Pesticide Exposure Surveillance in Texas: Enhancing surveillance data quality through automated real-time quality assurance and control

Western States Occupational Network Meeting, 2018
September 13, 2018
Denver, CO
Disclaimer

We are funded by cooperative agreement U60OH011359-02 from CDC-NIOSH. This presentation is solely the responsibility of the authors and does not represent the official views of CDC-NIOSH.
Background

**DSHS Pesticide Exposure Surveillance in Texas (PEST)**

- Acute Occupational Pesticide Poisoning (AOPP) is a reportable condition in Texas
  (Title 25, Texas Administrative Code, Rule §99.1)
- 1986 – present
- Laboratories & physicians required to report
Background

**DSHS PEST program**

- Conducts follow-up interviews
- If necessary, requests medical records
- Staff uses NIOSH guidelines for coding different variables and case ascertainment
Background

**DSHS PEST program**

- Maintains an in-house database for data management
  - SPIDER (until mid-2016)
  - MS ACCESS, SAS (mid-2016 to present)
  - MS SQL (anticipated 2019 onward)*

*All historic data will be migrated to SQL.*
Background

**DSHS Pest program**

- Historically, DSHS conducted manual data quality assurance and quality checks (QA/QC) once a year
  - QA/QC for data entry and coding errors only

- Submits de-identified data to SENSOR-pesticide program at NIOSH annually
Case for Action

• Manual QA/AC on an annual basis is not efficient and effective
• QA/QC did not assess data completeness and timeliness
• Need to identify issues in reporting, case follow-up and coding processes in a timely fashion
Objective

• Develop an efficient and effective method for QA/QC in real-time
• Assess data completeness
• Identify areas of improvement in data collection and coding
Methods: Data aggregation

Step 1: Import data from an in-house database into SAS

Step 2:
- For selected variables, calculate aggregate count of known
- Create new SAS dataset with year, total counts, percent known values for all selected QA/QC variables
Methods: Data aggregation

Step 2 example, variable sex:

<table>
<thead>
<tr>
<th>year</th>
<th>total_cases</th>
<th>sex_unknown</th>
<th>pct_sex_known</th>
<th>sex_known</th>
<th>pct_sex_known</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>434</td>
<td>8</td>
<td>0.0184331797</td>
<td>426</td>
<td>0.9815668203</td>
</tr>
<tr>
<td>2007</td>
<td>388</td>
<td>6</td>
<td>0.0154639175</td>
<td>382</td>
<td>0.9845360825</td>
</tr>
<tr>
<td>2008</td>
<td>346</td>
<td>4</td>
<td>0.0115606936</td>
<td>342</td>
<td>0.9884393064</td>
</tr>
<tr>
<td>2009</td>
<td>230</td>
<td>0</td>
<td>0</td>
<td>230</td>
<td>1</td>
</tr>
<tr>
<td>2010</td>
<td>180</td>
<td>0</td>
<td>0</td>
<td>180</td>
<td>1</td>
</tr>
<tr>
<td>2011</td>
<td>280</td>
<td>8</td>
<td>0.0285714286</td>
<td>272</td>
<td>0.9714285714</td>
</tr>
<tr>
<td>2012</td>
<td>392</td>
<td>6</td>
<td>0.0153061224</td>
<td>386</td>
<td>0.9846938776</td>
</tr>
<tr>
<td>2013</td>
<td>370</td>
<td>11</td>
<td>0.0297297297</td>
<td>359</td>
<td>0.9702702703</td>
</tr>
<tr>
<td>2014</td>
<td>384</td>
<td>3</td>
<td>0.0078125</td>
<td>381</td>
<td>0.9921875</td>
</tr>
<tr>
<td>2015</td>
<td>482</td>
<td>11</td>
<td>0.0228215768</td>
<td>471</td>
<td>0.9771784232</td>
</tr>
<tr>
<td>2016</td>
<td>94</td>
<td>0</td>
<td>0</td>
<td>94</td>
<td>1</td>
</tr>
</tbody>
</table>

If sex was recorded as M or F, then variable sex_known=yes, else variable sex_known=no.
Methods: Data visualization in Tableau

**Step 1:** Connect to aggregate SAS dataset from Tableau

**Step 2:** Create one sheet per selected variable

- Graph percent known (X axis) by year (Y axis)
Methods: Data visualization in Tableau

**Step 3:** Create a percent known* goal for each variable

Goal setting:
- At least 60% records should have industry and occupation known
- At least 95% records should have complete info for demographic and exposure-related variables

---

*Percent known assesses data completeness of variable, i.e. if we have the needed info.
Percent of AOPP cases with known sex
Methods: Data visualization in Tableau

- **Step 4:** Combine all sheets to create dashboard
Results

Tableau QA/QC Dashboard:

https://tabexternal.dshs.texas.gov/t/ENV-EP/views/PESTQAQCDashboard/QAQCDASH?iframeSizedToWindow=true&:embed=y&:showAppBanner=false&:display_count=no&:showVizHome=no
QA/QC Results: Age
QA/QC Results: Occupation

PEST QA/QC Dashboard

Year
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016

Percent CCOC2002 Known
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Red bar = goal not met  Green bar = goal met

Select a variable
- Age known
- Sex known
- Causal sufficient
- County known
- Workrel known
- Effect sufficient
- Expose sufficient
- Userstat sufficient
- Userstat known
- Status sufficient
- Status related
- Status related
- CCOC2002 known
- CCIC2002 known

Hover over variable name below to see variable description:
- Age
- Sex
- County
- Causal
- Workrel
- Effect
- Expose
- Userstat
- Status
- CCOC2002
- CCIC2002
QA/QC Results: Industry

PEST QA/QC Dashboard

Year
- 2006 - Green bar
- 2007 - Green bar
- 2008 - Green bar
- 2009 - Green bar
- 2010 - Green bar
- 2011 - Green bar
- 2012 - Red bar
- 2013 - Green bar
- 2014 - Green bar
- 2015 - Green bar
- 2016 - Red bar

Select a variable:
- Age known
- Sex known
- Causal sufficient
- County known
- Workrel known
- Effect sufficient
- Exposure sufficient
- Userstat sufficient
- Userstat known
- Status sufficient
- Status related
- Userstat related
- CCIC2002 known
- CCC2002 known

Hover over variable name below to see variable description:
- Age
- Sex
- County
- Causal
- Workrel
- Effect
- Exposure
- Userstat
- Status
- CCIC2002
- CCC2002

Red bar = goal not met, Green bar = goal met

Percent CCIC2002 Known

Scale: 0% to 60%
Conclusions

• DSHS developed a method for automated QA/QC in real time using Tableau

• This unique, simple, and timely method of QA/QC using Tableau helps address the challenges of manual QA/QC process.
Acknowledgements

Ketki Patel, DSHS Environmental Surveillance and Toxicology Branch

Emily Hall, DSHS Environmental Surveillance and Toxicology Branch
Thank you

For questions or additional info please contact:

Kindle Pierce, MPH
Kindle.Pierce@dshs.texas.gov
512-776-3723

Or visit program website
http://dshs.texas.gov/epitox/OH/