Steps in Transforming the Missouri Cancer Registry (MCR) from an Incidence Registry to a Survival Registry:

Estimate Female Breast Cancer Burden in Missouri Senatorial Districts

Improve Visualization of the Obtained Results Using Data Visualization Software

Assess the Usability of the Missouri Cancer Registry and Research Center's (MCR-ARC's) Published Interactive Maps and Profile Reports

By

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My Dissertation's Backbone

- Estimate Female Breast Cancer Burden in Missouri Senatorial Districts and Improve Visualization of the Obtained Results Using Data Visualization Software

  - Estimate and Visualize Female Breast Cancer Incidence Rates in Missouri Senatorial Districts in Interactive Mapping Formats, 2008-2012

  - Estimated Female Breast Cancer Mortality-to-Incidence Ratio (MIR) of the Counties and the Senatorial Districts Grouped to County Boundaries (SDGCs) in Missouri, 2008 – 2012

  - Estimate Female Breast Cancer Survival Data in Missouri Senatorial Districts and Improve Visualization of the Obtained Results Using Interactive Mapping Reports, 2004 – 2010

My Dissertation's Backbone

- Assess the usability of the Missouri Cancer Registry and Research Center (MCR-ARC)'s Published interactive maps and profile reports:
  - Geographic Information Systems: Usability, Perception, and Preferences of Public Health Professionals
  - Usability Assessment of the Missouri Cancer Registry's Published Interactive Mapping Reports: Round one
  - Usability Assessment of the Missouri Cancer Registry's Published Interactive Mapping Reports: Round two

How the Dissertation Projects Are Related?

- The projects are methodologically different, but the projects' outcomes are very connected

- The projects shared the same mission and vision towards FBC in Missouri

- We measured the FBC burden in Missouri and visualized all the results, using a specific methodology and technology

How the Dissertation Projects Are Related?

- In order to make the MCR's reports very informative and understandable by the reports' potential users:
  - These reports should undergo extensive usability assessment and evaluation using pilot samples of those actual users

How the Dissertation Projects Are Related?

- A scoping review was written to assess the preferences and perspectives of the reports' actual users using previous GIS usability literature for the years from 2000 to 2016

How the Dissertation Projects Are Related?

- By conducting the tow round usability study and the review:
    - We have comprehensive ideas and hints on how we could improve the published MCR maps' usability
    - We could expect the perception and the predilections of the reports' actual users.

