WISQARS™ Data Visualizations: Implementation, Lessons Learned, and Future Plans

Mick Ballesteros, PhD
Branch Chief
Statistics, Programming, and Economics Branch
DARPI/NCIPC/CDC

NCIPC BSC Meeting
June 20, 2018
Welcome to WISQARS™

CDC’s WISQARS™ (Web-based Injury Statistics Query and Reporting System) is an interactive, online database that provides fatal and nonfatal injury, violent death, and cost of injury data from a variety of trusted sources. Researchers, the media, public health professionals, and the public can use WISQARS™ data to learn more about the public health and economic burden associated with unintentional and violence-related injury in the United States.

- Fatal Injury Data
- Cost of Injury Data
- Nonfatal Injury Data
- Fatal Injury Mapping
- Violent Deaths
- About Us

https://www.cdc.gov/injury/wisqars
<table>
<thead>
<tr>
<th>Module</th>
<th>Year Launched</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal Injury Reports</td>
<td>2000</td>
</tr>
<tr>
<td>Leading Causes of Death</td>
<td>2000</td>
</tr>
<tr>
<td>Nonfatal Injury Reports</td>
<td>2001</td>
</tr>
<tr>
<td>Leading Causes of Nonfatal Injury</td>
<td>2001</td>
</tr>
<tr>
<td>Years of Potential Life Lost (YPLL)</td>
<td>2002</td>
</tr>
<tr>
<td>Violent Deaths</td>
<td>2008</td>
</tr>
<tr>
<td>Fatal Injury Maps</td>
<td>2010</td>
</tr>
<tr>
<td>Cost of Injury Reports</td>
<td>2011</td>
</tr>
<tr>
<td>Mobile Applications (Fatal Injury)</td>
<td>2014</td>
</tr>
<tr>
<td>Data Visualization (Fatal Injury)</td>
<td>2018</td>
</tr>
</tbody>
</table>

http://www.cdc.gov/injury/wisqars/
## 2017 Web Metric Usage

<table>
<thead>
<tr>
<th>Module</th>
<th>Queries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal Injury Maps</td>
<td>752,831</td>
</tr>
<tr>
<td>Fatal Injury Reports</td>
<td>197,671</td>
</tr>
<tr>
<td>Leading Causes of Death</td>
<td>138,036</td>
</tr>
<tr>
<td>Nonfatal Injury Reports</td>
<td>32,021</td>
</tr>
<tr>
<td>Violent Deaths</td>
<td>30,321</td>
</tr>
<tr>
<td>Cost of Injury Reports</td>
<td>13,062</td>
</tr>
<tr>
<td>Leading Cause of Nonfatal Injury</td>
<td>12,322</td>
</tr>
<tr>
<td>Years of Potential Life Lost (YPLL)</td>
<td>8,541</td>
</tr>
</tbody>
</table>

- **Utilization**: Are WISQARS™ data being fully utilized for scientific and programmatic purposes by key stakeholders?

- **Technology and Innovation**: How can modern technology and innovation be used to enhance the use of WISQARS™?

- **Data Sources**: What are the opportunities to expand WISQARS™ data sources/data sets?

- **Tools and Training**: What trainings, tools and resources would facilitate actionable data translation?
Portfolio Recommendations: Technology and Innovation

- How can modern technology and innovation be used to enhance the use of WISQARS™?
  - Develop more capacity for users to export both data and graphics.
  - Explore the possibility of a query tool capable of accessing and aggregating across disparate datasets.
  - **Improve visualization functionality in the system.**
  - Shift the mobile strategy from the proliferation of mobile apps to mobile responsiveness.
Goals of the Project

- To develop a visualization application to demonstrate the potential of interacting with fatal injury data in a visual format
- To enhance the tool and move it fully onto the WISQARS website
Data Visualization: Explain or Explore?

