UNIVERSITY OF HULL

Disrupting Public Health Disparities Toward Equity: a conceptual investigation using systems thinking and systems science

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Dedication

For Chris, Brandon, Michaela, and Stephen.

For Mom, Dad, Stephanie, and Amy.

For Grammy, Paw-Paw, Grandmollies, and E-Paw.

For my ancestors.

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Abstract

Submitted for the requirements of the PhD by Published Work, this reflective chapter offers a conceptual introduction to the complex nature of public health (PH) disparities experienced by certain marginalized populations in public health policy and bioethics. This critical investigation uses systems thinking (ST), systems science (SS), and complexity science (CS). This compilation of published works diverts from sole reliance on reductionism to unpack PH outcomes to decipher marginalizing inequities within complex systems. This analysis is important because approaches and methods in PH customarily utilize reductionist research questions and methods at the expense of not discerning the inherent complexity of health. The purpose of the investigation is to apply ST to the important PH issue of health disparities for policy and ethics, particularly that of Black, Indigenous, and People of Color (BIPOC) and sexual and gender minority (SGM, colloquially known as LGBTQIA+) populations in the United States. PH has a long, successful history of working to improve the health of communities using data. However, the macro and meso-level social dynamics require dynamic hypotheses and analysis for dynamic questions associated with disparate health outcomes. While health is a complex phenomenon with multiple interlinking factors, its complexity is often analyzed using functionalist methods. While traditional methods in PH have demonstrated the existence and burden of health disparities, these methods have not captured its structural complexity. PH, as a practice, is a mystery tracker and solver. PH takes observed evidence, which is often translated into data and trends. PH has been instrumental in improving health, evidenced by successes such as infection control, vaccination, and sanitation. On the other hand, PH has not fully harnessed the potential of ST, which leaves a gap in understanding the complexity of systemic health disparities of minoritized groups.

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Chapter 1 Introduction

Four themes emerge in the exegesis on the complexity inherent to PH disparities present in minoritized populations.

1. Systems thinking (ST) and systems science (SS) as perspectives and methods for understanding public health disparities;
2. Complex health disparities in the Black, Indigenous, and People of Color (BIPOC) communities;
3. Complex health disparities in the sexual and gender minority (SGM) communities;
4. Applying ST and SS to health policy and public health (PH) ethics.

The objectives of the analysis are to:

- Apply ST and SS to the disciplines of PH policy and PH ethics
- Apply ST and SS to understand and uncover the complexities of health disparities experienced by Black, Indigenous, and People of Color (BIPOC) communities
- Apply ST and SS to understand and uncover the complexities of health disparities experienced by sexual and gender minority (SGM-LGBTQIA+) communities

Black, Indigenous, and People of Color's (BIPOC) health in the United States is systemic. The United States bears a racial history borne of difference and subjugation that is unique since its founding. BIPOC is a uniquely American term that attempts to explain the structural oppression experienced by groupings of minoritized people in that country (Grady, 2020). This analysis is specific to the American experience, as BIPOC "was born primarily from multi-cultural and multi-racial movements working to dismantle the systems of oppression which create racial hierarchies" (Selvarajah et al., 2020, p. p.e004508).

It is acknowledged that racism exists based on a social construct better known as race, which erroneously implies a biological difference. This has implications on health as medical associations in the United States declare race a social, not a biological, attribute. The term "racism" implies a social determinant of health

and “race” is used as a cultural marker. There is the collective term Black, Indigenous, and People of Color (BIPOC), but it is acknowledged that each cultural group is unique. BIPOC populations have inter-group and intra-group differences, which are also recognized.

Lesbian, gay, bisexual, transgender, intersex, queer, nonbinary, gender non-conforming, and other LGBTQIA+ people have a vast array of unique health disparities in comparison to the general population (Hafeez et al., 2017; Health and Medicine Division, 2011). For research and policy purposes, LGBTQIA+ people are collectively termed sexual and gender minority (SGM). According to the U.S. National Institutes of Health (National Institutes of Health, 2023b), SGM people:

> “Include, but are not limited to, individuals who identify as lesbian, gay, bisexual, asexual, transgender, Two-Spirit, queer, and/or intersex. Individuals with same-sex or -gender attractions or behaviors and those with a difference in sex development are also included. These populations also encompass those who do not self-identify with one of these terms but whose sexual orientation, gender identity or expression, or reproductive development is characterized by non-binary constructs of sexual orientation, gender, and/or sex.”

Sexual minority (SM)- sexual orientation	People who identify as something other than straight or heterosexual, or whose sexual identity is outside of heterosexuality Examples: gay, lesbian, bisexual, asexual, pansexual, aromantic
Intersex	Biological. May identify solidly as a man, woman, both or neither; no typical sexual orientation or gender identity
Gender minority (GM)	People whose gender is different from their sex assigned at birth by others without consent; Gender is socially constructed; gender identity is outside of cisgender and/or strict binaries of gender Examples: transgender, trans man, trans woman, nonbinary, gender non-conforming, no gender, genderfluid, Two-spirit

Table 1-1- Taxonomy of sexual and gender minority categories

It was not until 2016 that SGM as a group was formally designated as a health disparity group eligible for targeted appropriated NIH research funding. However, the health inequity predated this declaration (National Institutes of Health, 2016).

It is important to LGBTQIA+ (Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, and Asexual Plus) communities that are stigmatized and marginalized to control the vernacular and name intersectional elements of their identity in research. Care is taken to be respectful and use the current preferred language. The terms used are not fully inclusive, and other terms describe sexual orientation and gender identity. The only exception is sexual and gender minority (SGM), which is a research term and is not an identity term used by the LGBTQIA+ community.

Table 1-2 maps sixteen published works with their respective themes. Two journal articles revised as publication #7 (2015g) are not included in the overall count.

Publications considered	Parts of this chapter have previously appeared as...	Systems Thinking/ Systems Science/ Complexity	BIPOC health	SGM health	Public Health Ethics/ Health Policy
Framing and Revisiting Ethical Policy with a Systems Perspective (Battle-Fisher, 2015b)	N/A	X			X
The Public, Private, and "Stepping on Toes" in Healthcare (Battle-Fisher, 2015d)	N/A	X			X
The Menagerie of Social Agents: People and Their Connections (Battle-Fisher, 2015c)	N/A	X			X
Communication and Politics in Healthcare (Battle-Fisher, 2015a)	N/A	X			X
Health Systems and Policymaking as the "Price Is Right" (Battle-Fisher, 2015e)	N/A	X			X
Ethical and Systematic Approaches to Health Policy (Battle-Fisher, 2015f)	N/A	X			X
Health Disparities in Public Health (Battle-Fisher, 2015g)	Journal Papers 2010 & 2011	X			X
Mental and Simulated Models in Health Policy Making (Battle-Fisher, 2015h)	N/A	X			X
Social Disparity, Policy, and Sharing in Public Health (Battle-Fisher, 2015i)	N/A	X	X		X
The Concentric Model of Health-Bound Networks (Battle-Fisher, 2015j)	N/A	X			X
Transhuman, posthuman and complex humanness in the 21st century (Battle-Fisher, 2020)	N/A	X			X
Health inequality as a socially created social system (Battle-Fisher, 2021)	N/A	X	X		X
Public and health professionals' misconceptions about the dynamics of body weight gain/loss (Abdel-Hamid et al., 2014)	N/A	X			
Commentary on Cooley's "LGBTQI+ bioethics: a pre-queer theory bioethicist reflects" (Feeling and Battle-Fisher, 2020)	N/A	X		X	X
The 'Next Normal' of Health Equity: toward a disparity-free Future during COVID-19 (Battle-Fisher, 2023)	N/A	X	X		
Scoping review of the experiences of sexual minority women treated for breast cancer (Arthur et al., 2024)	N/A	X		X	

Table 1-2- Table of published works based on themes

PRIMARY RESEARCH QUESTION

The role of ST and SS in Public Health (PH)-related Health Outcomes

(1) What is the role of systems thinking (ST) and systems modeling in understanding public health (PH)?