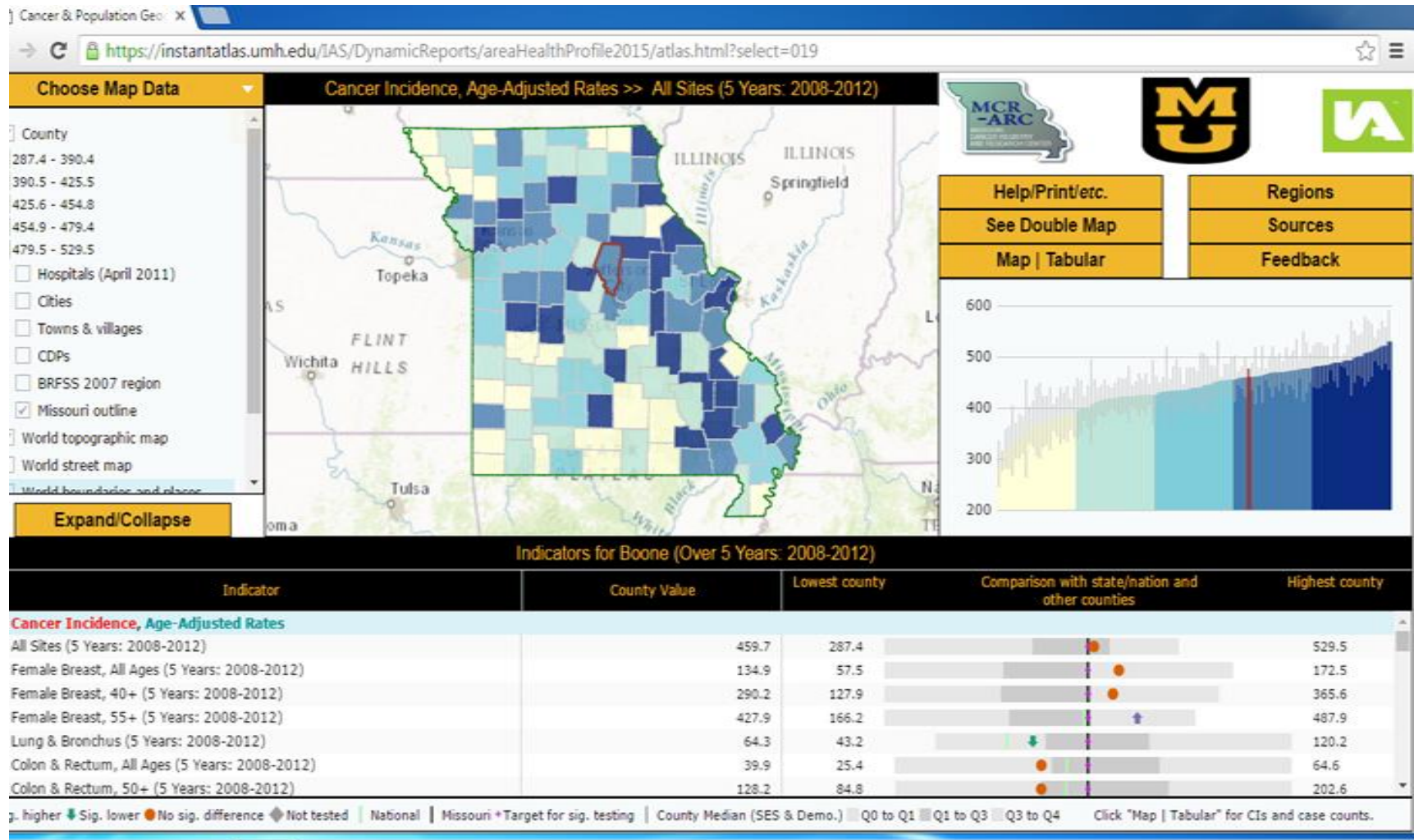# Usability Assessment of the Missouri Cancer Registry's Published Interactive Mapping Reports: Round one

Background

- Mapping reports offer an alternative to standard data tables in presenting health-related data

    - However, some users may experience difficulty interpreting information in spatial reports

Background

- MCR-ARC has produced interactive reports using a specific software for years

- These reports have never been tested for usability

MCR-ARC Mapping Reports

MCR-ARC Mapping Reports

Study Aims

- Assess the usability of MCR-ARC's published InstantAtlas reports

- Assess if participants' performance is affected by their demographic characteristics, education, experience in using GIS tools and work type/ job title

Methods

1. Study Design:

- Mixed methodology approach

- Per participants, the researchers conducted:

  - **A pretest questionnaire,**

  - **A multi-task usability test, and**

  - **System Usability Scale (SUS)**

Methods

1.a. The pretest questionnaire

- Includes questions on every participant's:
  - Demographics,
  - Work type, and
  - Experience in healthcare field
  - Experience with GIS tools

Methods

1.b. Multi-Task usability test

- We developed this multi-task scenario based on the expected functionality of the tested maps

- The tasks were in the same order for all participants

Methods

1.c. The System Usability Scale (SUS)

- Is an industrialized and simple ten-item scale to measure the participants' satisfaction

- The SUS score range between 0 and 100

Methods

2. Participants:

- Recruiting emails were sent to:
  - Faculty in the MPH program at MU
  - Faculty & staff in the HMI Dept
  - We ran the trial on the first 7 participants who responded
- Convenience sampling

Methods

3. Study Procedure:

- A computer laptop was used to conduct the trial

- Specific Microsoft Windows software was used to audio-video record the laptop screen

Results:
Participant demographics

- Number participants: 1 male, 6 females

- Age: 31-68 years (**Mean**=49.57, **Median**=49.14)

- Work: **3** - MPH program; **4** - HMI Dept.

