## Applying The Science of Where<sup>TM</sup> to Improve Health

Este Geraghty, MD, MS, MPH/ CPH, GISP Chief Medical Officer Esri



Hippocrates

The Father of Medicine

Born ~460 BCE



"When a race lives in a rough mountainous country, at high elevation, and well watered, where great difference of climate accompany the various seasons, there the people will be of large physique, well-accustomed to hardihood and bravery, with no small degree of fierceness and wildness in their character."



"On the other hand," he said "in low-lying, stifling lands, full of meadows, getting a larger share of warm than cold winds, and where the water is warm, the people will be neither large nor slight, but rather broad in build, and fleshy. Bravery and hardihood are NOT an integral part of their natural characters."

# For centuries, health has been focused on the microscopic

Joseph Lister The Father of Antiseptic Surgery

## Watson & Crick Discover the Structure of DNA



Finally, we're seeing a shift from microscope to the telescope and an appreciation for community context



## The Science of Where

Helps us to answer the fundamental questions of where ....

- Where is it
- How do I get there
- What's nearby
- Where are we going
- Where's the problem
- Where is it changing
- Where is the issue
- Where is it suitable
- Where should we locate



## What is where?

Why is it there?

Why do I care?

How can I prepare?

## **GIS Provides the Framework and Process**

That improves health workflows

Measure Outcomes

Outreach & Communication

Data Collection, Integration & Management

### Science

Visualization and Mapping

> Analysis and Modeling

### Jnderstanding

Mobilize Resources

Transforming How We Think and Act . . . . . . Creating a Healthier Future

## Homelessness

MELL

they will

## Why Should You Care?

Individuals:

- Kids drop out of school (increased vulnerability to long term unemployment)
- Chronic ill-health (depression, poor nutrition, poor dental health, substance abuse, mental health problems)

### Communities:

 Exclusion from social, recreational, cultural and economic opportunities

### National:

 More likely to interact with police, Juvenile Justice Dept., other government departments. Its costly!

Many are just one paycheck away from the street.





## Homelessness

Are there overlapping relationships in space and time?

Syndemic

Hepatitis A

Illicit Drug Use

## **Tools for Prevention**

32 Cars

## Data collection & visualization of risk factors

Unemployment



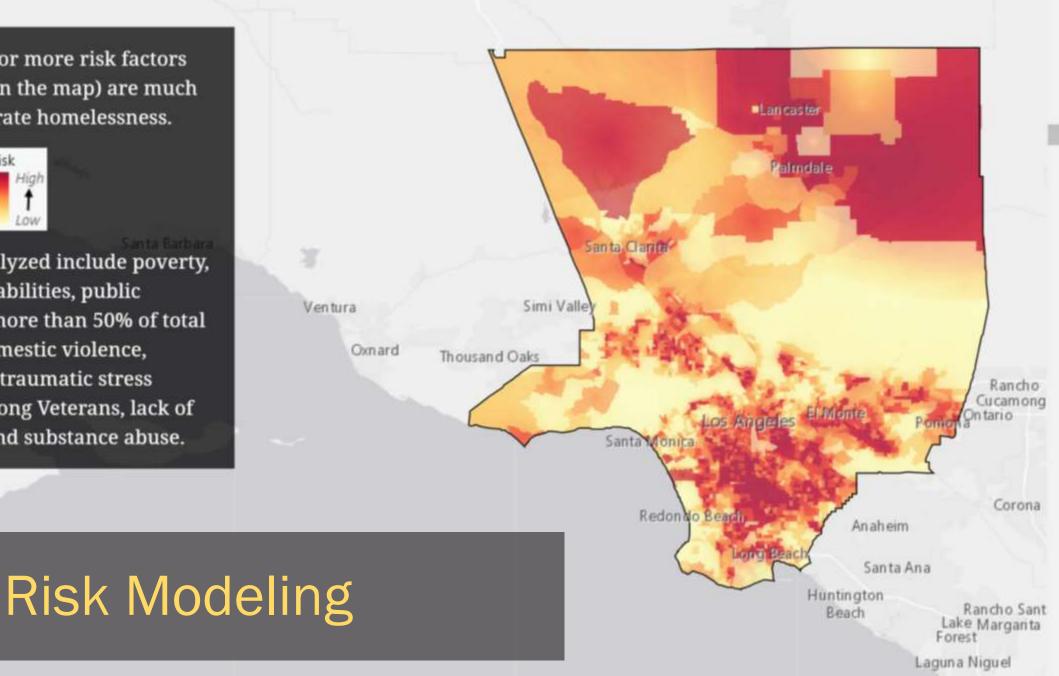
Lack of Affordable Housing

Lack of Insurance

Locations with one or more risk factors (the darkest areas on the map) are much more likely to generate homelessness.



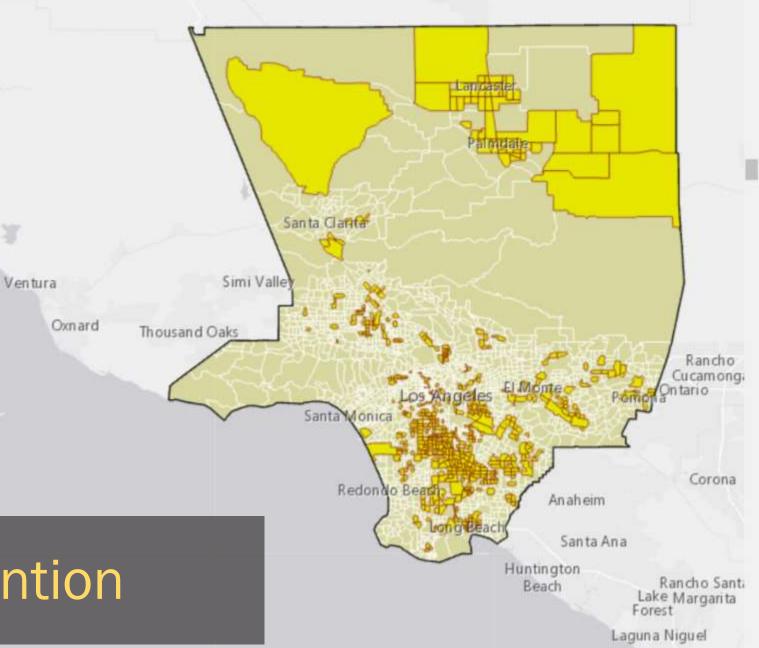
The risk factors analyzed include poverty, unemployment, disabilities, public assistance, paying more than 50% of total income for rent, domestic violence, mental illness, post traumatic stress disorder (PTSD) among Veterans, lack of health insurance, and substance abuse.



