Test Service Cost Analysis and Stakeholder Engagement

Nicole Galloway, PhD and Sheri Hearn, MPH
Oregon State Public Health Laboratory

Laboratory-wide: 66 people
• Administration: 7 people
• Operations: 15 people
• Newborn Screening: 19 people
  • ~110,000 babies screened
  • Oregon is a regional program
• Communicable Diseases (CD): 25 people
  • General Microbiology (GM): 14 people
  • Virology and Immunology (VI): 11 people
  • ~175,000 tests performed
OSPHEL Budget Overview

- Federal grant funds have been decreasing
- Limited in tests we bill for
- Fee for service test revenue is decreasing
- Fees are linked with Medicaid reimbursement rates
- Hard to contract with payors
- Testing costs increasing
- Perceptions of partners

Funding Source

- Federal Funds: 10%
- Test Fees: 16%
- Newborn Test kits: 8%
- General fund: 66%
Purpose

- To better understand the true cost of the testing services provided by the Oregon State Public Health Laboratory to support a sustainable business model and more appropriately meet the clinical needs of stakeholders to promote the health of all Oregonians.
- To better communicate the true cost of testing services.
- To understand how time was spent during testing processes to inform process improvement initiatives.
Method: Project Plan

- There was clear Leadership support.
- Resources were allocated to the project.
- A project plan was created that included an initial methodology and schedule.
- A phased timeline was established for each test to be captured.
- Two pilot captures were performed.
Method: Staff Engagement

- **All Staff Meeting**
  - Mandatory All-Staff Meeting
  - Leadership led the meeting, citing need and importance
  - All testing services were required to participate

- **Section Meetings**
  - Met with Section Managers / testing leads to refine plan
  - Accommodations to seasonal work
  - Held meetings with testing staff to adapt the process to each test

- **Informal Check-ins**
  - Regularly checked-in with testing staff to monitor progress, make adjustments, address concerns and answer questions.
Method: Time Capture Components

- Equipment
- Staff Time and Consumables (Two methods)
  1) All time capture
     - Staff Time: All time captured on pre-defined activities for a set duration
     - Consumables: Orders for each test totaled for one year
  2) Test specific capture
     - Staff Time: Time captured on specific tests for a set number of runs.
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Method: Time Capture Components

- **Equipment**
- **Staff Time and Consumables (Two methods)**
  1) **All time capture**
     - **Staff Time**: All time captured on pre-defined activities for a set duration
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     - **Consumables**: Consumables tracked for each test run.
Method: Time Capture Components - Equipment

**Equipment Worksheet**

<table>
<thead>
<tr>
<th>Equipment Description</th>
<th>Serial number (if available)</th>
<th>Manufacturer</th>
<th>How many tests use this item? (numeric field)</th>
<th>Year of purchase if known</th>
<th>(a) Purchase Price</th>
<th>(b) Life expectancy (years)</th>
<th>Annual maintenance service contract cost/year</th>
<th>(l/a)+(b)c 'd Cost</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g.: thermal cycler calibration kit</td>
<td>SFG-67789000</td>
<td>ABI</td>
<td>All equipment will have a serial #</td>
<td>2006</td>
<td>$42,937.50</td>
<td>10</td>
<td>1000</td>
<td>$3,987.49</td>
<td>GE, Resptory and triplex</td>
</tr>
<tr>
<td>ABI 7500 Standard Real-time Detection</td>
<td>SN275000574</td>
<td>ABI</td>
<td>3</td>
<td>09/28/04</td>
<td>$42,080.00</td>
<td>15</td>
<td>$9,099.96</td>
<td>$3,033.32</td>
<td>Depreciated - GE, Resptory and triplex</td>
</tr>
<tr>
<td>ABI Fast DX Real-Time PCR Detection system w/Laptop and software</td>
<td>SN 275012008</td>
<td>ABI</td>
<td>3</td>
<td>2/10/2009</td>
<td>$45,080.00</td>
<td>7</td>
<td>$9,099.96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total: $7,020.81

Per Sample Cost of Equipment = \[
\text{Sum} \left( \frac{\text{Purchase Price}}{\text{Life Expectancy}} \right) + \frac{\text{Maintenance Cost}}{\text{Number of Tests Using the Equipment}} \]

\[
\frac{\text{Number of Tests Per Year}}
\]
Method: Time Capture Components

- Equipment
- Staff Time and Consumables (Two methods)
  1) **All time capture**
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Method: Time Capture Components
Staff Time and Consumables- All Time Capture