SECONDARY RESEARCH QUESTIONS

Health Equity as an emerging system

(2) What is meant by health and its associated healthcare system being a "system"?

(3) What is the role of systems in PH policy?

(4) How complex are health disparities within the Black, Indigenous and People of Color (BIPOC) communities and the sexual and gender minority (SGM) communities?

The complex nature of unethical health and health disparities

(5) How would the application of ST help to explain the complex nature of unethical social norms and unequal societies?

In summary, the research questions fall under three categories: the role of ST and SS in PH outcomes, health equity as an emerging system, and the complex nature of unethical health outcomes. The research methods and systems perspectives employed or referenced are bioethical analyses, social network analysis, system dynamics, and general ST.

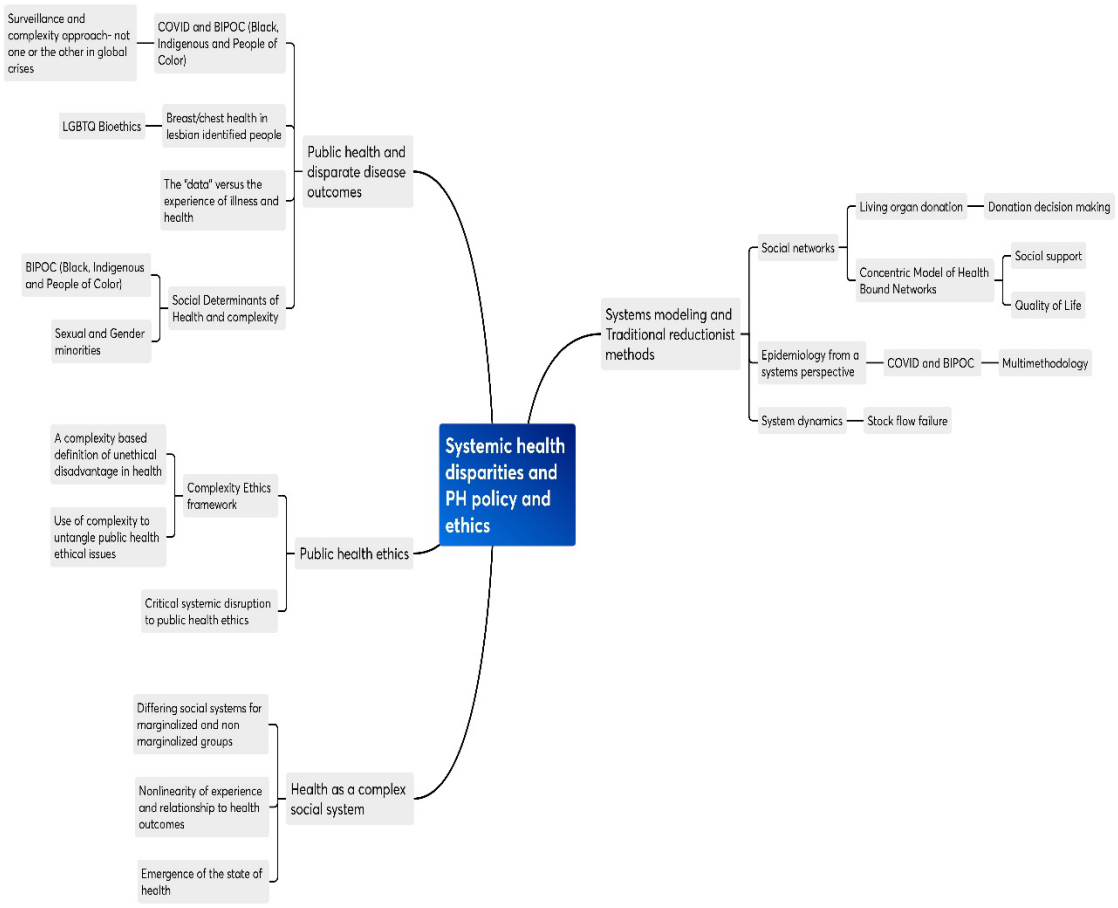

Figure 1-1- Mind Map depiction of exegesis structure and narrative

The research questions, outlined and linked in the Mind Map (Figure 1-1), display a common, epistemological focus and offer a common thread-based analysis discovered across the papers.

The exegesis is divided into distinct sections that critically explain and position the published works in academic scholarship on the complexity of public health disparities in certain minoritized groups.

Chapter 2 introduces a literature review that offers background on ST and SS in PH and healthcare. Lastly, an exposition on ST and health disparities in marginalized BIPOC and SGM populations is provided.

Chapter 3 is a presentation of the published works, with an in-depth investigation of the application of ST to a variety of health disparity-related topics.

Chapter 4 critically examines the published works' impact, contribution to PH research, and limitations of the research presented.

Chapter 2 Literature Review

2.1 Systemic thinking as action- a movement from reductionism to complexity

The public's health is plagued with intractable, wicked problems. Health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (World Health Organization, 2023). Health is multidimensional and is not limited to illness or infirmity. As such, the discipline of PH is a moral calling and a scientific endeavour that exists because of the quest toward the global society's fundamental human right to optimal health and longevity. Health is navigated in the social space, adding layers of complexity to already complicated biological mechanisms that cause disease and infirmity.

According to Sturmberg & Martin, there is a distinct difference between social complicatedness and health complexity (Sturmberg & Martin, 2013). To be complicated, there is a closed system with no external output to work, like the mechanisms of a machine. In addition, complications are equated with predictability in the action and performance of the system (Sturmberg & Martin, 2013). Once irrational agents are added to a social system, we enter the realm of open systems. Health can be defined by its open system characteristics of unpredictability of outcomes, the presence of external influences, and the state of elusive solution achievement. While health is unpredictable, this characteristic does not remove the need and desire to improve health on an individual and population level.

The health issue as hyper-complex is unknowable in the sense that reflection on different methods guides our ever-changing journey toward the knowledge (M. C. Jackson & Sambo, 2020). By convention, statistics are compared and computed to know which is based on historical events and conditions to guide understanding of current states and interventions that are to be undertaken. As health behaviors and actions are moving targets, dissecting the system in which the behaviors and actions embed and self-organize is imperative. In application, multiple realities versus a single objective reality must be reconciled to avoid the primacy of the reductionist systemic approach to PH.

