💭 Discuss with neighbor(s):

What do you consider when selecting classes? Why?

Priority Queue:

Ranking, Sorting and Prioritizing

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Hi, I'm Benji!

Why I'm here: Embedding ethics into CS courses (14 so far!)

Research: human-data interactions (computing education + HCI research)

My path:

- BS + M.Eng. ("co-term") in CS at MIT
- Ph.D. at University of Washington
- Embedded Ethics Postdoctoral Fellow at Stanford HAI, Ethics Center

What do you consider when selecting classes?

Contents

- **Values in technology**
- Priority Queues
- Coordinated Entry System
- Values Encoded & Value Conflicts

Values in Technology

- Design decisions encode values.
- They are expressive of what we care about.
- They reveal our assumptions about the world, the people who will be interacting with our design and benefiting from it.

Values in Technology

Explicit values: Values that designers intend their products to encode.

Collateral values: Values that are not explicitly encoded but crop up as side effects of design decisions and the way users interact with them.

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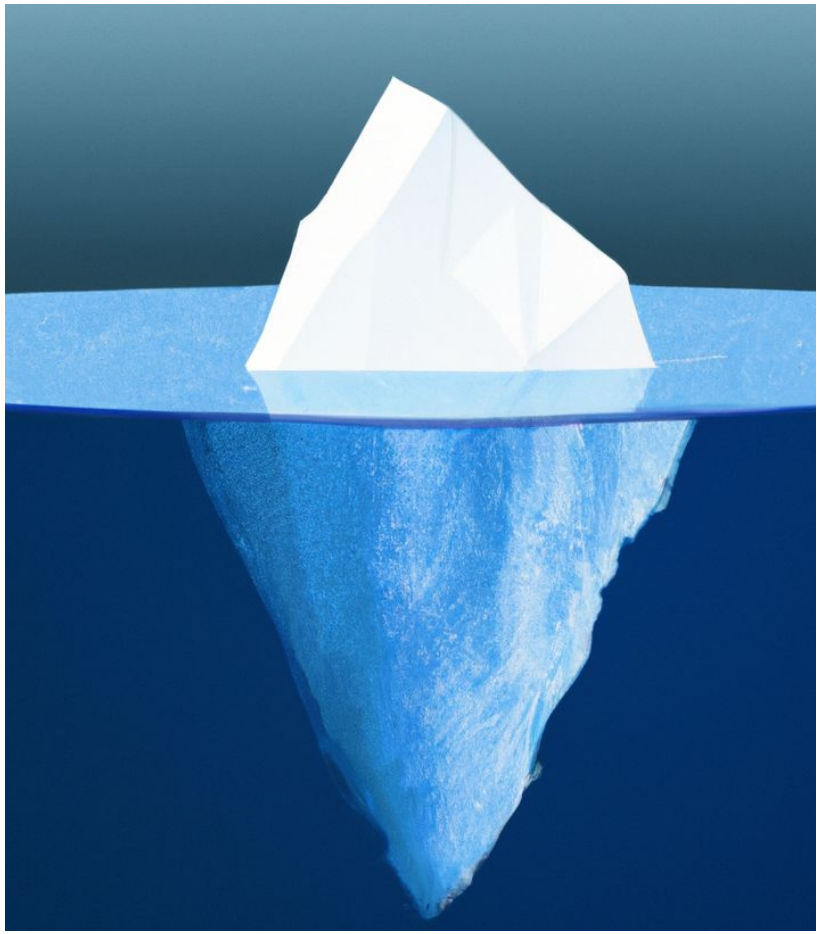


Values in Technology

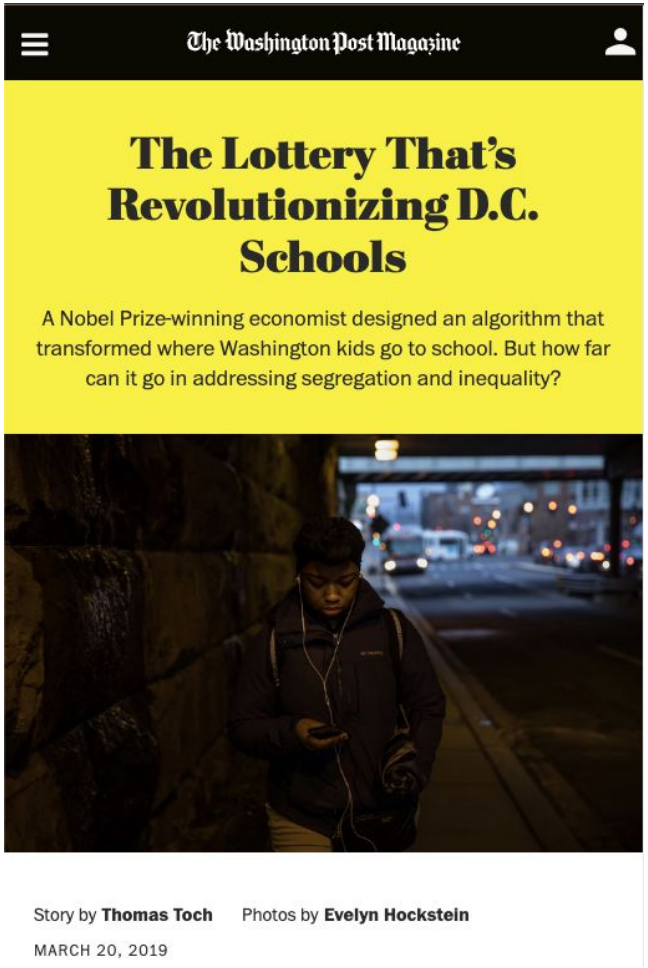
- Value tensions and conflicts may arise when the system operates in the world.

Example: My School DC School Placement Algorithm

Context: bias where families with financial and political capital can place children in “better” public schools

Goal: desegregate schools in Washington D.C. by debiasing

Approach: matching algorithm (given family’s school preferences, maximize number of matches to highest preferences)



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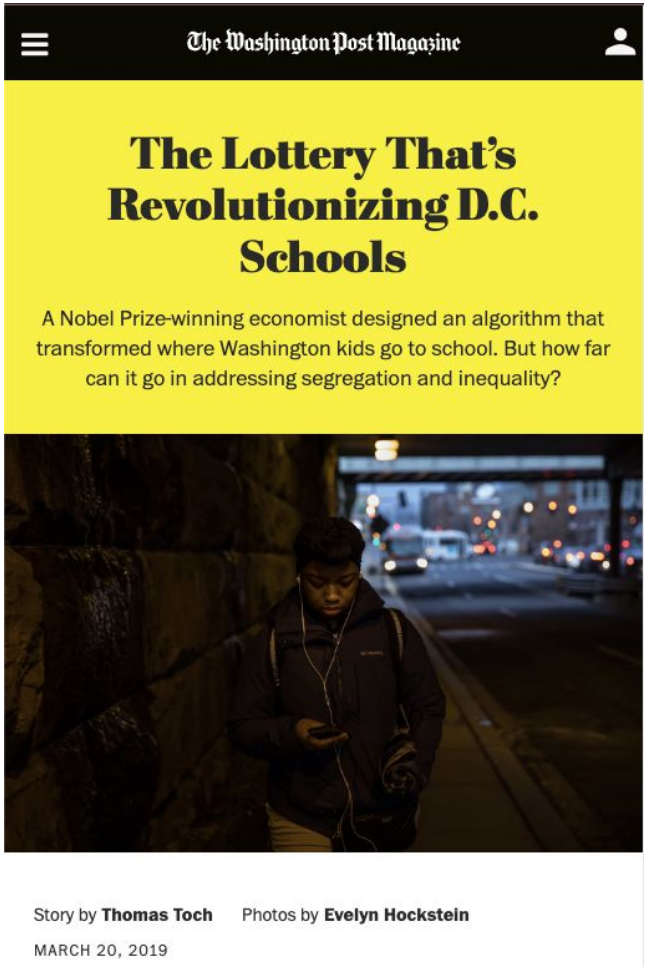
Explicit values:

neutrality (everyone has equal odds)

autonomy (people can make own decisions)



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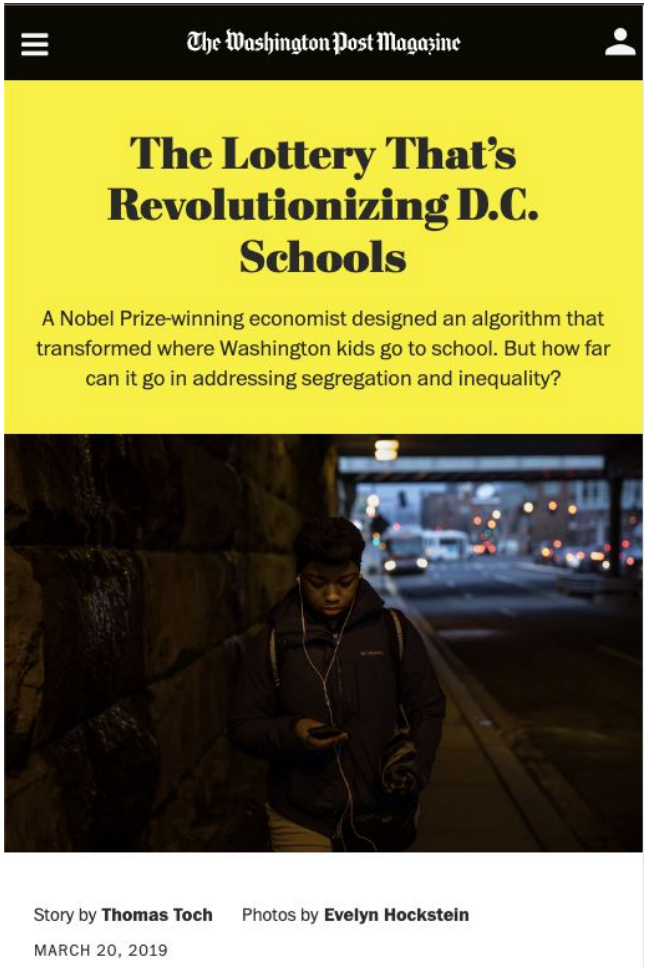

The Washington Post Magazine

The Lottery That's Revolutionizing D.C. Schools

A Nobel Prize-winning economist designed an algorithm that transformed where Washington kids go to school. But how far can it go in addressing segregation and inequality?

Story by **Thomas Toch** Photos by **Evelyn Hockstein**

MARCH 20, 2019

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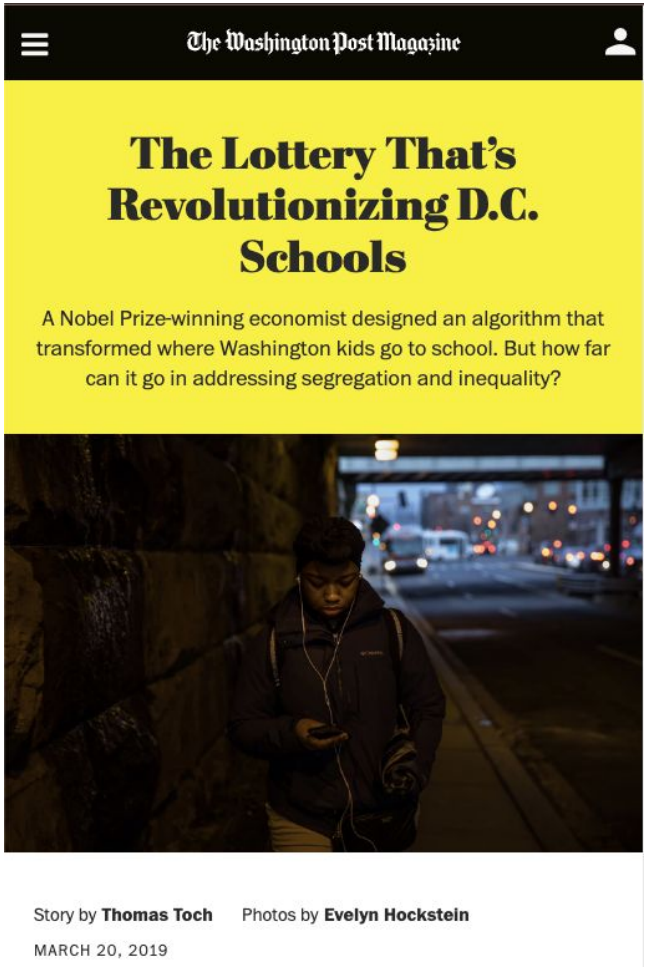
Value tension: algorithm reifies historical biases?



