The Influence of Disease Frequency and Cost of Testing in the Routine Screening of Newly Arrived Refugees in the United States

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**Background**

- United States receives ~60,000 refugees/yr from various locations around the world (CDC)
- Prior to departure, refugees undergo a medical examination
- Refugee populations are susceptible to various problems, including contagious illnesses and chronic diseases, some of which are rare and others common
- Upon arrival to the US, medical screening should be conducted within 30-90 days
- For many diseases, there are more than one tests available for screening
- Prompt diagnosis and treatment are essential to prevent the spread of illnesses
- When determining which diseases to screen for and which tests to use, disease frequency and the cost of testing are both important considerations
- Public Health - Dayton & Montgomery County (PHDMC) examines refugees who have recently arrived in Dayton, OH
- The objective of this study was to determine the cost-effectiveness of available screening tests for newly arrived refugees
Methods

- Retrospective review was conducted of records from PHDMC's Refugee program
- Records were reviewed for refugees seen from January 1, 2014 through December 31, 2015, 392 charts total
- Diagnoses were based on the assessment of the provider conducting the exam
- Countries of origin were grouped into geographic regions based on the World Health Organizations (WHO) classifications
- The cost data is based on the current charges paid by PHDMC for the tests conducted
- Demographic Information: Age, Sex, Country of Origin
- Screening: CBC, Glucose, Malaria smear, HIV, RPR, Chlamydia, Gonorrhea, Hepatitis B, Lead, CXR, Pregnancy, T Spot (or TST), Stool O&P, UA
Findings

- A total of 391 subjects were identified through chart review; the average age was 23.2 years Fig. 1 on page 6, 45% were female
- The majority of refugees migrated from the African (63.4%) and Eastern Mediterranean (26.9%) regions Fig. 2 on page 6
- *Giardia* was the most frequent stool pathogen, in a total of 49 of the samples; and was most common in the <13 age group (79.5%) and African region (89.8%) Fig. 3 on page 7

![Fig. 4: The percent of abnormal results summarized by age group.](image)

**References:** University of Dayton - Dayton/US

- Abnormal results were most common for stool O&P, with 210 abnormal results
- Abnormal T-Spot results most frequently occurred in the 46-55 age group (56.3%) and African Region (69.6%)
- Abnormal results for hemoglobin most frequently occurred in the 36-45 age group (25.5%) and the African Region (50.9%)
- High absolute eosinophil counts most frequently occurred in those <13 (14.2%) and 26-35 (12.9%), and the African region (70%)
- Finally, elevated blood glucose most commonly occurred in the >56 age group (57.9%), and the African Region (55.6%)
Fig. 5: Calculated cost per test conducted, and per abnormal test result. Cost calculations were performed using pricing from PHDMC’s Refugee Program.

**References:** University of Dayton - Dayton/US

- The highest cost per abnormal result were found for Lead ($6,255), Malaria ($5,814), GC DNA probe ($2,043), and HIV ($1,557)
Fig. 1: Refugee population age ranges. Refugees ranged in age from 7 months to 83 years, average age was 23.2 years.

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Fig. 2: Refugees grouped into regions based on WHO’s regional classifications. The majority of refugees were from the African (63.4%) and Eastern Mediterranean (26.9%) regions.

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**Fig. 3:** Summary of species of pathogenic parasites found in stool O&P.

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<table>
<thead>
<tr>
<th>Age</th>
<th>Number</th>
<th>Hg (%Abn)</th>
<th>Eos (%Abn)</th>
<th>Glu (%Abn)</th>
<th>Par value (%)</th>
<th>TB (%Abn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;13</td>
<td>122</td>
<td>7.5%</td>
<td>14.2%</td>
<td>8.3%</td>
<td>37.6%</td>
<td>8.9%</td>
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<td>18-25</td>
<td>63</td>
<td>17.7%</td>
<td>8.1%</td>
<td>14.5%</td>
<td>11.3%</td>
<td>22.6%</td>
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<td>36-45</td>
<td>52</td>
<td>25.5%</td>
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<td>35.3%</td>
<td>9.8%</td>
<td>31.4%</td>
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<td>&gt;56</td>
<td>19</td>
<td>21.1%</td>
<td>0.0%</td>
<td>57.9%</td>
<td>31.6%</td>
<td>31.6%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
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</table>

