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Tuberculosis Risk Assessment for Facility Residents and Staff

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Tuberculosis Testing: Statutes

- Tuberculosis (TB) testing is required for residents of public facilities and, upon hire, for staff.
- Statutes:
 - [Chapter DHS 132 Nursing Homes](#)
 - [Chapter DCF 250 Family Child Care Centers](#)
 - [Chapter DCF 54 Child-Placing Agencies](#)
 - [Chapter DCF 57 Group Foster Care for Children](#)
 - [Chapter DHS 75 Community Substance Abuse Service Standards](#)
 - [Chapter DHS 83 Community-Based Residential Facilities](#)
 - [Chapter DHS 88 Licensed Adult Family Homes](#)
 - [Chapter DHS 134 Facilities Serving People with Developmental Disabilities](#)

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Goals of This Presentation

- Explain Risk-based Testing
 - Why it is the best way to test for TB in Wisconsin.
 - How to do it.
 - How to interpret your results.
 - How to decide when to treat.
 - How to decide when to retest.

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What Are We Testing For?

- TB infection: evidence that the body's immune system has responded to *Mycobacterium tuberculosis* complex.
- Test does NOT tell us if there is disease; additional evaluation is necessary if test is positive.
- NO need for isolation or work restriction in case of positive test, UNLESS person has pulmonary symptoms.

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How Do We Test?

- Tuberculin skin test
 - Insertion of a mixture of more than 200 antigens to many mycobacteria under the skin.
 - Relies on an intact immune system for response.
 - Response is measured as induration (swollen NOT red), in millimeters, across the arm.
 - Can have a positive test due to BCG vaccine.
 - DOES respond to non-tuberculous mycobacteria such as *M. avium*, *M. fortuitum*.

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How Do We Test?

- Interferon gamma release assays (IGRAs; blood test; Quantiferon Gold IT™ or T-Spot™)
 - Draw a 5 ml tube of blood and send it to the lab.
 - Tests six (6) antigens relatively specific to *M. tuberculosis*.
 - Relies on an intact immune system for response.
 - Cannot have a positive test due to BCG vaccine.

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Risk-based vs. Routine Testing

- Wisconsin is a low TB incidence state.
- Many areas of the state have not had a case of TB disease in years.
- Repeat testing in a low incidence area results in many false positive tests – and associated unnecessary treatment for TB infection.
- Risk-based testing recommended by CDC since 2005.

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Who's at Risk for TB Infection?

- Close contacts of persons known or suspected to have active tuberculosis;
- Foreign-born persons from areas that have a high incidence of active tuberculosis (*e.g.*, Africa, Asia, Eastern Europe, Latin America, and Russia);
- Persons who visit areas with a high prevalence of active tuberculosis, especially if visits are frequent or prolonged;
- Residents and employees of congregate settings whose clients are at increased risk for active tuberculosis (*e.g.*, correctional facilities, long-term care facilities, and homeless shelters);

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Who's at Risk for TB Infection?

- Health-care workers who serve clients who are at increased risk for active tuberculosis;
- Populations defined locally as having an increased incidence of latent *M. tuberculosis* infection or active tuberculosis, possibly including medically underserved, low-income populations, or persons who abuse drugs or alcohol; and
- Infants, children, and adolescents exposed to adults who are at increased risk for latent *M. tuberculosis* infection or active tuberculosis.

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How Do We Measure TB Risk?

- Risk at work
- Risk at home/personal factors
- Risk in social life

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Risk at Work

- Presence of persons with known TB disease
- Presence of persons who MAY have TB but who haven't been tested
 - New admissions and/or staff
 - Readmissions who have been exposed to TB while away
 - Visitors and family
 - Temporary staff

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Risk at Home/Personal

- Foreign-born
- Live with foreign-born, or frequent visits from foreign-born
- Symptomatic, but thought to be caused by other factors (allergies, colds, flu)
- Medical history
- Immunosuppressed
- Knows/has known someone with TB disease

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Risk in Social Life

- Work/volunteer history – has worked where there were TB patients
- Social gatherings in higher incidence areas
- Drug/alcohol abuse
- Visits to TB-endemic areas, particularly if working in clinics or living with local residents

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How to Evaluate These?

