So You've Found a Healthcare Disparity, Now What?
New Visualization Capabilities to Enable Targeted Improvement Initiatives

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Abstract

We employed user-centered design to develop a novel health equity dashboard to support health system leaders by uncovering hotspots for healthcare disparities. Our dashboard identifies specific focus areas for reducing these disparities using the "Actual - Equitable"[1] metric. The dashboard displays graphs and tables generated from patient data and parameters such as population, outcome, and sub-population that users can input through our interface, which has been optimized via formative usability testing.

Introduction

As concerns increase regarding equity in healthcare systems, interactive dashboards are becoming more and more valuable as tools to address health disparities.[2] However, existing dashboards largely serve as higher level diagnostic tools without identifying a specific focus area or course of action to reduce a given disparity, and user-centered design is rarely implemented in their development.[3, 4] Children's Healthcare of Atlanta (CHOA) has a descriptive equity dashboard currently in use at the hospital, which allows users to compare outcome metrics across various social determinants of health within a population.[5] However, the current dashboard does not provide users with a potential course of action to address disparities. The lack of generalized dashboards which can both identify healthcare disparities as well as potential courses of action to reduce them motivates the following research goal (Figure 1): Enable clinicians and health system leaders to intuitively identify healthcare disparities and the sub-populations with the greatest opportunities for improvement.

Methods

We used an "Actual - Equitable" metric to identify focus areas for reducing a given disparity. This metric expresses the difference between the actual cumulative value of a given outcome for a potentially disadvantaged group with what the same value would be if the specified sub-population was equitable, thus providing the total magnitude of the disparity, which can be used as a guide when allocating resources during the intervention stage. Additionally, we implemented user-centered design (UCD) throughout the development of our dashboard to create an intuitive interface. The initial prototype was built using R Shiny, and from there we conducted several iterations of Formative Usability Testing with CHOA clinicians to ensure the interface would be used and interpreted as intended (Figure 2). With each round of testing, the clinician would explain their thought process out loud while interacting with our current version of the dashboard, and we would simultaneously create mockups of possible updates to make based on their feedback (Figure 3).

Results

The final version of our dashboard consists of two pages with distinct associated tasks. The first page includes a diagnostic graph which allows the user to identify a system-wide disparity. The second page includes four different prompts which allows the user to "dive deeper" and investigate which specific subpopulations are contributing the most to the disparity shown in the first graph in order to find a course of action for reducing this disparity. Our demo video is available here. Clinician feedback on the final version of our project has been largely positive, with most of them suggesting that they would like to see our tool implemented on a larger scale.

Discussion

The final dashboard was able to identify specific opportunity areas for improving disparities in the CHOA healthcare system and could be easily adapted to other health equity use cases. 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. Going forward, we would like to integrate the dashboard into the existing software ecosystem at CHOA, execute actual interventions and PDSA cycles based on insights from the dashboard, and expand to other health equity datasets that might benefit from the Actual - Equitable concept.
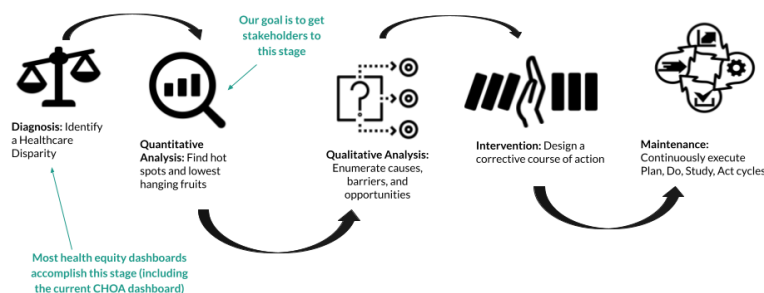
Figure 1: Conceptual model to improve health equity

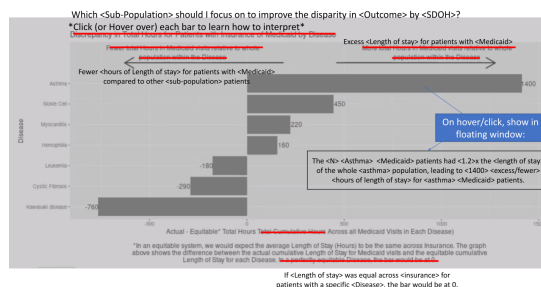**Figure 2:** Design framework for Formative Usability Testing

Figure 3: Annotated user interface created during Formative Usability Testing

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