ST has many much-debated definitions. ST is the recognition of the constant, dynamic interplay of interrelated elements that change over time. ST unveils how dynamic people are. ST is "the art and science of making reliable inferences about behavior by developing an increasingly deep understanding of underlying structure" (Richmond, 1994, p. 139). Approaching problem situations with ST is actionable as ST can improve health and support systems change. Arnold and Wade offer an actionable, skill-based definition of ST:

> "Systems thinking is a set of synergistic analytic skills used to improve the capability of identifying and understanding systems, predicting their behaviors, and devising modifications to them to produce desired effects. These skills work together as a system." (Arnold & Wade, 2015, p. 675)

Adam offers this definition: "Systems thinking is, foremost, a mindset that views systems and their sub-components as intimately interrelated and connected, believing that mastering our understanding of how things work lies in interpreting interrelationships and interactions within and between systems" (Adam, 2014, p. 1). It could be argued that even these definitions do not fully account for the uncertainty and messiness inherent in a stakeholder-led system. From Stacey's second order "idealist" perspective, systems are not something to be engineered and systems boundaries can be fluid to account for social construction. There is less agreement across the waves of systems thinking of what a system is and how it is best approached. However, there is agreement on the existence of systems, though epistemological approaches to them differ.

A system is complex if it consists of many parts that interact and have components that influence each other, thereby sustaining the system (L. Bertalanffy, 1968). A complex system is more robust "because of their ability to organise themselves relative to their environment" (Rickles et al., 2007, p. 935). According to Hodgson, a system is considered systemic when "invisible structure[s] are systems with properties that do not follow the usual anticipations" (Hodgson, 2019, p. 14). A system churns mechanically, and its path cannot be forecasted based on the knowledge of initial conditions. The system may be associated with less-than-optimal social results, but it fulfills its mechanical purpose.

According to more recent waves of ST, the system is not something that can be engineered but is an entity structurally embodied with human-related complexities. A goal-set system is one where a social element achieves a purpose (Meadows, 2008). Meadows asserts that a system has three requirements: elements, interconnections, and a function or purpose (Meadows, 2008). The goal or purpose of a system is the "direction-setter of the system, the definer of discrepancies that require action, (and) the indicator of compliance, failure, or success" (Meadows, 2008, p. 138). The concentric systems that affect health do not present themselves as divorced from other micro, meso, and macro systems. Instead, these systems act and react simultaneously (Meadows, 2008). It is in this synchronistic dance that health is performative and constructed.

The system supplies the mechanical purpose of sustaining the system that should be leveraged correctly (Meadows, 2008; Pescud et al., 2021). There is no forecasting over time, and it is destined to change directionally and by magnitude. Radical change does not entirely terminate a system but steers toward a circular state of outcomes (Byrne & Callaghan, 2023; Holland, 2014). According to the father of general systems theory, Ludwig von Bertalanffy, there is a steady state in open systems, which means reaching a level of homeostasis with influences of the environment (L. V. Bertalanffy, 1971). We seek a single strategy based on incomplete mental models to reach a steady state (equilibrium) (Trist, 1981). There are many diverse routes to achieve that desired state of homeostasis. The complication of eradicating a problem is represented as closing the gap between the lack of balance and the goal of homeostasis (Checkland, 1981).

Suppose this complexity principle is applied to equity in health. In that case, the system supporting disparity has difficulty sustaining a desired steady state of equity due to the fluctuations which are tied to resultant forces. The continued existence of disparities is shown via those temporary societal changes resistant to a constant equilibrium, as social systems are dynamic. A lack of durability of positive social change may be due in part to politics, changing social (in) action, and personal values/ethics.

Current reductionist methods lack the capability of capturing an understanding of such social volatility. A complication in dealing with systems is the inherent uncertainty. Uncertainty deals with issues of doubt and ambiguity in terms of an outcome. Uncertainty does not always mean a lack of knowledge. Kay and King describe resolvable uncertainty as "something that can be removed by looking up something or

represented by a known probability distribution of outcomes" (Kay & King, 2020b, p. 14). To deal with uncertainty, Berger et al. said "normative guidelines and "rules"…help… make the best, that is, the most rational, decision under uncertainty" (Berger et al., 2021, p. e2012704118). In PH, the knowledge-based uncertainty is resolved by concatenating information, computing statistics, conducting analyses, and analyzing trends for application to resolve health concerns.

To understand a system, there must be a method to unpack its complexity. One such approach is the use of SS. According to Heylighen, SS "does not aim to find the one true representation for a given type of system but to formulate general principles about how different representations of different systems can be constructed to be effective in problem-solving" (Heylighen, 1990, p. 423). Heylighen's definition is in line with general ST, which centers the attribute of generalizable constructs, and principles that can be applied across situations that garner measurable outcomes and problems (L. Bertalanffy, 1968; Heylighen, 1990). SS offers math and simulation to support or refute initial reactions to early conditions to a solution to a problem (Checkland, 1981). The first wave, hard systems thinking, which is another term for SS, is based on the reliance of knowable and quantifiable measurement of a real-world reality (Cabrera et al., 2021; M. Jackson, 2019). "The expression 'it is complex' in fact expresses the difficulty of giving a definition or explanation" (Morin, 2007, p. 61).

In the following section, the traditional PH method, epidemiology, is explained, its limits to uncover complexity are noted, and points are made to link with ST to discern complexity possibly missed by these traditional methods.

2.2 Epidemiology, reductionism, and uncovering complexity

Traditional PH methods work under the assumption of linearity, using independent and dependent variables chosen pre-analysis (Luke & Stamatakis, 2012). SS works under the assumptions of nonlinearity, chaos, and threshold events (Luke & Stamatakis, 2012). Checkland asks of the systems discipline, "What model of social reality is implied by the....methodology" (Checkland, 1981, p. 245). Considering Checkland's call for a moment of reflection, the social construction of reality calls for an implicit theory that should be linked to systems practice and the methods employed to dissect that reality. While certainly a welcome observation, looming and pressing questions in terms of the practical resolution of social problems may be a functionalist question of practice-based

philosophy as well as the global, cultural context that creates the problems that require intervention from ST and CS to resolve them. As a matter of context, at a minimum, ST should undergird the perspective taken about the boundaries of the social system and their element-based interrelationships.

Functionalist approaches to health lead to the fundamentalism of causal relationships, replicability, and the quest for regularity. To systematically reduce is to reduce parts that are acknowledged as interdependent, but we may nonetheless put them back together again in a reductionist fashion. While fundamentalist SS has historically started with a problem context to lead to the engineering of a resolvable system, knowledge of human complexity is restricted to challenging or structured problems that are resistant to resolution (Checkland, 1981; M. Jackson, 2019).

The science of epidemiology is defined as the "study of distribution and determinants of health-related states among specified populations and the application of that study to the control of health problems" (Evans, 2009, p. 1). Epidemiology by construction employs methods that do not harness the complexity of entities and necessarily dynamic events although rates can be measured at different time points. A wealth of calculations used in epidemiology and data sciences are utilized to understand health outcomes. According to Pearce and Merletti, epidemiology is not well suited for exploring complex adaptive systems (Pearce & Merletti, 2006). The reliance on causal inference of risk to exposure in epidemiology highlights that "the problem of translating epidemiologic research into public health interventions will persist, because of the sheer difficulty, perhaps impossibility, of addressing complex health phenomenon within the formal causal inference framework" (Rod et al., 2023, p. 4).

