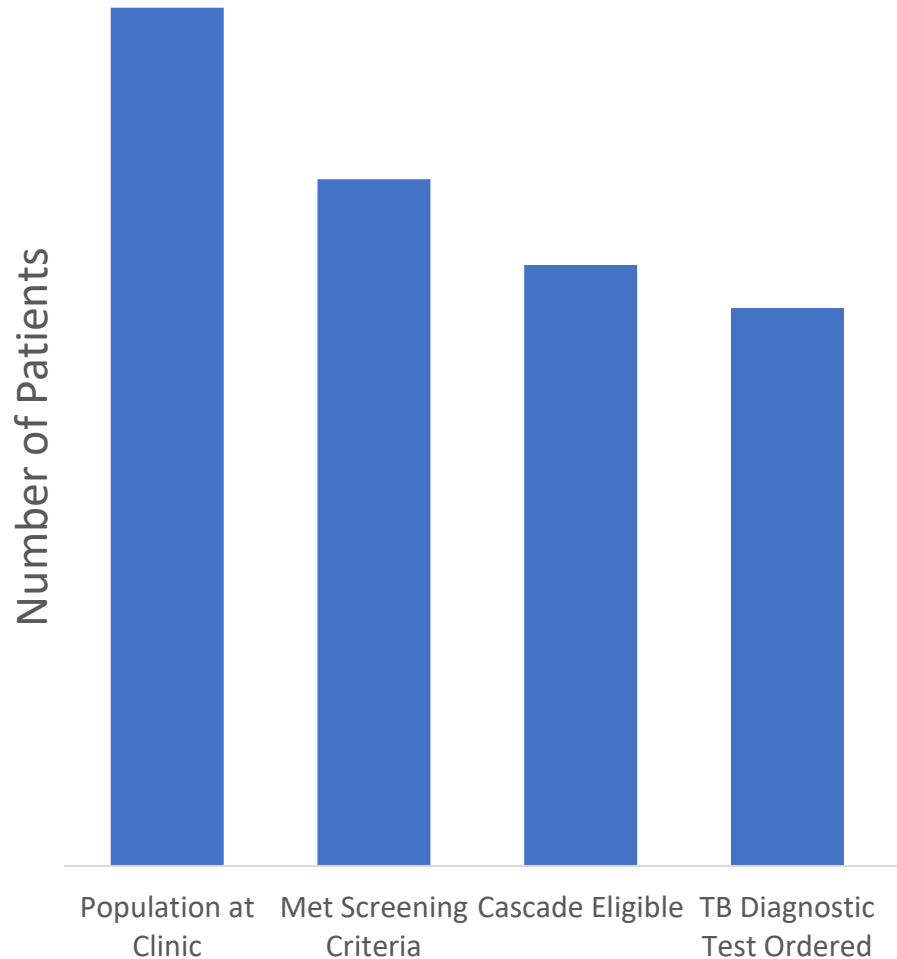
- For TBESC-III, this bar contains all patients who:
 - Were born outside the United States
 - If country of birth is missing for a patient then that patient is included if they have a non-English preference
- Both variables are often found in patient demographics
 - Country of birth generally has a high rate of missingness

Cascade Eligible



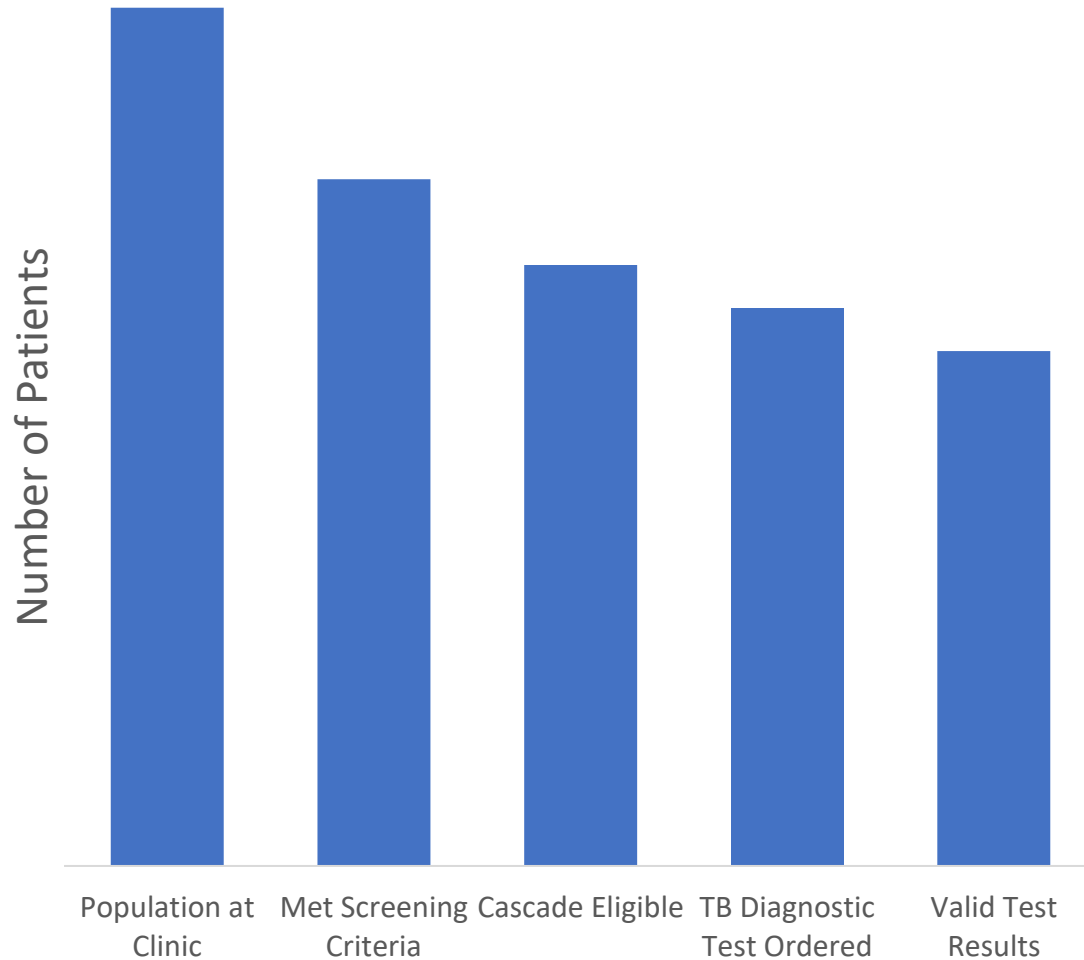
- Used in TBESC-III to identify patients eligible for interventions
 - Typically would not be used in other cascades
- Removes patients that had:
 - TB diagnosis ever
 - TB treatment ever
 - LTBI diagnosis prior to first visit
 - LTBI treatment prior to first visit
 - Valid TB test prior to first visit