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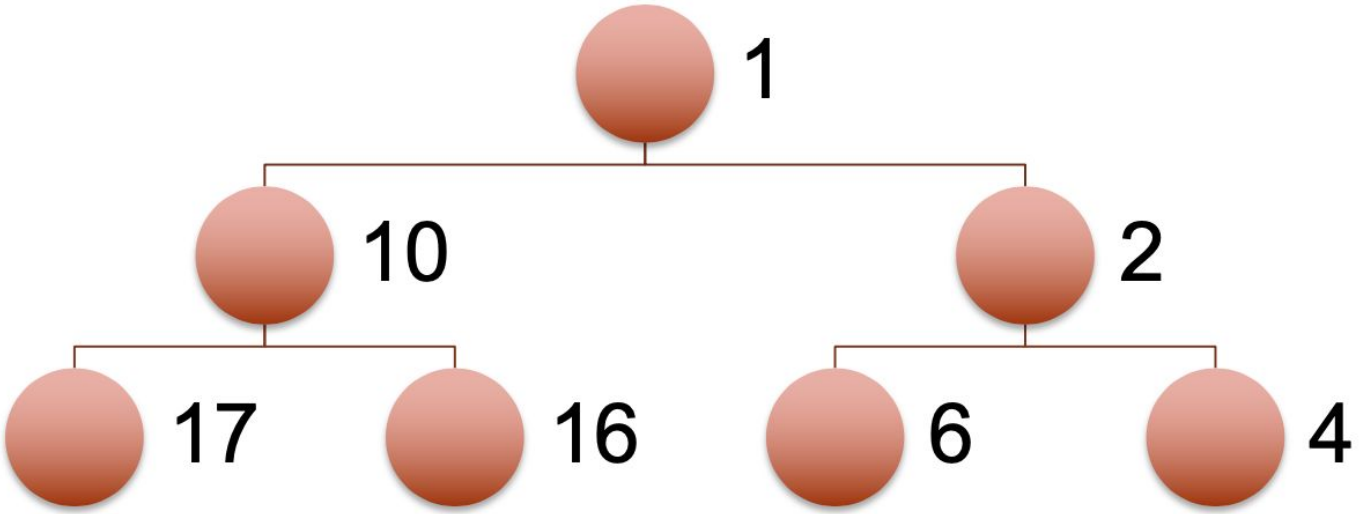
- Values Encoded & Value Conflicts

Priority Queue: a refresher

- In a queue, the **first-in-first-out rule** is implemented.
- A priority queue is a **special type of queue** in which each element is associated with a **priority value**. Elements are served on the basis of their priority. That is, higher priority elements are served first.

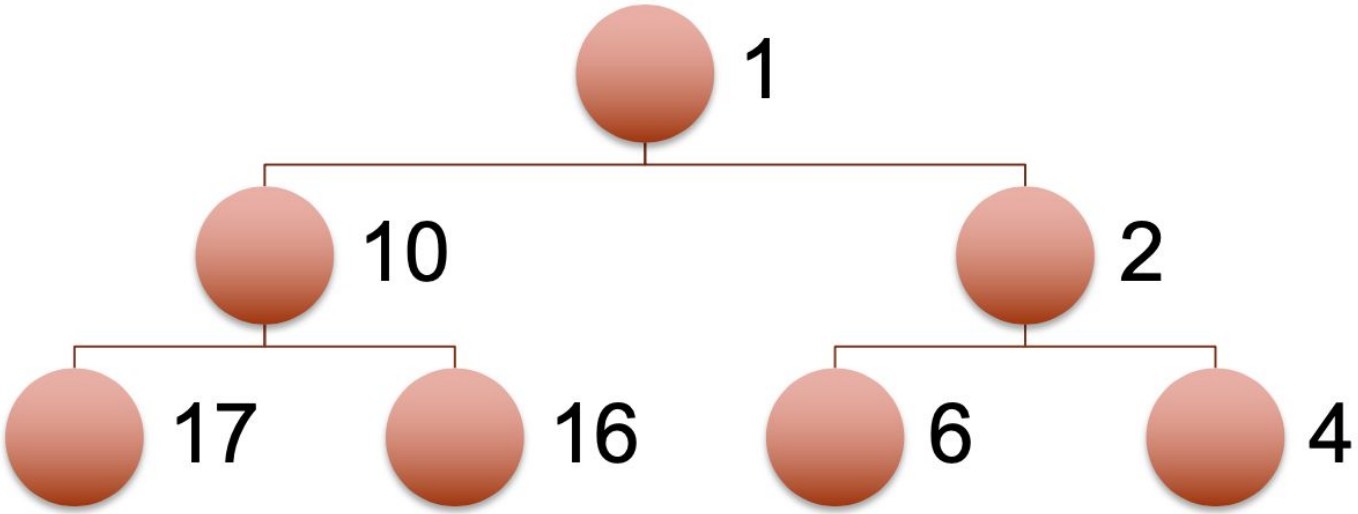
Priority Queue Implemented as Heap



Concept check: Which statements are true about heaps?

a. Parents always have a higher priority than their children
b. Right child always has a higher priority than left child
c. The heap shown above is a min-heap

Priority Queue Implemented as Heap



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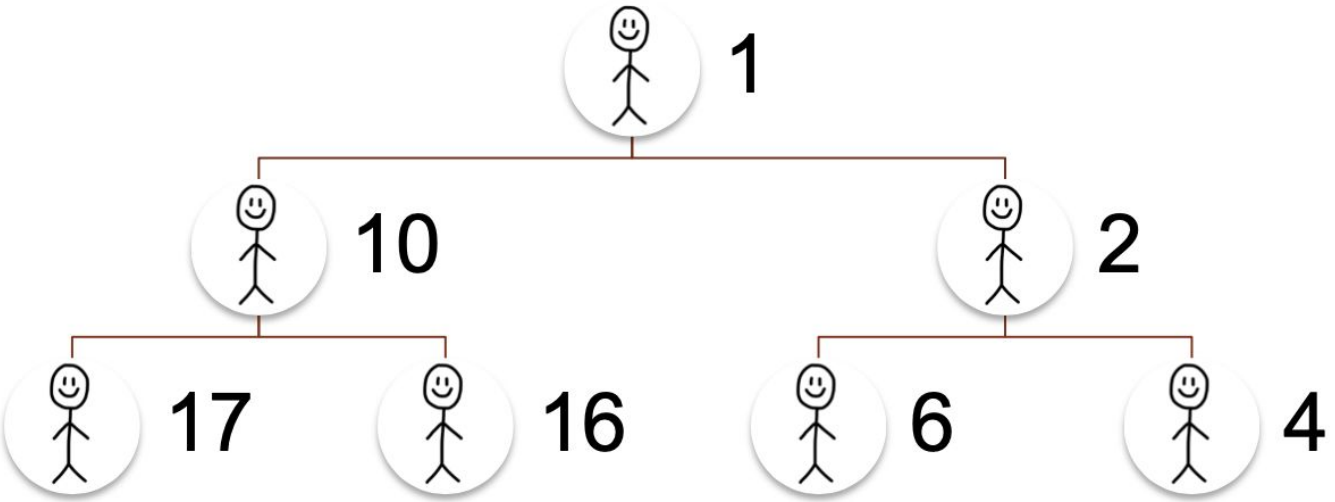
Priority Queue of People's Housing Needs



What do we use Priority Queue for?

For ranking people based on needs to receive limited resources

- Triage
- Vaccines
- Organ donation
- Social assistance programs 🏠

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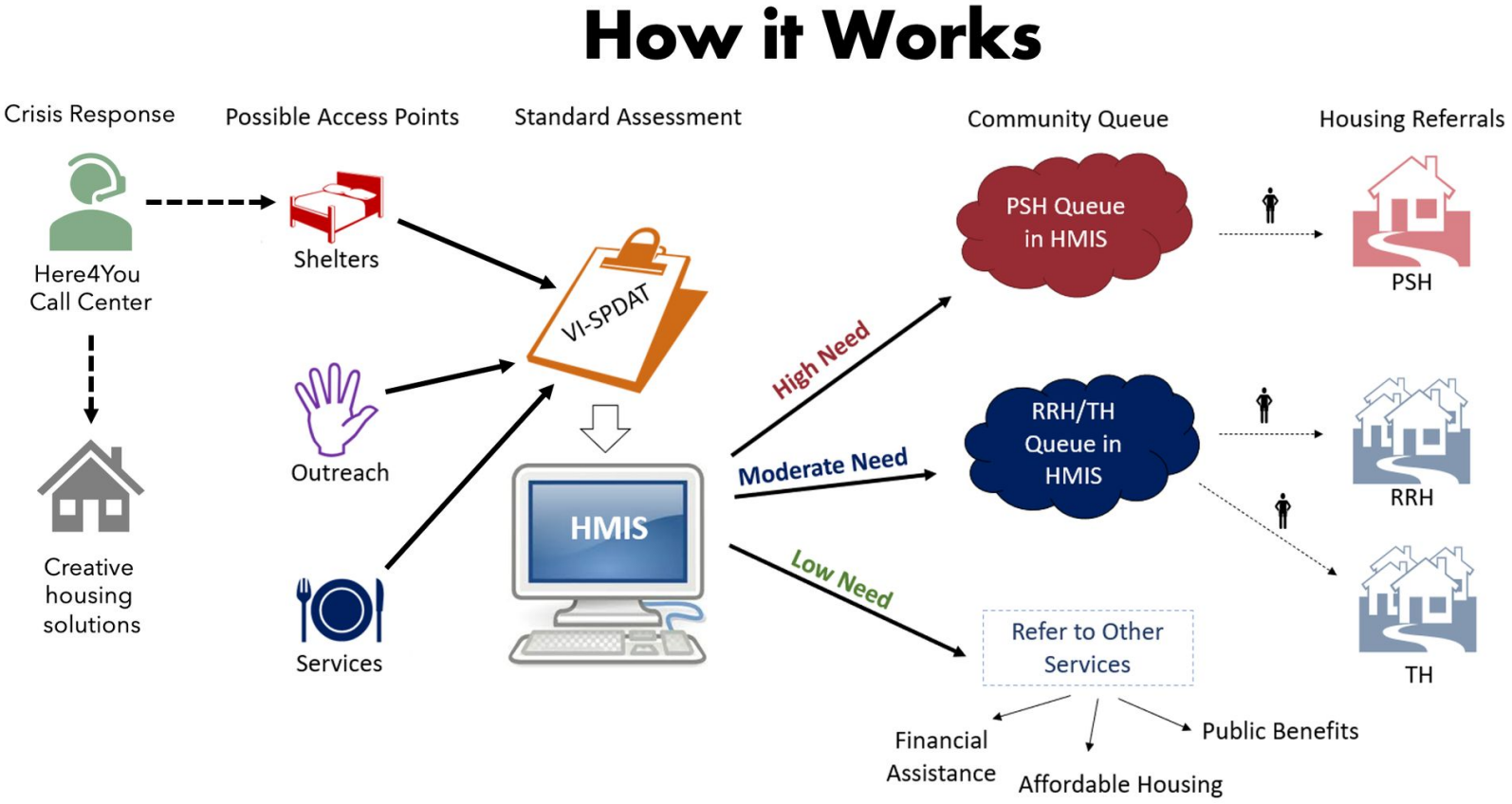
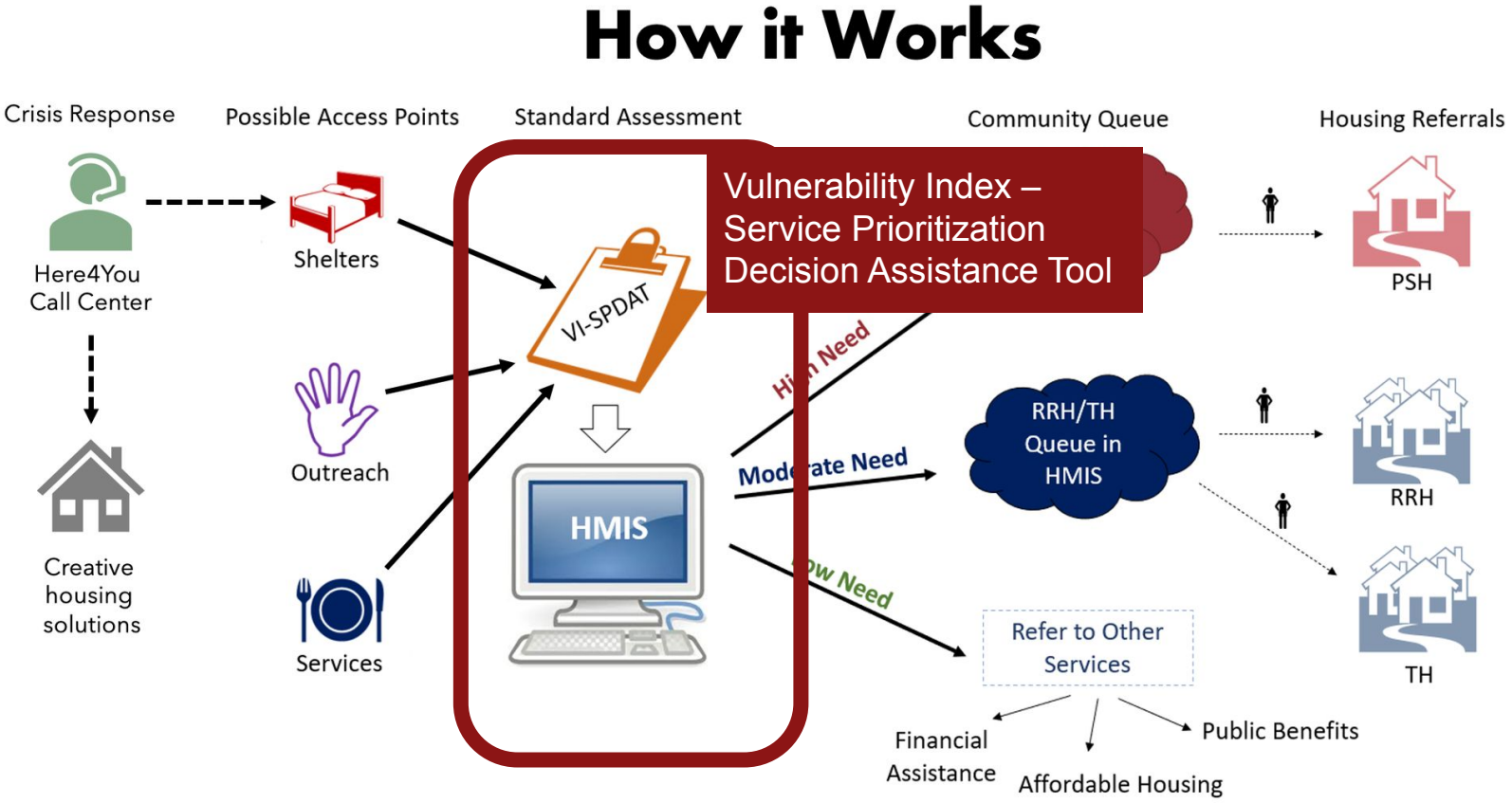
Coordinated Entry System



