



College of Engineering

# Prioritization of Risk Factors for the Prevention and Treatment of Pediatric Obesity

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## OVERVIEW

Urban communities are facing many challenges, the persistence of obesity disparities in early childhood is one example. Some risk-factors for obesity are highly specific to the community in which a particular child lives.

Successful efforts to prevent and treat pediatric obesity depend upon integration of data from multiple community sources and systems. Expert committee guidelines suggest a staged approach to prevention and treatment of pediatric obesity that begins in the primary care setting with a thorough assessment of medical and behavioral risk factors.

However, completion is a daunting task given the short duration allotted for well-child visits, which also does not include assessment of community-level risk factors.

An additional concern is that guidelines suggest providers to use clinical judgment to guide risk assessment because a qualitative formula to integrate information gathered is not available.

## AIMS

- Design innovative multi-level mixed effects machine learning methods and scalable algorithms that will integrate multiple datasets to precisely prioritize a preschooler's personalized risk.
- Develop a data- and tool-rich online Web portal dedicated to pediatric obesity by leveraging quantitative, community-aware information visualization techniques.

## DATA & METHODS

|           | Available Data on Detroit Families  |  |
|-----------|---|--|
| Child     | Height and weight<br>Blood pressure<br>Lifestyle behaviors (e.g., diet, activity, sleep)  | Self-control<br>Emotional/social functioning   |
| Family    | Height and weight<br>Feeding practices and styles<br>Lifestyle behaviors (e.g., diet, activity)<br>Social support<br>Sociodemographic characteristics (e.g., marital status, annual income) | Home food environment<br>Grocery shopping patterns<br>Perception of preschooler weight status<br>Emotional functioning<br>Stress |
| Community | Neighborhood walkability/safety<br>Built environment (e.g., green space, grocery stores/food markets)   | Transportation access  |

Figure 1: Datasets collected in the Detroit and Metro Detroit community for pediatric obesity.