- Education: **4** PhD in healthcare-related field, **3** MPH or MHA/MSHI

Results:
Participants' experience

- Years in healthcare ranged from **3 - 38 years** (**Mean** = 17.75 years, **Median** = 13 years)

- Experience in using GIS tools ranged from a **few months - 15 years** (**Mean** = 5.5 years, **Median** = 2 years)
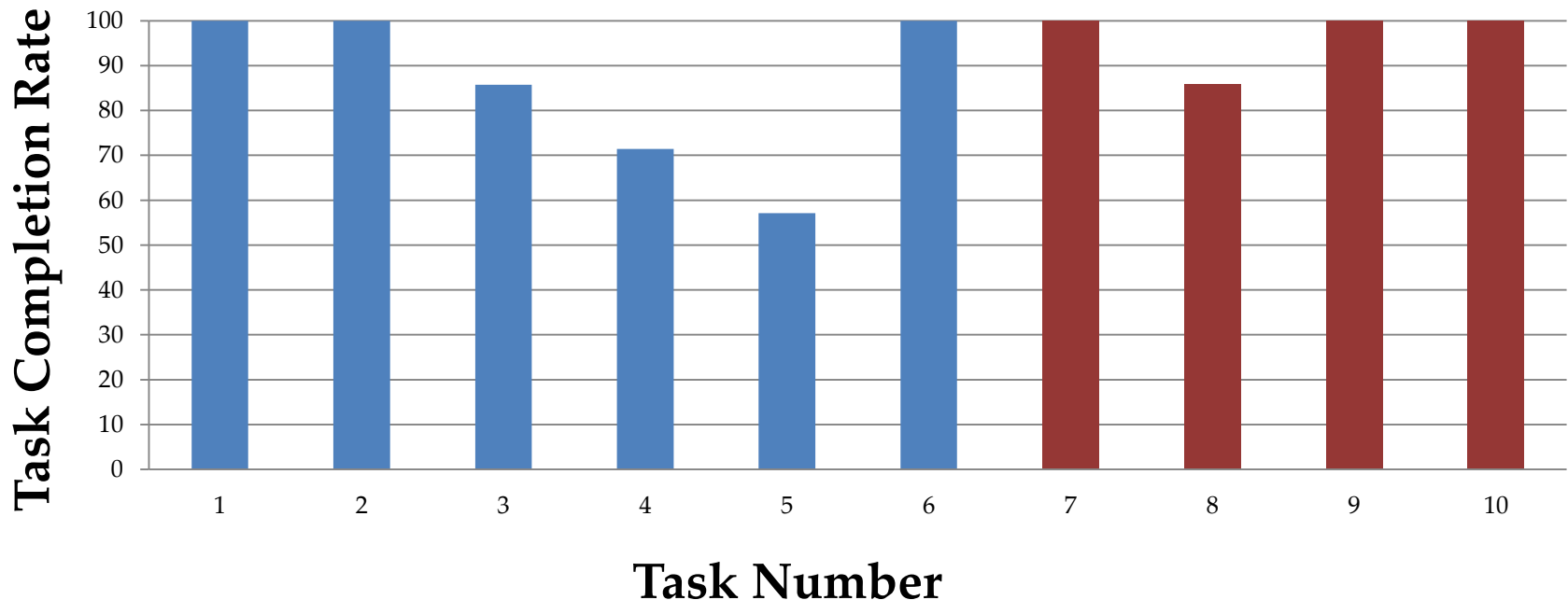
Results – Task completion rate by participant