Office of Supportive Housing, County of Santa Clara

Coordinated Entry System



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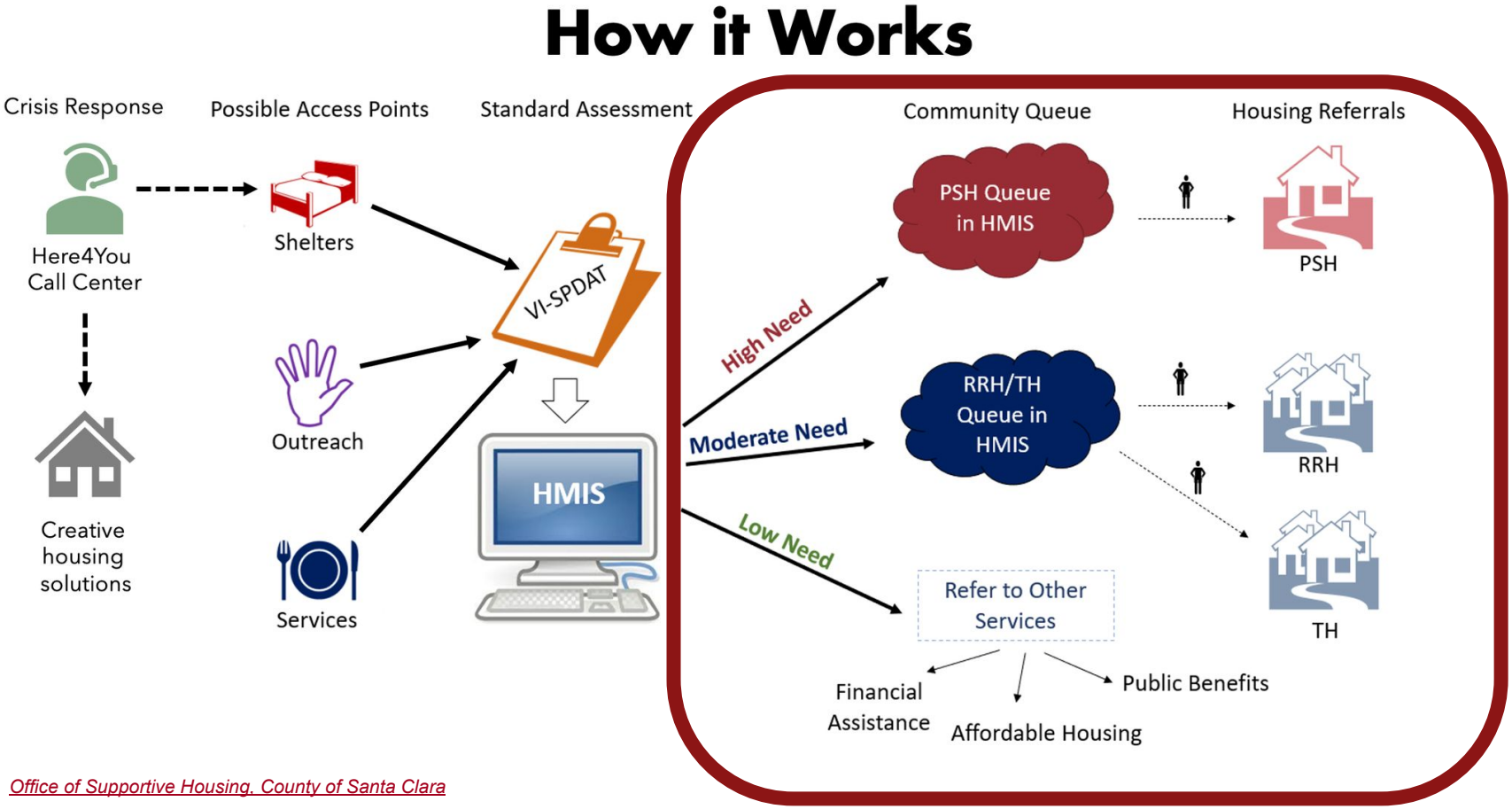


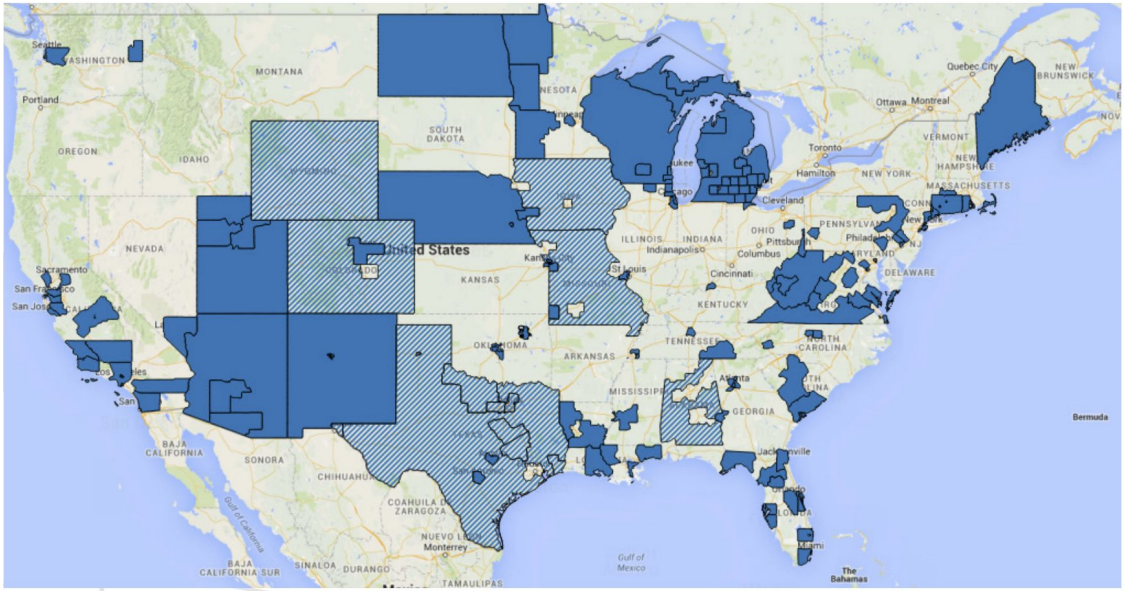
Office of Supportive Housing, County of Santa Clara

CES deployed at scale

In Alameda county (2019):

- 8,000 households on list for housing resources
- only ~20% get some kind of resource

Vulnerability assessment used by 100+ counties & states in U.S.



At this scale, Big(O) efficiency matters!

Before the Coordinated Entry System

- Unhoused people navigated a complex system of waitlists and social service programs
- Competition for rooms and funding among service providers.
- Corruption

Coordinated Entry System

Key Tensions

- "readiness" for housing?
- who/how to determine priority?

Two Philosophies

- Housing First
- Prioritization according to need

Coordinated Entry System

Housing First (Sam Tsemberis, 2004)

- Rejection of "house-readiness" approach
- Anti-paternalistic
- Better results
- Less public spending

Coordinated Entry System

Housing First (Sam Tsemberis, 2004)

- Rejection of "house-readiness" approach
- Anti-paternalistic
- Better results
- Less public spending

⚠️ Scarce resources and growing needs

Coordinated Entry System

Prioritization according to need

- Crisis homelessness
  - Requires a small, time-limited investment
- Chronic homelessness
  - Associated with other problems
  - Requires more complex social support

Coordinated Entry System

Prioritization according to need

- Need for a system that enabled agencies to:
  - Identify individuals' and households' needs
  - Sort them
  - Allocate resources

Coordinated Entry System

Entering the system

Meeting the definition of “literal homelessness”

Data gathering

Unhoused person provides personal information including name, DOB, SSN, immigration status, disability, current & past mental health, sexual activity, substance use.

Ranking

Algorithm uses personal data to assign a number from 1-17, least vulnerable to most vulnerable.

Matching

Risk score is used to assign housing and housing related services.

Coordinated Entry System

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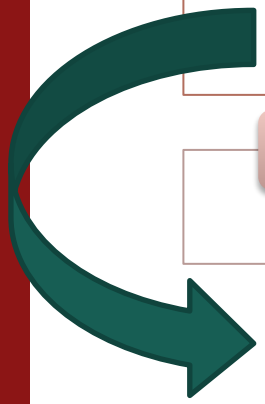
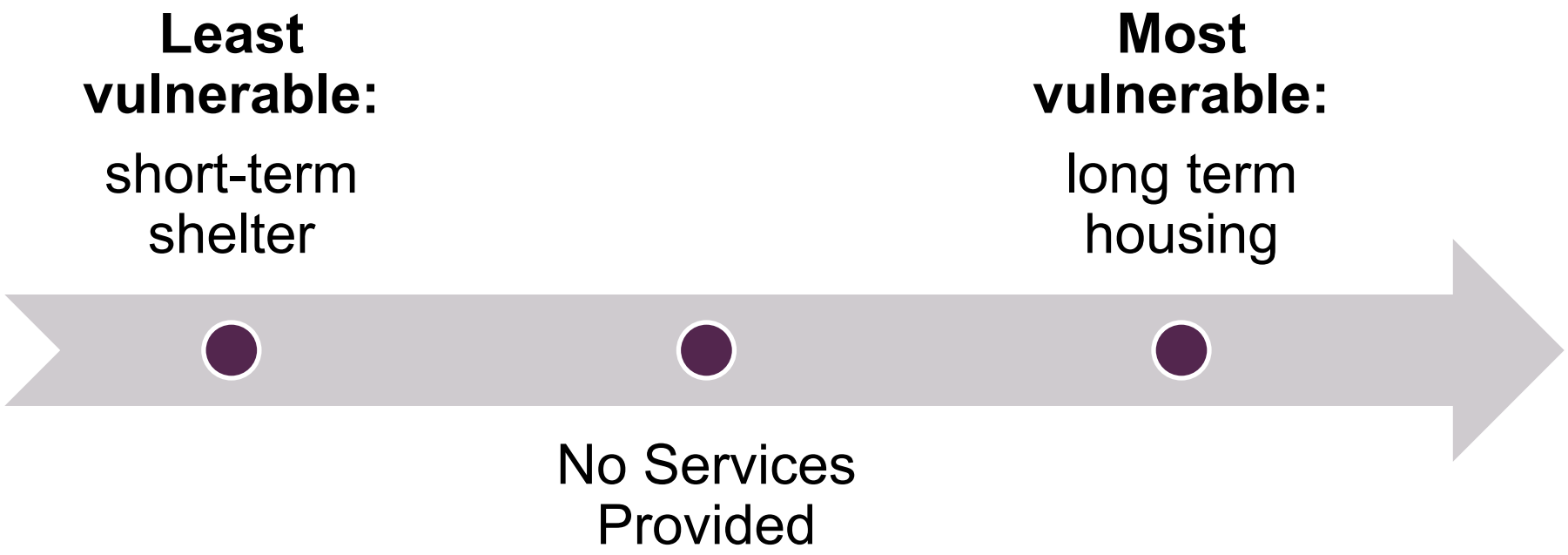


Priority Queue!


