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Research, part of a Special Feature on Panarchy: the Metaphor, the Theory, the Challenges, and the Road Ahead

Blurring the boundaries: cross-scale analyses of food systems

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ABSTRACT. The globalized and interconnected nature of food systems provides many examples of panarchies within social-ecological systems. However, few are analyzed using panarchy theory, particularly urban food systems, or in a comparative manner. We aimed to broaden the examination of cross-scale dynamics of food systems by applying panarchy theory through comparative study of three urban food systems: Flint, Michigan, Cleveland, Ohio, and Pittsburgh, Pennsylvania. These are all post-industrial Rust Belt cities that have experienced similar economic downturns but have responded in different ways, which has created significantly different food system outcomes. We present an approach for applying panarchy theory in food systems, and identifying indicators of potential and connectedness at multiple scales with sources for such data. We analyzed available data and demonstrate how the economic history of these cities has influenced their food system outcomes today. Economic recovery at the city scale in Pittsburgh/Allegheny County was reflected in reorganization in the food system, while the lack of economic recovery in Flint/Genesee County and the uneven access to economic recovery in Cleveland/Cuyahoga County potentially placed the cities and their food systems in lock-in traps. We also reflect on the limitations of publicly available data at the city scale for the food system and over time. Overlooking such gaps may blur boundaries within a panarchy analysis and lead to assumptions about cities based on county data which might not be accurate or may hide critical variables such as race or geographic size. We caution researchers to be clear about scale in panarchy analyses and to acknowledge the limitations of current data sets and thus the importance of mixed methods primary data collection. The incorporation of place and historical context into panarchy analyses can lend valuable explanatory power to our understanding of cross-scale dynamics in food systems.

Key Words: *connectedness; food systems; potential; Rust Belt; urban*

INTRODUCTION

Understanding cross-scale dynamics is a critical component of analyzing food systems from a social-ecological resilience perspective. Panarchy describes the existence of systems in a nested, interconnected hierarchy in various stages of growth, collapse, innovation, and reorganization (Gunderson and Holling 2002), and thus provides a framing to explore these cross-scale dynamics but is rarely operationalized to do so. Previously, we used resilience assessment (Resilience Alliance 2010) to identify panarchy dynamics using a mix of qualitative and quantitative data from a community-engaged research project in Flint, Michigan (Hodbod and Wentworth 2022). Drawing on this work, we aimed to broaden our examination of cross-scale interactions on the resilience of food systems by including two additional Rust Belt cities—cities in the U.S. Midwest that were once dominated by industry (Dieterich-Ward 2015). Our original goal was to use panarchy to examine distinctions in the post-war history of these cities and analyze what led to the different food systems regimes today. We designed a comparative study of the cross-scale dynamics of the Flint, Michigan, Cleveland, Ohio, and Pittsburgh, Pennsylvania food systems using a panarchy framing. These post-industrial cities experienced similar effects of industrial decline, depopulation, and economic hardship, the effects of which resulted in significantly different food system outcomes. Our original aim was to draw on secondary data to compare how food systems within each city evolved after deindustrialization and how they then responded to crises in order to identify releases and reorganizations that influence the food system.

Through this work, we demonstrate that data essential to understanding food systems are currently collected at differing scales, but rarely the city scale. Frequently, data are presented at a county scale, and researchers, when comparing data, make assumptions about underlying similarities between cities and the counties in which they are located. However, those broader assumptions ignore significant differences between cities and their size and impact relative to the counties in which they reside. This led us to a significant, yet unexpected conclusion—the current data environment obscures the realities of food systems, particularly at the city scale. We highlight the ways that current data affect the ability of researchers to conduct effective cross-scale analyses, which often results in blurring the boundaries between city and county data and obscuring significant contextual information about the importance of scale and place in understanding food systems. Through a presentation of data from Flint, Pittsburgh, and Cleveland, we outline the data we intended to use to make cross-scale comparisons and highlight what distinctions we can draw between focal cities and their counties. This process illustrates ways in which food security data are collected that prevent accurate comparisons. Ultimately, using a panarchy framing reveals the effect of place on cross-scale analysis, underscores critical distinctions between city and county data, and provides important reframing for the study of food systems from a social-ecological perspective.