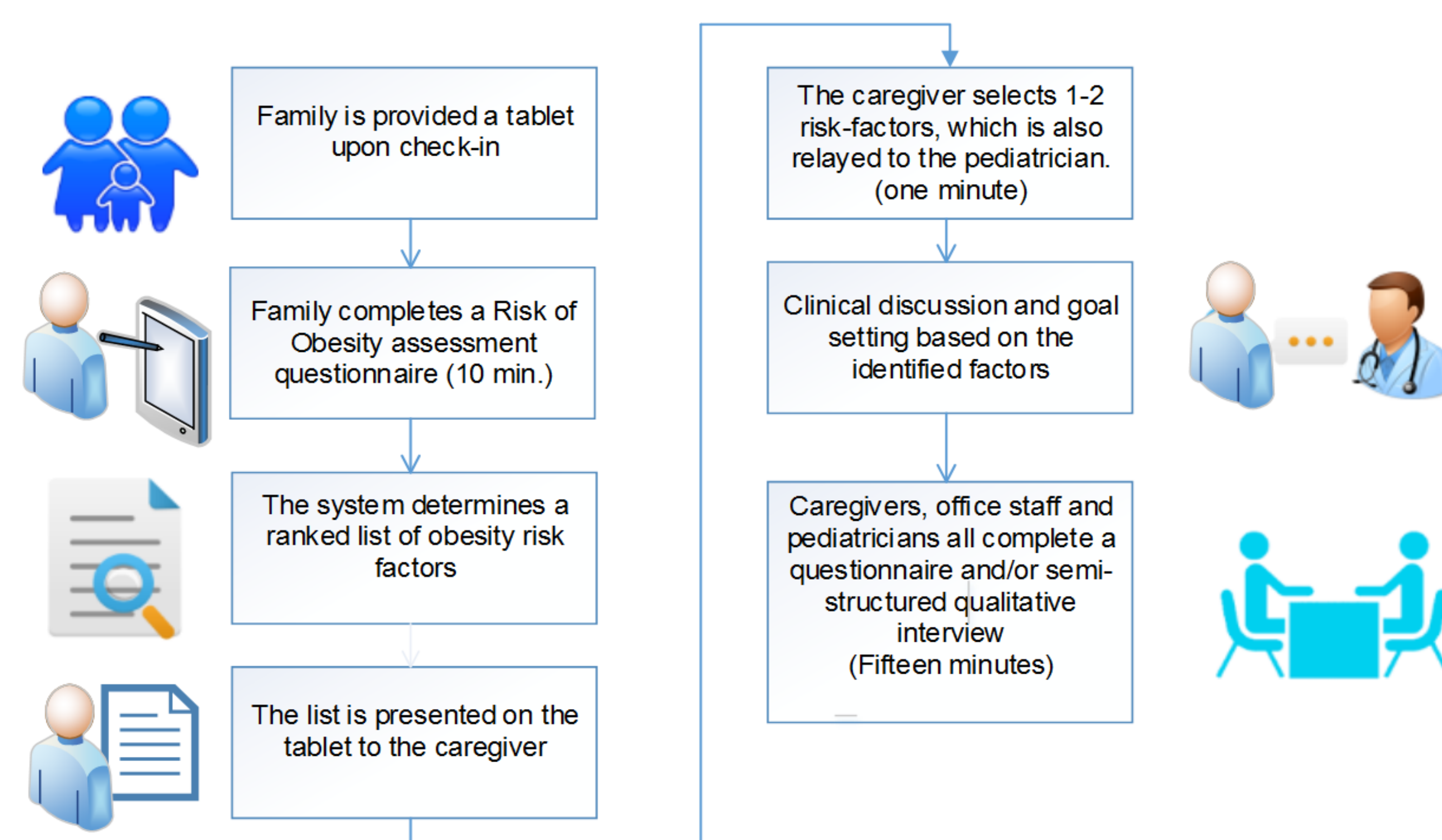


Figure 2: Operation flow of our system.

| ID | BMI | Child       |               | Income | Family                    |             | Community |           |
|----|-----|-------------|---------------|--------|---------------------------|-------------|-----------|-----------|
|    |     | Food        | Activity      |        | Demography                | Education   | GYM       | Transport |
| 1  | 28  | [Pie chart] | [Radar chart] | \$ 38k | Black 32<br>Christian     | [Bar chart] | [Map]     | [Map]     |
| 2  | 33  | [Pie chart] | [Radar chart] | \$ 24k | Hispanic 26<br>Catholic 3 | [Bar chart] | [Map]     | [Map]     |