TB Diagnostic Test Ordered



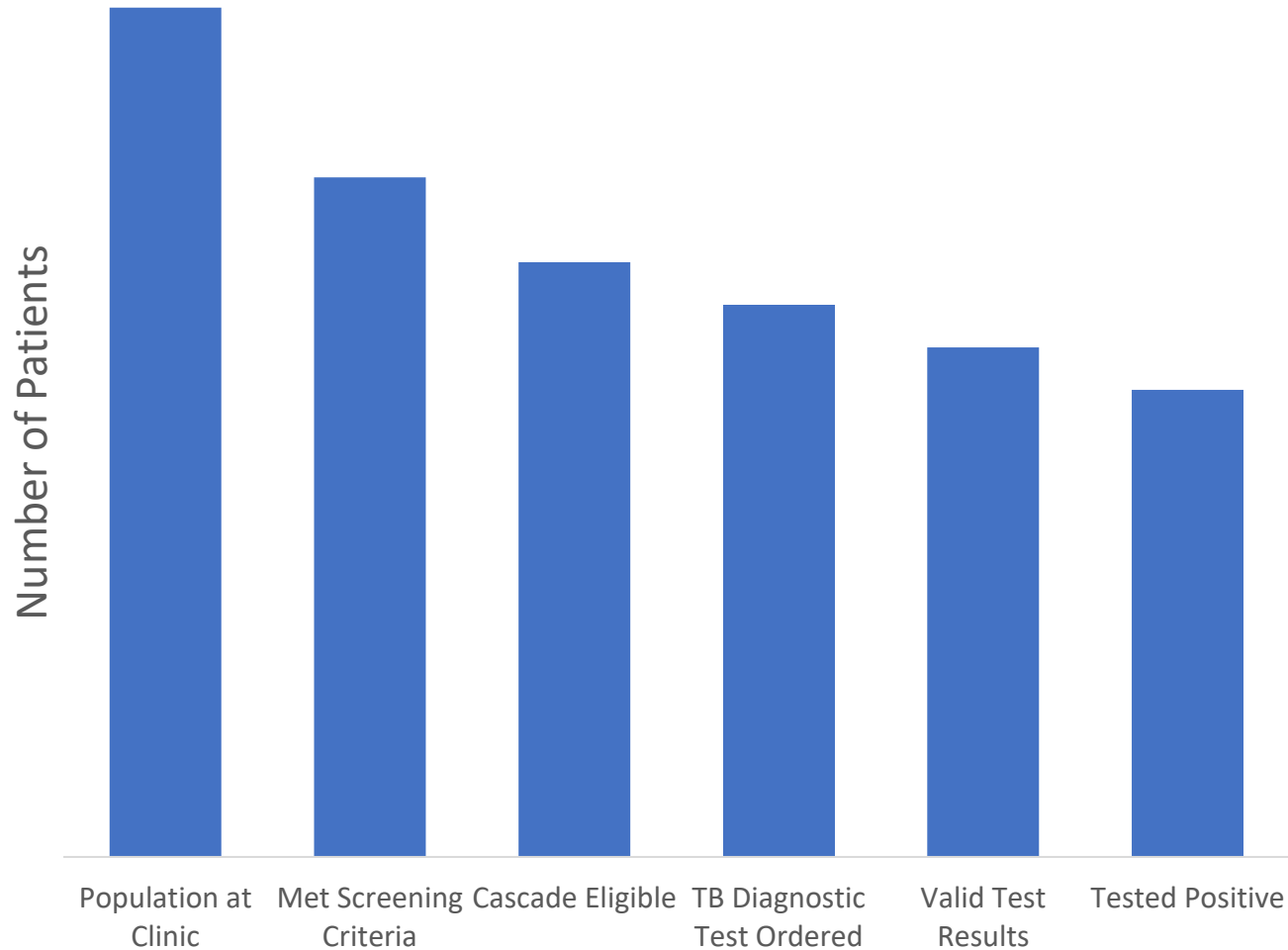
- Testing typically found in a lab/diagnostics table in the EMR
 - Sometimes Tuberculin Skin Test (TST) is in immunizations table
- TBESC-III limited this part to Interferon Gamma Release Assays (IGRAs) but others may want to include TSTs
 - IGRA is recommended over TST for patients > 5 years old, especially for non-U.S.–born patients