Lompoc

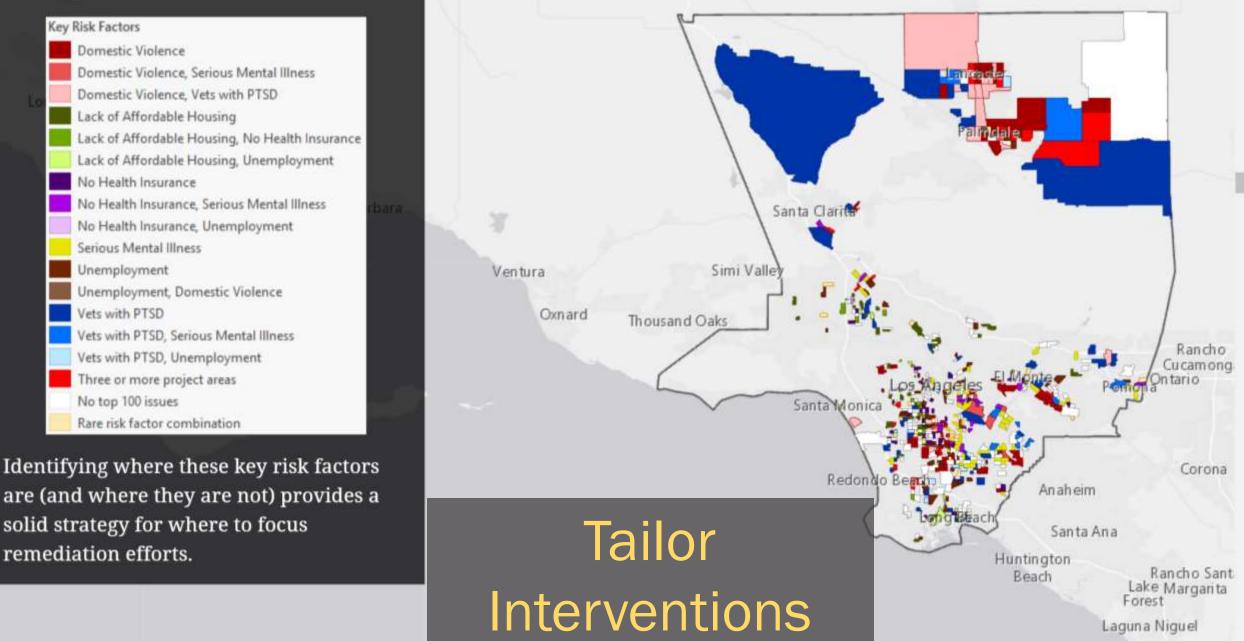
These census tracts don't necessarily have the largest homeless populations, but they do have the largest potential for generating new homeless individuals and families.

Highest Risk Tracts



## **Prioritize Prevention**

Each of these high risk tracts is associated with key risk factors.



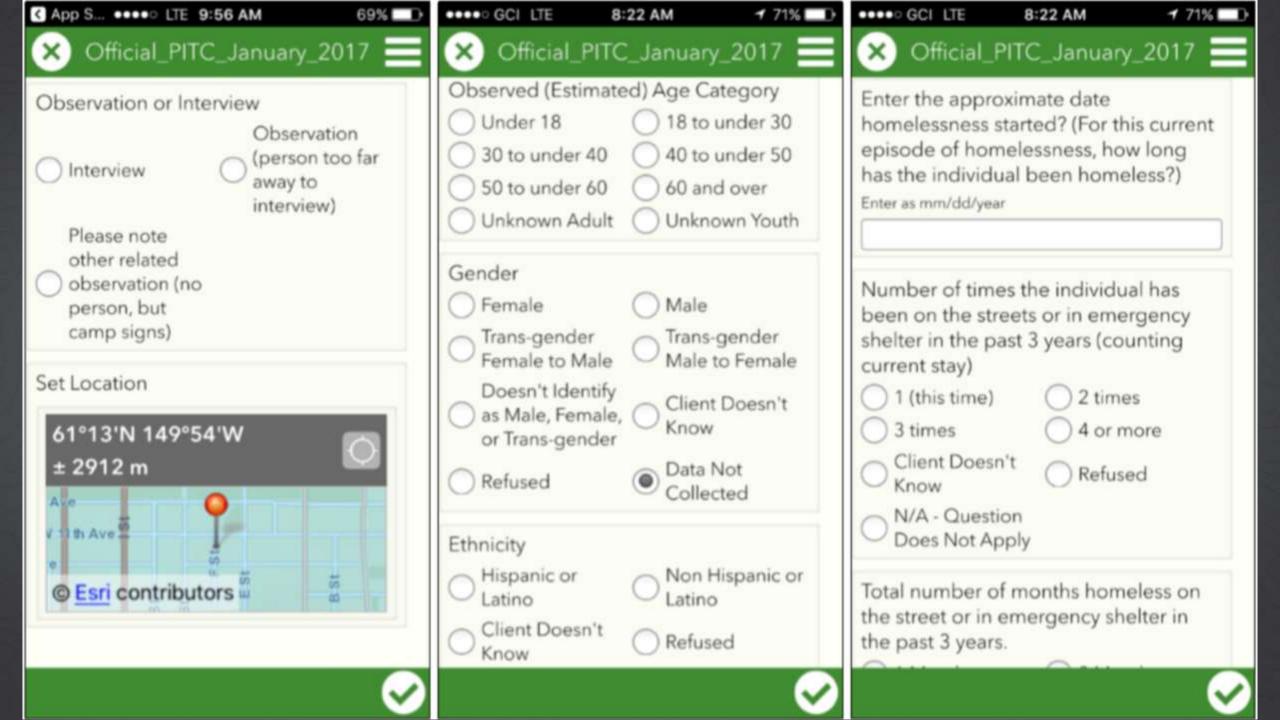


## Quantifying the Problem

- Australia: 1 in 200 are homeless on any given night
- Japan: 25,000 homeless
- Philippines: Manila has the largest homeless population of any city in the world
- South Korea: homelessness is increasing
- India: 78 million homeless
- USA: about 500,000 are homeless on any given night

