

## C3: Design Evaluation and Report

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### Part I: Basic Evaluation Plan

#### Introduction: Goals of the Evaluation

Our goal is to create a single convenient dashboard for policymakers, advocates, nonprofit workers, and others interested in homelessness in the United States. It will allow these stakeholders to visualize data brought together from disparate sources describing trends in (a) homelessness rates by metropolitan statistical area (MSA) and (b) various factors thought to influence those rates. Academic studies<sup>1</sup> have identified variables that are predictive of homelessness; we synthesized them into six categories:

- Non-housing cost of living
- Housing expense/availability
- Public health predictors
- Strength of safety net programs
- Demographic predictors
- Policy climate predictor

Our dashboard makes proxy variables representative of these six categories available to our prospective users.

#### Evaluation Plan Ensures Proposed Design Fulfills User Needs

We designed this dashboard with the anticipated needs of our stakeholders in mind. Knowing research generally connects some factor to homelessness is one thing; our design allows users to take the next step, i.e., zooming in on a specific area<sup>2</sup>, seeing trends in the data over time, and visualizing how tightly associated the predictors are with the homelessness rates.

**Concretely, these goals translate into a few tasks users should be able to accomplish using our dashboard. These tasks (next page) form the core of our evaluation plan and user tests.**

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<sup>1</sup> See, for example:

Deden Rukmana (2020) The Causes of Homelessness and the Characteristics Associated With High Risk of Homelessness: A Review of Intercity and Intracity Homelessness Data, *Housing Policy Debate*, 30:2, 291-308, DOI: [10.1080/10511482.2019.1684334](https://doi.org/10.1080/10511482.2019.1684334)

<sup>2</sup> Most policymakers are responsible for addressing homelessness in a city or a small area, not in the country as a whole.

**Users should be able to:**

- **Visualize the most recent homelessness rate in U.S. metropolitan areas**
- **Choose a metro area of interest** and quickly see that metro area's **homelessness rate over time**.
- **Compare the predictiveness of different input variables for that MSA** - after choosing a MSA, users should be able to see which factors are most predictive of year-to-year changes in the homelessness rate.
- **Visualize trends in predictors** - if a user learns that rising inflation predicts increasing homelessness, they should be able to check how inflation is trending in their MSA.

### **Evaluation Plan Methodology**

The primary goal of our user test is that the user can achieve each of the four tasks above. We constructed a low-fi prototype (Appendix, Figures 1, 2, and 3) of our user journey to show to test users. Before showing the prototype to users, we planned to (a) provide background on the motivations of the project and (b) share the four tasks we wanted users to be able to accomplish (both verbally).

To ensure our test users represent our target audience, we reached out to county officials working in homelessness policy, a public administration researcher with expertise in related topics as well as our peers.

We planned to evaluate our design by recording successful completion of tasks, qualitative comments about the user experience observed by the tester, and feedback shared directly by users. Finally, our evaluation plan included preparation of a series of questions to guide user conversations (Appendix, Exhibit 1).<sup>3</sup>

In the following section, we summarize the key messages shared by test users and the steps we will take to incorporate their feedback.

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<sup>3</sup> These questions were intended to help focus users on important feedback points if the user did not proactively share specifics; not all user interviews included these questions and not all were posed.

## Part II: Evaluation Results

### Summary of Test User Profiles

Name	User Persona/Job Title	User Story
Ahana Raina	Grad Student - MPA (Public administration)	Assess impact of different policies (public health, macroeconomic, etc.) on rates of homelessness.
Lisa Renfro	County Level: Manager of Social Services	Get a quick overview of the state of homelessness and resources available. Build case studies of success and failures when planning next steps at the county level.
Nancy Aguirre	County Level: Research Specialist II	To develop useful reports for stakeholders and managers involved in development of local pilot programs aimed at improving homelessness
Vanja Glisic	MSDS grad student / Data Analyst at Liberty Mutual insurance	Predict future trends in homelessness by forecasting related variables like median salaries
Chakita Muttaraju	MSDS grad student / ex-SDE at Amazon	Get introduced and gain high-level insights to the topic of homelessness in the U.S.
Apoorva Sheera	MSDS grad student / ex-consultant at McKinsey	Assess trends in homelessness and relate them to trends in other variables like housing prices and inflation.

### Expert User Interviews: Key Feedback and Refinements

The expert users we interviewed were able to complete the four tasks listed in the evaluation plan and generally felt the dashboard was navigable and understandable. Their comments on each page of the prototype are summarized below.