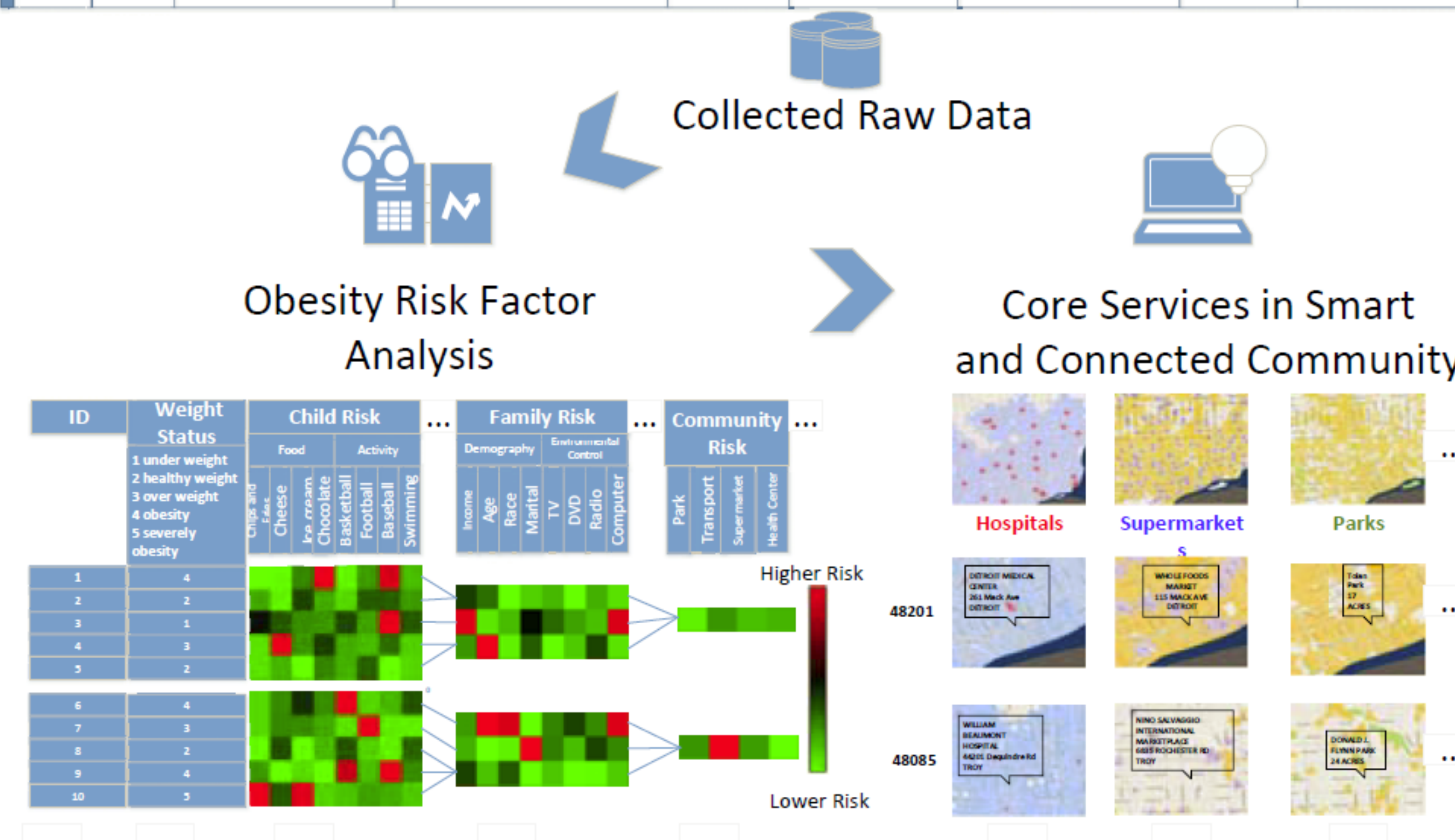


Figure 3: Quantitative and community-aware visualization of risk-factors for obesity.