Valid Test Results



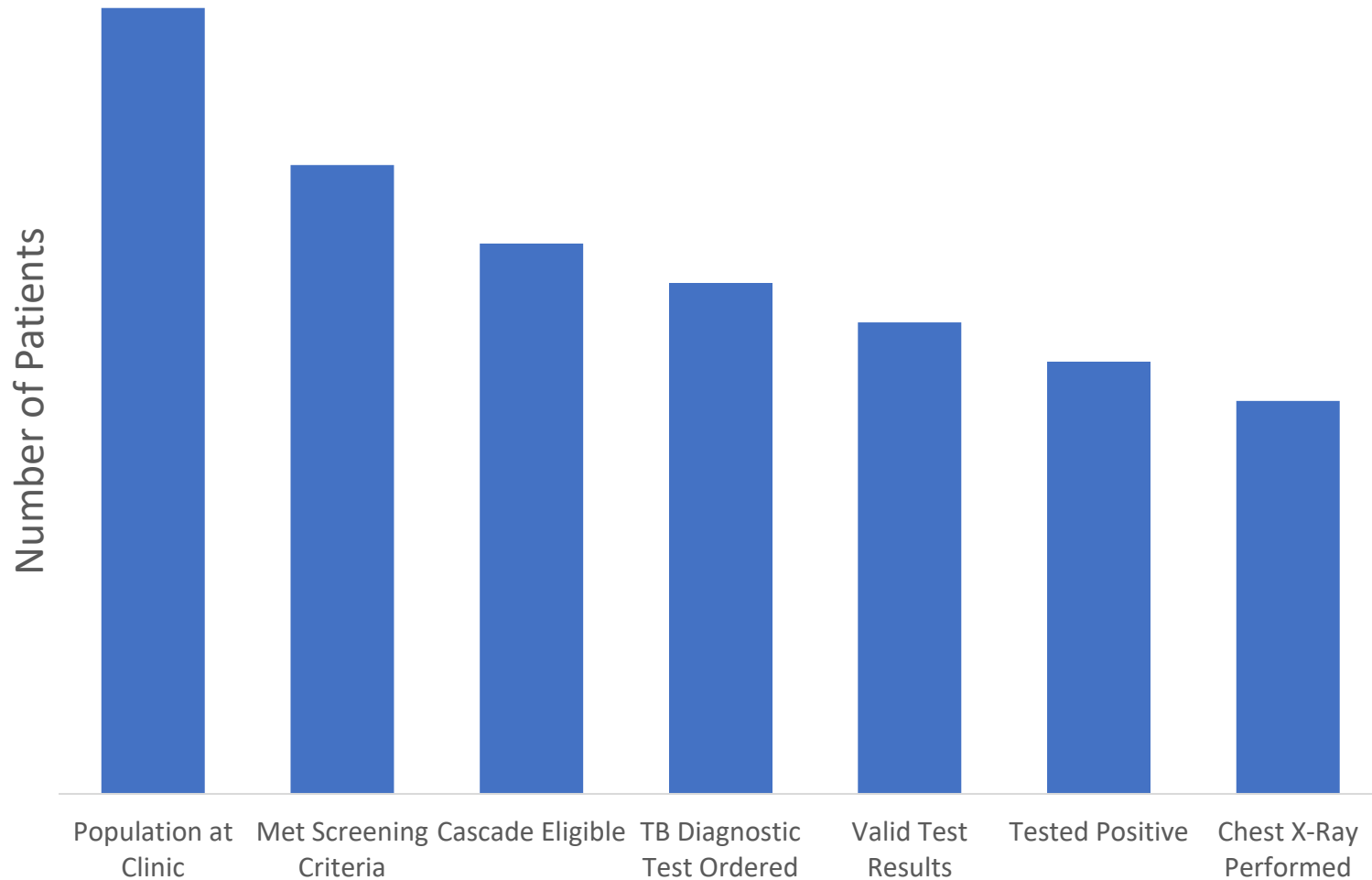
- Exclude tests that do not have a positive or negative result
- Test results limited to standardized results fields
 - Results in free text ignored
- Used in TBESC-III to assess lab performance and get better estimates of positivity
 - Often not included in cascades