Least vulnerable:
short-term shelter
Most vulnerable:
long term housing
No Services Provided

Design decisions?

- Sort individuals based on certain characteristics
  - Which characteristics?
  - How are they weighted?
  - What data is needed?
  - How do we gather information?
  - Categories?
- Once they are classified and ordered, how do we treat individuals in each category?
- How do you treat the data?

Excerpt from vulnerabilitv assessment (VI-SPDAT)

B. Risks

4. In the past six months, how many times have you...

a) Received health care at an emergency department/room?	___	☐ Refused
b) Taken an ambulance to the hospital?	___	☐ Refused
c) Been hospitalized as an inpatient?	___	☐ Refused
d) Used a crisis service, including sexual assault crisis, mental health crisis, family/intimate violence, distress centers and suicide prevention hotlines?	___	☐ Refused
e) Talked to police because you witnessed a crime, were the victim of a crime, or the alleged perpetrator of a crime or because the police told you that you must move along?	___	☐ Refused
f) Stayed one or more nights in a holding cell, jail or prison, whether that was a short-term stay like the drunk tank, a longer stay for a more serious offence, or anything in between?	___	☐ Refused

IF THE TOTAL NUMBER OF INTERACTIONS EQUALS 4 OR MORE, THEN SCORE 1 FOR **EMERGENCY SERVICE USE.**	**SCORE:** 0

21. Has your drinking or drug use led you to being kicked out of an apartment or program where you were staying in the past?	☐ Y	☐ N	☐ Refused
22. Will drinking or drug use make it difficult for you to stay housed or afford your housing?	☐ Y	☐ N	☐ Refused

IF "YES" TO ANY OF THE ABOVE, THEN SCORE 1 FOR **SUBSTANCE USE.**	**SCORE:** 0

Scoring Summary

DOMAIN	SUBTOTAL	
PRE-SURVEY	0	/1
A. HISTORY OF HOUSING & HOMELESSNESS	1	/2
B. RISKS	0	/4
C. SOCIALIZATION & DAILY FUNCTIONS	0	/4
D. WELLNESS	0	/6
GRAND TOTAL:	0	/17

RESULTS

Score:	Recommendation:
0-3:	no housing intervention
4-7:	an assessment for Rapid Re-Housing
8+:	an assessment for Permanent Supportive Housing/Housing First

Concept Check:

Unlike collateral values, explicit values are those that…

Encoded Values?

Think-Pair-Share:

What are some explicit values encoded in the C.E.S.?

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Encoded Values?

- Efficient use of resources
- Neutrality
- Promoting autonomy
- Priority of the worst-off

Encoded Values?

Efficient use of resources

Efficiency?

- C.E.S. intended to **reduce public spending** by streamlining the process of housing allocation.
- It sought to **optimize the use of existing housing resources** by allocating them to households who would benefit most.

Efficiency?

- Total cost to L.A. County: $11 million
  - C.E.S. improved matching between people and services, NOT number of people housed
- Cost per housed person: $1140
  - Would the $11 million have been better spent on giving each person $1,140 to put towards a security deposit for an apartment?

Encoded Values?

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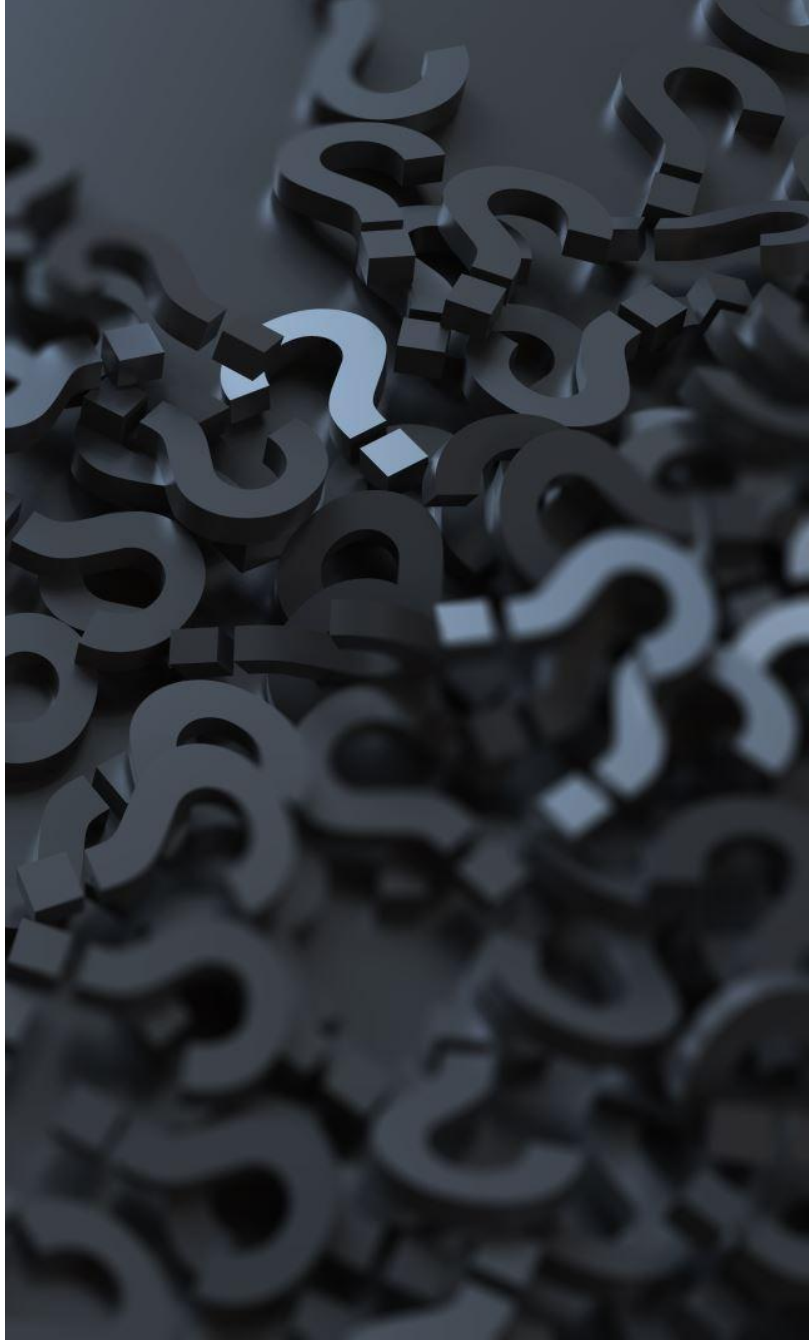
Encoded Values?

Neutrality?

"I'm doing the matching and it's very unbiased as far as our work because the computer tells me, based on a scoring system, which families are higher need than other families"

Worker Interviewed

According to Need Podcast

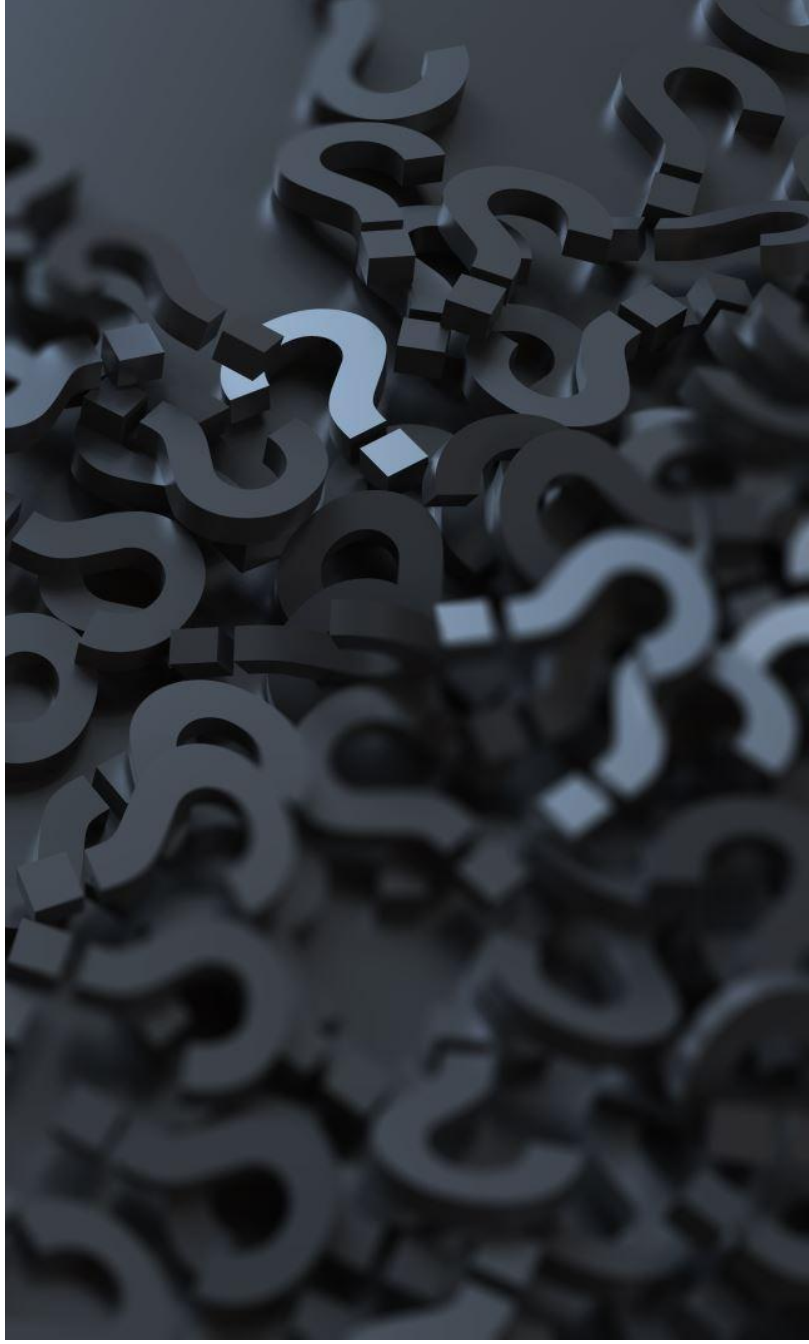


Neutrality?