- **EXPLAIN** – to tell a story
  - Answers a question
  - Communicates message

- **EXPLORE** – to discover many stories
  - Leads to new research questions
  - Discovers new areas of interests
Data Visualization: Explain or Explore?

- **EXPLAIN** – to tell a story
- **EXPLORE** – to discover many stories

Data Visualization: Explain or Explore?

- **EXPLAIN** – to tell a story
- **EXPLORE** – to discover many stories

[Map of global road injuries](https://vizhub.healthdata.org/gbd-compare/)
Our Process
Visioning Session

**Activities**
- Use WIGARS as a source to understand a data point (e.g., efficiency)
- Understand data to inform decisions and program development
- Communicate findings to their organization
- Rank & compare across dimensions (e.g., cause of death, state)
- Show data to support initiatives/programs they've implemented
- Visualize data (e.g., offer on event)

**Goals**
- Enhanced ability to explore data at a high level before drill down after exploring
- Access data/query suggestions to guide search
- Link program information related to a query to the results
- Beyond state/country: view urban vs. rural
- Compare results from multiple states/cause
- Apply filters graphically
- Fewer words/more visuals
- Help find insights they aren't necessarily looking for
- Common use experience across platforms & devices including API
- Enable user input to generate visuals

**Challenges**
- CLI/Console is antiquated (at least a year)
- Need to access multiple reports to understand all desired data
- PI/data limitations — can only get to a limited depth of data (e.g., no ZIP codes)
- 508 compliance/accessibility/usability
- Role stability less than 20 in numerators, can be leading
- Software platform approval
Journey Mapping & Business Questions
Initial Requirements and Functionalities

- Data to include injury mortality & population data from 1999-2015
- Data presented in highly visual manner (e.g., charts, graphs, maps)
- The user interacts, queries, and changes parameters by clicking on visuals
  - Less dependence of checkboxes and drop down menus
  - Parameters to filter on same as current WISQARS fatal module
- Results shown as numbers and rates (crude and age-adjusted)
- Charts and data tables available for download
- Global filtering
- Documentation and knowledge transfer from developer
Wireframing - Brainstorming
Wireframing – Hi Res
Decisions on Software and Programming

- Customized Application
- Open Source Tools
- JavaScript executed using Node.js
- D3.js library for visuals
“Scrum Agile” Process for Development

- Started development in January 2017
- Identified all the actions that need to be done
- Established 2 week “sprints”
  - 1st sprint included first critical actions tackled
  - After each sprint, reviewed the current version, discussed and gave feedback, outlined actions for next sprint
  - A total of 5 sprints initially planned
- Mirrored application versions on internal CDC development servers to test
Challenges along the way

- Data use agreements
- Approval for software technology stack used for development inside CDC firewall
- Initial slow application response
- Suppression of low counts
- 508 Compliance
- Knowledge transfer
Do Demo Here
Discussion
Future Plans

- Companion “Compare” tab/application

- Non-fatal Visualization application

- Integration of Mapping, YPLL, Leading Causes

- Exploration of other datasets and topic areas to build out
Acknowledgements

- Deloitte Consulting, LLP
  - Scott Klisures
  - John Zimmerman
  - Sri Jonnalgadda
  - Andrew Martone
  - Babette Groves

- CDC, NCIPC, DARPI
  - Kevin Webb
  - Nimesh Patel
  - Dionne Williams
  - Bob Thomas
  - Darryl Owens
  - Ann Spann
  - Graham Kirkland
  - Melvin Crum
  - Tad Haileyesus
BSC Discussion Questions

- How have you used data visualization tools or approaches for working with data? How have data visualization approaches been most useful for you?

- Are you aware of other data visualization sites or tools that you find useful and think we should review?

- Have you used legacy WISQARS (Fatal Injury Reports) and WISQARS Data Visualization? Which did you find more useful and why?

- Are there other types of data or data tools you would like to see on WISQARS? How does WISQARS address or not address your needs?
Thank you!

Discussion and Questions

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.