So You've Found a Healthcare Disparity, Now What?

New Visualization Capabilities to Enable Targeted Improvement Initiatives

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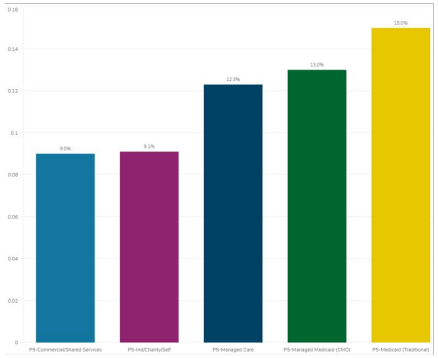
Background: Health Equity Dashboard Literature

- **Interactive dashboards are becoming more and more valuable to address health disparities**
  - “[A]re these data dashboards meeting their intended promise? Are they useful to public health stakeholders? We believe the answer is rapidly trending toward ‘yes’” (Thorpe, L. et al. 2022).

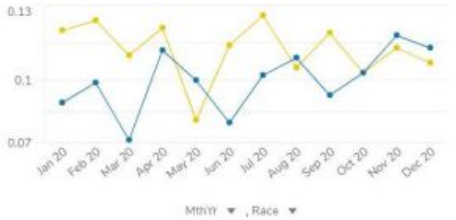
- **Existing dashboards only identify disparities, leaving stakeholders wondering what to do next**
  - “[I]dentifying disparities in quality metrics is only the first step to advancing healthcare equity. Eliminating identified disparities requires additional steps, including diagnosing the reasons for identified inequities that are unique to the patient population and healthcare organization in which they occur” (Connolly, M. et al. 2021).
  - “Future directions include using these data to refine hypotheses on ED disparities, understand root causes, develop interventions, and measure their impact” (Tsuchida, R. et al. 2021).

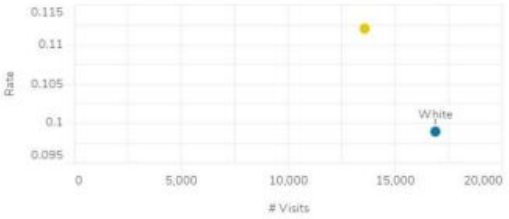
Background: Local

- Children's Healthcare of Atlanta (CHOA) has a descriptive equity dashboard currently in use at the hospital.
- This allows users to compare outcome metrics across various social determinants of health within a population.
- However, the current dashboard does not provide users with a potential course of action to address discrepancies.



Financial Class Group	N	Rate	Case Mix Index	p-value
Totals	**6,111**	**12.8%**	**0.31**	**0.202**
P5-Medicaid (Traditional)	339	15.0%	0.32	0.202
P5-Managed Medicaid (CMO)	4,337	13.0%	0.31	0.202
P5-Managed Care	1,115	12.3%	0.30	0.202
P5-Ind/Charity/Self	253	9.1%	0.30	0.202
P5-Commercial/Shared Services	67	9.0%	0.31	0.202





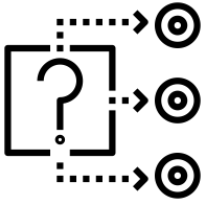
Screenshots of 30 day readmission rates by race and financial class from the health equity dashboard currently in use at CHOA (Kandaswamy, S. et al. 2022)

Background: Conceptual Model to Improve Health Equity

Diagnosis: Identify a Healthcare Disparity

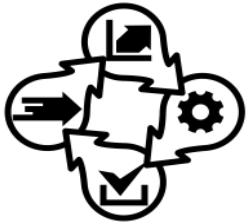
Quantitative Analysis: Find hot spots and lowest hanging fruits

Our goal is to get stakeholders to this stage



Qualitative Analysis: Enumerate causes, barriers, and opportunities

Intervention: Design a corrective course of action



Maintenance: Continuously execute Plan, Do, Study, Act cycles

Most health equity dashboards accomplish this stage (including the current CHOA dashboard)