The presence of self-organization in complex adaptive systems poses a problem for conventional analytical approaches (Pearce & Merletti, 2006). Pearce and Merletti define the self-organization of adaptive systems as "life itself, not only in terms of individual organisms but also in evolutionary terms—organisms adapt to each other through evolution into a finely tuned ecosystem" (Pearce & Merletti, 2006, p. 515). This complex situation, in addition to adaptation, is the existence at the edge of chaos and the unpredictability of effects proves difficult for epidemiology to measure (Pearce & Merletti, 2006). Regarding health disparities, rates, and risks/odds offer necessary yet static, retroactive measurement. If ST is used multimethodologically, the potential of

employing modern epidemiology with ST promises results more in line with the inherent complexity of health. Causal inference implies causal, not associative, discovery of the underlying risk associated with a health outcome which is based on the assumptions on which the analysis is built (Hernán & Robins, 2020; Pearl, 2010).

A new complex framework for epidemiology based on patterns, dynamics and mechanisms is more inclusive of dynamic measurement (Rod et al., 2023). This framework calls for a multimethodology of epidemiological and other methods to "understand emergent health phenomena, identify vulnerable population groups, and detect leverage points for promoting public health" (Rod et al., 2023, p. 505). To accomplish this methodological goal, combining epidemiology with SS methods and data produces a more nuanced, complexity-sensitive analysis of a PH problem (Rod et al., 2023).

People-based emergence tends not to be fully captured in big datasets (Rod et al., 2023). Limitations in emergence lie in the sense-making required to extrapolate beyond the results (Rod et al., 2023). Epidemiology is less proficient in mechanisms, and analyses such as additive interaction analysis and compartmental models can be used in the field (Rod et al., 2023). Evolution and dynamics of change are not often studied using epidemiology, whose conventional methods "necessitate research designs and analytical methods not typically employed in PH" (Rod et al., 2023, p. 510). Rod et al. offer four principles that can move epidemiology into "complex ST":

- Complex research questions based on patterns, mechanisms, and dynamics
- "Methodologic pluralism" in epidemiology as mixed methods
- New types of data with network data mentioned alongside conventional data such as time-series and multidimensional data
- "Dynamic evidence synthesis" focusing on discovery of the "unresolved and understudied." (Rod et al., 2023, p. 511)

Apart from a mention of network data (social network analysis), the Rod et al. (2023) framework utilizes pluralism with advanced analytic methods to achieve a complex analysis.

A search of peer-reviewed articles found when searching for BIPOC (and search term variants) and ST found few articles, and those that were found applied systems thinking to systemic racism (powell et al., n.d.; Reynolds, 2021; Watson & Collins, 2023). Some articles used the term ST in spirit but rather employed an ecological or intersectional perspective devoid of ST methods. Fraser et al. present intersectionality as a companion to ST (Fraser et al., 2019). However, intersectionality and ST are complimentary but are not synonymous. Intersectionality factors overlap, marginalizing identities in navigating society (Crenshaw, 1989).

In a departure from ST used loosely, Watson & Collins utilized causal loop diagrams to present the systems variables related to systemic inequities in early care and development in BIPOC children and their working parents (Watson & Collins, 2023). In terms of applications of SS methods, group-model building, social network analysis, and system dynamics were all represented. Some articles focused on health outcomes and disease states (Frerichs et al., 2016; Gullett et al., 2023; Harley et al., 2020; Nam et al., 2023). However, SS methodologies remain underutilized in public health research that focuses on BIPOC health. The next section introduces the potential of using ST to investigate SGM health.

Few research studies use ST to understand health disparities in SGM populations. Fraser et al.'s qualitative study of intersectional, systemic factors of LGBTIQ+ homelessness found that the proximate causes for being unhoused must be accounted for in the quest to imagine and maintain the ability to improve this challenging situation (Fraser et al., 2019). Jurich and Myers-Bowman presented a review of studies that applied systems thinking to the inherent complexities of human sexuality (Jurich & Myers-Bowman, 1998). Moore et al. described four hard systems (SS) techniques (social network analysis, group-model building, system dynamics, and agent-based modeling) that could be instrumental in dissecting health equity in LGBTQIA+ youth (Moore et al., 2021).

In the following section, the argument is presented that ST is instrumental to understanding the complex state of health disparities and should be called upon to reverse negative health outcomes.

2.3 Systemic thinking and its potential in understanding and reversing public health disparities

PH in practice, particularly with resistant problems such as health disparities, is confronted with social, biological, emotional, and political problems that are interdependent and are embedded within political contexts. The constructionism of the health experienced by marginalized people requires ingenuity to see the need for systemic approaches. Ultimately, extinguishing health disparities is elusive and possesses situational wickedness, therefore requiring ST and CS. Mental models depend on the individual conceiving them and the social norms and beliefs that shape them. Unfortunately, this susceptibility to marginalizing mental models in health may mirror the broader society's determinants.

Social determinants inform our understanding of health disparity. According to the National Institutes of Health, an essential distinction of health disparity is that the health difference presents itself as a measurable difference from a reference group that is not marginalized and therefore does not suffer from measurable disparities (National Institutes of Health, 2023a). Social determinants are systemic factors that affect personal illness and PH (National Institutes of Health, 2023a). The nature of the effect of social determinants on health requires a comprehensive approach that interwoven these factors among others affecting health status and outcomes. Disparities exist across four dimensions- material, biological, cultural, and social (Lang & Rayner, 2012). When combating disparities via systems approaches, it is essential to assess failure or success temporally and assess the internal/external influences on the system in addition to deviation from the system's goal. The disparity is related to social determinants, which refers to the "conditions in which people are born, grow, live, work, and age" (Commission on Social Determinants of Health, 2008). As defined, the explanation leans toward a conceptualization of disparity as the institutional dysfunction within and among biological, environmental, and social attractors.

PH should take social determinants one step further and investigate structural determinants, or "written and unwritten rules that create, maintain, or eliminate durable and hierarchical patterns of advantage" (Heller et al., 2024, p. 351). Central to structural determinants are the power possessed by the marginalizing system and the lack of power inherent to agents, such as BIPOC and SGM populations, in the marginalized systems that disadvantage them (Heller et al., 2024).

For the sake of structural context, the CSDH (Commission on Social Determinants of Health) framework, set forth by the World Health Organization, models the connections and interactions of structural and intermediary determinants of health (Solar & Irwin, 2010). A structural determinant of health, which operates via intermediary determinants, is “all social and political mechanisms that generate … stratification and social class divisions in society and that define individual socioeconomic position within hierarchies of power, prestige and access to resources” (Solar & Irwin, 2010, p. 5). Of note, the presence of “social position” includes social constructions such as social class, gender and ethnicity (race tied to racism) (Solar & Irwin, 2010). The structural determinants “enshrine” structural racism. It may be extrapolated that prejudices related to SGM people may work similarly.