#### **Figure 1: Expert User Feedback**

- Suggestion: Change the hue of 'Rate of Homelessness' bubbles in the legend to match bubbles on the map. Although hue is not the encoding, this marked difference in the legend may cause confusion in associating it to the map.
- Suggestion: Could be interesting to geo-encode the predictor variables, same as the homelessness rate

#### **Planned Refinements**

- Adding tooltips detailing the MSA, the rate of homelessness in the MSA and the overall population of the MSA on the maps that will be visible on hover.
- Experimenting with the best way to encode the varied rates of homelessness across different MSAs to make the discrepancies more explicit.
- As a stretch goal, we could try to geo-encode the predictor variables. This is not a primary concern though.

### ***Figure 2: Expert User Feedback***

Users advised us to

- Be more precise in titling columns and in variable names
  - For example, Nancy Aguirre mentioned that “predictiveness” by itself is vague; she said this column “needs more of a description” to clarify that it measures how closely associated a variable is with the homelessness rate.
  - Similarly, she noted confusion about how some variables are calculated, especially variables that express the % increase in some metric
  - Ahana Raina agreed, commenting that we need to be “very explicit and intentional with our labeling” of different vis elements
  - Include numerical values and percentages wherever possible, and make it straightforward. Ahana mentions, “Policy folk really like numbers, but really hate doing the math”.
- Avoid confusion in interpreting predictiveness by encoding predictiveness through either color or bar length, not both

### ***Planned Refinements***

- To make the indicators table (Figure 2) readable, we favor simplified variable titles like “% Increase in Median Rent.” But to respond to user feedback that variables should be defined more precisely, we will include footnotes that spell out in detail how metrics like “% Increase in Median Rent” are calculated.
- Express predictiveness only in terms of bar length, where the length represents  $R^2$ , all in the same color

### ***Figure 3: Expert User Feedback***

Users advised us to

- Clearly indicate trends to help understand the relationship between variables
  - Nancy Aguirre said it may not be clear on what is considered low, moderate, high inflation, or high levels of homelessness
  - She also mentioned that the numbers for the variables are unclear, specifically what “Avg. Overall Homeless” meant.
  - There is very little context in regards to the methodology of prediction. It would be useful to add a detailed summary of the lag regression model and how it works, as a footnote or documentation.
  - Ahana mentioned the staggering of the years between inflation rate and homeless population would be to need explicit/explained
- Consider the end users and their purpose
  - Nancy, a research specialist, asked if the data was able to be exported into an Excel spreadsheet, or the graphs a PDF file?
  - Additionally, she wanted to see side-by-side trends of the different variables.
  - Lisa Renfro said end users would be interested in the availability of low income housing/housing options based on median rent range.

### ***Planned Refinements***

- To label variables more clearly and explicitly indicate how things are measured.
  - For example, change “Avg. Overall Homeless” to “Avg. Homeless Population” or “Avg. Count of Homeless Population”
  - Consider possibilities to make trends more comprehensive, possibly add trendlines or hues to indicate an increase in inflation rate and homeless population, respectively.
  - Make a note regarding the staggered years, and briefly explain that it is an indicator/predictive way to see how changes in x year affected the number of homeless people x+1 years into the future.
- Consider adding a way for users to download the data and make our data exportable in both Excel and PDF format.
- In “Safety Nets” or “Housing”, gather data regarding low income housing.

### **Peer User Interviews: Key Takeaways and Refinements**

We received positive feedback regarding our overall layout of the dashboard including the multi-layered aspect and how interactive it was. It was clear that the users knew to click on the map to be brought to a city specific homepage but that we need it to explicitly say the map is indicating homelessness rates by MSA (Figure 4).

Most user feedback focused on clarifying the MSA-specific page (Figure 2). When users were on that screen, there was some confusion around our predictiveness column. Vanja stated, “why were there 2 bars and what exactly are they showing?”. While our response could clear up most of the confusion, we needed to take this feedback into consideration and try to update our method. One suggestion would be to limit the number of encodings by either only showing color differences on a scale or the length of the bar changing depending on the  $R^2$ . Apoorva also remarked that, “an automatic ranking of the predictiveness by variable would be helpful” and so we will be attempting to make that possible for each MSA page.

When we redirected Chakita’s focus to the line charts on Figure 4, she remarked “Oh! I missed it, possibly because the US map occupied most of the space”. She inquired about the feasibility of having all line charts on this page. While we informed her about our intention to provide the option to zoom in for clearer visibility, we also acknowledged her feedback and expressed our willingness to explore different spatial arrangements while designing the dashboard.