Vulnerability assessment:

- If no one intervenes
  - Death
  - Chronic homelessness
  - Use of costly social services

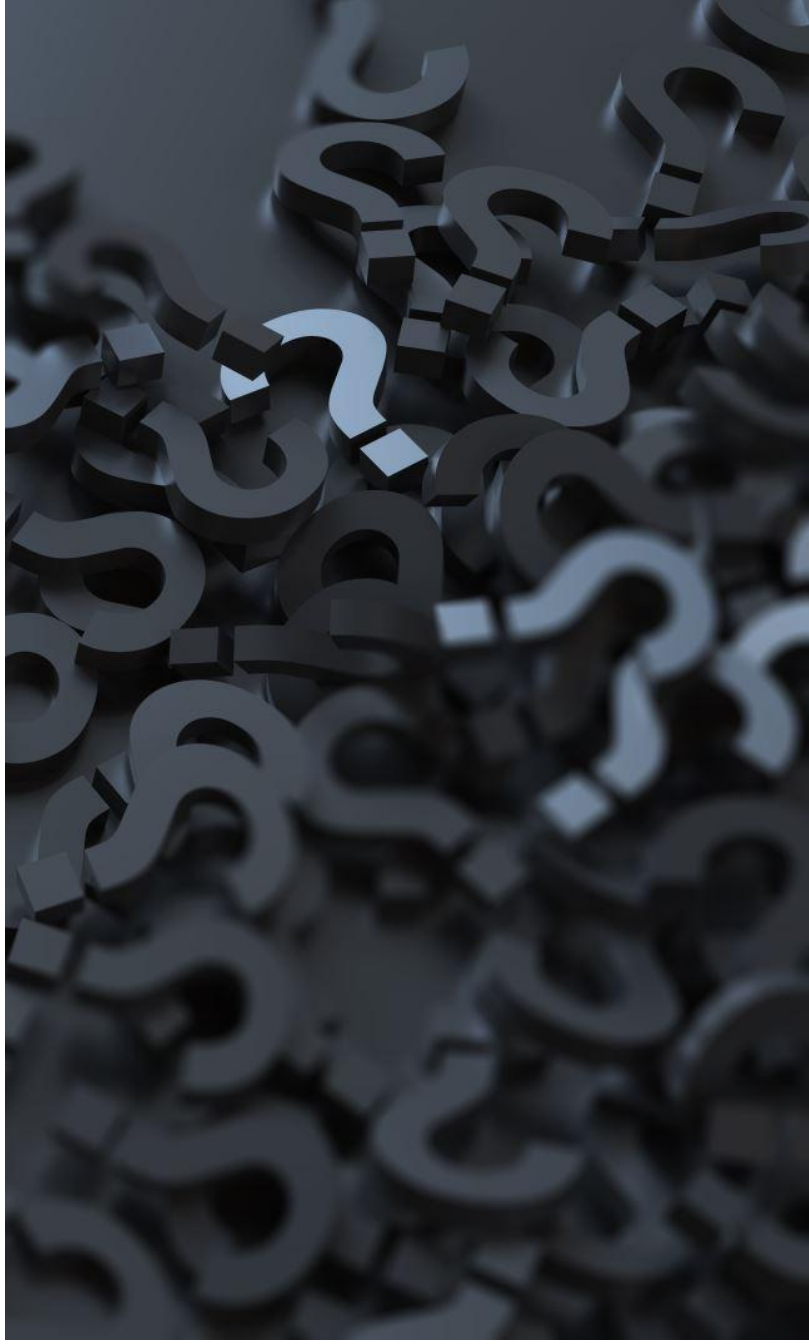
- Some criteria
  - Physical or mental illness
  - Disability
  - Addiction
  - Length of time unhoused



Neutrality?

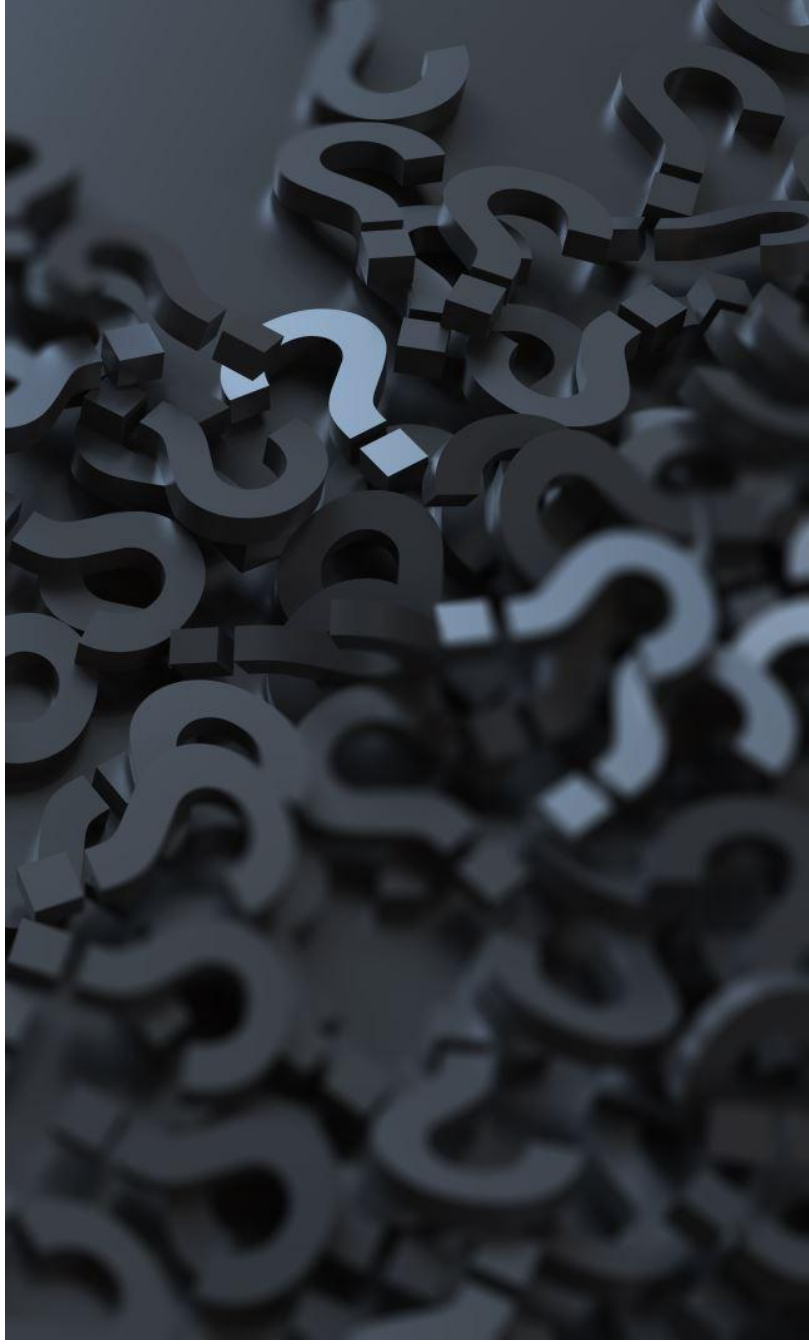
Unintended consequence:

- Because of economic disparities, it is easier for people of color to become unhoused.
- A higher proportion of white unhoused people meet the criteria of high vulnerability.
- => White unhoused people score higher on the ranking and more likely to receive benefits.



Neutrality?

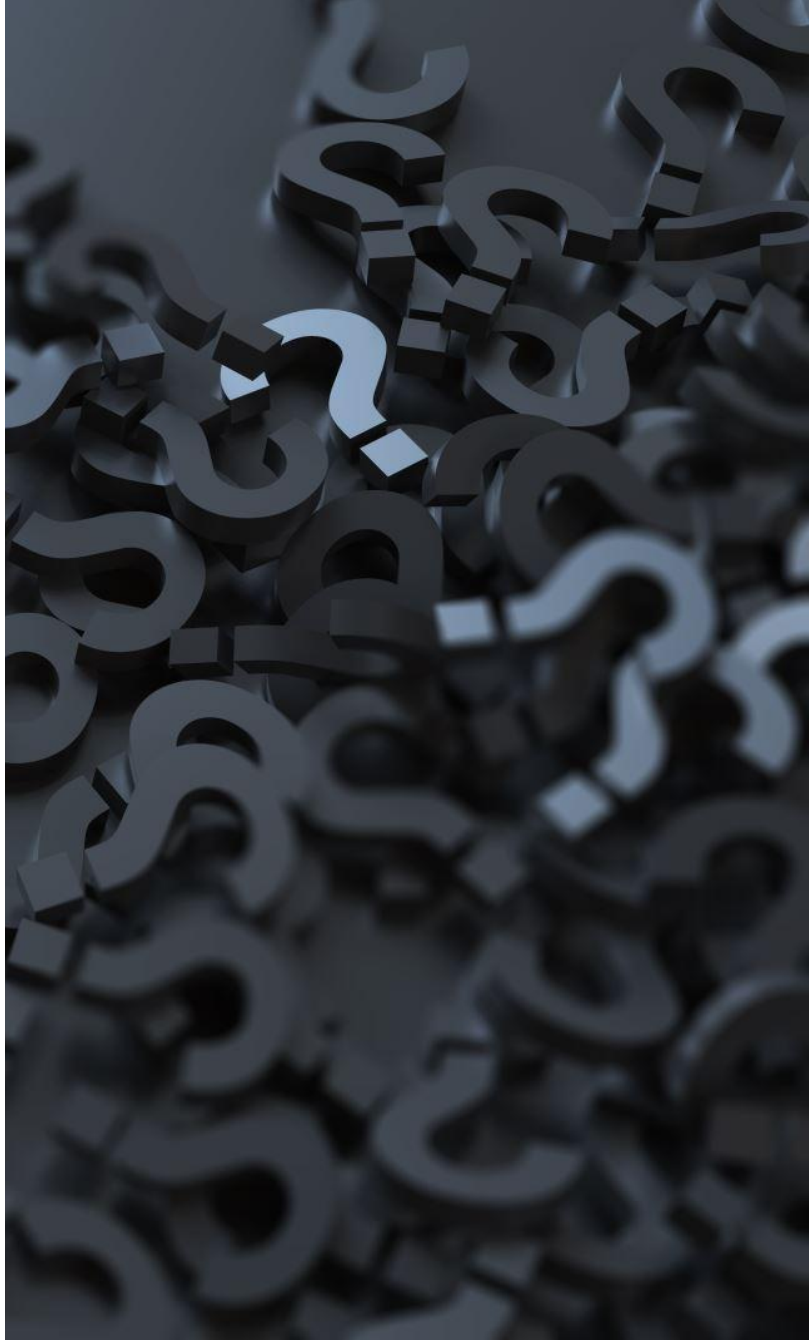
- Individual vulnerability does not take structural factors into consideration.
- => systems may work less effectively for people of color



Neutrality?

<u>Concept Check:</u>

The designers of the C.E.S attempted to encode the value of neutrality by….



Encoded Values?

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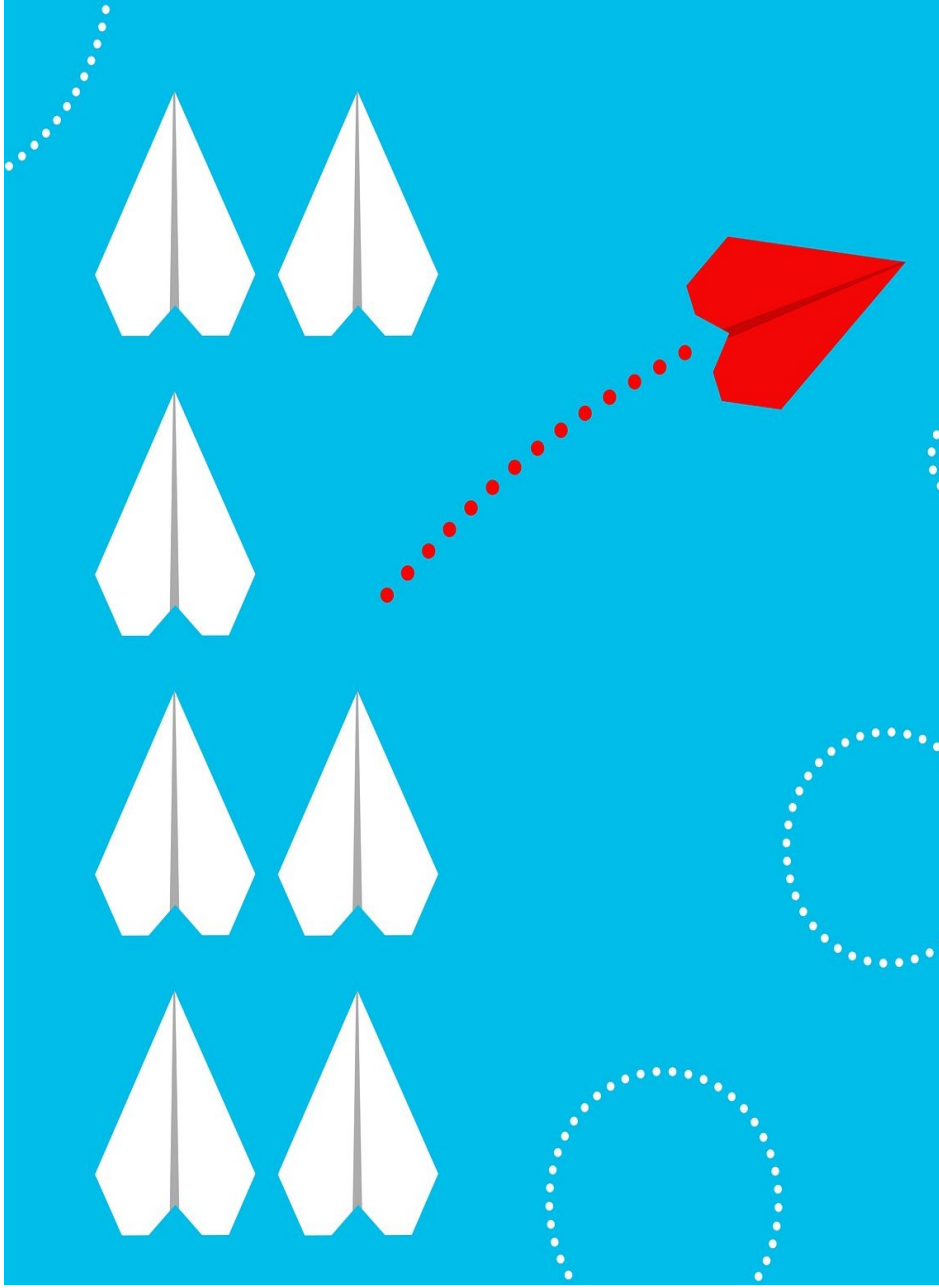
Encoded Values?