- Educate as to TB risk factors
- Questionnaire for staff and residents
- Knowledge of risk factors and assessment of all new staff and residents by program manager

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Why Is Too Much Testing a Bad Thing?

- The more you test in a low prevalence area, the more likely you are to get FALSE positive results.
- Likelihood of this is a function of positive predictive value, negative predictive value, sensitivity, specificity.
- A quick overview of all of the above.

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Definition of Terms

Sensitivity: ability to correctly identify the people **WITH** the disease.

Specificity: ability to correctly identify people **WITHOUT** the disease.

These do not change with disease prevalence.

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Definition of Terms

Positive predictive value: how good the test is at identifying those who truly **ARE** positive.

Negative predictive value: how good the test is at identifying those who **DON'T** have disease.

These **DO** change with disease prevalence.

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Doing the Math

Example taken from
“**Understanding sensitivity and specificity with the right side of the brain**” by Tze-Wey Loong, BMJ. 2003 September 27; 327(7417): 716–719.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC200804/>

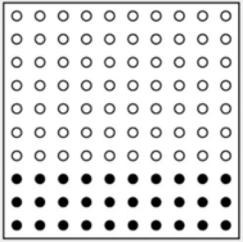
- Prevalence of disease: 30% of the population.
- Test a random 100 people (since we never test **EVERYBODY**).

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Prevalence of disease in the population



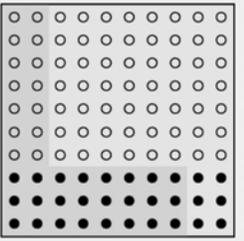
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC200804/>

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Testing the Population



Shaded area is positive test results.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC200804/>

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Results of Testing

- Correctly identified 24 of 30 with disease, so sensitivity = $24/30$ or 80%
- Correctly identified 56 of 70 without disease, so specificity = $56/70$ or 80%

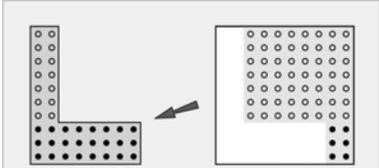
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Predictive Values

- Positive predictive value is the chance that a positive test result will be correct; here it is 24 true positives out of 38 positive results, so $24/38 = 63\%$



<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC200804/>

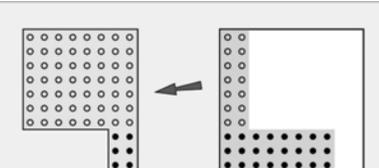
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Predictive Values

- Negative predictive value is the chance that a negative test result will be correct; 56 true negatives of 62 negative results = 90%



<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC200804/>

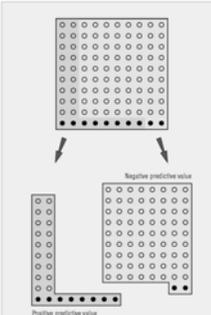
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Changes with Disease Prevalence

- Those are the results with 30% disease prevalence; 1/3 of the population has the disease.
- What happens when only 10% of the population has the disease?



<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC200804/>

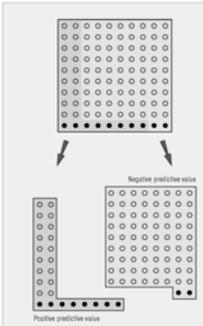
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Disease Prevalence 10%

- Sensitivity = 80%
- Specificity = 80%
- Positive predictive value
 $8/26 = 31\%$
- Negative predictive value
 $72/74 = 97\%$



<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC200804/>

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Conclusion

- As the prevalence of the disease goes down, the positive predictive value (chance of getting a true positive test) goes down, and the chance of getting a true negative test goes up.

