Using Community-Engaged Systems Science to Inform Food Service Delivery Among Hollywood Food Coalition's Community Exchange Program: A Case Study for Informing Complex Systems Within the Cancer Care Continuum

N. Stanley, B. De Leon, Z. Walts, M. Sabbaghtorkan, T. Gwanzura, J. Gonzalez-Mejia, H. Olson-Williams, S. De La Torre, B. Akasreku, N. Angelo, J. Aronhalt, S. Flores-Rojas, K. Kruger, J. Mikuliak, E. Abrahams, D. Young, H. Zhou, R. Nianogo, M. Prelip, M. Wang

Moffitt Cancer Center

1. Background
We describe our experience in the R25 "Modelers and Storytellers: Transdisciplinary Training to Advance Community Health Interventions," which provided 96 hours of didactic systems-science, community-engagement, and mixed-methods training in partnership with University of California Los Angeles (UCLA) and Hollywood Food Coalition (HoFoCo). HoFoCo operates a food distribution network serving over 37 organizations across Los Angeles County. As the network grows, HoFoCo seeks to better understand the populations reached, downstream use of partner services, and how food recovery activities strengthen trust, capacity, and service delivery across partner organizations.

Community-engaged systems science extends beyond Community-Based Participatory Research (CBPR) by focusing not only on shared decision-making but also on how community partners conceptualize system structure, feedback, dependencies, and leverage points. Rather than centering discrete programs or behaviors, this approach centers on community-generated hypotheses about dynamic interactions that shape population outcomes. For cancer centers—whose community outreach efforts operate within complex ecosystems of social determinants, health care access, and partner capacity—systems-science frameworks can reveal nonlinear drivers of disparities and identify intervention points not visible through traditional needs assessments alone.

2. Goals
- Outline essential components of a community-engaged, transdisciplinary systems-science project
- Demonstrate operationalization with a community partner to improve their food distribution network
- Describe how cancer centers can adapt these methods to strengthen community engagement and understand the structural drivers of cancer inequities

3. Solutions and Methods
We applied principles of community-engaged systems science by collaboratively defining the problem with HoFoCo; integrating the varied disciplinary backgrounds of the R25 cohort; conducting systems mapping through causal-loop diagramming and system-dynamics (SD) modeling; and engaging in iterative co-learning via site visits to HoFoCo's warehouse and conversations with staff.

Primary and secondary data were analyzed in ArcGIS Pro to characterize HoFoCo's service area. HoFoCo Pulse Surveys from 36 partner organizations were analyzed using sentiment analysis and thematic coding in R. Emergent qualitative themes and insights from partner meetings informed the development of a Food Security Causal Loop Diagram, which guided stylized SD model construction in AnyLogic.

4. Outcomes
Spatial analysis showed that HoFoCo's partner sites were concentrated in communities with limited access to food resources. Qualitative themes highlighted partner-reported barriers, the importance of personal connection, and the role of food recovery in reducing waste and strengthening relationships. Three major feedback loops emerged: reinforcing loop for distribution demand, balancing loop for food-waste mitigation, and reinforcing logistics-constraint loop. SD simulations projected how staffing, volunteer capacity, food-waste volume, and warehouse expansion influence sustainability thresholds within the network.

5. Lessons Learned and Future Directions
Engagement with HoFoCo informed model structure, validated assumptions, and ensured realistic representation of system behavior, demonstrating the value of community expertise in systems modeling. Transdisciplinary collaboration across public health, engineering, social sciences, and statistics clarified complex interdependencies that would be difficult to identify using CBPR alone.

For cancer centers, community-engaged systems science offers a framework for uncovering how social, environmental, and organizational forces interact to shape cancer risk, prevention uptake, screening access, and survivorship. By incorporating community-generated feedback loops and dynamic modeling into outreach and engagement strategies, cancer centers can better identify leverage points, anticipate unintended consequences, and design interventions that reflect real-world system complexity.

Figure: HoFoCo Food Distribution Food Security Causal Loop