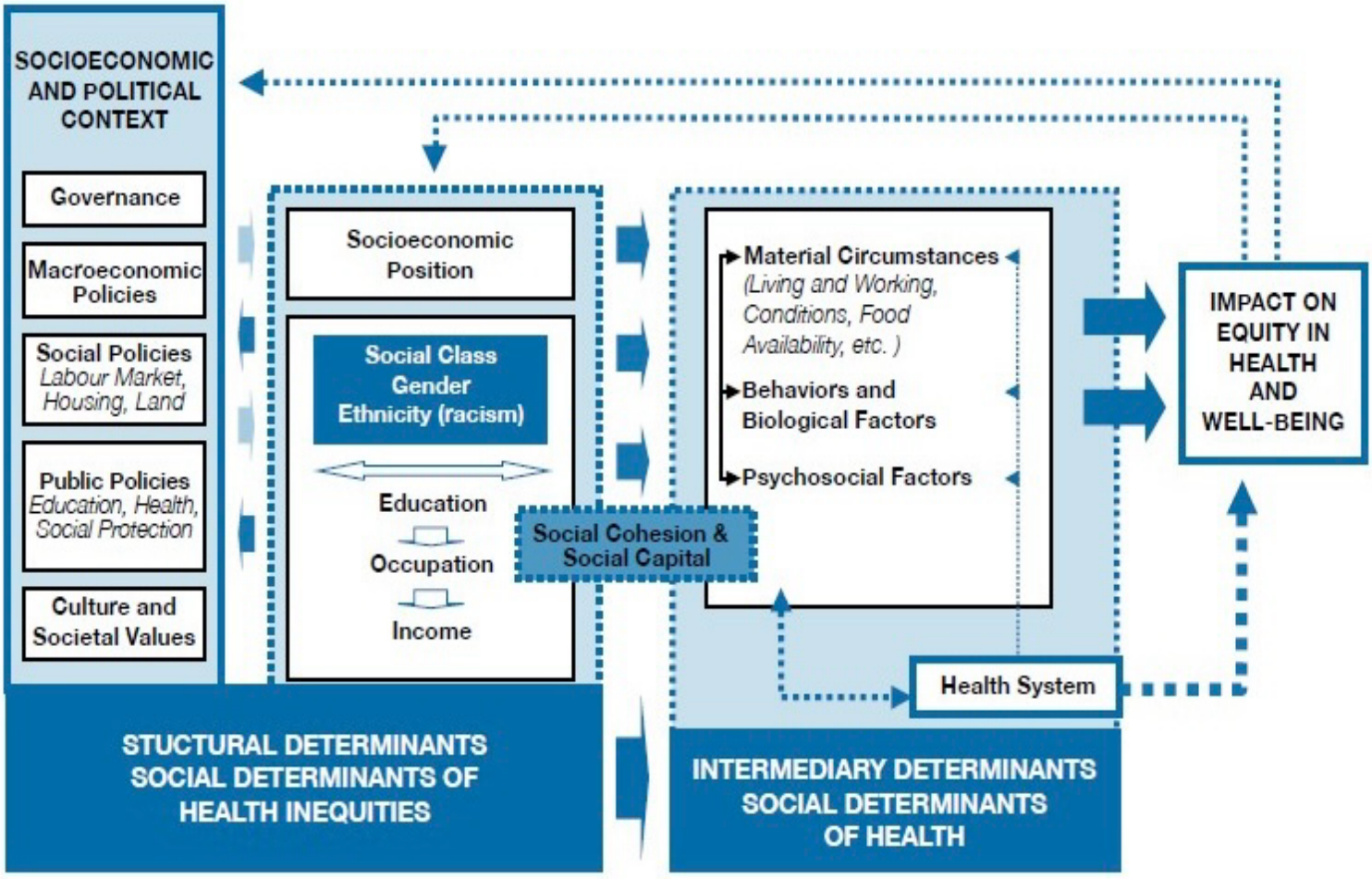

Figure 2-1- World Health Organization CSDH conceptual framework (Solar & Irwin, 2010)

Reproduced from "A Conceptual Framework for Action on the Social Determinants of Health (Social Determinants of Health Discussion Paper 2)", Solar & Irwin, p. 6, Copyright 2010.

Structurally determined and socially propagated, marginalization is defined as "a process through which persons are peripheralized based on their identities, associations, experiences, and environments" (Hall et al., 1994). Marginalization relegates a group of persons with shared, socially constructed characteristics to a subordinate, othered position (Hall et al., 1994). Marginalization is systemic, effectively creating concentric yet unequal subsystems that, at their core, are based on interdependence across and among social elements and individuals. Some communities are benefiting despite the negative payoff for others. There must be more to put forth the leveraged action to harness the system to reverse inequality.

Three under-researched areas of inquiry are highlighted:

- ST and PH ethics and PH policy
- ST and Black, Indigenous and People of Color (BIPOC) health
- ST and sexual and gender minority (SGM) health

People act ethically (or unethically) based on socially created and accepted ethics and norms (Battle-Fisher, 2015b). To that end, "the messiness and complexity of the real world is something that stands in the way of us getting a grip on what is going on, ethically speaking, or whether this messiness and complexity is what is going on, ethically speaking" (Wilson, 2014, p. 19). While there is controversy in the systems world about realities, Bioethics as a discipline should accept the practical by accounting for the complex workings of society and the interdependent influences and choices of the irrational agents acting on their ethical stances (Battle-Fisher, 2015g; Wilson, 2014).

Ethics should be interpreted and analyzed as complex entities that cannot be divorced from emergent and unpredictable human actions and systemic characteristics. Silva and colleagues propose that ethical problems are complex systems, as interrelated entities that should be operationalized (Silva et al., 2018). An ethic can be viewed as a type of mental model, or a combination of divergent inputs that we piece together qualitatively (Battle-Fisher, 2015d). There is an inherent complexity to satisfying the requirements of the common good. Stoeklé, Deleuze, and Vogt suggest a synthetic, graphic approach to

bioethical inquiry (Stoeklé et al., 2019). After the systemic analysis of a situation ethics are then analyzed by mapping out its interrelated components to understand the whole (Stoeklé et al., 2019). Stoeklé and colleagues state that there be "better spatial and temporal representation of …phenomena, in terms of their changes and transformations, and opportunities to act on them" (Stoeklé et al., 2020, p. 200).

The civic society runs on governance and its enacted policies. There are many definitions of health policy but there is an opening for a new operational definition that accounts for social complexity. A systemic articulation of what constitutes health policy is necessary to approach the complexity of governance and policymaking. Battle-Fisher presents a modified version of the World Health Organization's definition of health policy, accounting for the tenets of systems thinking (Battle-Fisher, 2015b).

Systemic elements of health policy are:

- Interdependent social situations
- Constructed social realities
- Epidemiological goals and measures (if science is accounted for with past, present, and future implications of policy initiatives)
- Governance's effect on the success and failure of healthcare system
- Actions of agents (people) affected by the policy, with the policy often unbeknownst to them
- Individual and community-level ethics and morals, and
- Political climates before, during, and after policymaking (Battle-Fisher, 2015b)

The attempts at PH improvements through policy may be disconnected from the research. Battle-Fisher argues that without an infusion of ST research into praxis, the success of PH cannot be fully realized (Battle-Fisher, 2015d, 2015b). Governance executes policies at the public level, which affects people expected to abide by those strictures (Battle-Fisher, 2015a). The catch-22 of policy is that a social system is more prone to error in the long-term versus short-term effects (Forrester, 2007a). Error in policy has a direct effect on the public.

Elements leading to disparity can be viewed as an endogenous factor that only the individuals living in this marginalization occupy marginalized space will be affected by. A

social system built in a manner that organizes its agents and stakeholders by social influence and stratification diminishes the effect of the parts of the system only affecting marginalized groups. In addition, by delineating distinct subsystems for privileged and unprivileged, the models will better tease out the experiential effects of structural social determinants on BIPOC and SGM communities versus privileged communities. The system of privilege should not obscure or ignore stratification but highlighted as the overlapping effects of its marginalization are inexplicably tied to health disparities.