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What Does This Have to do With TB?

- The prevalence of TB in Wisconsin is between 0.7 and 4%, depending on where you live.

	TST	T-Spot	QFT-GIT
Sensitivity	95	91	84
Specificity	85	88	99

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Assessing Risk

- Employees: questionnaire, education
 - Issues:
 - Characteristics of your workforce;
 - TB stigma;
 - Ignorance.
- Residents: Use risk factor list (next slides)
 - Although there is little TB in Wisconsin, the last generation of those routinely exposed to TB is now in our assisted living and longterm care facilities.

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Who is at Risk to Become Infected with TB?

Risk factors - Medical

- Fibrotic changes or "old healed TB" on CXR
- HIV infection
- Diabetes mellitus
- Chronic renal failure
- Gastrectomy or jejunioileal bypass
- Immunosuppressive therapy (including immunomodulators for arthritis)
- Pulmonary silicosis
- Hematologic disorders such as leukemia or lymphoma
- Malignant neoplasms such as carcinoma of the head or neck

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Who is at Risk to Become Infected with TB?

Risk Factors: Non-medical

- Age \leq 5 years
- Residency or occupation in high-risk congregate settings
- History of previous complete or partial treatment for TB
- Birth in a country having a high TB prevalence/incidence
- Children or adolescents with parents born in a country with a high prevalence of TB cases
- Socioeconomic predictors: Low income, Inner-city residence, Migrant labor, Drug and/or alcohol abuse, Homeless
- Exposure to a known case of tuberculosis

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The Major Factors for TB Disease in Wisconsin are

- o Foreign-born and/or
- o Direct contact to someone with TB disease

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Once You Test, What Do You Do With the Results?

- Handouts
 - o Positive TST – What Next?
 - o Positive IGRA – What Next?
- Local public health and state TB program happy to assist with interpretation and decisions
- Test with intent to treat positives – not much benefit in random TB testing result

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Treatment for TB Infection

- Treat those most likely to progress from infection to disease.
- Treatment available free from local public health if necessary.
- Usually covered by insurance.
- Three separate regimens available (12 week, 4 month, 9 month), plus custom regimens if persons unable to take the most common medications.

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Who's At Risk to Progress to Active TB Disease? (1)

Persons at increased risk for progression of infection to active tuberculosis include

- persons with human immunodeficiency virus (HIV) infection;
- infants and children aged <5 years;
- persons who are receiving immunosuppressive therapy such as tumor necrosis factor- α (TNF- α) antagonists, systemic corticosteroids equivalent to ≥ 15 mg of prednisone per day, or immune suppressive drug therapy following organ transplantation;
- persons who were recently infected with *M. tuberculosis* (within the past 2 years);
- persons with a history of untreated or inadequately treated active tuberculosis, including persons with fibrotic changes on chest radiograph consistent with prior active tuberculosis;

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Who's At Risk to Progress to Active TB Disease? (2)

Persons at increased risk for progression of infection to active tuberculosis include

- persons with a history of untreated or inadequately treated active tuberculosis, including persons with fibrotic changes on chest radiograph consistent with prior active tuberculosis;
- persons with silicosis, diabetes mellitus, chronic renal failure, leukemia, lymphoma, or cancer of the head, neck, or lung;
- persons who have had a gastrectomy or jejunioileal bypass;
- persons who weigh <90% of their ideal body weight;
- cigarette smokers and persons who abuse drugs or alcohol; and
- populations defined locally as having an increased incidence of active tuberculosis, possibly including medically underserved or low-income populations.

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Repeat Testing

- How often should testing be repeated?
 - Low-prevalence area:
 - Known exposure
 - Higher-prevalence area:
 - May do annual, may do every three years, may do every six months

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Special Cases

- Travel to endemic area
 - Test just before leaving
 - Test 10 weeks after return OR earlier if any symptoms are present

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Questions?

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