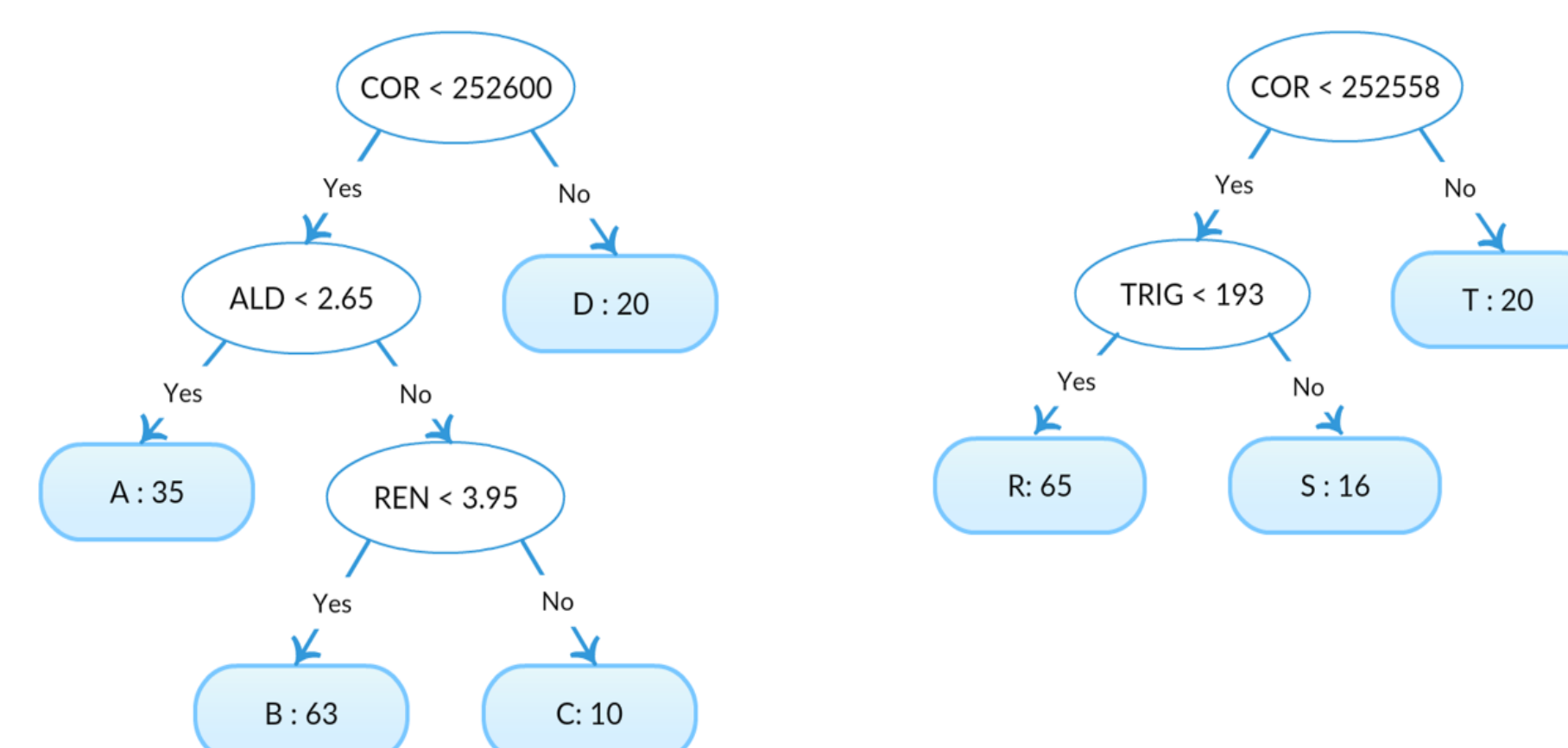


Figure 4. Cast study: patient subgroup detection and risk factor prioritization. Left panel: Our Subgroup Detection Tree (SDT). Right panel: CART(benchmark method).