On Figure 3, the interactive hovering tool-tip was received well and should help the user complete our intended tasks. Another suggestion was to make the lag regression a part of the hovering interaction so that the years were visible for comparison. We have assessed the feasibility of this interaction and it will be a part of our final design.

## Appendix

### Exhibit 1: User Experience Questions

- How approachable is the prediction oriented setup with staggered years?
- Is any part of the dashboard navigation confusing or unintuitive?
- For what purpose are you most likely to use this dashboard?
- Is there anything left unanswered that you wish the dashboard included?
- Which feature or visualization felt the most useful for your specific user needs?
- How could this impact your effectiveness on the job?
- What was easy or difficult about navigating the dashboard?
- How simple and clean was the interface layout?
- Which parts of the dashboard would you use most often?
- What did you think of the explanations and titles on the page?
- What do you think [feature] is trying to communicate to you?
- Are there any important questions that are left unanswered after using the dashboard?

### Exhibit 2: Prototype Figures

Disclaimer: prototype features **illustrative, not actual data** for test purposes

Figure 1

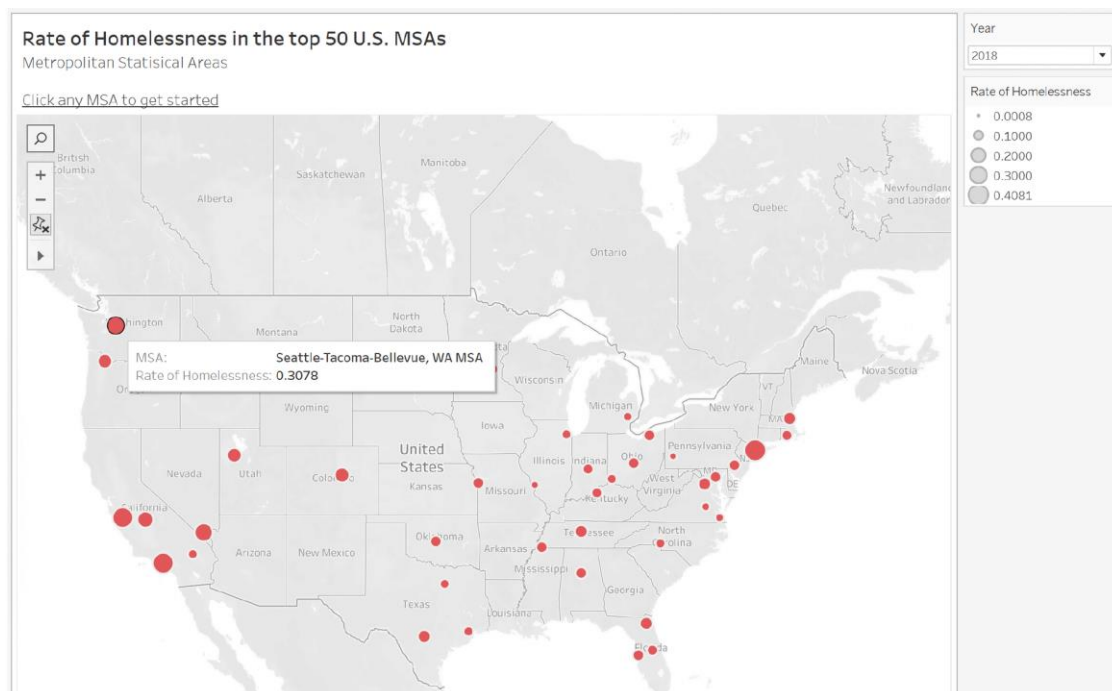


Figure 2

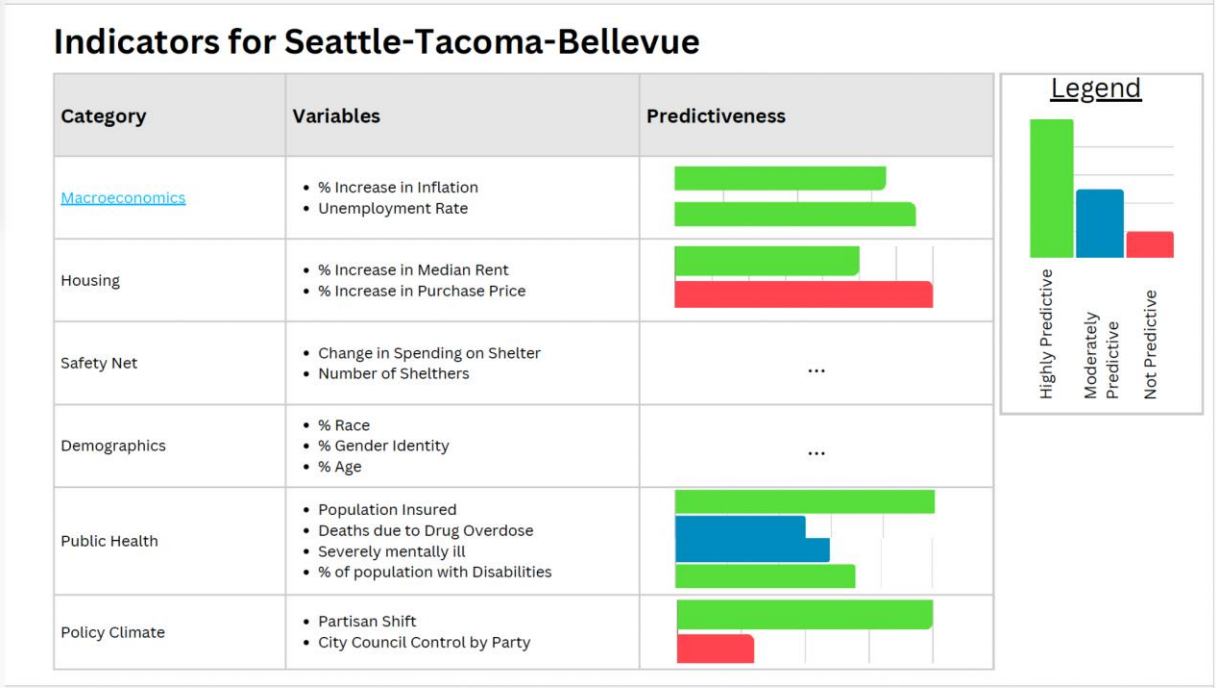


Figure 3

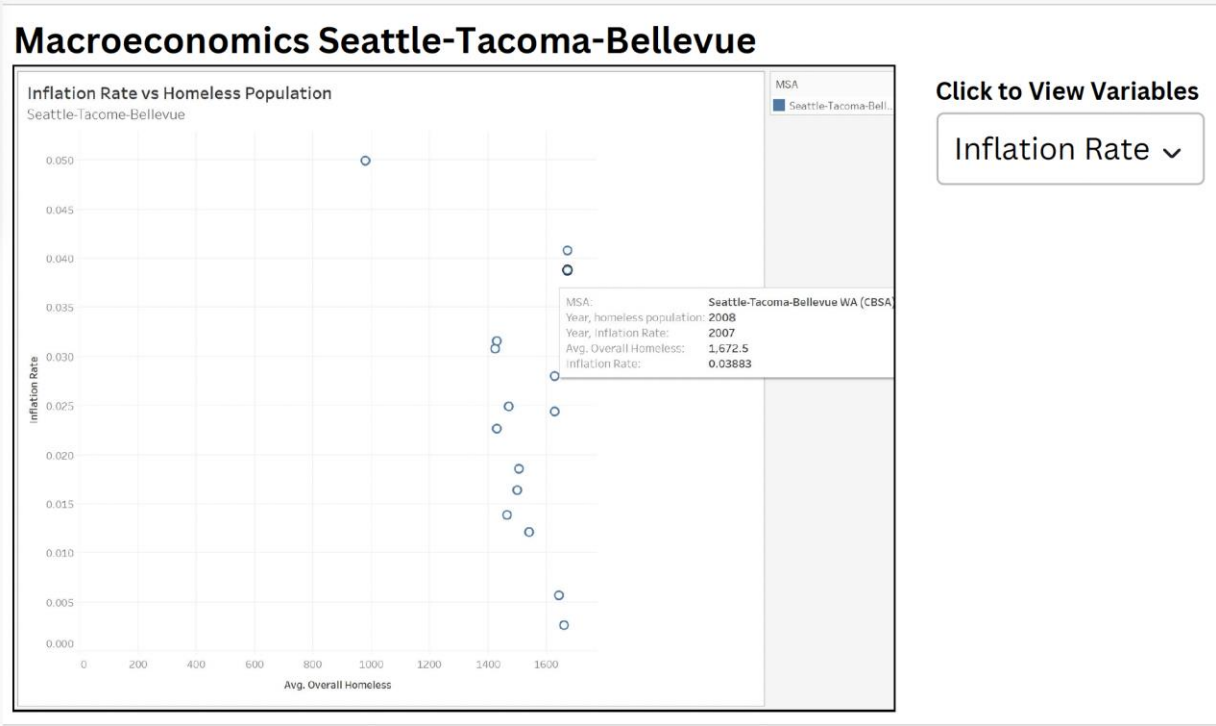




Figure 4: Low-fidelity prototype

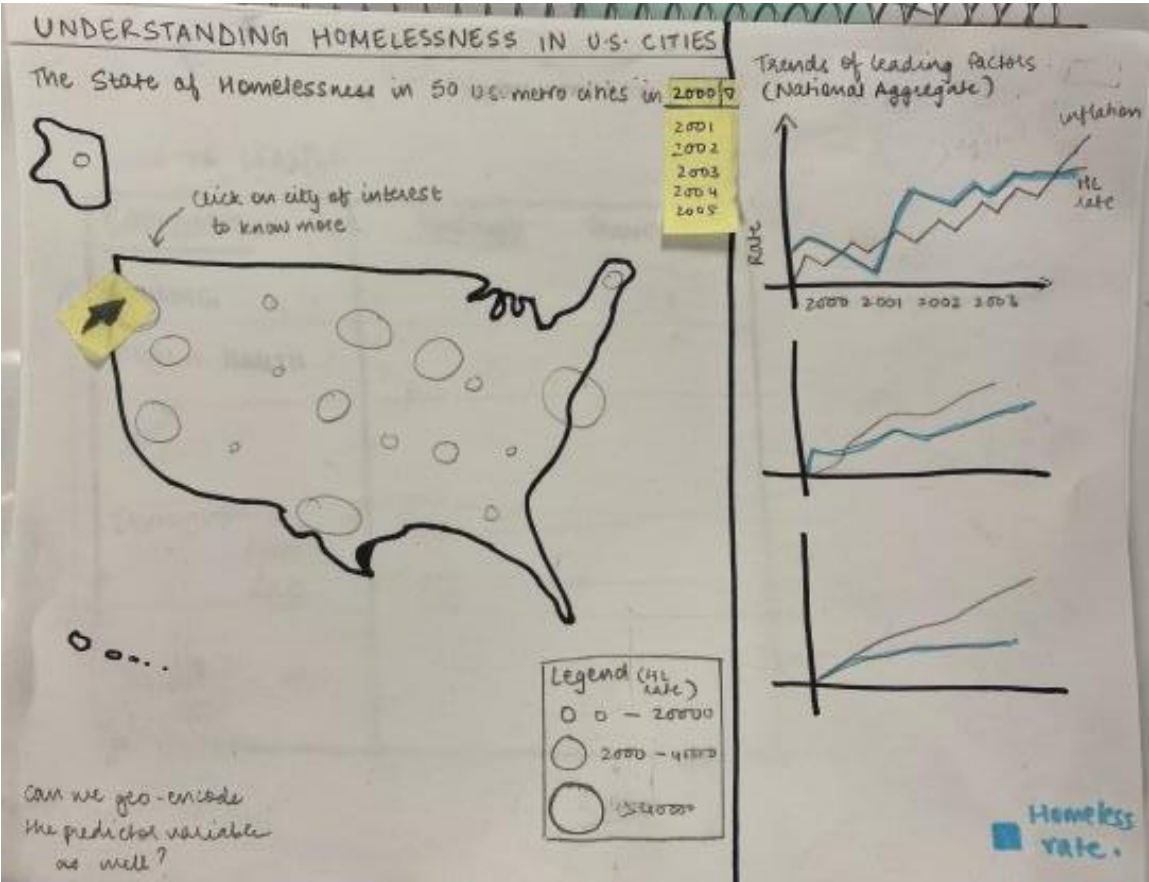


Figure 5: Low-fidelity prototype

← Back to Main Map

# STATS FOR THE CITY OF SEATTLE

CLICK TO  
CHOOSE A CATEGORY...

Make "predictiveness"  
more obvious

can we make the ordering of  
factors more intuitive - strong/primary?

CATEGORY	VARIABLE	PREDICTIVENESS
HOUSING	% Increase in median rent \$	<div><div></div></div>
PUBLIC HEALTH	% Change in pop insured	<div><div></div></div>
<ul style="list-style-type: none"> <li>category selected gets highlighted</li> <li>.</li> <li>.</li> <li>.</li> <li>.</li> <li>.</li> </ul>	<ul style="list-style-type: none"> <li>.</li> <li>.</li> <li>.</li> <li>.</li> <li>.</li> <li>.</li> </ul>	<ul style="list-style-type: none"> <li>.</li> <li>.</li> <li>.</li> <li>.</li> <li>.</li> <li>.</li> </ul>
CLICK TO SEE AN OVERVIEW	—	—