Tested Positive



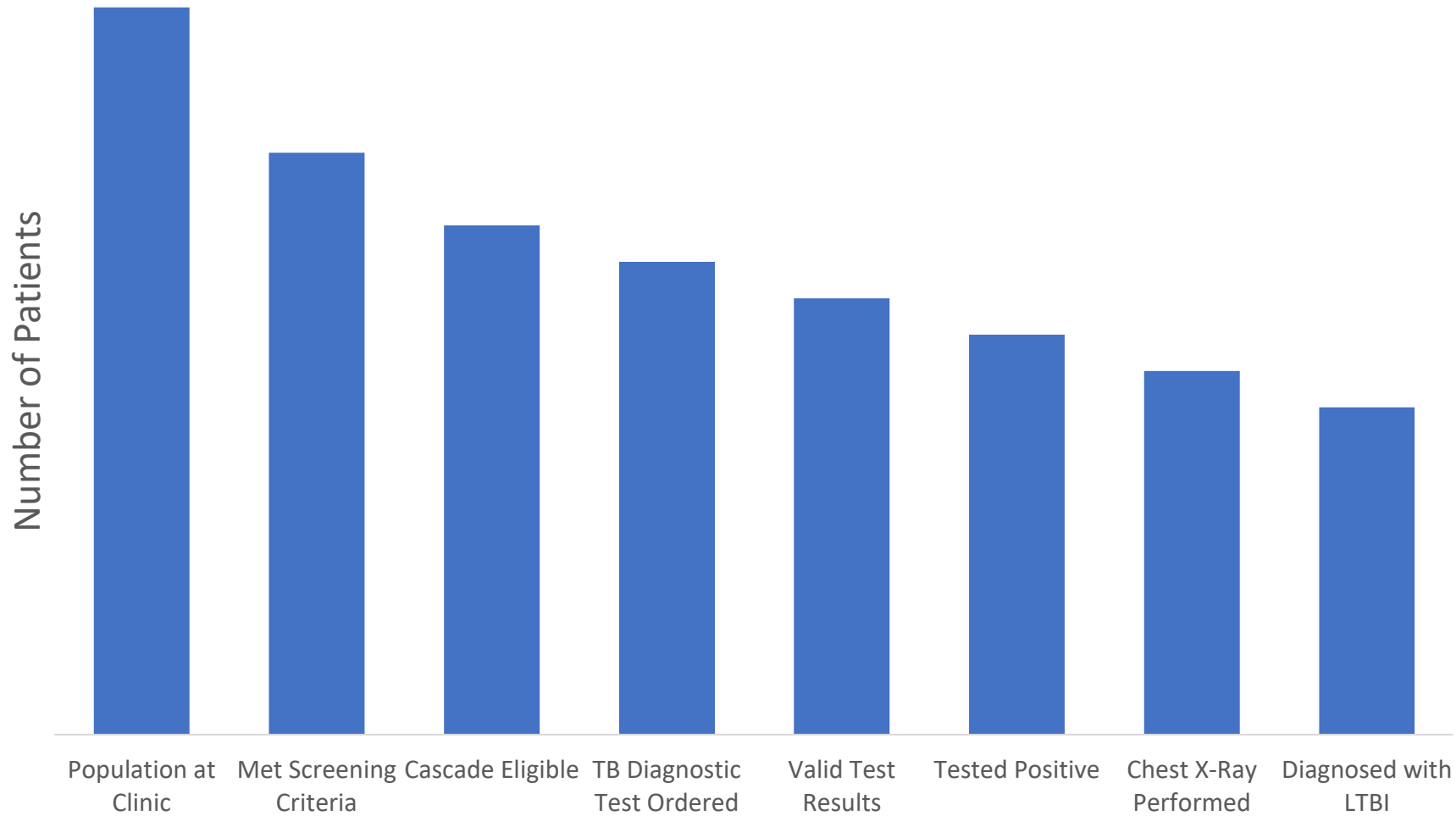
- Only patients with positive test results
 - Drop off at this step represents patients that test negative so are ineligible to continue in the care cascade
- Need to handle multiple test results

Chest X-Ray Performed



- Chest X-ray needed to rule out pulmonary TB disease
- Results generally in free text field so not easily analyzable
- TBESC-III only looks to see if chest X-ray was ordered