Sterman contends that endogeneity, which calls for looking inward into a bounded system rather than external factors to that system, works in terms of system behavior (Sterman, 2009). According to Sterman, "(almost) nothing is exogenous" (Sterman, 2002, p. 505). Sterman offers an example of the weather (Sterman, 2002). Sterman notes that weather is endogenous as we "shape" it with our human actions and inactions (Sterman, 2002). Therefore, moving forward, variables such as structural determinants of health should be acknowledged as an endogenous part of the social system affecting health through human action and moral choice.

The next section presents gaps in the extant literature with analyses of how ST, SS, and CS can be useful in comprehending PH policy, bioethics, BIPOC health, and SGM health.

Chapter 3 Presentation of Published Works

3.1 Introduction

This chapter discusses sixteen publications, weaving together an explanatory narrative of the four themes. Third-person language is used to indicate citations of my articles and chapters analyzed in this exegesis.

3.2 What is the role of systems in public health (PH) policy?

Two publications are considered to answer this research question.

1. Framing and Revisiting Ethical Policy with a Systems Perspective (Battle-Fisher, 2015b)
2. The Public, Private, and "Stepping on Toes" in Healthcare (Battle-Fisher, 2015d)

Battle-Fisher frames the argument that ethical PH policy should be done from a systemic perspective (Battle-Fisher, 2015b). No one is untouched by policies though we might be unaware of policies working behind the scenes. Battle-Fisher frames the argument that with ST, the process of health policymaking and governance can better elucidate and engage problem situations that are resistant to change (Battle-Fisher, 2015b). As presented in 2.3, the WHO definition of health policy requires more systemic framing, and a new conceptualization is offered (Battle-Fisher, 2015b). It is important to make plain the inherent complex elements of not only the contents of a policy but also how the policy breeds complexity and affects citizens.

Policy governance is an act often divorced from the people affected by the policies. Policymakers are elected but the process of policymaking is often shrouded in mystery. This lack of transparency counters the full engagement of stakeholders toward improvement and emancipation through the "possibility of discourse" (M. Jackson, 2019; Ulrich, 2003, p. 332).

Midgley's discussion on Ulrich's boundary critique is useful here. Policymaking is being framed as systemic practice and intervention that may deal with social marginalization. To reconcile stakeholder participation, Midgley discusses the quandary of engagement when "2 or more groups of people make different value/boundary judgments, and the situation becomes entrenched." (Midgley, 2006, p. 467) Policymaking serves the public through imposed limits that govern public action for society's betterment. This

governance is one-sided as stakeholders are mostly not involved unless a policy measure with wide influence comes to the public vote. Even in this situation, the policy is debated and set forth on behalf of the public. To negotiate a boundary through discursive critique, false, even marginalizing judgments can be made toward the judgments offered by stakeholders (Midgley, 2006).

The linear assumption that the past behavior of a system alone is the generator of future events is misleading (Hodgson, 2019). This analysis does not override the fact that policy "bread crumbs" leave residual systemic effects on current health policy and resultant health (Battle-Fisher, 2015b). Social states are tied to past effects and follow a trajectory from their history (Forrester, 2007b). While past health disparities leave a path behind because they exist and continue, the behavior and structure of the current system are borne of current states which led to present outcomes resulting from the past systemic action.

Battle-Fisher breaks down the stringently applied dichotomy of PH and private illness (Battle-Fisher, 2015d). The way that illness is treated is based on a model of personalized care, one that treats one person at a time. While this model is proficient, though not perfect, in curing illness, it is wanting in affecting and elucidating population-level outcomes. There is an overlap between the public and the private. Often, discussions of public and private revolve around the public and private sectors of healthcare, service delivery, and how these institutions differently serve patients (Battle-Fisher, 2015d).

Sterman considers the probable effect of faulty models on policy by stating that "common mental models lead to erroneous but self-confirming inferences, allowing harmful beliefs and behaviors to persist and undermining the implementation of beneficial policies" (Sterman, 2006, p. 505). Shortcuts via mental models are often culprits in making misguided policy decisions. Battle-Fisher says that "the mental model is not the problem; failing to return to (and with) more nuanced analysis, accounting for the mental model is" (Battle-Fisher, 2015b, p. 9). The role of cognition in policymaking cannot be overemphasized. Irrational agents make the policies based on their irrational; frequently linear understanding of the social situation targeted by the policy.

Rothstein examines the stress PH faces in discordant approaches and interpretations (Rothstein, 2002, p. 146). Those in governance for people take varied approaches and understandings of what constitutes a personal relationship to health. While Rothstein

(2002) spoke to the lack of definition of PH, the system, albeit in the need of clarity, continues to work and needs policy to subvert it. According to Rothstein (2002), government and non-government stratagems should not be mixed in terms of operationalizing public health (Rothstein, 2002). In contrast, Battle-Fisher contends that the public and private by nature are interlinked and concentric, even in terms of harms, and making sense of public health required admittance of this for "some of our private lives has to give up for the sake of the public" (Battle-Fisher, 2015d, p. 25). The roles of PH, with or without definition, are assumed and policy decisions continue to be made, for better or for worse.

In the next section, the topics of general health inequity as a system and systemic inequity in the time of COVID-19 for BIPOC people are presented.

3.3 What is meant by health and its associated healthcare system being a "system"?

Two publications are considered to answer this research question.

1. Health inequality as a socially created social system (Battle-Fisher, 2021)
2. The 'Next Normal' of Health Equity: toward a disparity-free Future during COVID-19 (Battle-Fisher, 2024)

The state of PH outcomes changes, but disparities remain reliable at present. In other words, the fight against social disparity is against a moving systemic target as a persistent presence of social disadvantage within a stable state. The system supporting disparity needs help to remain at a desired steady state of equality. Society is unique as it is prone to change while simultaneously permanent with the continued presence of inequity (Battle-Fisher, 2021). The existence of disparities has a temporary state based on changes that accumulate, altering the new system which continues to marginalize (Battle-Fisher, 2021). The system may make slight changes to and from equality while it returns to an unequal social state even with a small displacement such as social interventions to make changes to the social system.

The BIPOC disparity in COVID-19 is customarily represented by epidemiological findings based on this knownness and quantification of what can be observed (Kay & King, 2020a). This ontological approach to complexity is contrary to what Kay and King call radical uncertainty (Kay & King, 2020b). The mission of intervention into epidemics is to

resolve. The goal of eradicating disparity is as an epidemic embedded in the crisis. Measurement within systems is experientially based, meaning there may be no variables not touched by social construction in making meaning. Meaning toward measurement is constructed to support discernment of how variables play out in a system.

A popular phrase, the "Next Normal," originated after COVID-19 to describe the upheaval and the difficulty of returning to the "normal" before the pandemic. It is time to focus on the systemic bottom-up redesign of health systems if a movement is to take shape as a more equitable normal (Battle-Fisher, 2024). With the "Next Normal" after COVID-19's arrival comes unprecedented challenges that are now acknowledged due to their gravity and scope on human society. This shift from global emergency designation in public policy signals a "formal movement away from social importance and political urgency of the continuing pandemic" (Battle-Fisher, 2024, p. 523). The disparate health outcomes remain as policies are rolled back.