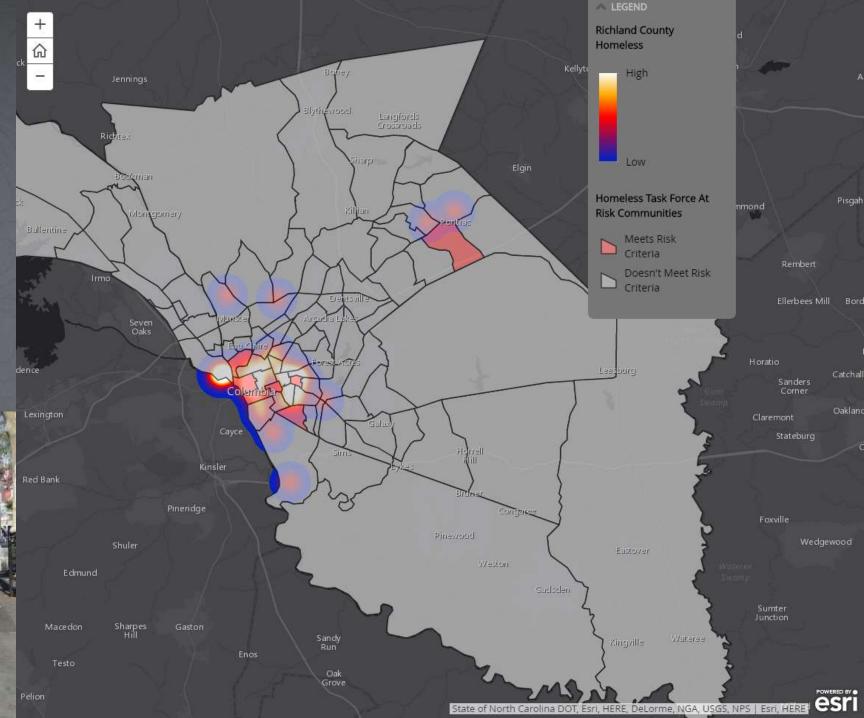


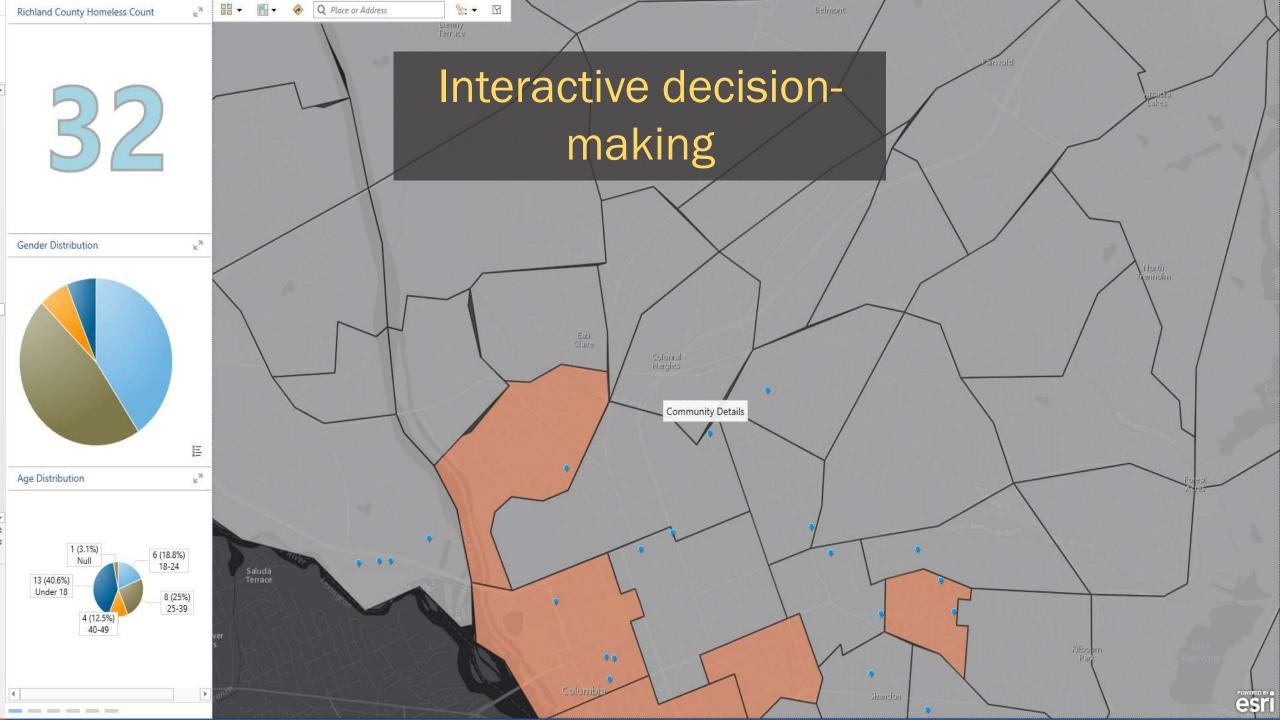
\* Survey123 Forms can be opened in a browser or Mobile App