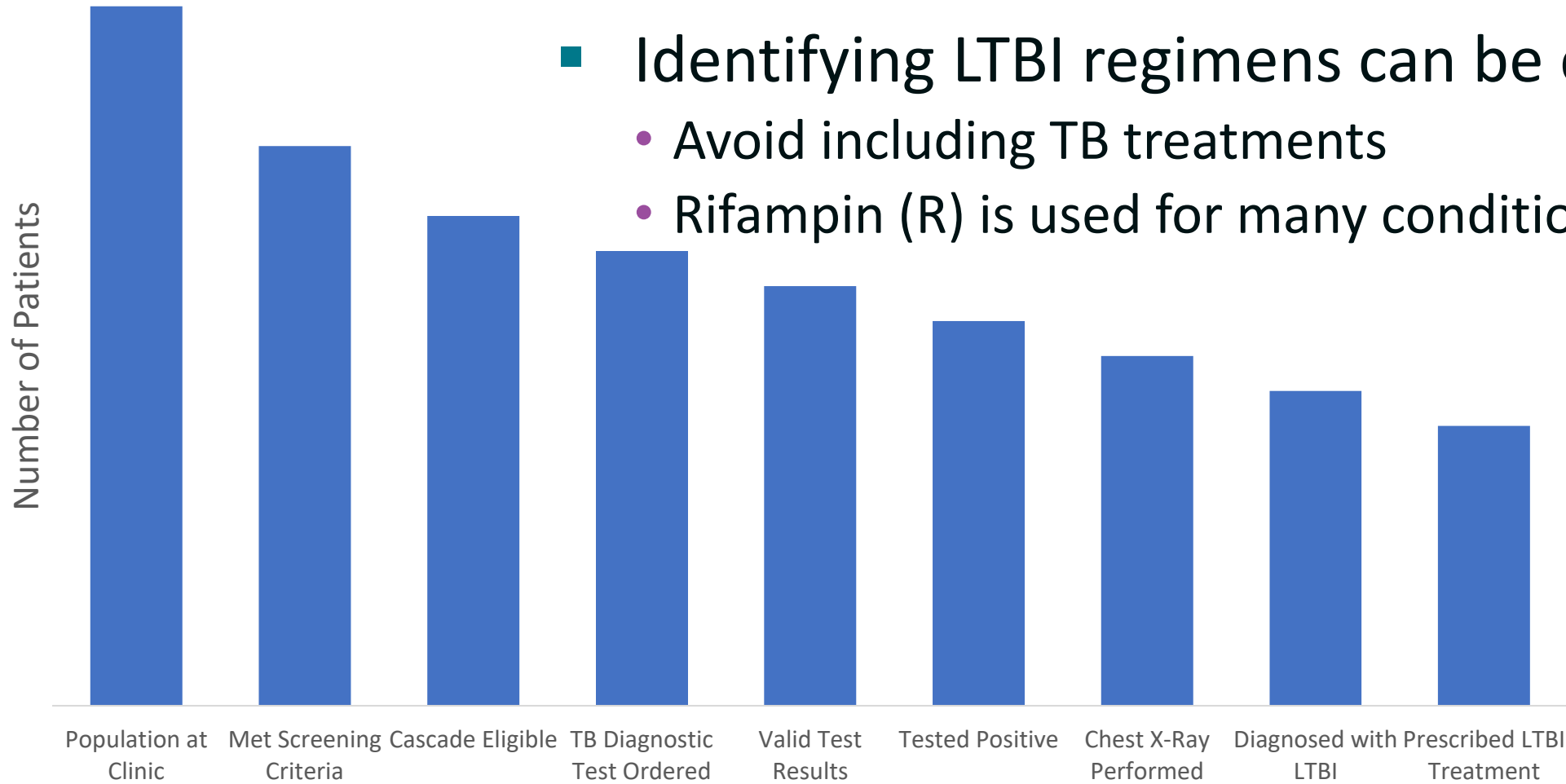
Diagnosed with LTBI



- TBESC-III uses ICD codes
- ICD use varies by clinic, clinician, and time

Prescribed LTBI Treatment

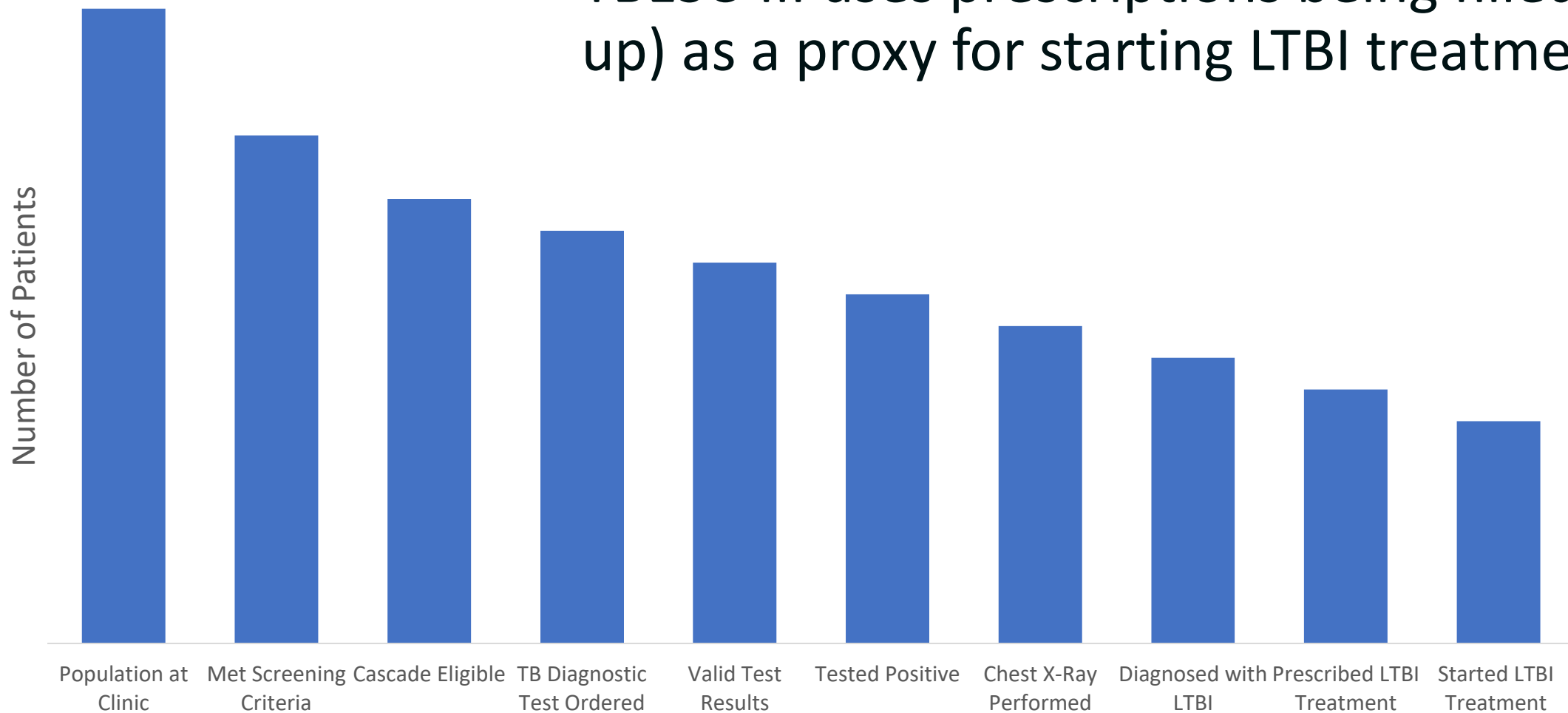
- TBESC-III uses prescriptions as a proxy for patients being offered and accepting treatment
- Identifying LTBI regimens can be challenging
 - Avoid including TB treatments
 - Rifampin (R) is used for many conditions



- TBESC-III LTBI treatment regimens:**
- 3 months isoniazid (H) and rifapentine (P; 3HP)
 - 4 months R (4R)
 - 3HR
 - 6 months or 9 months H (6H or 9H)
 - 6-12 months Moxifloxacin
 - 6-12 months Levofloxacin