Graph 1: Task Completion Rate for All Tasks per Participant
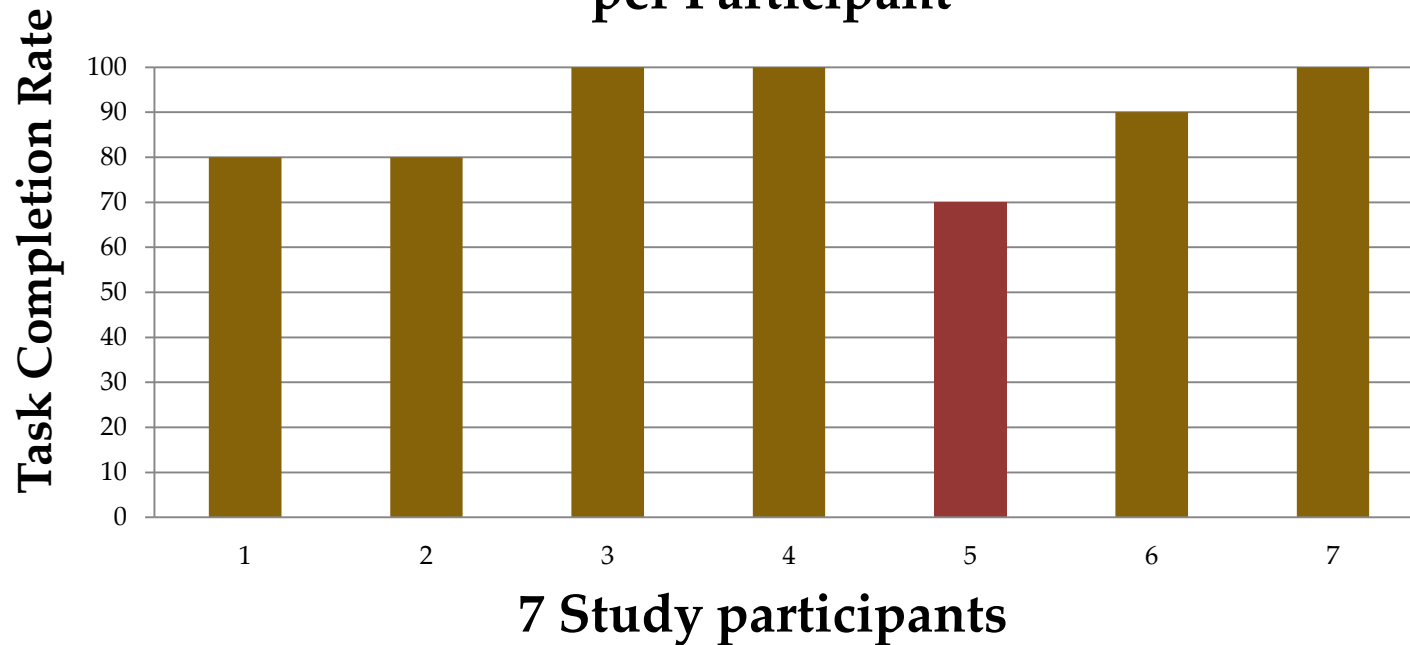
Effectiveness= # of tasks successfully completed X 100