Promoting autonomy

Autonomy?

Housing First:

- Rejection of paternalism
- Creating conditions for individuals to make their own choices

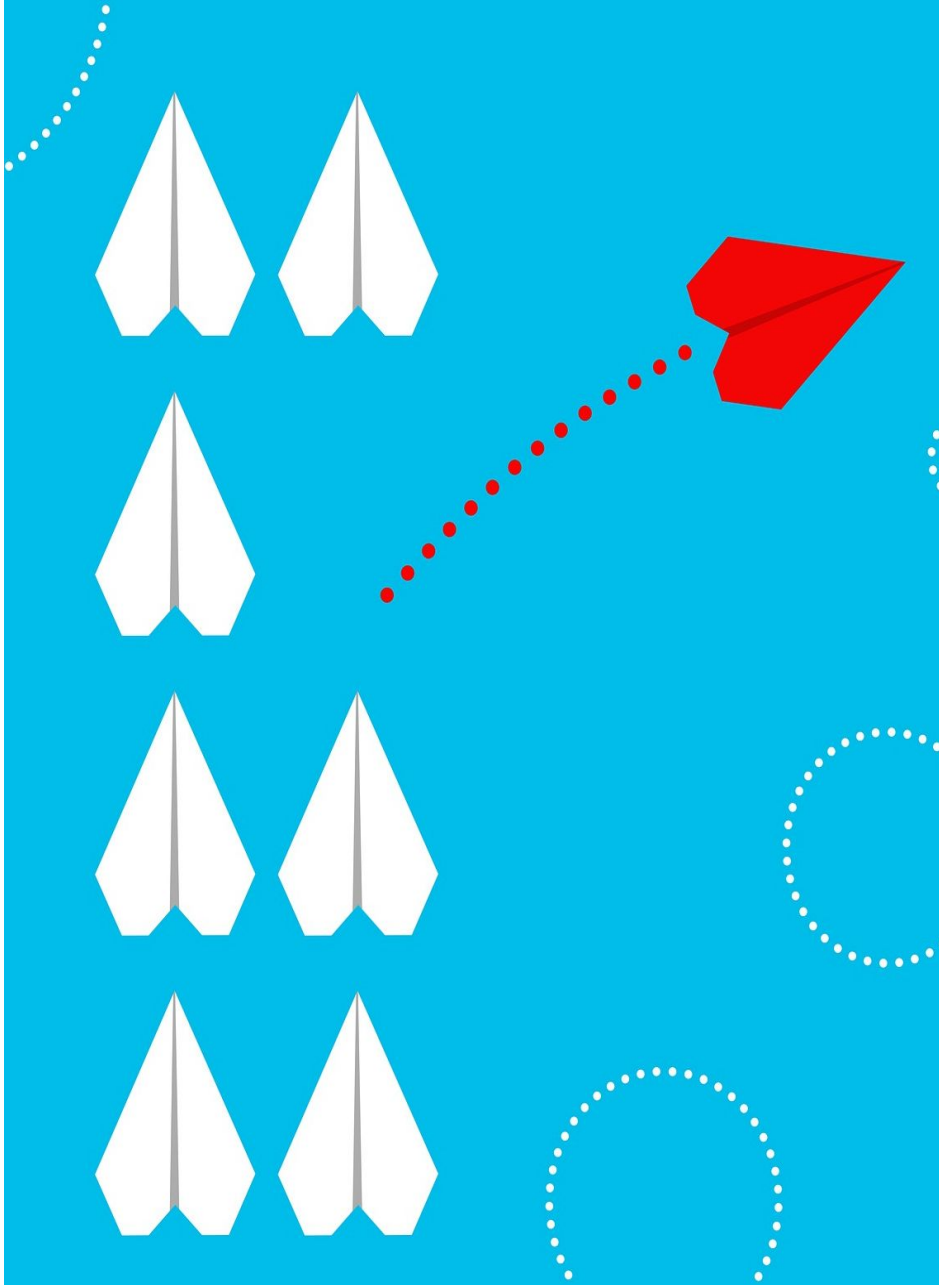


Autonomy?

No other path to services

Sensitive data

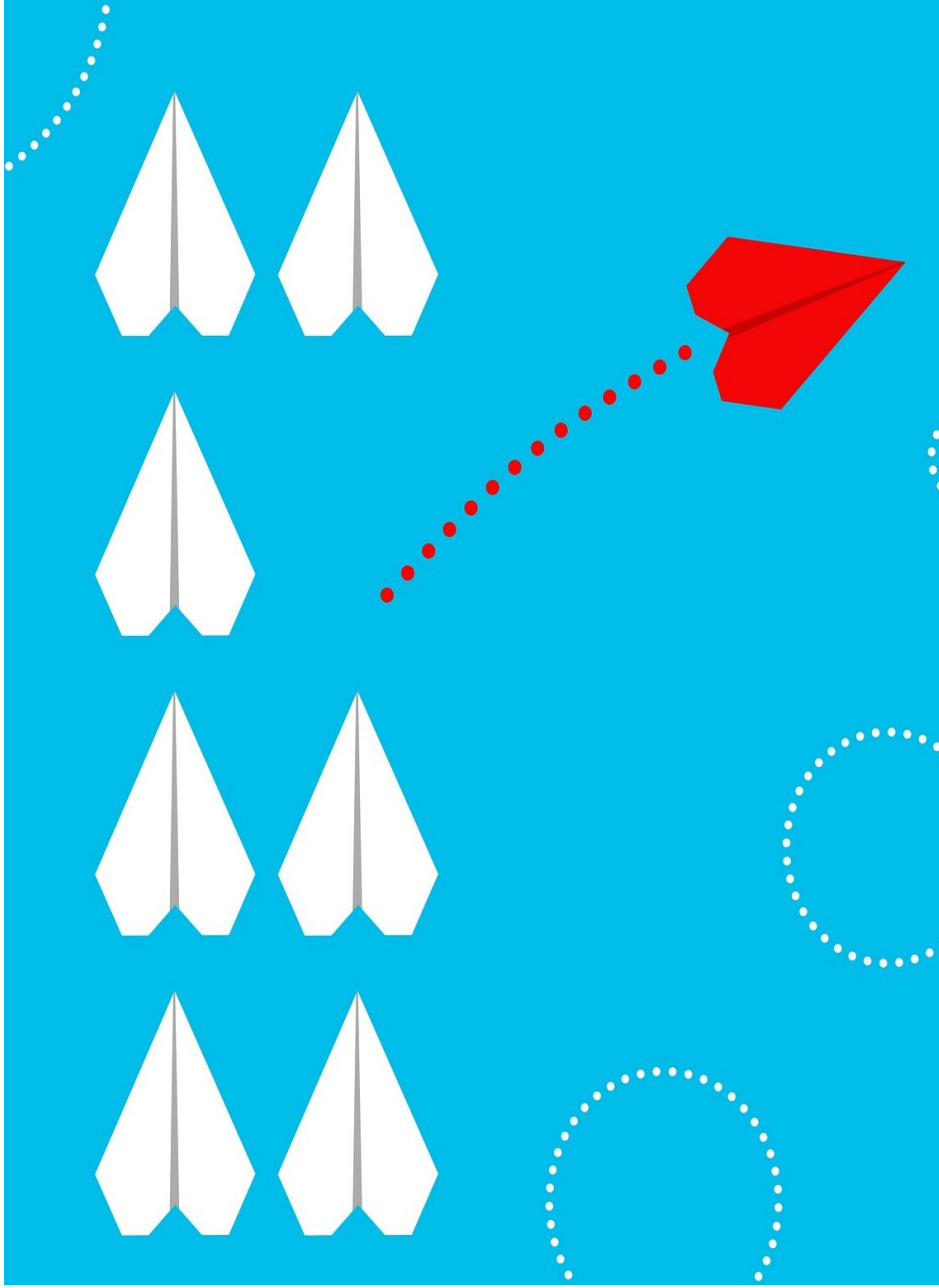
- Demographic
- SSN
- Immigration status
- Mental health
- Disability
- History of domestic violence
- Sexual activity
- Substance use



Autonomy?

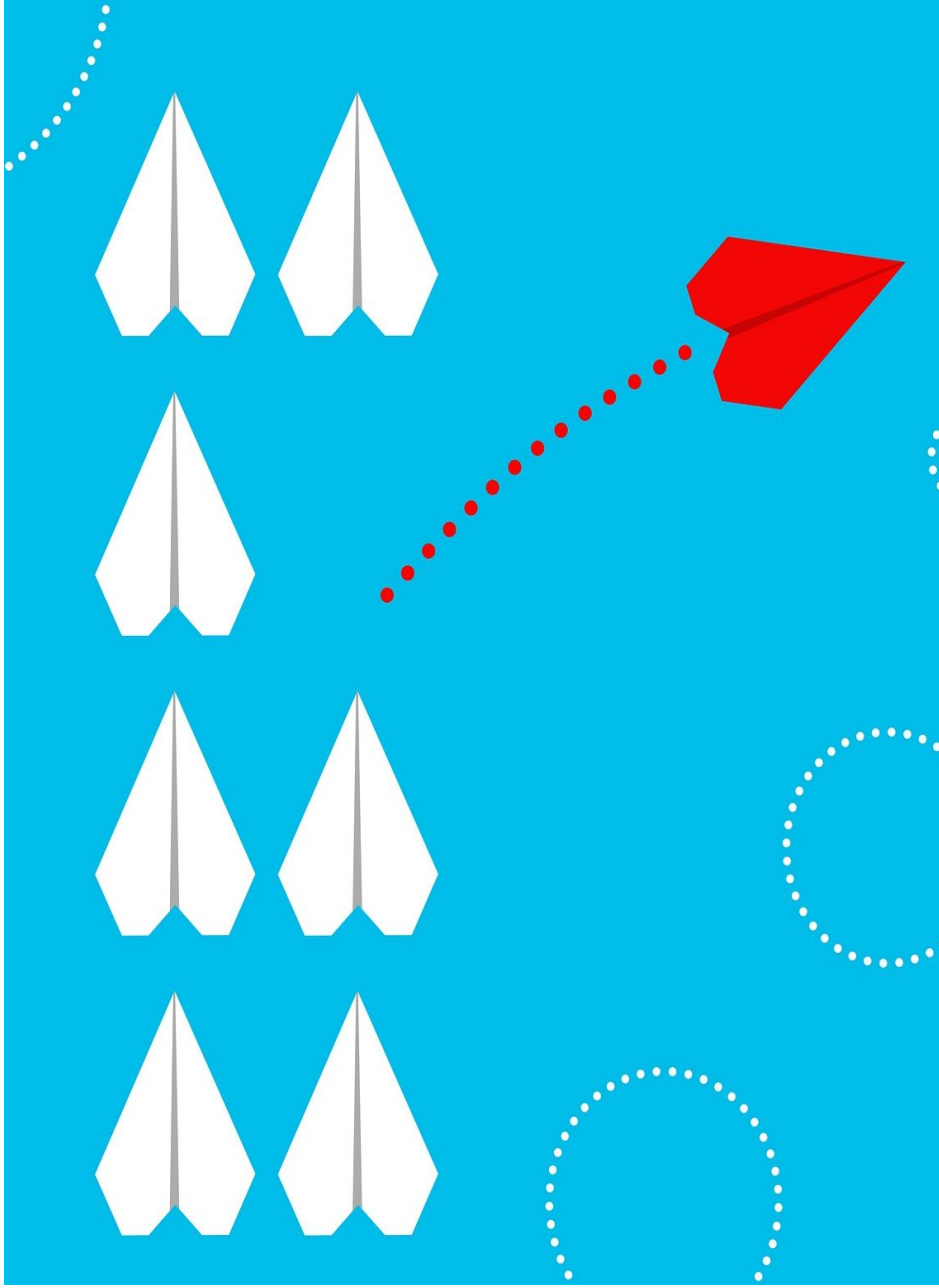
"It was like I was talking to my therapist [...] I was honest. I would prefer to do [the survey] with somebody that I trust […] But I would have done it with a stranger if I had to do that to get housed.… If it was to get me a roof over my head, I will talk to you, and tell you the truth, and tell you what you want to hear.""