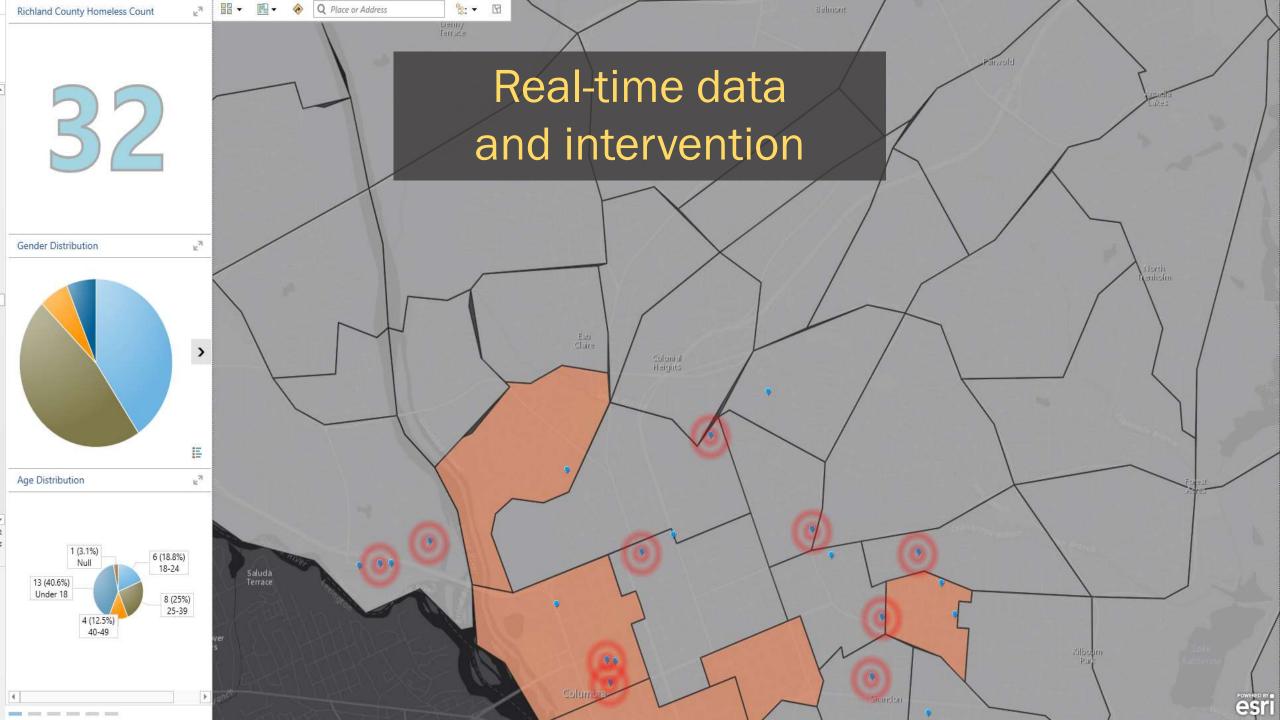


Determine and communicate the extent of the problem in the community











## Community Participation & Engagement



#### Homeless Activity Reporter

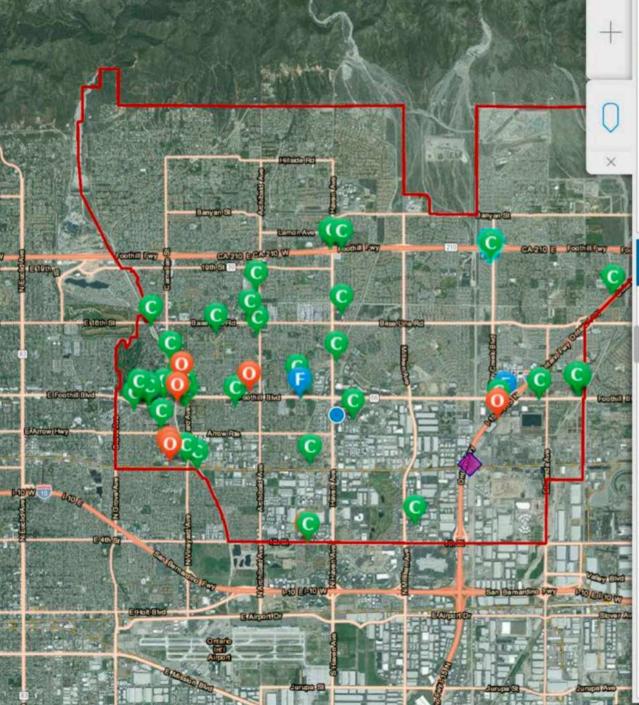
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## Assign Cases

- Track field workers
- Assign cases by location
- Enable mobile status updates



Case Status:Closed Starbucks at day creek and highland City Limits: CITY OF RANCHO CUCAM .... CITY OF RANCHO CUCAMONGA Details Location C Lat: 34.134399° Long: -117.537379° Case Status: Closed Location Name Starbucks at day creek and highland Date April 21, 2015 Comments 1 Call for service regarding a BFA transient at location. With a camp in the bushes and at Starbucks.