Total # of tasks undertaken

Results – Completion rate by task for all participants

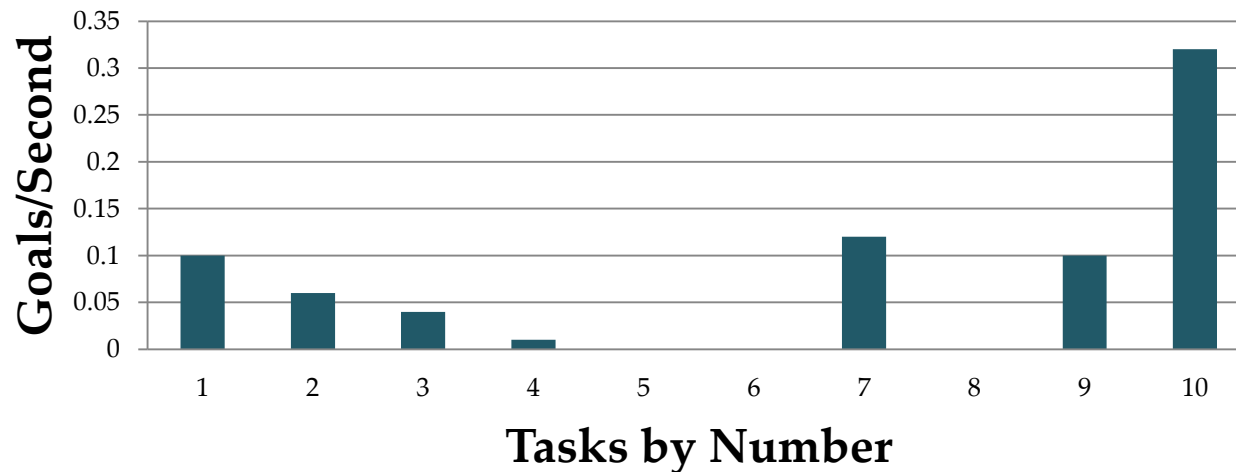**Graph 2: Task Completion Rate by Task for All Participants**

Effectiveness= # of tasks successfully completed X 100

Total # of tasks undertaken

Results: Time-based Efficiency

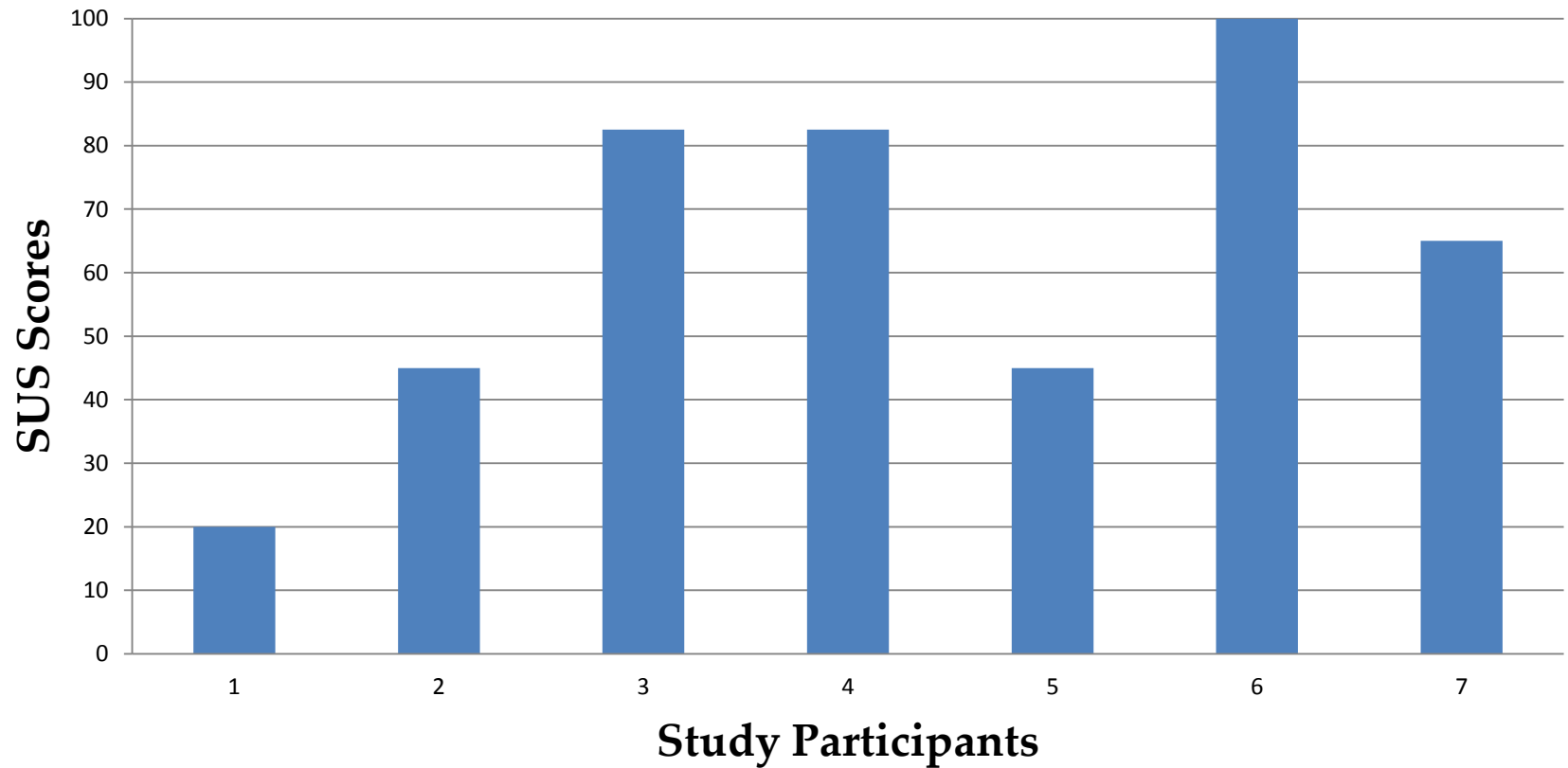**Graph 3: Time-based Efficiency (TBE) per Task**