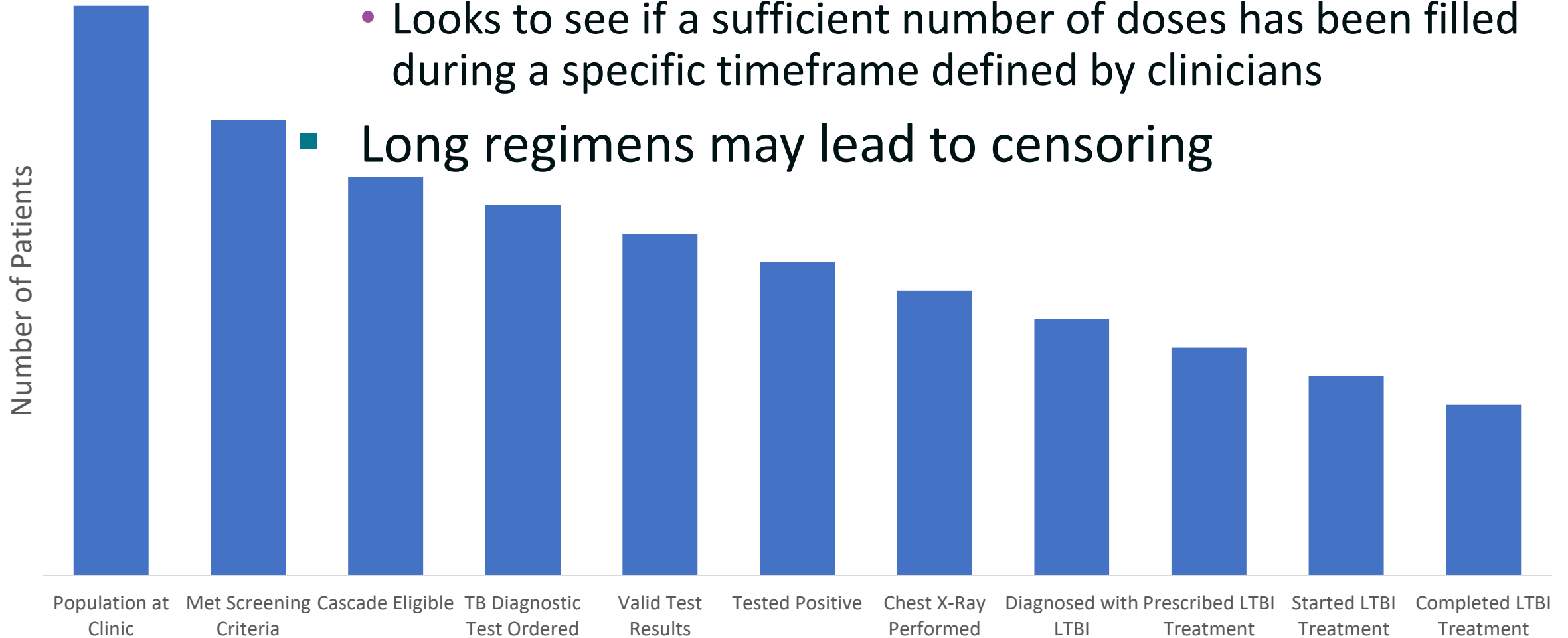
Started LTBI Treatment

- TBESC-III uses prescriptions being filled (picked up) as a proxy for starting LTBI treatment



Completed LTBI Treatment

- TBESC-III uses filled prescriptions as a proxy for completing LTBI treatment
 - Looks to see if a sufficient number of doses has been filled during a specific timeframe defined by clinicians
- Long regimens may lead to censoring