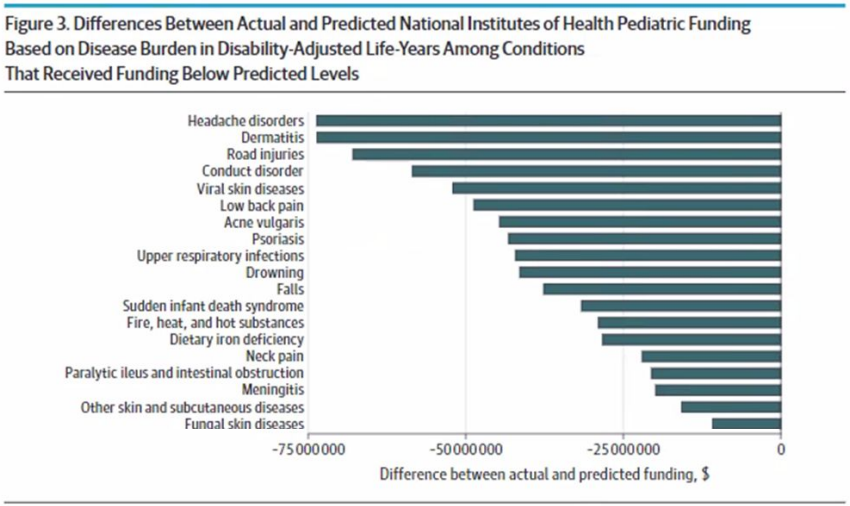
Research Goal and Specific Objectives

Enable clinicians and health system leaders to intuitively identify healthcare disparities and the sub-populations with the greatest opportunities for improvement.

- Define a metric to identify hotspots for targeting interventions
- Develop a usable interface to enable identification of the most opportune areas for disparity improvement

Methodology: Metric Development

- **Inspiration:** “Actual - Predicted” to identify variations from expected
- **Adaptation:** “Actual - Equitable”
- **Example:**
    1. The average Length of Stay (Hours) across all patients with Billing Diagnosis of Acute respiratory failure with hypoxia was 127.89 for n=506 patients, yielding a total of 64712 Hours of Length of Stay.
    2. Among the 506 patients with Billing Diagnosis of Acute respiratory failure with hypoxia, 16% are Hispanic patients. Imagine that the average Length of Stay (Hours) was equal across all Ethnicity groups. In that case, we would expect the 81 Hispanic patients to have 10359.04 total Hours of Length of Stay.
    3. In reality, Hispanic patients had 12967 total Hours of Length of Stay.
    4. The difference of Actual - Equitable is 2607.96 Hours.
    5. The Billing Diagnosis with the highest Actual - Equitable value may give you the most "bang for your buck" to resolve the disparity in Length of Stay by Ethnicity group globally.



Actual - Predicted metric for National Institute of Health funding allocation (Rees, C. et al. 2021)

Methodology: User-Centered Design

Formative Usability Testing:

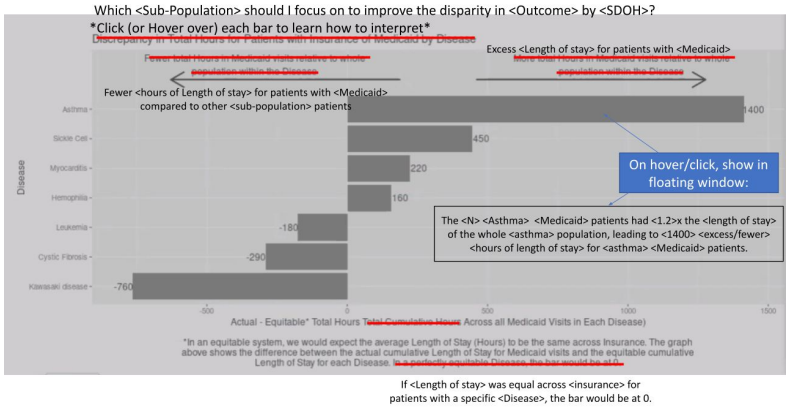
- Created a candidate application and interactive user interface (R Shiny)
- Created scenarios simulating health system leader tasks
  - Identify a disparity
  - Decide on focus area(s)
- Observed 7 clinicians of varying expertise interacting with the prototype
- “Think Aloud” protocol
- Iterative design changes between participants