The Rust Belt—industrial decline and divergent recovery in Flint, Pittsburgh, and Cleveland

The Rust Belt is a section of the American Midwest near the Great Lakes that was once characterized by high industrial production and shipping but which suffered economically with industrial collapse. The metaphor links the rusting of old steel to economic downturn and decay experienced in the later 20th century across this region. To determine our sample, we chose three Rust Belt cities with similar histories of growth and achievement but very different food system outcomes today. For this research, site

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panarchy analyses, which explains why the current literature commonly uses panarchy in one focal SES over time (Fraser 2003, Allison and Hobbs 2004, McAllister et al. 2006, Fraser 2007, Dugmore et al. 2009, Moen and Keskitalo 2010, Rosen and Rivera-Collazo 2012, Perez Rodriguez and Anderson 2013, Stroink and Nelson 2013, Salvia and Quaranta 2015, Rawluk and Curtis 2016, Teuber et al. 2017, Jiménez et al. 2020). These studies commonly integrate mixed methods approaches, synthesizing primary data collection with historical narratives, which is easier at a smaller scale than mid-size cities, as we attempted here. While mixed methods approaches require additional resources, we argue that they are essential to panarchy analyses of food systems, especially where data are not publicly available for food system studies.

Longitudinal food system data at more granular spatial-temporal scales would address both the limitations we have outlined. Our analyses, while limited, support the rationale for using history to understand food systems and for recognizing distinctions between place (i.e., county and city) which otherwise can significantly hinder our understanding of cross-scale interactions. Food system research needs to move beyond county and national scale data and acknowledge diversity within our food systems, in both the global north and south. In the United States, strengthening analyses requires more city-scale data, which could be achieved by adding food-system questions to the American Community Survey and similar statewide studies. More generally, assessing resilience or panarchy (common approaches to and metrics of, which have been recently called for [Angeler et al. 2015, Knippenberg et al. 2019, Jones et al. 2021]) requires common data across multiple spatial-temporal scales to support an understanding of the local context.

CONCLUSION

We have outlined the first comparative study of three urban food systems, using a panarchy framing to explore how social and economic history influenced the food system in three case studies in the U.S. Rust Belt. Economic recovery at the city scale in Pittsburgh, Pennsylvania was reflected in reorganization in the food system, while the lack of economic recovery in Flint, Michigan and the uneven access to economic recovery in Cleveland, Ohio potentially placed both cities and food systems in lock-in traps. However, we cannot make these conclusions definitively because key data were missing, both at the city scale and over time. Overlooking such gaps may lead to making assumptions about cities based on county data, which might not be accurate or may hide critical variables such as race or geographic size, and which anecdotal and primary data may contradict. Therefore, we end on a note of caution: be clear about scale in panarchy analyses and acknowledge the limitations of current data sets.

However, even though our analyses were limited, we still advocate for operationalizing panarchy to understand food systems. Panarchy allows for the identification of important indicators of potential, connectedness, and resilience at multiple scales of interest. Critically, it supports the incorporation of place and historical context into analyses, which can lend valuable explanatory power. Such analyses also show when we are not collecting the right data to make comparisons that further our understanding of urban food systems. This acknowledgement provides a crucial check on our assumptions and reveals the importance of incorporating the impacts of structural racism in our analyses. Addressing these limitations will ground our understanding of food systems in a social-ecological context and will simultaneously help develop panarchy theory.

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[1] We used 1 June 2020 as the standard date to calculate all 2020 U.S. dollar amounts adjusted for inflation.

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Data Availability:

The data that support the findings of this study are from resources available in the public domain.

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