• Each staff member recorded time spent on activities for 4-6 weeks.
• The cost of consumables was determined by looking at all orders for a year, with the exception of a few consumables that were directly tracked during the Time Capture.
• Cost of each test was determined by summing the total cost of time, consumables and equipment for that test divided by the number of tests run in a year.
Method: Time Capture Components
Staff Time- All Time Capture

<table>
<thead>
<tr>
<th>Function</th>
<th>Level of Staff</th>
<th>Start Time</th>
<th>End Time</th>
<th>Median Salary (per minute)</th>
<th>Total Time (in minutes)</th>
<th>Labor Cost</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>The primary activity</td>
<td>Job-classification</td>
<td>(e.g. 11:58 AM)</td>
<td>(e.g. 1:45 PM)</td>
<td>Don’t fill-in this field</td>
<td>Don’t fill-in this field</td>
<td>Don’t fill-in this field</td>
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<td>#/N/A</td>
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<td>Total</td>
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</tr>
</tbody>
</table>

**List of Functions:**
1) Specimen receiving  
2) CD data entry  
3) Proofing  
4) Cat A/B packaging/shipping  
5) NBS kits  
6) CD kits  
7) Quality Assurance  
8) NBS specimen sorting  
9) NBS report sorting  
10) NBS stuffing  
11) NBS mailing  
12) NBS faxing  
13) Autoclaving  
14) Packaging receiving/distribution  
15) Servov calls  
16) Other
Method: Time Capture Components
Staff Time Compilation - All Time Capture

- Time spent on each defined activity was compiled and summed for each week.
- The time spent each week was averaged and used to calculate the labor cost on each defined activity.

<table>
<thead>
<tr>
<th>Week</th>
<th>CD Specimen Receiving Time (Time in min, Labor Cost)</th>
<th>CD Data Entry Time (Time in min, Labor Cost)</th>
<th>CD Proofing Time (Time in min, Labor Cost)</th>
<th>CD Other Time (Time in min, Labor Cost)</th>
<th>LABOR Subtotal (Time in min, Labor Cost)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1457.0000, 1,897.40</td>
<td>3943.0000, 4,978.22</td>
<td>489.0000, 635.14</td>
<td>314.0000, 410.64</td>
<td>5,203.00, 7,921.40</td>
</tr>
<tr>
<td>2</td>
<td>1925.0000, 2,518.73</td>
<td>3022.0000, 3,792.08</td>
<td>245.0000, 316.35</td>
<td>175.0000, 227.09</td>
<td>5,367.00, 6,854.25</td>
</tr>
<tr>
<td>3</td>
<td>1761.0000, 2,276.43</td>
<td>2804.0000, 3,509.65</td>
<td>478.0000, 617.77</td>
<td>150.0000, 194.70</td>
<td>5,193.00, 6,598.56</td>
</tr>
<tr>
<td>4</td>
<td>2646.0000, 3,392.42</td>
<td>3015.0000, 3,789.79</td>
<td>512.0000, 658.36</td>
<td>274.0000, 358.02</td>
<td>6,447.00, 8,198.58</td>
</tr>
<tr>
<td>5</td>
<td>2589.0000, 3,334.80</td>
<td>2209.0000, 2,818.53</td>
<td>466.0000, 601.69</td>
<td>140.0000, 183.70</td>
<td>5,404.00, 6,938.71</td>
</tr>
<tr>
<td>6</td>
<td>2781.0000, 3,539.31</td>
<td>2497.0000, 3,137.13</td>
<td>514.0000, 660.16</td>
<td>397.0000, 541.41</td>
<td>6,189.00, 7,878.02</td>
</tr>
<tr>
<td>Average</td>
<td>2193.1667, 2,826.52</td>
<td>2915.0000, 3,670.90</td>
<td>450.6667, 581.58</td>
<td>241.6667, 319.260</td>
<td>5,800.50, 7,398.25</td>
</tr>
</tbody>
</table>

Cost Per Year: 114044.67, 146978.82, 151580.00, 190886.81, 23434.67, 30242.07, 12566.67, 16601.52, 301626.00, 384709.22
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Method: Time Capture Components
Test Specific Capture- Staff Time