Status

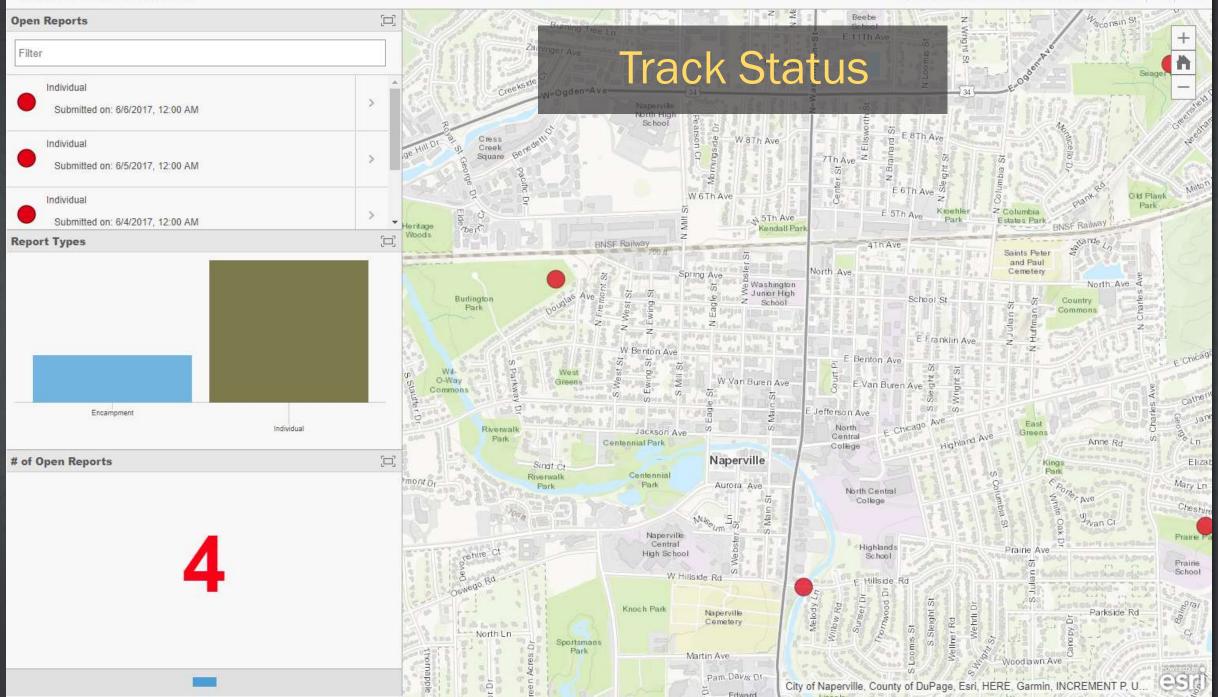
Closed

FollowUp Date #2 May 6, 2015

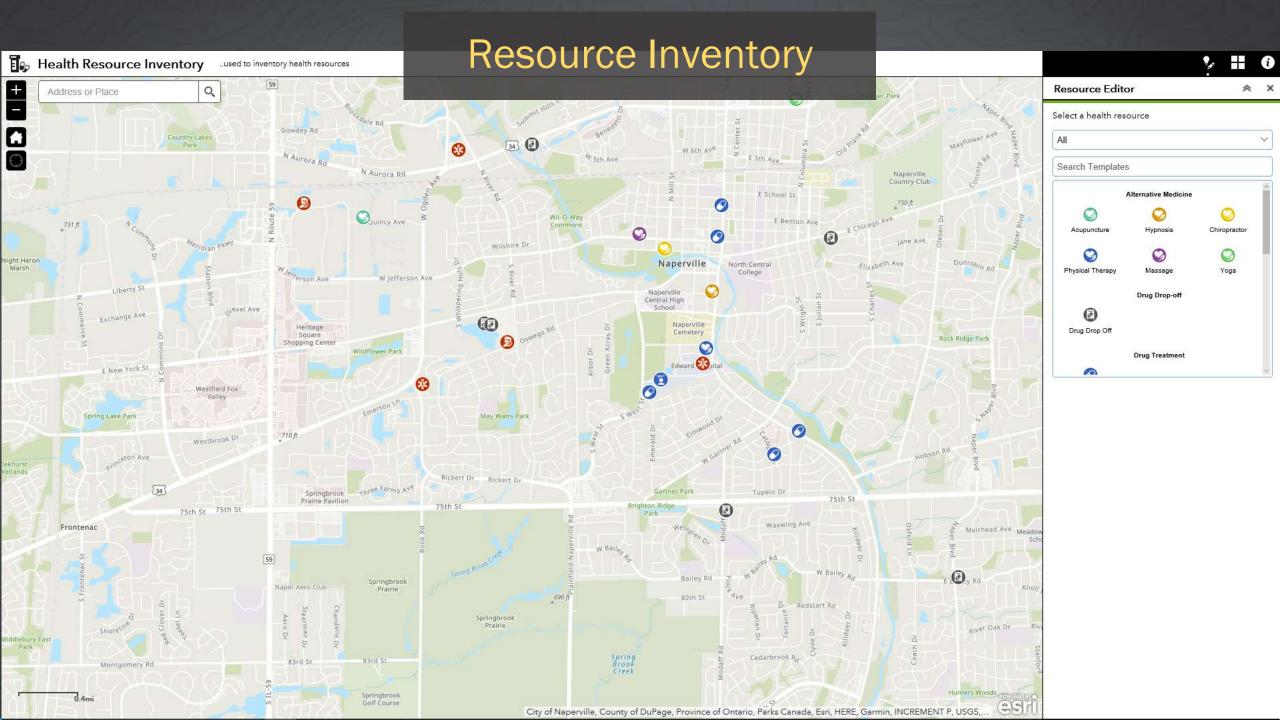
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#### Homeless Activity Dashboard



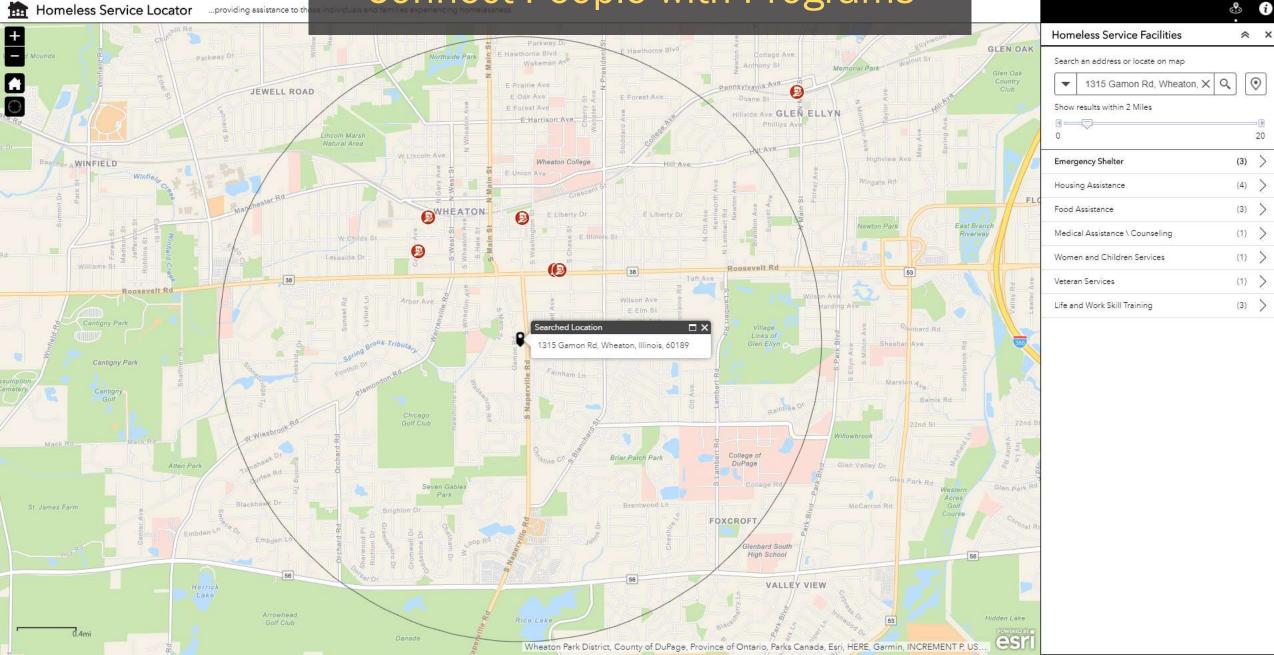
## Interventions



### **Connect People with Programs**

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#### **Optimize social equity**

