From Home to School: Tribal Indoor Air Quality Study Preliminary Results

EPA Grant Number: 83559601
TU Project Number: 14-2-1201-468
Presentation Summary

- Study Overview—Richard Shaughnessy & Sohail Khan
- Data Collection Training & Challenges—Richard Shaughnessy
- Data Collection & Sampling—Richard Shaughnessy
- Home Conditions—Richard Shaughnessy
- School Conditions—Richard Shaughnessy
- Preliminary Results—Richard Shaughnessy

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Study Overview
Richard Shaughnessy, PI
&Sohail Khan, CI
Objectives

• Demonstrate the importance of traditional ecological knowledge (TEK) for addressing asthma triggers.
• Develop and refine asthma/allergy trigger reduction and targeted cleaning education for tribal homes and schools based on TEK.
• Test differences between home and school environments to determine if asthma symptom days are reduced in school and home environments that implement TEK education-based practices.
• Based on study results, develop practical/transferable educational materials/modules to encourage adoption of effective practices in tribal homes and schools.
• Disseminate research results, in publications, webinars, Cherokee, Navajo, and Nez Perce environmental and health related events and outreach activities, and conferences.

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Top 10 Diagnosis
FY’2008 – FY’2014

1. Diabetes
2. Hypertension
3. Depressive Disorders
4. Asthma
5. Hyperlipidemia
6. Oesophageal Reflux Disease
7. Hypothyroidism
8. Acute Upper Respiratory Infection
9. Otitis Media
10. Chronic Airway Obstruction

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Data

- Indoor Environmental Variables
  - CO₂
  - Humidity/Temperature

- ATP Sampling
  - Allergen Dust Sampling
  - Building Condition

- Assessment
  - CO₂
  - CO
  - Humidity/Temperature

- Illness-absenteeism
  - Nurse Visits and reported illnesses/symptoms

- Health Outcomes
  - Building Attributes
  - Student Demographics

- Outdoor Environmental Variables Monitoring

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Year 3-4 Analysis

- Structuring databases for analyses
  - Outdoor environmental variables
  - Indoor environmental variables
  - Building conditions/attributes
  - Attendance/health data
  - Health Outcome (Asthma Control Test)
  - Cherokee Nation medical records/asthma codes
- QC reviews of databases
- Statistical analyses/hypotheses tests
- Research Advisory Panel review and interpretation

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Year 3-4
Dissemination

- Research Advisory Panel recommendations
- Development of conference presentations
  - ITEP conference (plenary and breakout sessions)
  - ITEC conference
  - NNHRRB Research Conference (Navajo Nation)
  - Selected conferences
- ITEP intern development of training modules/guides
- ITEP family/school outreach
- Preparation of scholarly articles for publication
- EPA technical reporting

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Year 2 Data Collection
Training & Challenges
Richard Shaughnessy
Field Researcher Training

Training covered:
- Asthma triggers
- Research protocol
- Equipment use
- Safety
- CITI human subject
- Engaging families

Field Researcher training is ongoing process throughout data collection.

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Field Research Challenges

Getting lost

Rugged Roads

No One Answers Door/Cancelled Appointments

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Challenge: Variety of Homes

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Sampling Challenges

Finding Sampling Site is a Challenge

Sampling on Dresser Drawer

Children Wanting to Assist

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Year 2 Data Collection & Sampling
Richard Shaughnessy
Sampling

- Three visits over the school year at each school and home
- IAQ: CO₂, RH, Temp, CO
- Allergen: dust mite, cat, dog, mouse and cockroach
- High-touch points/targeted surfaces – swab to gauge surface residual bio contamination

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10. Record Indoor Living Room Temperature (F), Relative Humidity, CO2, & CO.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°F)</td>
<td>82.5</td>
</tr>
<tr>
<td>Relative Humidity (%)</td>
<td>44.9</td>
</tr>
<tr>
<td>Carbon Dioxide (ppm)</td>
<td>1349</td>
</tr>
<tr>
<td>Carbon Monoxide (ppm)</td>
<td>0</td>
</tr>
</tbody>
</table>

| Time Recorded (HH:MM)    | 13:30 |

Is living room temperature below 60 degrees F?
- Yes [ ]
- No [x]

Is living room RH% above 60%?
- Yes [ ]
- No [x]
## Example Field Data Sheet

### Main Living Area

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Surface Description:</th>
<th>Surface Material:</th>
<th>Clean/Dirty:</th>
<th>RLU:</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Coffee Table</td>
<td>wood</td>
<td>clean</td>
<td>269476</td>
<td>1:30 PM</td>
</tr>
<tr>
<td>#2</td>
<td>Coffee Table</td>
<td>wood</td>
<td>clean</td>
<td>301649</td>
<td>1:32 PM</td>
</tr>
<tr>
<td>#3</td>
<td>Coffee Table</td>
<td>wood</td>
<td>clean</td>
<td>283444</td>
<td>1:34 PM</td>
</tr>
<tr>
<td>#4</td>
<td>Coffee Table</td>
<td>wood</td>
<td>clean</td>
<td>469177</td>
<td>1:36 PM</td>
</tr>
</tbody>
</table>