## RESULTS

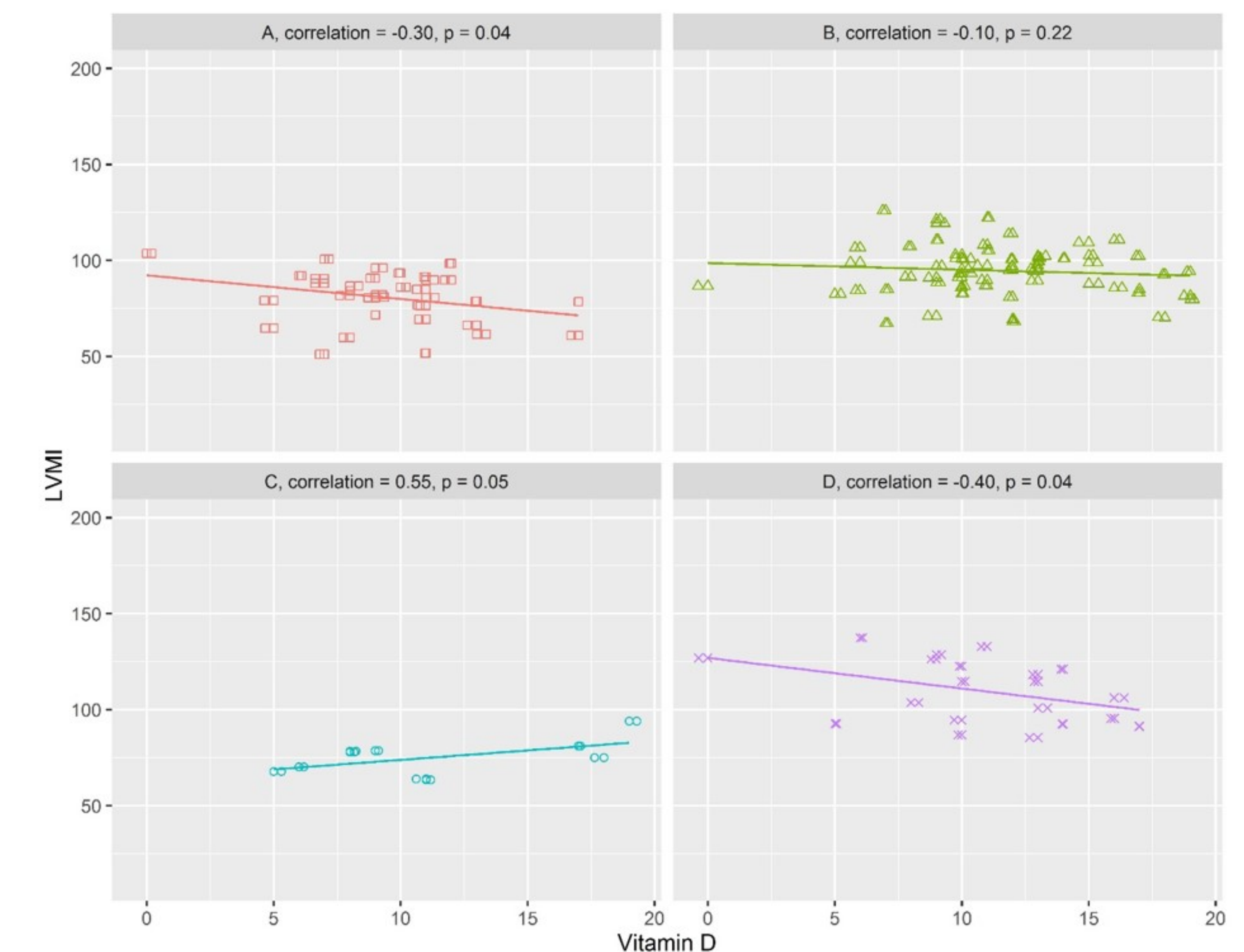
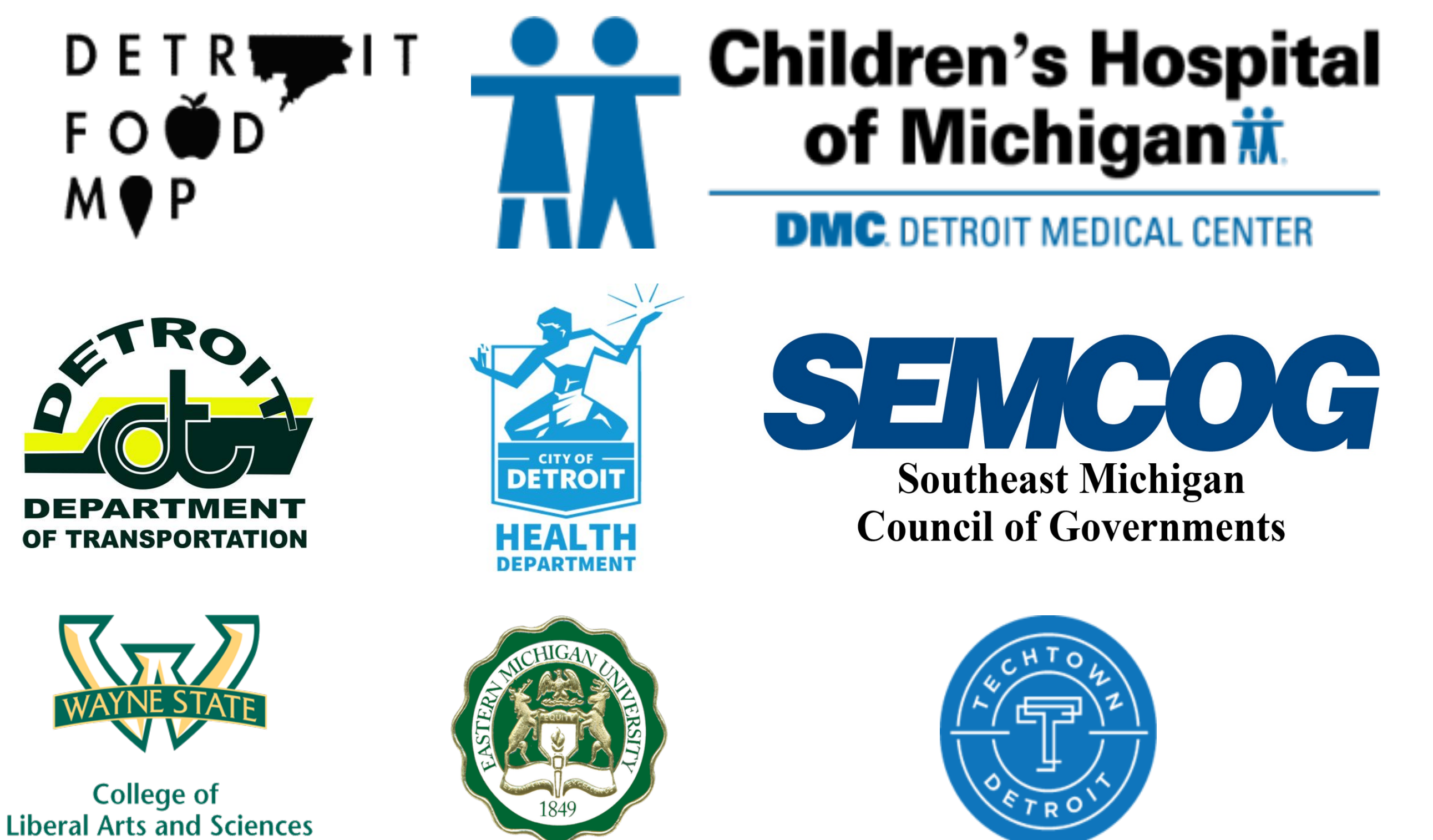


Figure 5: Cast study: patient subgroup detection and risk factor prioritization. Scatter plot for each subgroup of SDT.

## ACKNOWLEDGEMENTS

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