$$\overline{P_t} = \frac{\sum_{j=1}^{R} \sum_{i=1}^{N} \frac{n_{ij}}{t_{ij}}}{NR}$$

Mean = 0.08 goals/second   Median = 0.05goals/seconds

Results: User Satisfaction

SUS Scores of the Study's Participants

Results

Demographic and Previous Expertise Factors of the Study Participants Versus the trial's TCR and SUS Scores

The Studied Factors	*P*
Education Level vs TCR	.91
Education Level vs SUS score	.82
Work Type vs TCR	.75
Previous Experience in Healthcare Field vs TCR	.70
Previous Experience in GIS use vs TCR	.03
Previous Experience in Healthcare Field vs SUS Score	.82
Previous Experience in GIS use vs SUS Score	.17

Results
Correlation Between the Studied Usability Elements

The Studied Factors	Correlation Coefficient	*P*
TCR per participant vs SUS Score	.70	.08
TCR per task vs TBE	.50	.25
TCR per task vs ORE	.92	.003
Efficiency per participant* vs SUS Score	.70	.07

Discussion & Conclusion

- The tested maps' effectiveness outcomes was better than the efficiency and satisfaction outcomes
- The study discovered that the effectiveness and efficiency metrics were related to the given tasks' degree of complexity

Discussion & Conclusion

- The ranked easier tasks were accomplished effectively and efficiently easier than the ranked complicated tasks

- The user satisfaction scores assessed by the SUS scale for these users were very poor and excellent school grades (A-F) with average of D grade

Discussion & Conclusion

- No significant statistical relationship between the participants' performance and all of these factors: Education level, work type, the experience in public health, and SUS level

Discussion & Conclusion

- Significant statistical relationship between the participants' performance on the study trial and the experience in using GIS tools factor

Strengths of the Study

- First usability study to assess usability of published MCR-ARC InstantAtlas mapping reports

- Results might be generalized to assess usability & functionality of all MCR-ARC's mapping reports

  – possibly generalizable to other GIS health-related reports and tools

Recommendations

- Conduct another usability study with health professionals from the cancer surveillance community

- Refine & update tested maps to overcome identified usability issues

Recommendations

- Conduct usability testing studies before releasing maps

- Consider using advanced usability software in analyzing audio-video records in future

Future Research

- Conduct a second-round usability study
  - Evaluate & assess
    - MCR-ARC's published mapping reports using public health practitioners & cancer policy makers
    - Unpublished MO senate district mapping reports using the same methodology
  - Use advanced usability software in analyzing audio-video records

References

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Thank you

Questions?