Eubanks (2018), p. 96



Autonomy?

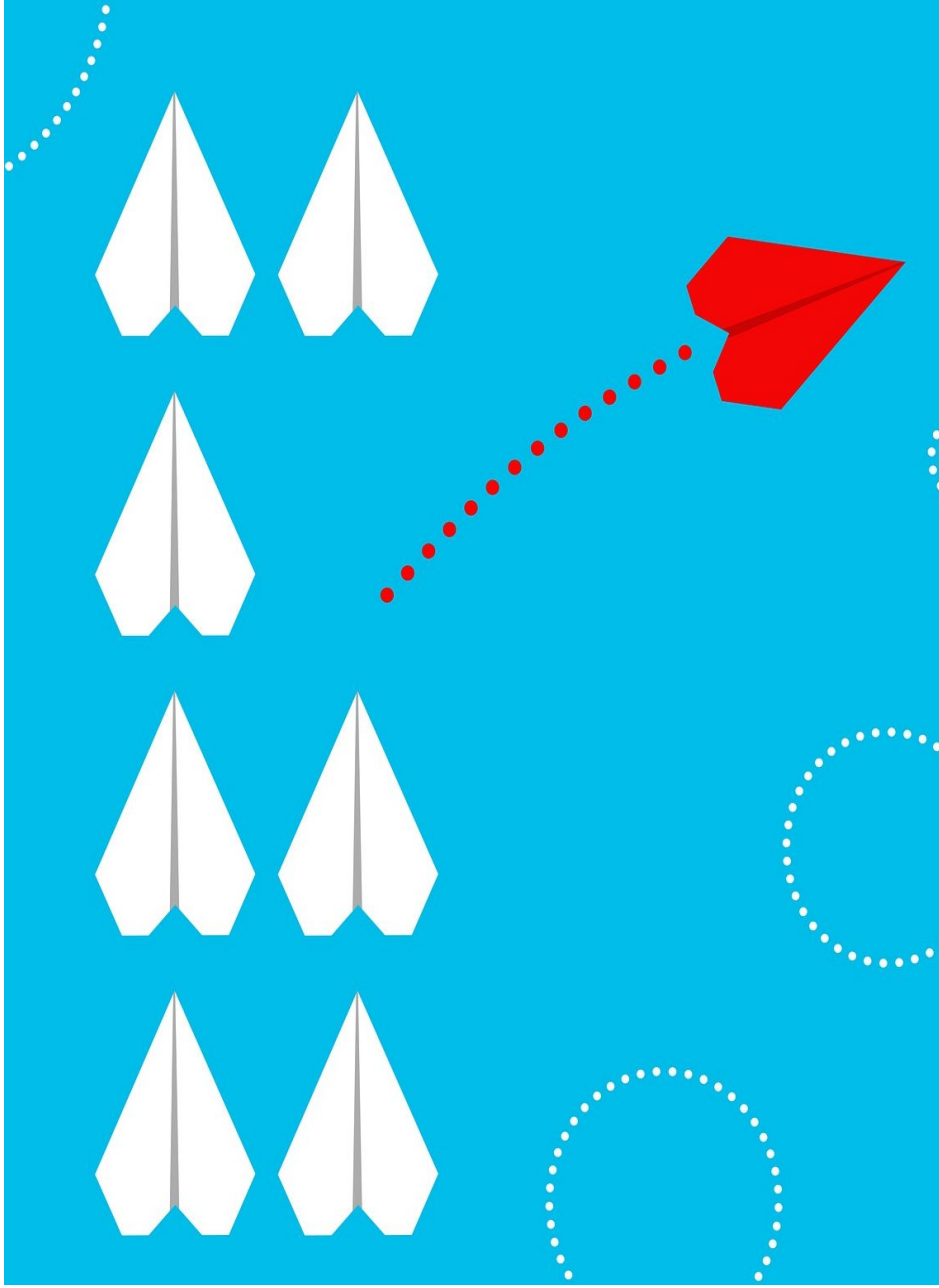
- Survey responses are shared with 168 agencies.
- Consent is valid for 7 years
- Initially there were rigorous procedures for data protection, but later, SSNs were introduced and linked to sensitive personal data.
- Absent strong data protection rules, C.E.S. enables a system of increased surveillance of the unhoused.



Autonomy?

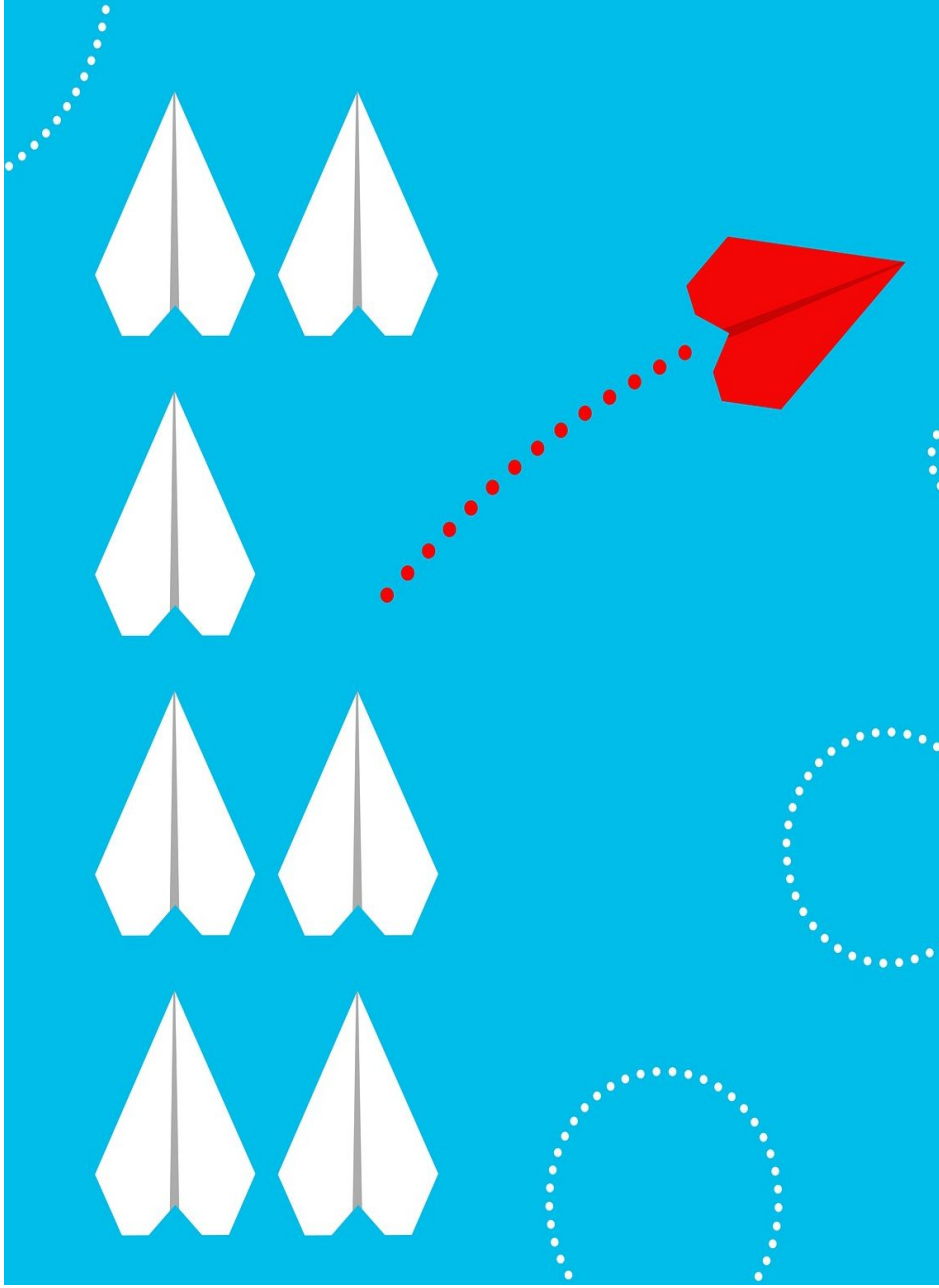
”The pattern of increased data collection, sharing and surveillance reinforces the criminalization of the unhoused, if only **because so many of the basic conditions of being homeless –having nowhere to sleep, nowhere to put your stuff, nowhere to go to the bathroom– are officially crimes** […] tickets turn into warrants and then law enforcement has further reason to search the databases to find “fugitives””

Eubanks (2018)



Autonomy?

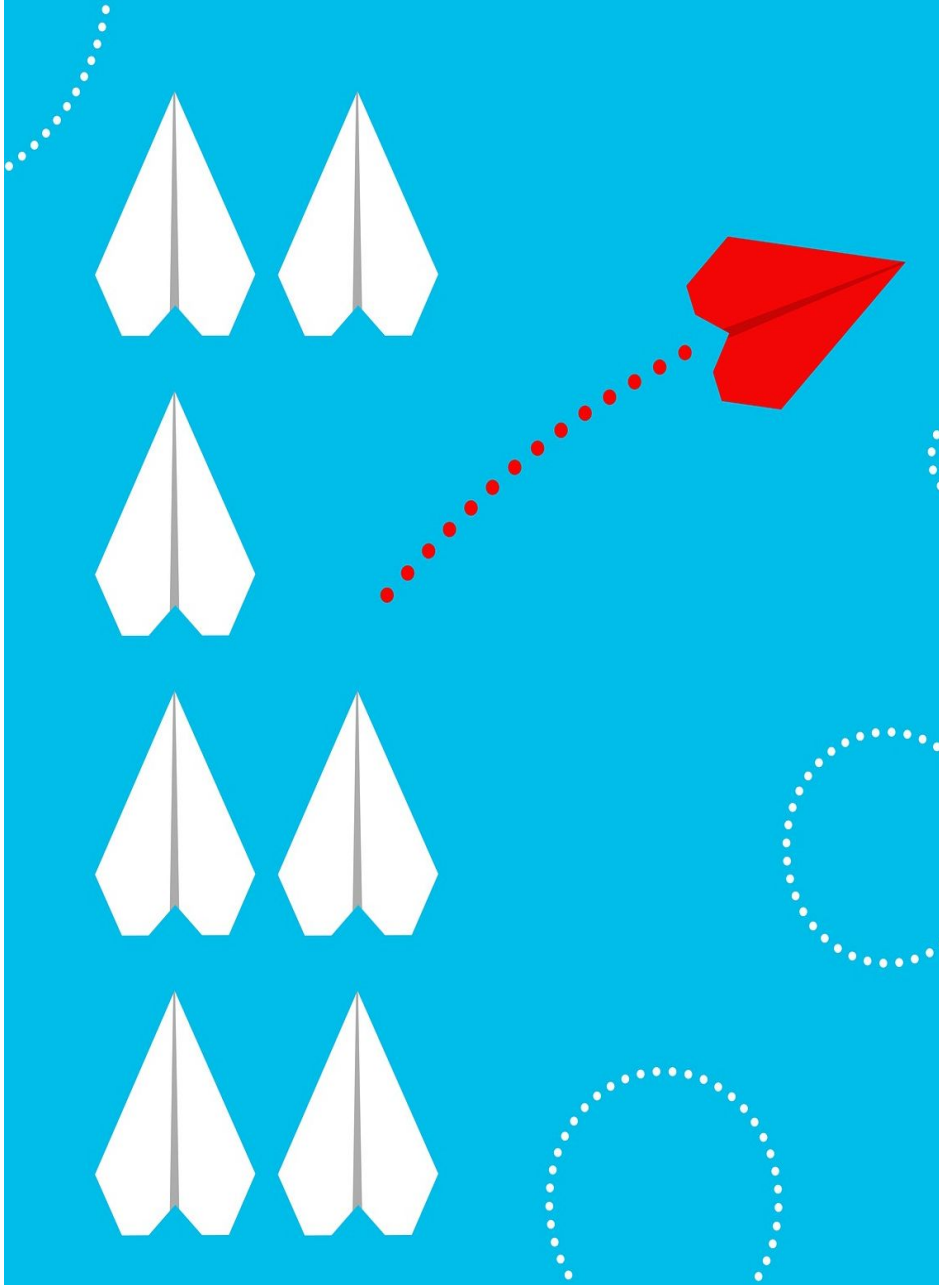
- The behavior of the unhoused is therefore more visible, trackable, and predictable.
- The values of individual autonomy and self-determination are in tension with a state of surveillance.