**Current Study Code:** 63106923  
**Previous Study Code:** 63102369

- **Study Home:** STUDY - ATP Only

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### Example Allergen Data

<table>
<thead>
<tr>
<th>Project ID#</th>
<th>Site</th>
<th>Dust ID#</th>
<th>Fel d1 (ng/g)</th>
<th>Can f1 (ng/g)</th>
<th>Mus m1 (ng/g)</th>
<th>Der f1 (ng/g)</th>
<th>Der p1 (ng/g)</th>
<th>Bla g2 (ng/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>66497014</td>
<td>BR</td>
<td>#4107</td>
<td>876.31</td>
<td>1978.62</td>
<td>59.57</td>
<td>169.42</td>
<td>710.39</td>
<td>1269.27</td>
</tr>
<tr>
<td>66497014</td>
<td>LR</td>
<td>#4108</td>
<td>712.83</td>
<td>547.54</td>
<td>155.49</td>
<td>106.50</td>
<td>956.85</td>
<td>916.09</td>
</tr>
<tr>
<td>10034544</td>
<td>BR</td>
<td>#4109</td>
<td>805.55</td>
<td>383.81</td>
<td>10.65</td>
<td>15.05</td>
<td>135.34</td>
<td>46.62</td>
</tr>
<tr>
<td>10034544</td>
<td>LR</td>
<td>#4110</td>
<td>1407.00</td>
<td>2108.77</td>
<td>467.52</td>
<td>18.64</td>
<td>635.59</td>
<td>153.39</td>
</tr>
<tr>
<td>13552099</td>
<td>BR</td>
<td>#4111</td>
<td>178.17</td>
<td>4163.44</td>
<td>1324.72</td>
<td>1484.34</td>
<td>1166.14</td>
<td>298.39</td>
</tr>
<tr>
<td>13552099</td>
<td>LR</td>
<td>#4112</td>
<td>696.57</td>
<td>1372.44</td>
<td>399.97</td>
<td>89.77</td>
<td>632.22</td>
<td>802.93</td>
</tr>
</tbody>
</table>

*Research Supported by US EPA NCER Grant 83559601*
Home Sampling
Grady

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School Sampling

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Year 2 Data Collection
House Conditions
Richard Shaughnessy
House Conditions
Siding Issues
House Conditions
Mouse Hole
House Conditions
Warped Ceiling/Wood Stove

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House Conditions
Moldy Shade & Rusty Blinds
House Conditions
Stained & Moldy Carpet
House Conditions
Pets

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House Conditions
Roof Issues
Year 2 Data Collection
School Conditions
Richard Shaughnessy

Lower Elementary Building
E-la-di-ge
Su-da-le-gi-ni-da-yu-da-le-nv
A-da-ne-lv
Bajo Edificio Gimnasio
Room # 4
School Conditions
Outdoor Sources
School Conditions
Moisture

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School Conditions

VOC Sources

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School Conditions
Pets
Preliminary Results
Richard Shaughnessy
Baseline Data

- Predominantly, parents satisfied with their home
- Most frequent indoor environmental concerns related to dampness/mold, and pests

<table>
<thead>
<tr>
<th>Base-line data</th>
<th>Control home</th>
<th>Study home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year house built, mean (SD)</td>
<td>1986 (19)</td>
<td>1987 (20)</td>
</tr>
<tr>
<td>Square footage [ft$^2$], mean (SD)</td>
<td>1607 (535)</td>
<td>1578 (545)</td>
</tr>
<tr>
<td>Satisfied or highly satisfied with the home, N (%)</td>
<td>27 (66)</td>
<td>34 (76)</td>
</tr>
<tr>
<td>Pets in child’s bedroom reported, N (%)</td>
<td>20 (47)</td>
<td>23 (51)</td>
</tr>
<tr>
<td>Smoking inside the home reported, N (%)</td>
<td>5 (13)</td>
<td>3 (7)</td>
</tr>
<tr>
<td>Stuffy or lingering odors reported, N (%)</td>
<td>7 (13)</td>
<td>9 (20)</td>
</tr>
<tr>
<td>Places that are persistently damp or mold, N (%)</td>
<td>8 (19)</td>
<td>8 (18)</td>
</tr>
<tr>
<td>Evidence of cockroaches reported, N (%)</td>
<td>5 (11)</td>
<td>5 (10)</td>
</tr>
<tr>
<td>Evidence of rodents reported, N (%)</td>
<td>12 (27)</td>
<td>10 (20)</td>
</tr>
<tr>
<td>No asthma symptom free days (past 2 weeks), N (%)</td>
<td>8 (20)</td>
<td>8 (19)</td>
</tr>
<tr>
<td>Doctor visit because of asthma symptoms, N (%)</td>
<td>5 (12)</td>
<td>8 (18)</td>
</tr>
<tr>
<td>Asthma medication changed, N (%)</td>
<td>5 (12)</td>
<td>9 (20)</td>
</tr>
</tbody>
</table>
Similar conditions in the study and control homes at the baseline provides necessary background information for assessment of effects of home and school-based educational efforts to reduce asthma triggers and symptoms among the study population.
Asthma Symptom Free Days

During past 2 weeks, how many asthma symptom free days did your child have?

- Increase in both groups, especially in study homes
During the past 4 weeks, how many days, if any, did your child have a respiratory illness such as a cold, allergies or sinus infection?

- Increase in control homes, decrease in study homes
During the past 4 weeks, how many days, if any, did your child have a gastro-intestinal illness such as stomachache, vomiting, or diarrhea?

- Increase in both groups (seasonal related?), especially in control homes
Contact Information

Richard Shaughnessy, PhD
The University of Tulsa
Henneke 212
800 South Tucker Drive
Tulsa, OK 74104
918-230-3908
rjstulsau@aol.com