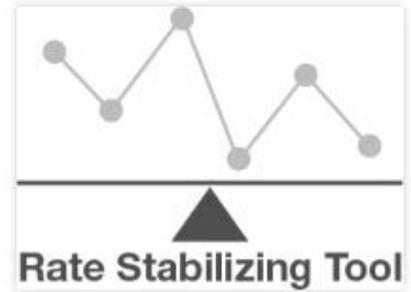


The Rate Stabilizing Tool (RST)



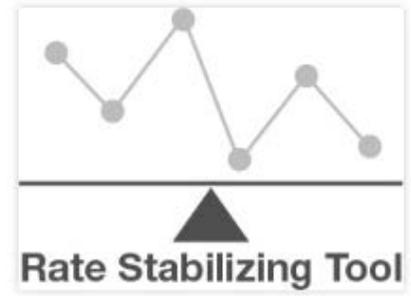
Learning objectives

- Introduce the Rate Stabilizing Tool (RST)
- Gain experience installing the tool and managing the user interface
- Develop an understanding of the required data inputs
- Interpret and map the output



What is the Rate Stabilizing Tool (RST)

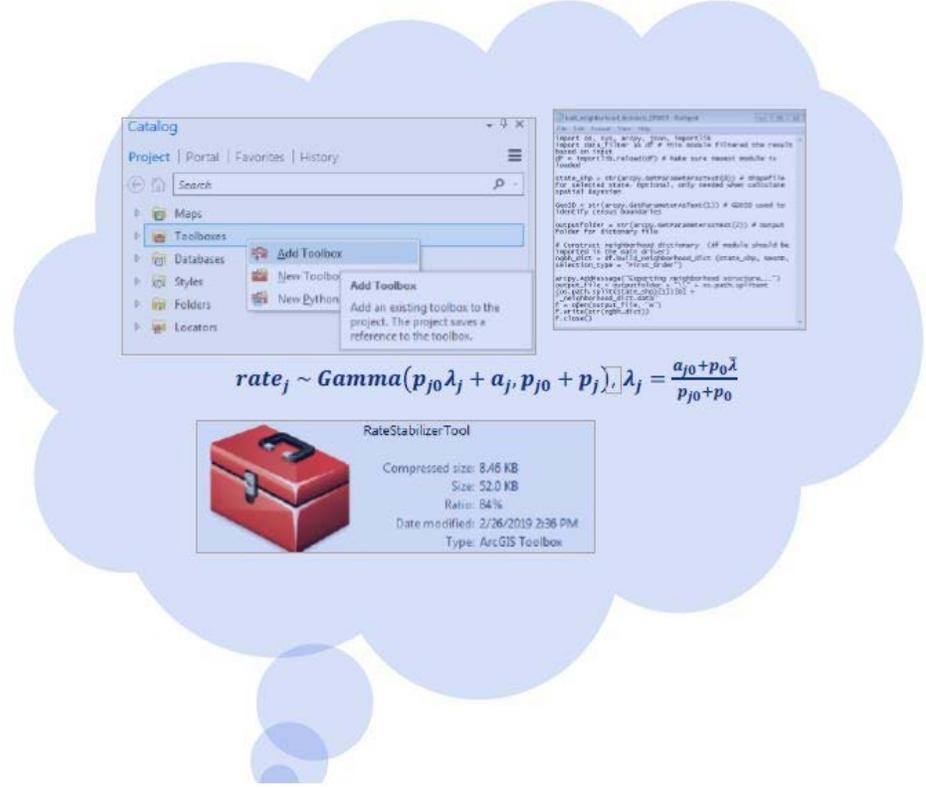
- Developed in response to increasing demand for robust small area age-adjusted measures of chronic disease.
- Users input their own data
- Uses Bayesian spatial **smoothing** models to generate robust small area estimates at the county and sub-county levels.
- Produces measures of statistical uncertainty (i.e., credible intervals) and alerts for unreliable rates (based upon 95% credible intervals).



Making spatially smoothed data more accessible

• What would a tool that allows health departments to generate their own spatially smoothed estimates of chronic disease look like?

- Make use of available tools
- Use proven statistical methods
- Include age standardization
- Generate sub-county estimates
- Handle state and community-specific datasets



The thought bubble contains the following elements:

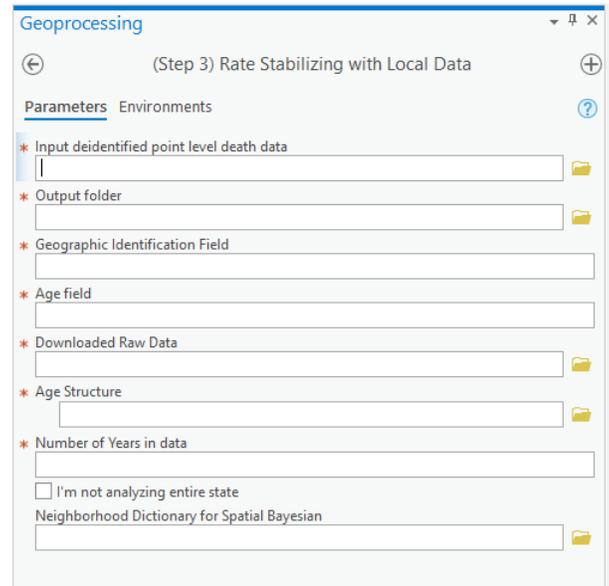
- A screenshot of the ArcGIS Catalog interface showing a 'Toolboxes' folder with options to 'Add Toolbox', 'New Toolbox', and 'New Python'.
- A code editor window showing a Python script for a rate stabilizer tool, including comments and code for data processing and spatial analysis.
- The mathematical formula: $rate_j \sim \text{Gamma}(p_{j0}\lambda_j + \alpha_j, p_{j0} + p_j), \lambda_j = \frac{\alpha_j + p_0\bar{\lambda}}{p_{j0} + p_0}$
- A metadata box for 'RateStabilizerTool' with a red toolbox icon, listing: Compressed size: 8.46 KB, Size: 52.0 KB, Ratio: 84%, Date modified: 2/26/2019 2:36 PM, Type: ArcGIS Toolbox.

Need ArcGIS and individual level data, and then it's point and click.
 Do not need any advanced stats knowledge.
 Bonus points for age standardization

Details about the Rate Stabilizing Tool (RST)

- Python based; designed for easy use in ArcGIS desktop (ArcMap) and ArcGIS Pro
- Integrates age standardization
- Provides smoothing using standard approaches
- Straightforward inputs:
 - Death data with age and census geography identifier
 - Census boundary file

Name	Type	Date
 (Step 1) Fetch Population by Age to File (Census Disclai	Script	
 (Step 1.5 Optional) Join Population Data to Container	Script	
 (Step 2 Optional) Build Neighborhood Dictionary	Script	
 (Step 3) Rate Stabilizing with Local Data	Script	



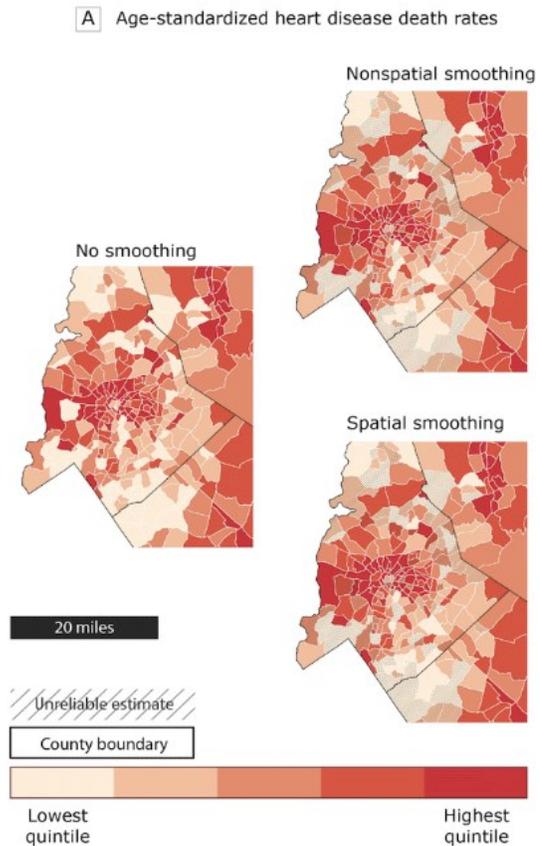
Census Tiger boundaries – not cartographic (currently configured for county and tract) are required for mapping and spatial Bayesian smoothing

Tool will fetch the census population data via US 2010 Census API real time

Tool generates an adjacency matrix (for Spatial Bayesian Estimate smoothed ASR)

RST: What you get

- Age-standardized rate (ASR)
- Non-spatial Bayesian Estimate smoothed ASR
- Spatial Bayesian Estimate smoothed ASR
- Alerts users to unreliable rates for smoothed rates with credible interval



Ref: Quick, H., et al. (2019). "The Rate Stabilizing Tool: Generating Stable Local-Level Measures of Chronic Disease." [Prev Chronic Dis 16: E38.](#)

After quickly generating estimates, the tool allows you to compare important variations within areas of interest at sub county scales

Lower and upper boundaries at 95% credible intervals for both smoothed rates- used to determine whether rates are reliable- or not

In most cases the estimate from the RST that is more precise than if you only used the crude data- so you can be more confident in any inference you can make from those data.