Design framework for Formative Usability Testing

Results: Lessons Learned in Formative Testing

The Challenge: Convey "Actual - Equitable" Concept

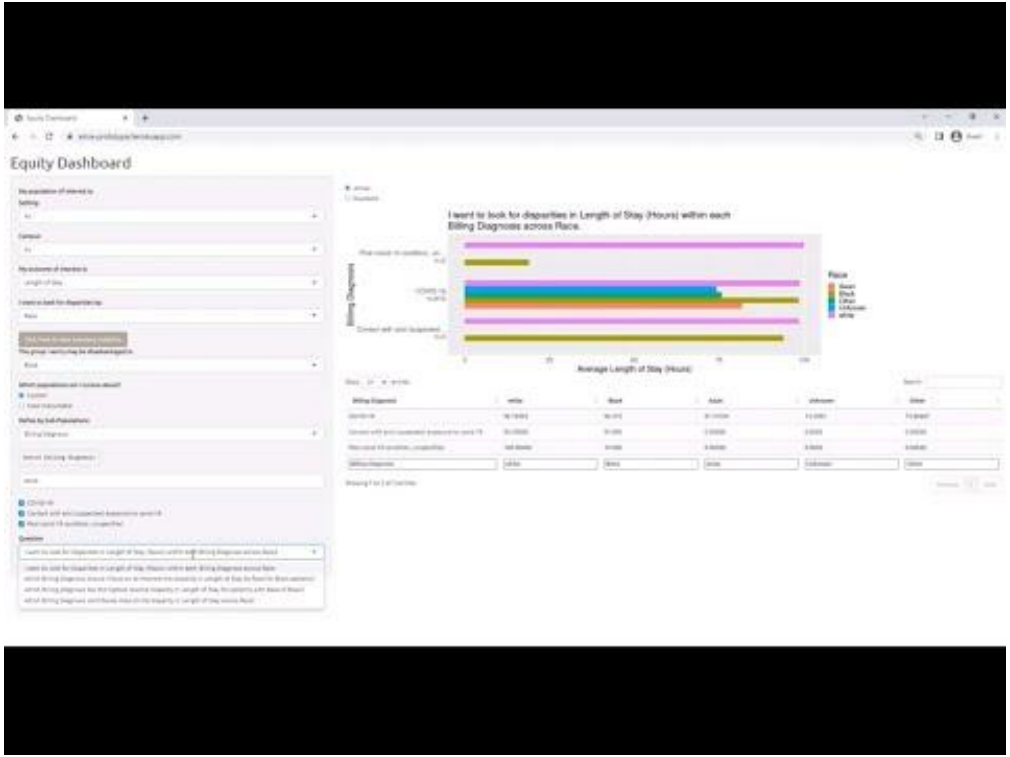
- Distinguished Tasks
  - Landing interface provides crude disparities only
    - e.g. 7 Day Unplanned Readmission Rate by Insurance is 4.7% for Self Pay patients, 6.9% for Public patients, and 6.6% for Private patients.
  - "Dive Deeper" graphs are labeled with the question they are trying to answer
    - e.g. Which Zip Code should I focus on to improve the disparity in Length of Stay by Race for Black patients?
- Interactive Explanatory Framework
  - Clicking on individual results exposes detailed calculation and reasoning.



Annotated user interface created during Formative Usability Testing

Results: Demo

- As shown in the video, the final version of the dashboard prototype has extensive functionality and is able to both identify healthcare disparities and help direct a course of action to reduce them
- Additionally, the interface is designed to be flexible and user friendly to make the relevant data easily accessible for clinicians and health system leaders



Results: Feedback from CHOA

“This is exactly the kind of thing we need to be doing”

- Chief Diversity Officer

“I can definitely see this being a very useful tool for other clinicians and myself, and even for researchers with addition of p-values and significance”

- Pediatric Cardiologist

"This is a different way of looking at problems we have in the system"

- Pediatric Interventional Radiologist

"I would hope to have this for many different disease processes and sub-populations”

- Pediatric Emergency Medicine Physician

Conclusions and Next Steps

Conclusions

- The final dashboard was able to identify specific opportunity areas for improving disparities in the CHOA healthcare system
- Additionally, our final rounds of usability testing indicated that users were able to navigate the dashboard and interpret the graph and table data as intended

Next Steps

- Integrate the dashboard into the existing software ecosystem at CHOA to allow real-time updates
- Execute interventions and PDSA cycles based on insights from the dashboard to see how well the data translate to the actual reduction of disparities

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