While there is an application of the "Next Normal" that can be made for the state of public health under COVID-19, the "Next Normal" can account for the complex interplay of public health disparity, clinical care, political influence, and public health emergencies by infusing ST (Battle-Fisher, 2024). The "Next Normal" focuses on the acknowledgment and focus of business and economic upheavals (Sneader & Singhal, 2020). The public health goal is for the "Next Normal" to support a sustainable normal without unethical COVID-19 health disparities.

In the following section, issues concerning PH policy and disparity sensitivity in urban housing, and LGBTQIA+ affirming bioethics, and sexual minority women (SMW) breast/chest survivorship are described.

3.4 How complex are health disparities within the Black, Indigenous and People of Color (BIPOC) communities and the sexual and gender minority (SGM) communities?

Three publications are considered to answer this research question.

1. Social Disparity, Policy, and Sharing in Public Health (Battle-Fisher, 2015i)
2. Commentary on Cooley's "LGBTQI+ bioethics: a pre-queer theory bioethicist

reflects" (Feeling & Battle-Fisher, 2020)

3. Scoping Review of Experiences of Sexual Minority Women Treated for Breast Cancer. *(*Arthur et al., 2024)

Battle-Fisher frames systems structure considering social disparities found inappropriate in terms of U.S. housing policy to uplift equal opportunity in housing for resource challenged communities (Battle-Fisher, 2015i). A social determinant of health is safe, adequate housing. According to Rolfe et al., unsafe housing has been established as an influencer of unstable health and inadequate well-being (Rolfe et al., 2020). Using the example of social network effects of cultural and racial homophily on desegregation in minority neighborhoods, U.S. housing policy often worsened the problem by further entrenching the inequalities.

Schelling's Tipping Model uses a rule-driven, agent-based model to find the tipping point where agents favored in group preference-based "happiness rules" that favored flight from urban communities (Schelling, 2006). While a propensity for racial homophily was found, there is the need for context to rule-based analysis, which by design does not account for exogenous factors. Battle-Fisher highlights the systemic nature of social network effects as determinants of health inequities (Battle-Fisher, 2015i). For instance, social network characteristics have been found to have differences in health outcomes (Child & Albert, 2018; Smith & Christakis, 2008). For example, larger, denser networks have been found to support better health outcomes (Kawachi & Berkman, 2001). But Ajrouch et al. found that minorities had less dense networks which can have implications on the social resources that can be passed and used for optimal health (Ajrouch et al., 2001).

In terms of implications for health policy, social realities such as social network composition influence the health status that the policy targets. For BIPOC and SGM individuals, the policy has at times, deepened disparity while attempting to reverse it. These effects can be a sign of a flawed policy that does not account for the complexity inherent to the intended effects that the policy seeks to support (Sterman, 2000).

The paper by Feeling & Battle-Fisher highlights the shortcomings of linear thinking in understanding the complexity of breast/chest health using LGBTQ+ Bioethics (Feeling & Battle-Fisher, 2020). This commentary on LGBTQIA+ Bioethics discusses the lack of precision and attention given to SGM, specifically in Bioethics and the clinical care

field (Feeling & Battle-Fisher, 2020). These lessons can be extrapolated to PH in general as well. This commentary centers attention on the disparities experienced by this marginalized group. This work supports the thesis that understanding the SGM disparity situation requires a systemic lens to offer to affirm care, which may, in time, reduce health disparities among lesbian-identified people in breast/chest care (Feeling & Battle-Fisher, 2020).

SGM patients often encounter heteronormative, cisnormative health care including patient interactions, which are unethical and inappropriate for their unique needs (Kilicaslan & Petrakis, 2023; Utamsingh et al., 2016). Bioethics presently mirrors the current health system and has yet to account for the morally deserved needs of SGM people. LGBTQ+ Bioethics simultaneously requires acknowledgment of the need to center social difference for the marginalization of the SGM experience may result from an inequitable health care system. By centering differences inherent to the specific needs of those most in need of public health intervention, systemic action must flow with and not against the present structure of SGM healthcare as a complex system.

There are inherent problems that are unique to sexual minority women (SMW) who report a history of survivorship of breast/chest cancer (Arthur et al., 2024). Lim et al. said that LGBTQIA+ care must be culturally appropriate and sensitive to the specific needs of the SGM communities (Lim et al., 2018). Stigma and insensitive communication, as examples, mar clinical care, leading to a deepening of marginalization and stigmatization in clinical care (Lim et al., 2018). However, the accumulation of such events compounds the ill effects on morbidity and mortality in this group. It is ideal if, in the end, the action in healthcare were culturally affirmed and targeted reversing SGM community maltreatment to eradicate the disparities.

In the scoping review of critiqued qualitative studies of survivorship among SMW treated for breast/chest cancer, it was found that there are unique challenges for SMW with breast/chest cancer care (Arthur et al., 2024). Of the many unique challenges, SMW reported the detrimental heteronormative, cisnormative biased care both at the surgeon as well as the system/institutional levels (Arthur et al., 2024). Heteronormative depictions of “womanhood” tied to the breast/chest fall in opposition to an SGM framing of self-image which, for some in the studies, call for an act of resistance to prevalent norms taken on by the cancer survivors (Arthur et al., 2024). In addition, the

social isolation that may come with being a sexual minority has effects on the quality and durability of social support (Arthur et al., 2024). In terms of the uniqueness of SMW's lived experiences with breast/chest cancer, the systemic interrelationships between the factors are both at the personal and structural levels. Systems that are associated with adverse outcomes and the social complexities that support said disparities display the complexity of seeking care in a heteronormative, cisnormative system.

In the next section, the complex nature of unethical social norms that lead to unequal societies is explored in depth. The topics include systems modeling of political deliberation, the concept of ethical malleability, the introduction of the "Complexity Ethics" framework and gain/loss in complex ethical dilemmas.

3.5 How would applying systems thinking (ST) help explain the complex nature of unethical social norms and unequal societies?

Four publications are considered to answer this research question.

1. Communication and Politics in Healthcare (Battle-Fisher, 2015a)
2. Ethical and Systematic Approaches to Health Policy (Battle-Fisher, 2015f)
3. Transhuman, posthuman and complex humanness in the 21st century (Battle-Fisher, 2020)
4. Health Disparities in Public Health (Battle-Fisher, 2015g)

Battle-Fisher discusses systems and modeling beyond the anecdotal and applies them to communication around policy issues (Battle-Fisher, 2015a). Using the example of policymakers as "policy" puffins, the imprinted behavior of the seabird can be found in political behavior (Battle-Fisher, 2015a). Clustering based on attitude homophily may be misleading as association in a group is not always a sign of agreement (Goel et al., 2010). Battle-Fisher says that "strict adherence of political homophily at all costs breeds an environment where attribution errors and snuffing of novel information into the system can harm the public policy" (Battle-Fisher, 2015a, pp. 44–45). Binary choices of political position (pro versus con) may be due in part to the collective model of threshold behavior, which may explain the benchmark required for people to participate in deliberation (Granovetter, 1978). Choice does not always equate to action, but we start with a grounding principle that supports action to avoid dissonance.