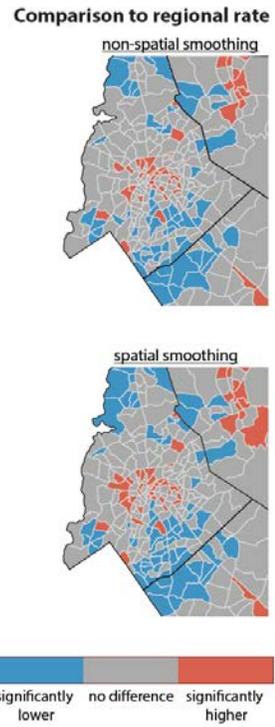
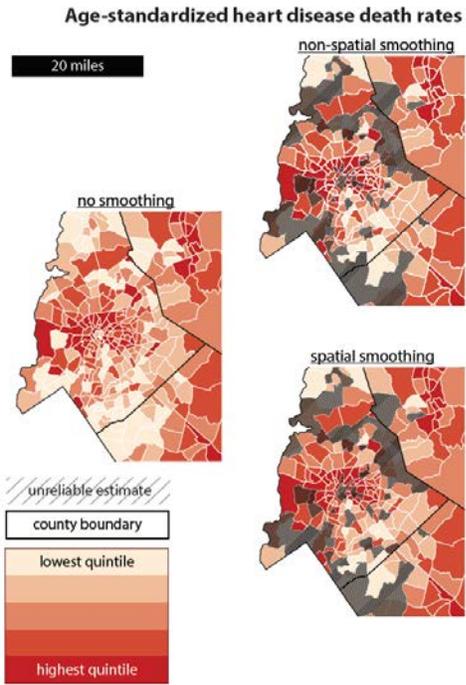
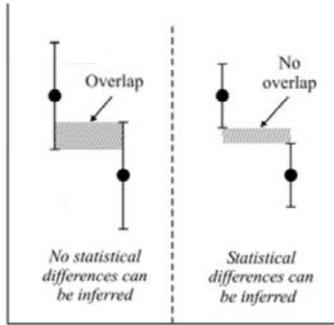
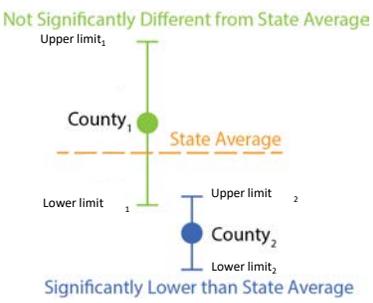
This means better information to plan programs and understand the epi of the disease.

Map Differences

- Statistical difference:

Estimates are statistically different at a given credible interval if their confidence bounds do not overlap

- Can be used to evaluate difference against certain value (e.g. state average) or across multiple years



Getting the word out

- Download instructions online
- Working with state & local health departments to operationalize the RST
 - Self guided training content
 - Webinars training sessions
- A case study paper is in progress



<https://www.cdc.gov/dhdsp/maps/gisx/rst.html>

GIS Exchange

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GIS Training Modules +

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Rate Stabilizing Tool -

Installation Instructions and User Guide for ArcGIS Pro

Installation Instructions and User Guide for ArcMap v10.5

Using Aggregate Data in the RST

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Rate Stabilizing Tool

Generating Robust Local-level Measures of Population Health

The Rate Stabilizing Tool (RST) is an ArcGIS-based tool that allows users to input their own record-level data to generate reliable, local-level age-standardized measures of chronic disease (e.g., prevalence, incidence, and mortality) or other population health outcomes. The RST uses Bayesian modelling techniques to generate population health estimates and enable users to evaluate statistical uncertainty in the estimates. The RST is especially useful for estimating population health measures when the population or number of events is small.

Key Features of the Rate Stabilizing Tool

- Developed in response to increasing demand for small area measures of chronic disease.
- Uses Bayesian spatial smoothing models to generate robust small area estimates at the county and sub-county levels.
- Produces measures of statistical uncertainty (i.e., credible intervals) for each estimate that is generated.

Acknowledgements

The RST was developed by the Children's Environmental Health Initiative, in partnership with the Centers for Disease Control and Prevention, the North Carolina Department of Health and Human Services, the Florida Department of Health, and the National Association of Chronic Disease Directors.

The Children's Environmental Health Initiative (CEHI) at Rice University is a research, education, and outreach program committed to fostering environments where all people can prosper. CEHI has developed, maintains, and offers an extensive fully spatially referenced data architecture on children's environmental health. This makes it possible to jointly consider diverse variables collected by different disciplines, creating the opportunity to explore and compare the different types of health components.



Rate Stabilizing Tool

Use the RST

[Download RST installation files for ArcGIS Pro](#) [ZIP - 41 MB]

[Download RST installation files for ArcMap v10.5](#) [ZIP - 41 MB]

[Installation instructions and user guide for ArcGIS Pro](#)

[Installation instructions and user guide for ArcMap v10.5](#)

[Using aggregate data in the RST](#)

More Information

[Introduction to the RST](#) [PDF - 521 KB]

[Detailed Statistical Methods](#)

<https://www.cdc.gov/dhdsp/maps/gisx/rst.html>



Acknowledgements

- **US Centers for Disease Control and Prevention –Division for Heart Disease and Stroke Prevention**
- **National Association of Chronic Disease Directors**
- **Past and present state and local health department GIS Capacity Building Project participants**