- Each test was captured up to 10 times. The final cost is an average of each capture.
Method: Time Capture Components
Test Specific Capture- Consumables

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity Used/Batch (c)</th>
<th>Unit of measure</th>
<th>Vendor</th>
<th>Item Number</th>
<th>Item Cost ($)</th>
<th>Units/Item (b)</th>
<th>Cost (alb) x $</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the consumable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffer A</td>
<td>25</td>
<td>liters</td>
<td>self</td>
<td>n/a</td>
<td>$1,000.00</td>
<td>100</td>
<td>$250.00</td>
<td></td>
</tr>
<tr>
<td>5 ml culture tubes</td>
<td>6</td>
<td>each</td>
<td>Fisher</td>
<td>03-341-1</td>
<td>$70.55</td>
<td>1000</td>
<td>$0.42</td>
<td></td>
</tr>
<tr>
<td>p1000 pipet tips</td>
<td>6</td>
<td>each</td>
<td>Rainin</td>
<td>17014967</td>
<td>$84.45</td>
<td>768</td>
<td>$0.66</td>
<td></td>
</tr>
<tr>
<td>p200 pipet tips</td>
<td>13</td>
<td>each</td>
<td>Rainin</td>
<td>17014963</td>
<td>$84.45</td>
<td>960</td>
<td>$1.14</td>
<td></td>
</tr>
<tr>
<td>p20 pipet tips</td>
<td>4</td>
<td>each</td>
<td>Rainin</td>
<td>17014961</td>
<td>$84.45</td>
<td>960</td>
<td>$0.35</td>
<td></td>
</tr>
<tr>
<td>IgG kit</td>
<td>2</td>
<td>strips</td>
<td>Biotrin/Diasorin</td>
<td>V619 Imus</td>
<td>$962.00</td>
<td>12</td>
<td>$100.33</td>
<td></td>
</tr>
<tr>
<td>IgM kit</td>
<td>2</td>
<td>strips</td>
<td>Biotrin/Diasorin</td>
<td>V519 Imus</td>
<td>$962.00</td>
<td>12</td>
<td>$100.33</td>
<td></td>
</tr>
<tr>
<td>combi tips</td>
<td>7</td>
<td></td>
<td>VWR</td>
<td>40000-006</td>
<td>$79.19</td>
<td>100</td>
<td>$5.64</td>
<td></td>
</tr>
<tr>
<td>Total*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$328.79</td>
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<tr>
<td>Per Sample</td>
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<td></td>
<td></td>
<td>$109.60</td>
<td></td>
</tr>
</tbody>
</table>
Method: Time Capture Cost Components

Equipment costs

Staff time and consumables
Method: Time Capture Cost Components

- Equipment costs
- Staff time and consumables
- Operational Costs

Facility maintenance costs
Accreditation fees
Shipping and mail
Travel
Support staff salaries
Management salaries
Continuing education
Membership fees
Utilities and rent
Waste removal
LIMS
Billing vendor

OREGON STATE PUBLIC HEALTH LABORATORY
Public Health Division
Method: Time Capture Cost Components

- Equipment costs
- Staff time and consumables
- Operational Costs
- Cost Allocations (Agency Overhead)
- Payroll
- IT Services
- Human Resources
- Agency Management
- Financial Office
- Security Office
- Risk management
Method: Time Capture Cost Components

- Equipment costs
- Staff time and consumables
- Operational Costs
- Cost Allocations (Agency Overhead)
- Cost of Quality

Repeated runs
Wasted reagents / supplies
Improper purchasing
Method: Time Capture Cost Components

- Equipment costs
- Staff time and consumables
- Operational Costs
- Cost Allocations (Agency Overhead)
- Cost of Quality
- Total Cost of the Testing Service
Method: Calculating the Cost of Staff Time

- The cost of staff time includes:

  1) Salary (average salary per classification)
  2) + Other payroll expenses (benefits)
  3) + Operational costs

  = Yearly Staff Salary Sub-total

  4) + Allocations

  = Yearly Staff Salary
Method: Calculating the Cost of Staff Time

- Determined the number of yearly working minutes*

1) Days in a year
2) - Weekends, Holidays, Vacation days, Sick days
   = Working Days
3) x Hours in a working day (8 – breaks, lunch and an estimate for non-captured time)
   = Working Hours
4) x 60 minutes
   = Working Minutes