**Fig. 4:** The percent of abnormal results summarized by age group.

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<table>
<thead>
<tr>
<th>Test</th>
<th>Total Cost</th>
<th>Cost Per Abnormal Test Result</th>
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<tbody>
<tr>
<td>CBC with differential</td>
<td>$2,443.38</td>
<td>$16.51</td>
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<tr>
<td>Glucose</td>
<td>$2,062.71</td>
<td>$28.65</td>
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<tr>
<td>Hepatitis B Immunity Panel</td>
<td>$22,283.46</td>
<td>$83.46</td>
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<tr>
<td>Lead</td>
<td>$6,255.48</td>
<td>$6,255.48</td>
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<tr>
<td>Ova &amp; Parasites</td>
<td>$4,831.08</td>
<td>$22.90</td>
</tr>
<tr>
<td>RPR (Syphilis serology)</td>
<td>$1,840.08</td>
<td>$613.36</td>
</tr>
<tr>
<td>Urinalysis, complete</td>
<td>$2,354.58</td>
<td>$31.39</td>
</tr>
</tbody>
</table>

**Fig. 5:** Calculated cost per test conducted, and per abnormal test result. Cost calculations were performed using pricing from PHDMC’s Refugee Program.

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Interpretation

- Only 3 abnormal results were obtained for Chlamydia, costing $2,043 per abnormal result; lower prevalence in refugee populations compared to the U.S. may be due to cultural factors; another study found the prevalence to be 0.6% compared to the US population 2.2%
- The cost per abnormal result for stool O&P ($23) and T-Spot ($270) were reasonable compared to other similar interventions
- Previous studies have suggested that serology may be a better test than stool O&P, and testing only symptomatic adults, with routine screening for children
- Our results showed testing for HBsAg to cost $377 per abnormal test. Another study found that testing for HBsAg in populations of chronic infection of 2% would cost $750-$3,752 per person. This cost is lower than other programs such as HIV screening, and a variety of fetal and newborn screening tests.
- Only one abnormal result was found for Lead screening in children, costing $6,255. In a previous study they found that the rate of initial elevated blood lead levels in refugees was 3.3% compared to 1.8% in statewide children during the same time frame.
- The highest cost was for lead ($6,255) and malaria ($5,814) testing, these are reasonable due to the seriousness of the resulting disease and comparison with other screening measures
- Well accepted screening interventions such as mammography ($29,900 per QALY gained) and colonoscopy ($14,900 per QALY gained) support the reasonable cost of the refugee screening measures
- The results suggest that for certain screening interventions it may be beneficial to switch screening tests; or complete testing based on targeted guidelines such as: country of origin, reception of presumptive treatment, age, and other risk factors
- The existing literature reports intervention effectiveness in DALY's and QALY's which are difficult to compare to our data
- Existing literature on refugee screening use a variety of tests, making comparison of cost-effectiveness of methods difficult
- Future research should be conducted into cost-effectiveness of refugee screening programs to establish reasonable cost of screening
References


Short Bio (max. 150 words or less)

Ashley Trent is a senior undergraduate at the University of Dayton, majoring in Pre-Medicine and Psychology, and will graduate with a Bachelor of Science in May 2018. She is an active member of Alpha Epsilon Delta and completed two service trips to Nicaragua through Global Brigades. In addition, last summer completed a summer internship at Public Health - Dayton & Montgomery County; in which she engaged in a variety of projects regarding public health and infectious disease. In the future, Ashley intends to attend medical school to pursue a dual M.D. /M.P.H. degree, and plans to work in global health.

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