Defining the Baseline LTBI Care Cascade

Each step must occur after the prior step

All patients with a primary care visit during baseline

Non-U.S.—born

- if country of birth unknown, **non-English language** preference

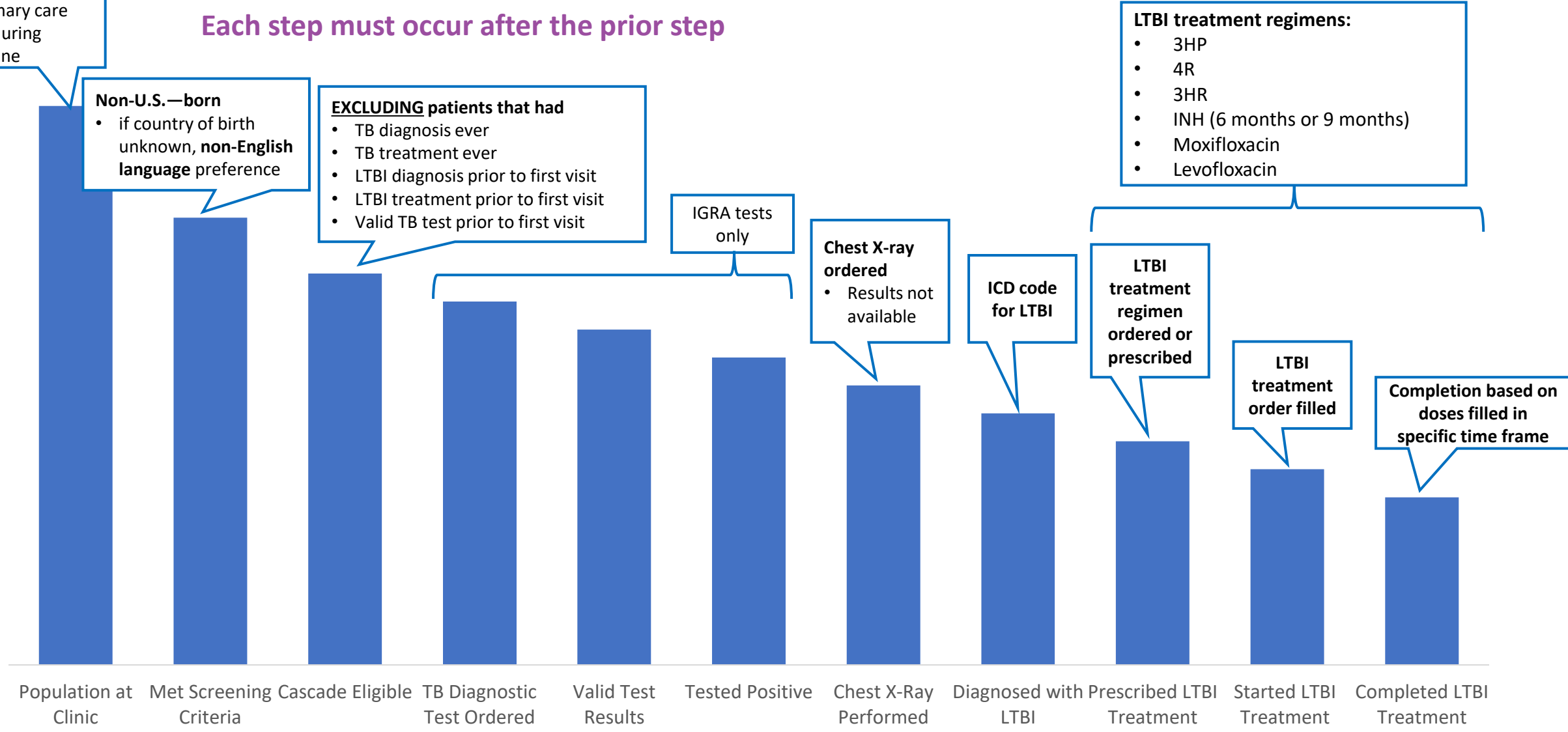
EXCLUDING patients that had

- TB diagnosis ever
- TB treatment ever
- LTBI diagnosis prior to first visit
- LTBI treatment prior to first visit
- Valid TB test prior to first visit

LTBI treatment regimens:

- 3HP
- 4R
- 3HR
- INH (6 months or 9 months)
- Moxifloxacin
- Levofloxacin

Number of Patients



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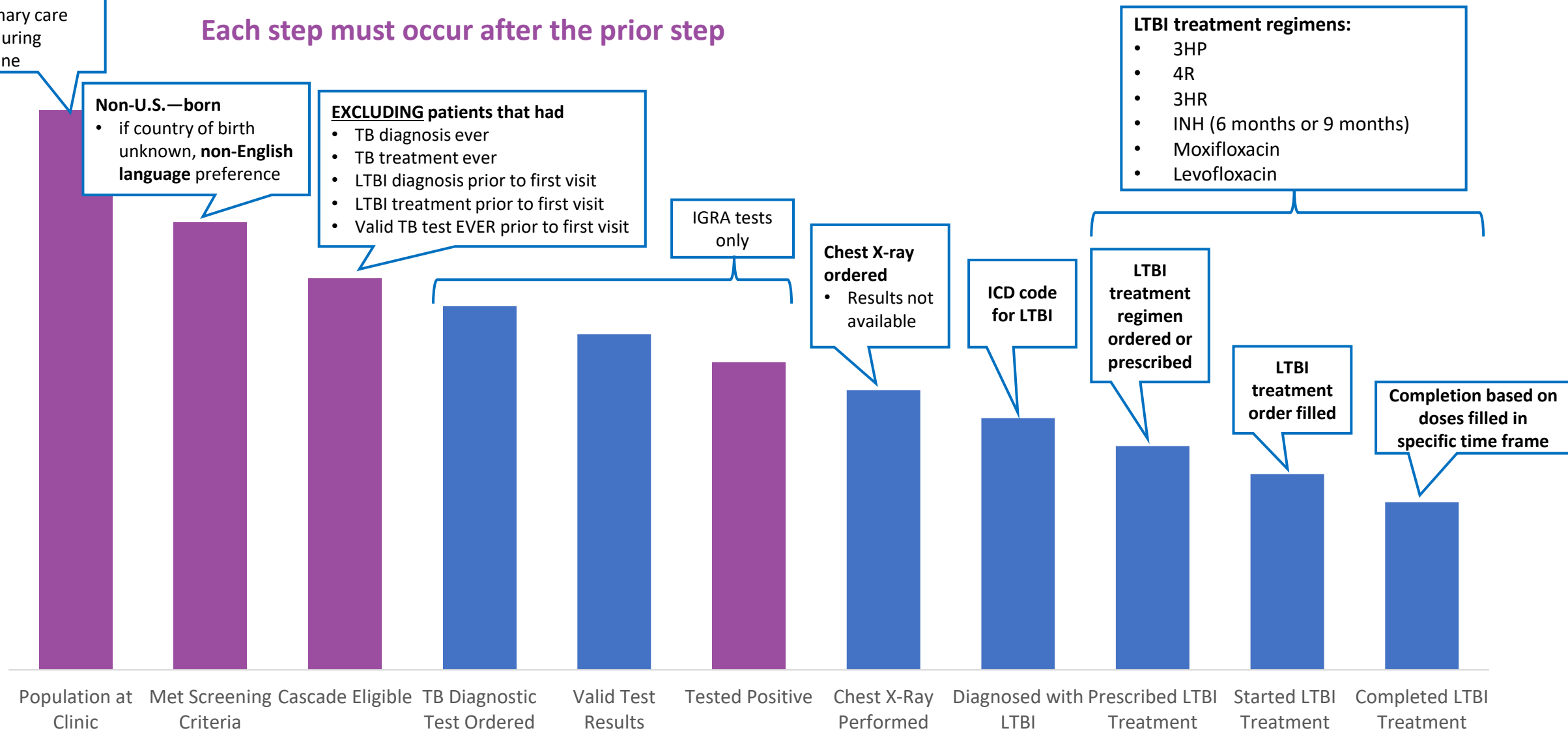
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LTBI treatment regimens:

- 3HP
- 4R
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- INH (6 months or 9 months)
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- Levofloxacin

Number of Patients



Purple bars indicate steps that are defined by the patient population and cannot be changed by interventions

TBESC-III interventions to improve the LTBI care cascade in primary care settings

TBESC-III Work Plan

- Sites will design and propose interventions that improve adoption of CDC LTBI recommendations:



Increase targeted testing of non-U.S.–born population



Use of IGRAs for TB testing



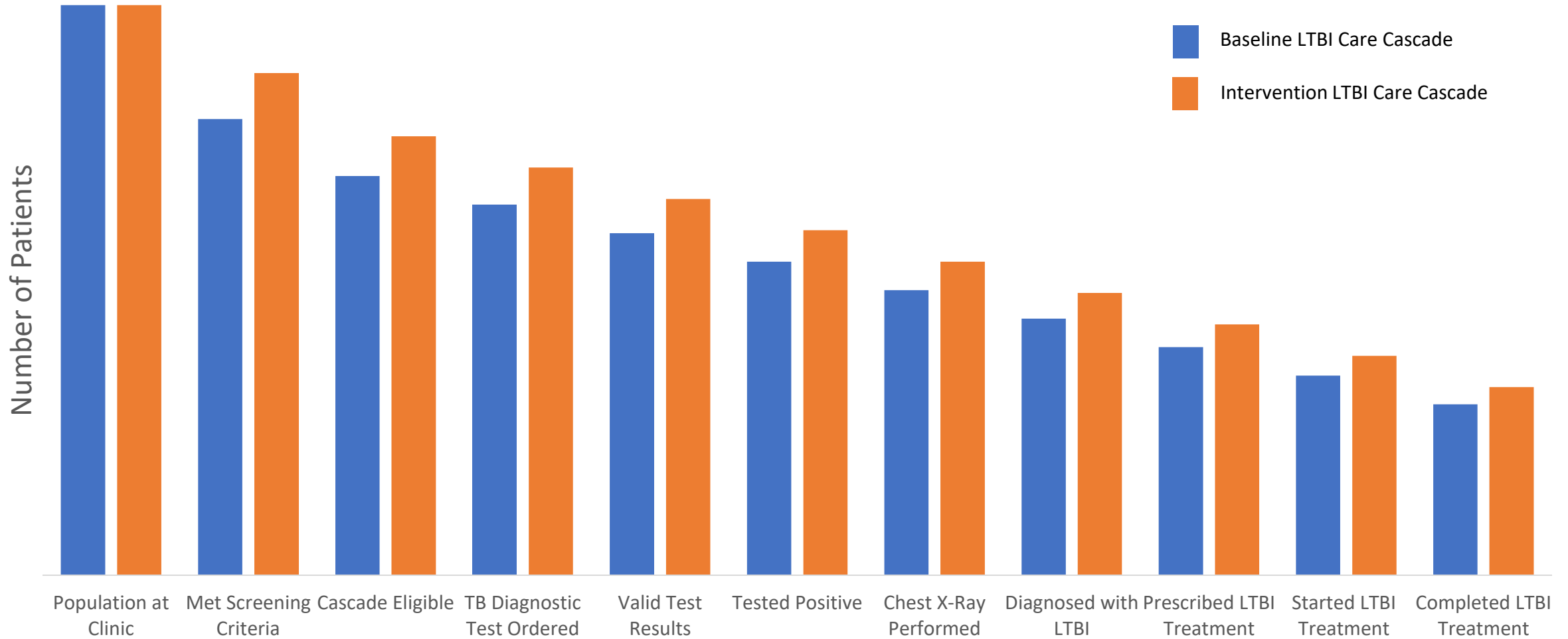
Use of rifamycin-based short course treatment regimens for LTBI

Overview of Interventions

Site	EMR modification	Case management / Care navigation	Education / Trainings	Site specific interventions/ Activities
A	✓	✓	✓	
B	✓		✓	✓
C	✓	✓	✓	✓
D	✓	✓	✓	

EMR Analytic Plan

Hypothetical LTBI Care Cascade



Intended Project Outcomes

- *Increased* availability of policy-based screening programs
- *Increased* percentage of non-U.S.–born populations screened for LTBI
- *Increased* treatment completion for LTBI
- *Decreased* progression from LTBI to TB disease
- *Decreased* incidence of TB disease in the United States

Key Takeaways

- LTBI care cascade can be used to **identify where patients are lost** in the process of TB testing and treatment
 - Interventions can be designed to improve steps with large drops
- LTBI care cascade can be built from **EMR data**
 - Steps and definitions are not standardized
- TBESC-III is using the LTBI care cascade to determine **which primary care interventions are most effective**

Acknowledgments

Epidemiology Team

TBESC sites

TBESC patients

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



Why non-USB?

- In 2021, 71% of reported TB cases in the United States were non-U.S.–born
 - Consistent with prior years
- An estimated 16% of non-U.S.–born persons living in the United States have LTBI (NHANES)
 - Compared to 2.8% in the U.S.-born

TB Incidence Rates and Percentages by Origin of Birth, *
United States, 2021 (N=7,849)