*Adapted from RWTH Aachen “calculating man month’s”
Method: Calculating the Cost of Staff Time

Yearly Staff Salary/Working Minutes = Salary/Minute
Challenges and Assumptions

- Operational Costs: The longer it took to perform an activity, the more operational costs were allocated to that activity.
  - Other potential methods:
    - Spilt equally among all tests
    - Appropriate based on test specimen volume
  - Capturing time spent on quality assurance activities and non-testing time was difficult.
  - These methods may need to be adapted to determine the testing costs of other laboratories.
## Results

<table>
<thead>
<tr>
<th>Test</th>
<th>Yearly Totals</th>
<th>Time Study Calculated Cost</th>
<th>Funding</th>
<th>Current Fee Structure</th>
<th>Public Health Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Copia</td>
<td>Per Sample</td>
<td>Federal: As of June</td>
<td>Maximum Fee</td>
</tr>
<tr>
<td><strong>Communicable Diseases</strong></td>
<td></td>
<td></td>
<td></td>
<td>Fees: As of April 2018</td>
<td>Fee</td>
</tr>
<tr>
<td>Arbovirus Testing</td>
<td>2014</td>
<td>2015</td>
<td>2016</td>
<td>2017</td>
<td>$415,677.74</td>
</tr>
<tr>
<td>Zika Virus Antibody</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$425.62</td>
</tr>
<tr>
<td>West Nile Virus Antibody &amp; St. Louis Encephalitis</td>
<td>70</td>
<td>65</td>
<td>16</td>
<td>18</td>
<td>$376.27</td>
</tr>
<tr>
<td><strong>Biodote</strong></td>
<td></td>
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<td></td>
<td>$42,775.40</td>
</tr>
<tr>
<td><strong>Enteritis</strong></td>
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<td>-</td>
</tr>
</tbody>
</table>

**Oregon State Public Health Laboratory**
Public Health Division
Highlighted Results

- Tuberculosis:
  - Cost: $1,000,000
  - Funding: ~$61,000 + some variable funds

- Miscellaneous Serology (i.e. Rubella, Rickettsia Battery, Hantavirus, etc.):
  - Cost: ~$138,000
  - Fees: ~$7,000

- Gastroenteritis testing (Noro, Astro, Rota and Sapovirus PCR and Sequencing):
  - Cost: ~$676,000
  - Grant Funding: ~$294,000

- Rabies
  - Cost: ~$55,000
  - Funding: ~$4,000

- Cost of providing specimen collection kits
  - Cost: ~$200,000
Lessons Learned

- Many tests were performed due to tradition (Parvo).
- Identified tests where there was a public health need and no funding (Tuberculosis, Hepatitis).
- The challenge of emerging pathogen testing (Zika).
- Validating new tests is laborious and expensive (WGS).
- Batch testing decreases tests costs (HIV).
- QA activities are a significant unfunded cost.
- There is a cost associated with the capacity to do testing (Anthrax, Orthopox).
Stakeholder Engagement

- Held a series of meetings to share the results and receive feedback with:
  - **Laboratory staff**: 1) Managers 2) Leads 3) All staff
  - **Division Partners**: Targeted meetings with State Epidemiologists and Public Health Physicians.
  - **External Partners and Clients**: Created a communication plan to share results and receive input from Local Public Health Authorities and sent out communications to clients.
Outcomes

• Discontinued over 15 tests (Rabies, Botulism).
• Improved workflows for 3 tests to increase efficiency (Tuberculosis, Norovirus).
• Increased funding for some testing from PH partners (HIV, Syphilis).
• Increased awareness of costs (laboratory staff, partners).
• Identified gaps between funding and testing needed to support public health programs (Tuberculosis, Hepatitis).
• Helps with budgeting, grant development and identifying costs for outbreaks and emerging testing.
• A resource for laboratory improvements (inventory management system).
Thank You!!

- Texas DSHS Public Health Laboratory
- APHL
- John Fontana, OSPHL Laboratory Director
- Collette Young, CPHP Center Administrator
- Oregon State Public Health Laboratory staff
- Oregon Health Authority, Public Health Division staff