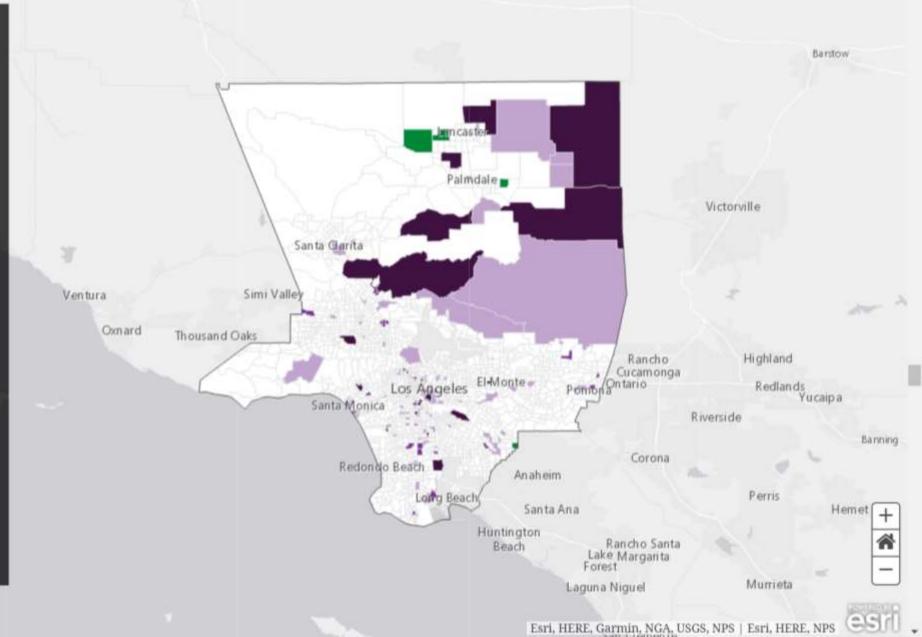
One option is to promote social equity. If we believe that everyone has a responsibility to share the burden of homelessness, the goal will be to distribute resources equitably. From this perspective, a location with 1% of the population should be associated with 1% of homelessness.



Who is bearing the brunt of LA County's homelessness?

## For this scenario, adding new resources to the green tracts would improve equity.

To create this map, you will create a supply-versus-demand variable based on the total number of people and the total number of homeless people in each census tract.



#### **Optimize access to resources**

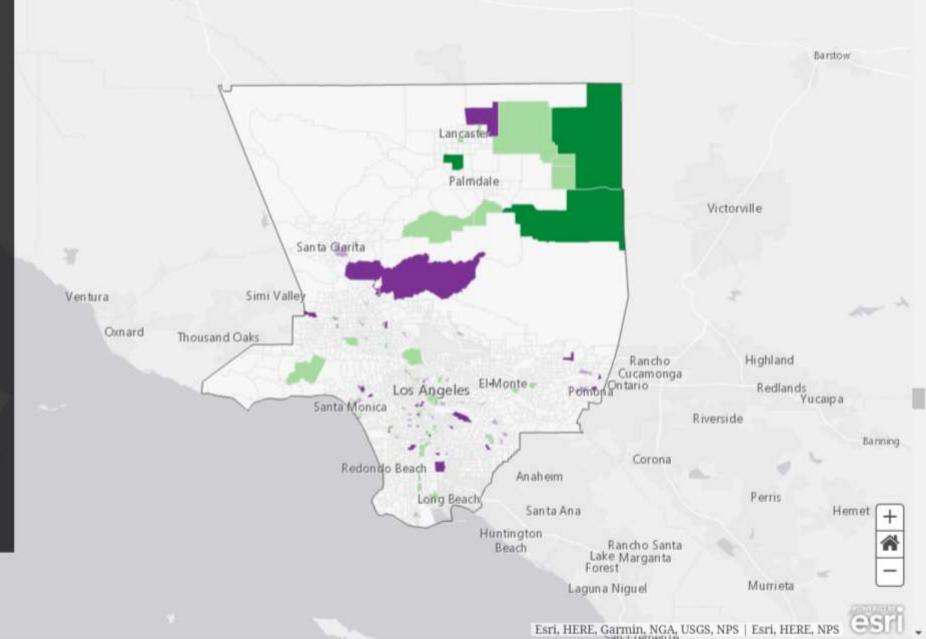
A second option is to prioritize access by putting new facilities where existing homeless people live.



Where do homeless people have good or poor access to existing resources?

Adding new resources to the green tracts will improve access.

To create this map, you will create a supply-versus-demand variable based on the total number of homeless people and the total number of homeless resources in each census tract. The number of shelter beds will be used as a surrogate for homeless resources.



#### Focus on high risk areas

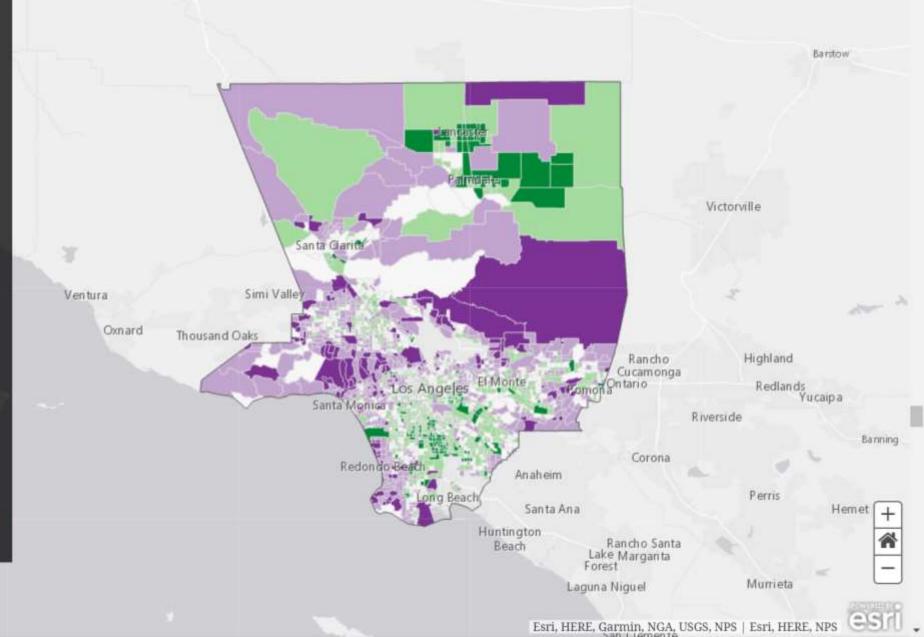
A third option is to locate new resources in the highest risk areas. If resources are available where they become homeless, people are more likely to remain close to existing communities where their children attend school, where they know their neighbors, and where they are likely to have existing resources.