Autonomy?

<u>Concept Check:</u>

The C.E.S. erodes the value of autonomy by…



Encoded Values?

- Efficient use of resources
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Encoded Values?

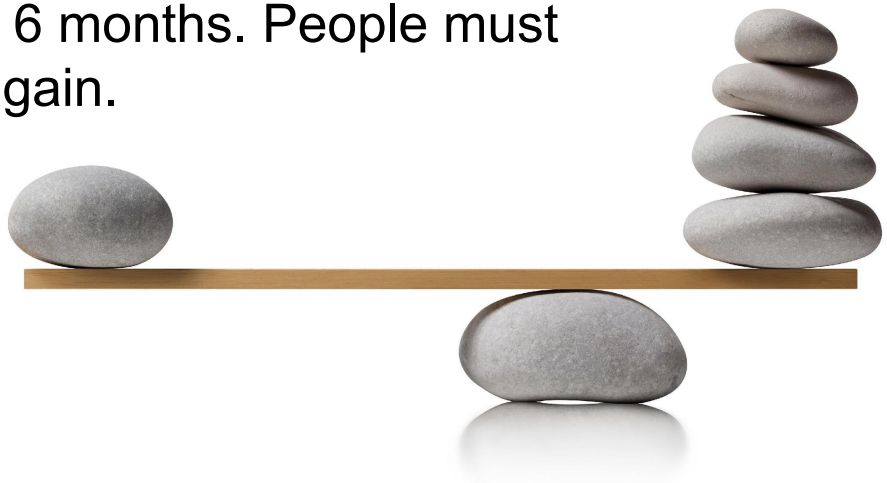
Priority of the worst-off

The worst off?

- Between 2014 and 2018, the C.E.S. in L.A. surveyed 31,124 individuals and connected 9,627 with housing (or housing-related resources).

- Some people aren't considered "literally homeless", and some make it to the system but receive no assistance.

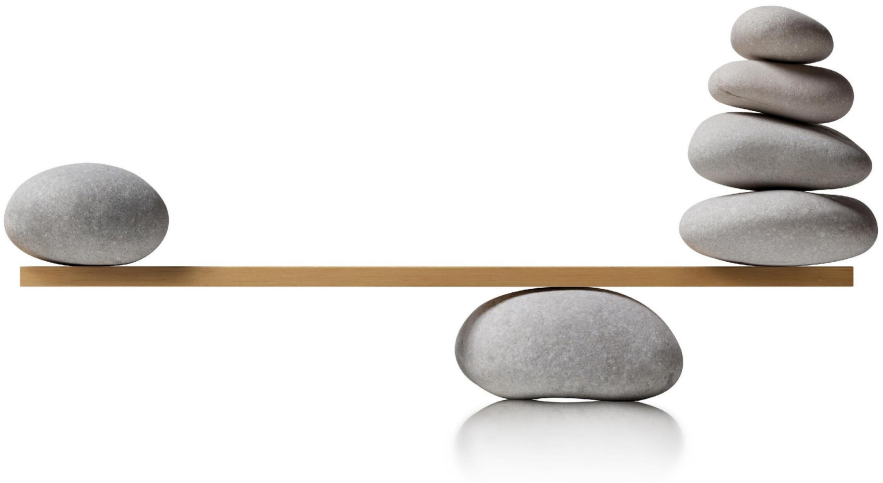
- Sometimes housing is not available, or interviews go poorly, and vouchers expire after 6 months. People must go through the process all over again.



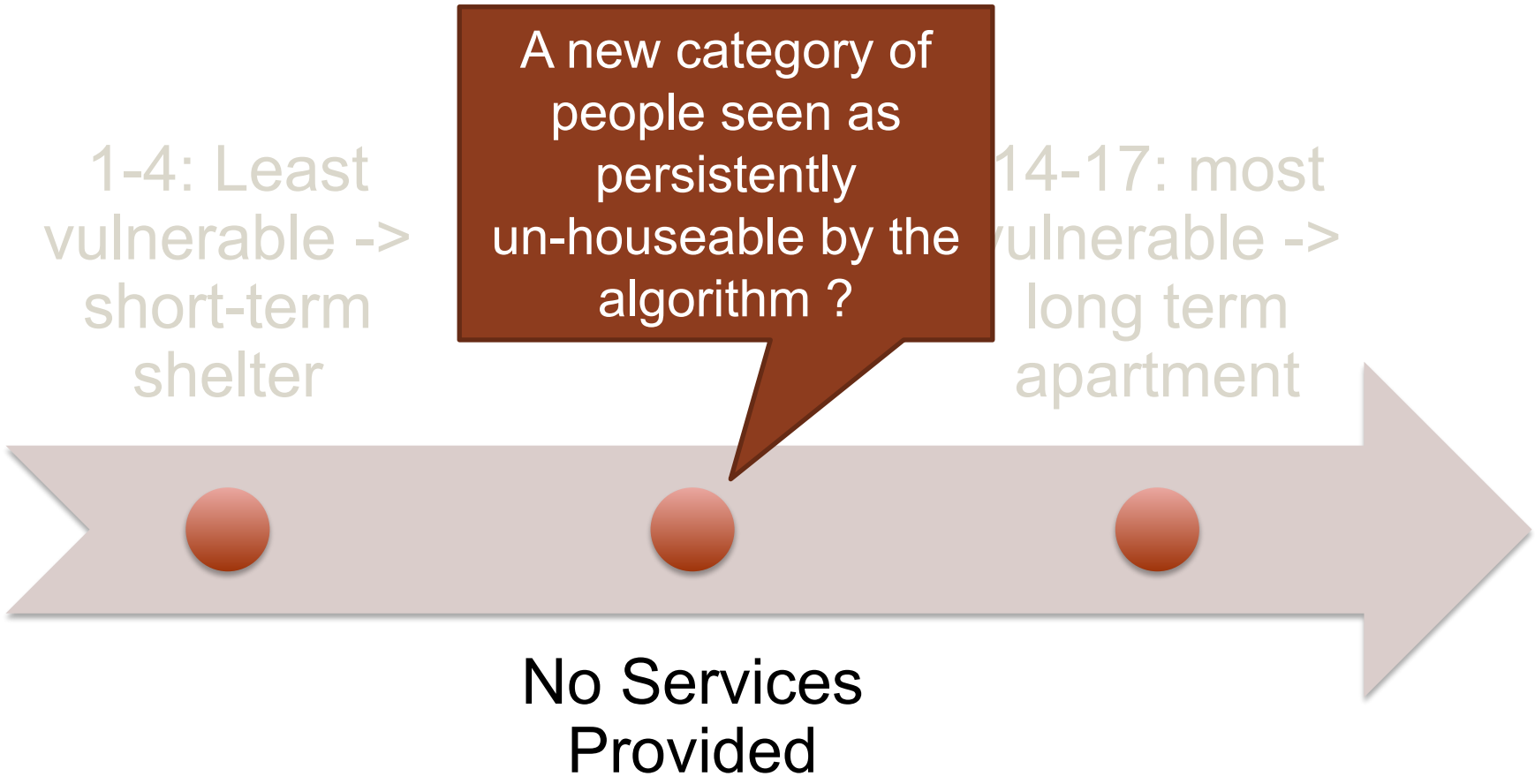
The worst off?

- What happens with those individuals in the middle that do not receive services?

  - Accumulated frustration and trauma may lead to decreasing mental health.
  - Enhanced surveillance may lead to diminished resources and sometimes incarceration.

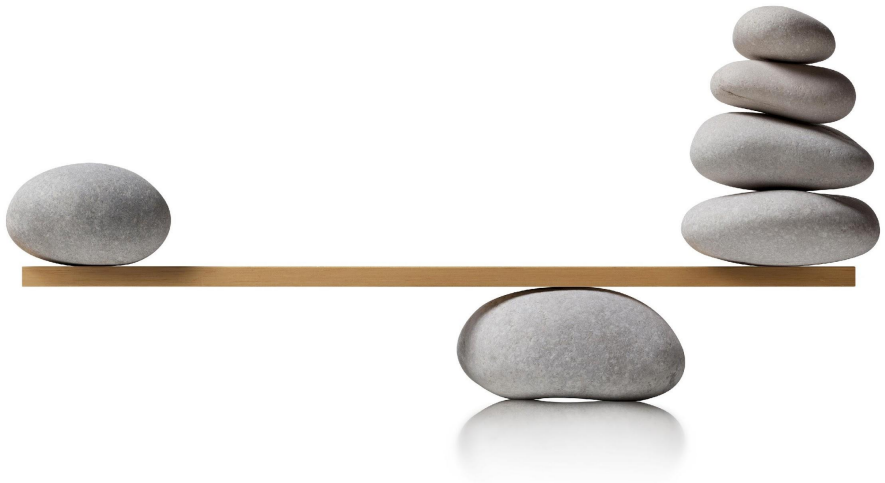


The worst off?



The worst off?

- By creating these categories, it is possible to create a self-reinforcing cycle, making it increasingly difficult for persons to exit the category.



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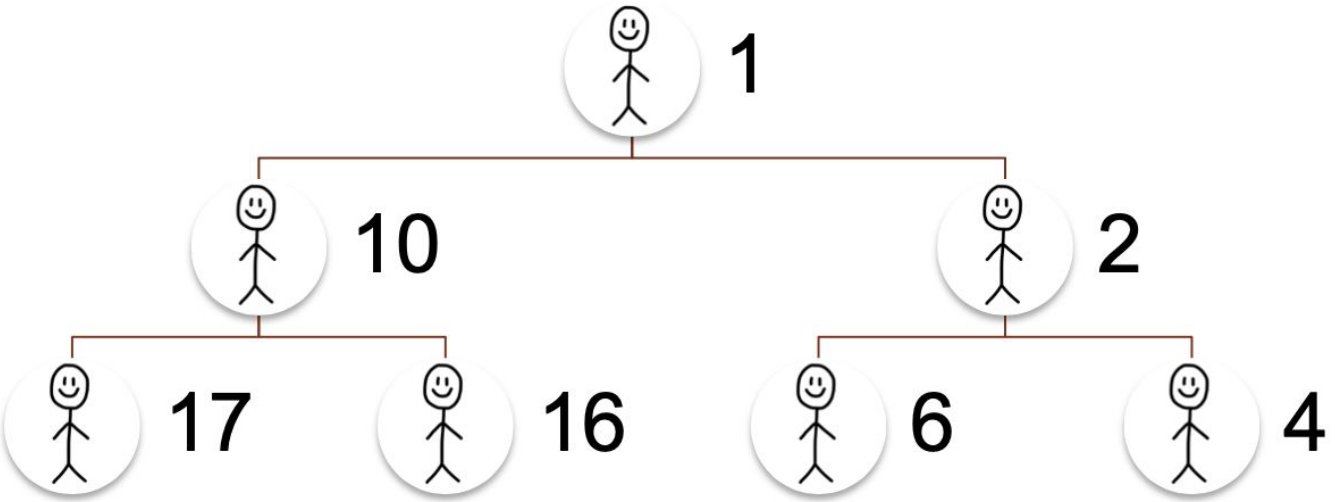

Conclusions

- Priority queues may be used to address social problems in innovative ways.
- Design decisions that go into ranking algorithms embody values and principles.
- When they are used in complex social contexts, conflicts may emerge between the system's intended values and its impact.

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