Where will the newly homeless have the best chance of remaining in their local communities?

For this scenario, avoid the purple tracts and add new resources to the green tracts.

This is the strategy the mayor of New York is promoting.



#### **Centralize resources**

Another option is to consolidate new resources into homeless triage centers by encouraging centralization of resources.



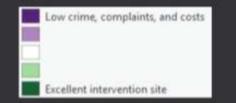
Adding new resources to the green areas will promote centralization.

This is the model San Francisco has adopted.



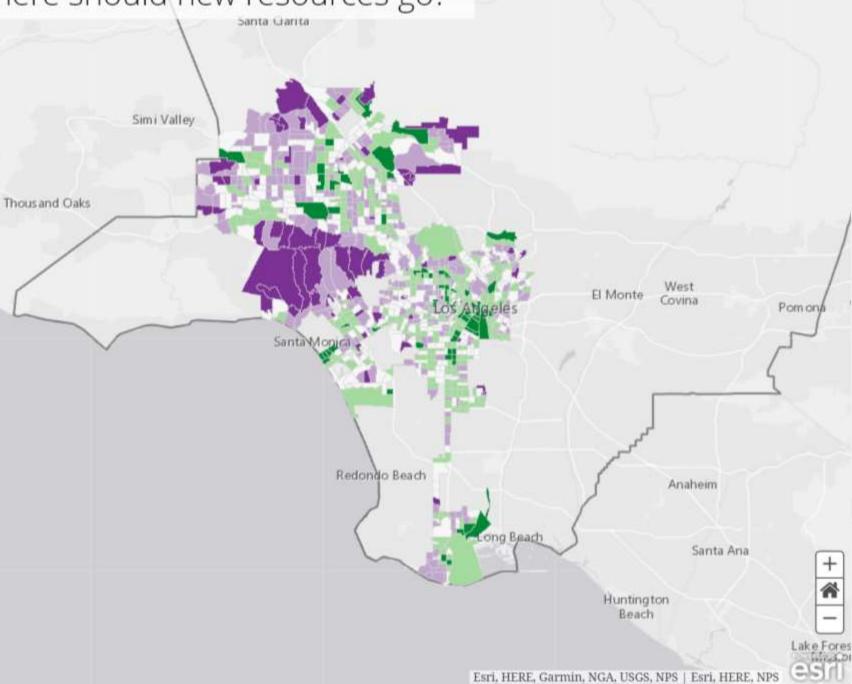
#### Street strategy

A final option focuses on the most vulnerable homeless populations, evidenced by high numbers of 311 calls and crime incidents related to homelessness, and high numbers of chronically homeless individuals. These locations become candidates for rapidresponse, focused interventions aimed at getting every homeless person precisely the resources they need to move out of homelessness permanently.



Which locations are most dangerous and most costly?

Research indicates a small portion of the homeless population use a majority of money targeted for homelessness. Addressing these people first, will have the biggest impact on reducing costs.

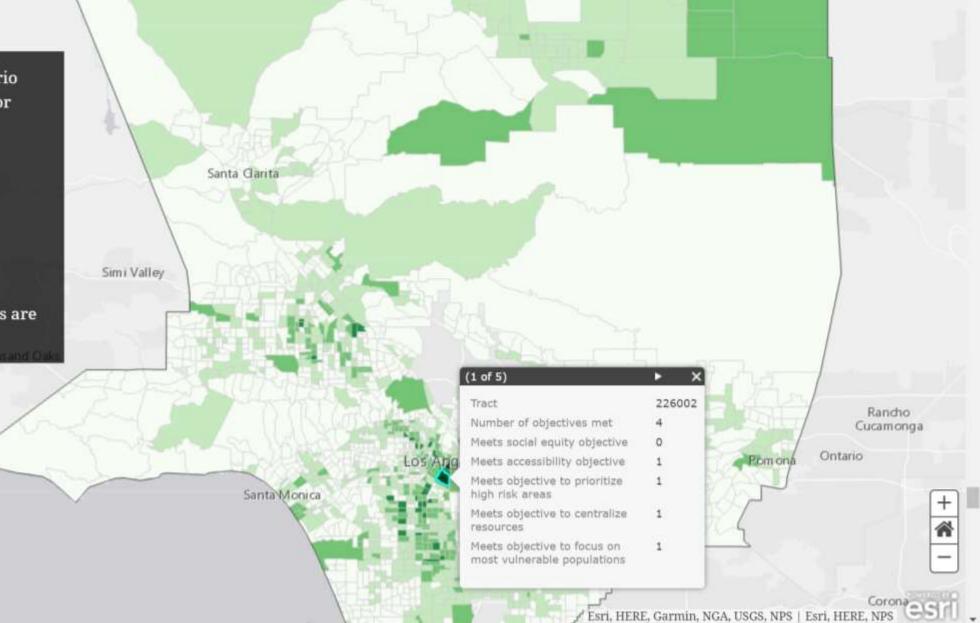


### Which locations best serve multiple objectives?

Overlaying the maps for each scenario reveals solutions that optimize one or more objectives.

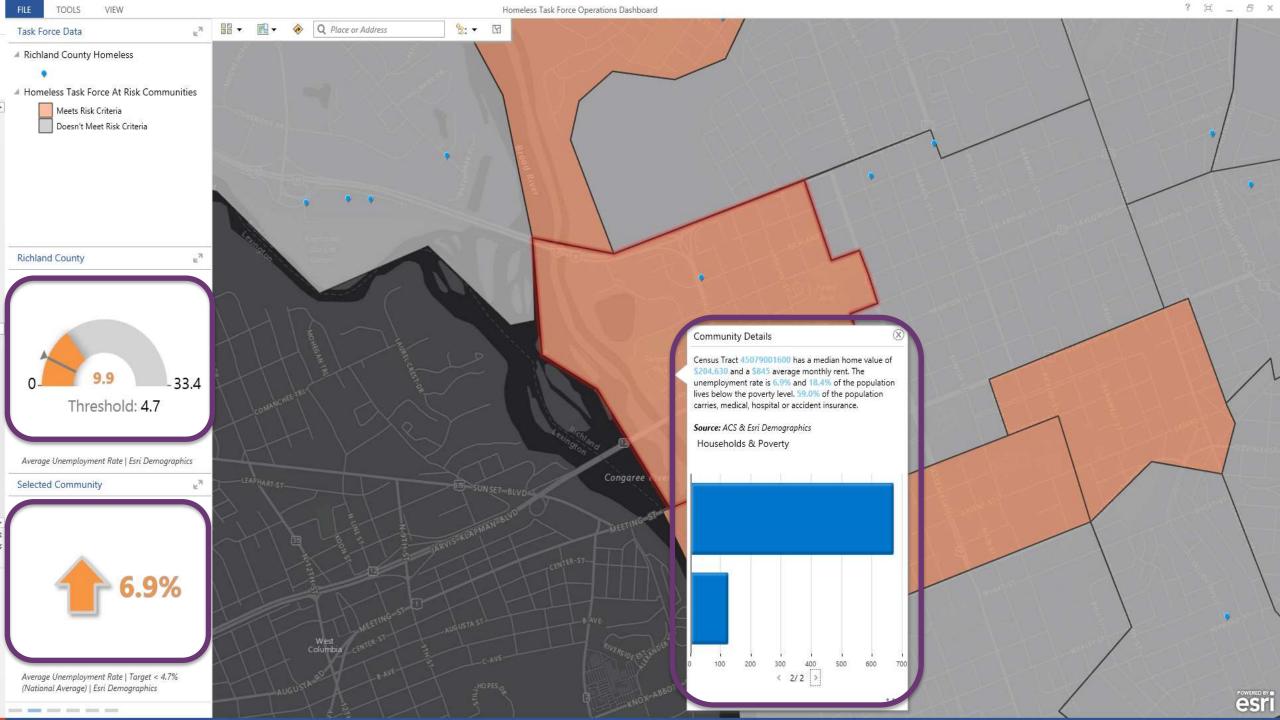
> Number of Objectives Met 0 1 2 3 4

Click the map to see which objectives are met in each location.



## **Evaluate for Impact**

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#### **Combating Homelessness**

The Richland County Homeless Task Force is coalition of Health and Human Services agencies and volunteer groups that have come together to eliminate homelessness in your community through education, outreach and targeted intervention. Our strategy includes locating both at risk communities and the existing homeless to connect them with the resources they need.

Homelessness is a complex issue and to eliminate it we need to better understand it and address the underlying causes. While every individual's path to homelessness is unique there are a number of factors that can put individuals and communities at higher risk. The Taskforce selected the 5 different factors below to help locate areas to target initial outreach efforts:

- Lack of Affordable Housing
- Unemployment
- Poverty
- Low Wages
- Lack of Insurance

#### Indentifying At Risk Communities

Data to represent these factors from a variety of sources was mapped to the census tract level to help visualize the distribution of the overall risk in each community. This process helped determine what communities were being impacted by each factor and which areas were performing poorly across the board on all factors.



## **Communicate with Constituents**



## The Value of GIS in Addressing Homelessness

1. Created a risk surface for homelessness and examining the spatial patterns of various risk factors.

2. Map the distribution and characteristics of the homeless population.

3. Weigh different options for locating new homeless resources.

4. Develop a framework to quantify and monitor performance (return on investment).

5. Quantify the homeless population in the community.

6. Engage citizens in the effort.

7. Identify resources and make them easily accessible

## The Value of GIS in Addressing Homelessness

8. Is the average number of days a person remains homeless going down?

9. Is the percentage of chronically homeless decreasing?

10. Are outreach programs (for substance abuse, domestic violence, unemployment or institutional discharge, for example) assisting a larger number of people and as a consequence, are the percentages of people homeless due to these factors decreasing?

11. Has every homeless veteran been placed in permanent housing?

12. Does emergency shelter and housing capacity match the number of newly homeless each month?

### **Reduce Homelessness Solutions**

#### **Conduct Point-in-Time Counts**

ArcGIS

- Homeless Count Survey
- Homeless Count Dashboard
- Homeless Count Analysis View

#### **Report Homeless Activity**

- Homeless Activity Reporter
- Homeless Activity Manager
- Homeless Activity Dashboard
- Homeless Activity Reporter Analysis View

#### **Collect & Promote Resources**

- Health Resource Inventory
- Homeless Service Locator

http://solutions.arcgis.com/local-government/health/homeless/

### Planning & Analysis

- ArcGIS Desktop
- Community Analyst

### Get Connected!

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THE SCIENCE OF WHERE

...Complex problems are solved

**Esri Health & Human Services** 

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October 23-25, 2018

Redlands, CA

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for Health & Human Services

#### Fall 2017

#### **Creating a Healthier Klamath County**

A Geographic Approach to Building a Healthy Community

Finding out that your county is second to last in the 2016 County Health Rankings for Oregon can be sobering. So Healthy Klamath, a coalition of community health partners, decided to take action to improve the health of Klamath County by turning to the geographic information system (EIS) personnel from the Oregon Institute of Technology (VIT).

#### The Challenge

Public health advocates realized that they needed to increase Klamath County's overall health ranking score, but they wanted to implement targeted interven tions where they were most needed. An apportunity to make those improve ments came about through the work of Healthy Klamath and the Blue Zones. Project, which works to increase life expectancy and quality of life. With the help of Dr. John Ritter from Off, the tear wanted to find geographic areas that had high incidences of certain chronic dnmasm and poor health outcomes. With a grant from the Cambia Health Foundation, the team used GIS technol ogy to see whether these disease occur rences were related to neighborhood walkability, demographics, or both The goal was to use spatial analysis to help deect resources for intervention efforts, and the GIS team can with it.

#### The Solution

The team began by creating a walkability residel using Esr) Modelthalder with data



such as local slope, population density, and read density—six variables in total. The team also worked with Sky Lakes Machical Center and Sky Lakes Wellness. Center to receive 60,000 de identified patient records from 2012, sorted into several disease categories including diabeties, uncke, and obserity. The data was then aggregated into 2010 US Census block groups within the study area. Ritter and the team started encolourup

incidence density maps for each disease category. Using AreGBS Online, a web app was created to show how the spatial distribution of walkability vorus the identified disease categories. ArcGBS Online allowed the maps to be viewed by multiple organizations structurescuby. enabling them to see progress and provide feedback quickly and effectively.

Next, the team added data for population density, race, average household income, age, and other variables obtained from the 2010 US Census. This was done to use whether there were any connections between the identified dimensed incidence and walkability, dimedgraphics, or other dimenses.

#### The Results

Many connections between the domographic variables and this recurrince of the identified diseases were confirmed, but some relationships were stronger than others. Where there was a high

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An American succession

ordered. Where there are place