PH is tied to the value-laden morality of its issues and how society navigates them. Battle-Fisher explores the interplay of ethics and health policy and introduces the complex nature of ethical malleability (Battle-Fisher, 2015f). This chapter further builds on the thesis that we make social decisions made under social stress (Battle-Fisher, 2015f). Ethical malleability, a complex situation of changing one's ethical stance because one can if without coercion, makes ethical deliberation and negotiation a shared social matter where social agents can influence each other (Battle-Fisher, 2015f). People have the right to change their minds, but there can be social repercussions for that decision. According to Battle-Fisher, "Politics and ethical decisions intermingle insomuch as the explicit rules come under constant scrutiny by a public that themselves stay malleable based on their exogenous factors that pull at them as well" (Battle-Fisher, 2015f, p. 58).

Ethics are dynamic socially and relationally influenced and should be treated as such. Bioethics tends to be individualistic in analysis utilizing clinical ethics, which concentrate on one-on-one relational ethical deliberation. The Complexity Ethics framework uses complexity principles to reconfigure how ethical deliberation and obligations are viewed and analyzed. Battle-Fisher presents the "Complexity Ethics" framework, in Table 3.1 (Battle-Fisher, 2020). Battle-Fisher approaches bioethics as a complexity-sensitive and cognitively rich search for causes and solutions within health and larger social environments (Battle-Fisher, 2020). The CE framework does not shy from CS and SS. CE uses ten CS-based strategies to untangle public health ethical dilemmas.

Principle	Analysis	Application
"Iterations"	-Requirement to continue to openly retool system model as systems by nature change over time - Multiple rounds of iterations leading to a boundless social inquiry	- An ethic can be revised and revamped at any time. The ethic has systemic circumstances influencing the follow-through or deferral of acting on an ethical stance.
"Energy"	-The forces of external factors on social determinants in open systems -Constant information and social turbulence	- Constant energy input (physical, moral, social, emotional) exists in social situations involving dilemmas
"Interdependent"	-Several interconnected, unique agents are part of the system - Level of engagement and influence on ethics may differ.	- Agents vary (e.g., people, organizations) and are connected in a social space where we demonstrate and uphold ethics.
"Malleable"	-Malleable and adaptable ethics based on network effects	-Social networks influence our ethics and with autonomy (with no coercion), we change them.
"Macro & Time"	- Macro and micro level ethics change over time	- Society-wide and personally held ethics are dynamic over time.
"Former into Future"	-Personal and population-level ethics change with a starting point of a "former" ethic	- Former ethics feed into future ethics. - All ethics, past, present and future, are connected.
"Emergence"	-Interactions between the internal system and the environment, broadly defined, which yield unique results	- Systemic behavior over time and space could demonstrate and support an ethical stance.
"Feedbacks"	-Forward momentum and negative setbacks complicate the explanation of the system - Complex and pattern-based with feedback on personal and collective ethics	- A person will experience positive (magnifying) feedbacks that strengthen ethics as well as negative (depleting) feedbacks that reign them in.
"Self-organization"	-Experience spontaneous (dis)order as internal energy spurs change that are resistant but are discernible in pattern - Order within an adaptable environment - There is no external influence, only local interactions in the social system that create and sustain a social order.	- People breed ethics through local interactions with people of the same or differing ethics.
"Chaotic Paths"	-Highly sensitive to change from initial condition/ dissipative structures	- There are twists and turns to one's social journey therefore ethics cannot be predicted with total certainty. - It is hard to know what will come about that will support or test one's ethics.

Table 3-1- Complexity Ethics Principles, Model Analysis and Applications (Battle-Fisher, 2020)

Battle-Fisher presents the argument that even a supportive social environment supporting an ethic, people engage in negotiating ethics as a process (Battle-Fisher, 2015g). In a discussion of heteronomy, a difference in collective values, and living organ donation, Battle-Fisher presents a taxonomy of a "potential" donor based on an ST lens (Battle-Fisher, 2015g). In doing so, donorship is an exemplar for similar ethical dilemmas that involve personal loss for public welfare. It is an interesting question to apply this loss/gain paradox to the issue of health disparities. While social disadvantage is different from the donation of a viable organ, there is a perception that someone gains while another incurs a setback or a loss. Living organ donation is altruistic. There is no appearance of altruism in inequality. However divergent they appear to be, ST illuminates the difficulty of binary assumptions about anything complex. People have different motives for acting and not acting. People are acting in their complex nature. In the next section, SS and its use of modeling are presented to dissect PH and, specifically, PH policy. Specifically, social network analysis and system dynamics are highlighted as tools to decipher social complexities related to PH policy and ethics.

3.6 What are the roles of systems thinking (ST) and systems modeling in understanding public health (PH)?

This is the primary research question.

Five articles highlight the application of modeling to understand public health (PH), public health (PH) policy, and the application of SS.

1. The Menagerie of Social Agents: People and Their Connections (Battle-Fisher, 2015c)
2. Health Systems and Policymaking as the "Price Is Right" (Battle-Fisher, 2015e)
3. Mental and Simulated Models in Health Policy Making (Battle-Fisher, 2015h)
4. The Concentric Model of Health-Bound Networks (Battle-Fisher, 2015j)
5. Public and Health professionals' misconceptions about the dynamics of body weight gain/loss (Abdel-Hamid, T., Ankel, F., Battle-Fisher, M., et al., 2014)

A discussion has circulated about the utility of models and systems-based analyses in PH prediction. Approaching disparities as merely the prototype model or as data may lead to a less than holistic understanding of the problem situations. Models beyond mental

ones are important and will remain so. While mapping out social experiences, which are approximations and biased to their creator, models, in general, are expected to be useful (Box, 1979). In this case, social models can only be helpful if the context is included in model conceptualization and creation. Model the problem situation of the real-world context not the system. Many overlapping systems defy understanding and attempting to model a completely inclusive model is futile.

The inclusion of Battle-Fisher lays the groundwork for introducing social network analysis as a framework undergirding sound health policies (Battle-Fisher, 2015c). According to Gamper, social networks can be applied to investigate health disparities, though few studies use this perspective of systems science with health disparities (Gamper, 2022). The fact that health is connected to social embeddedness and relational networks makes social networks a prime method to apply to health disparities (Klarner et al., 2022). The relational network (based on social relationship/ kinship ties) example in the chapter explores possible HIV risk in teens who are unhoused and the nature of bond formation within their "survival networks" (Battle-Fisher, 2015c). The "survival network" is comprised of three factors: personal networks, propinquity, and bond formation at risk for interdependence and conformity. The macro effects of HIV risk are not tied solely to personal culpability, but risk based on homelessness status as a collective (Aidala et al., 2005). In terms of implications for HIV policy for the unhoused, using social network findings is a good move, allowing the systemic changes and effects being unhoused has on teens to be infused into public policy.

Battle-Fisher employs game theory to investigate the balance between public sentiment and political plausibility that is often at odds (Battle-Fisher, 2015e). Game theory is the simulation of predicted outcomes among rational agents with an emphasis on strategy (Murnigham, 2018). In order to illustrate rational decision-making on the probability of success, Battle-Fisher uses the example, "The Price is Right" which is a televised game show in the United States (Battle-Fisher, 2015e). Using the standing ovation problem of peer effect, studied by Miller and Page, illuminates the strength of peer effect on public compliance (Miller & Page, 2007). The Living Organ Donation scheme that requires the public action upon one's stance of organ donation is amenable to game theory. If one donates, then that person has demonstrated their ethic and belief systems regarding donation (Battle-Fisher, 2015e). From a systems perspective, people are embedded in

social networks that may support or not support a person's stance. In addition, there is a threshold point where one will change their mind due to peer influence.

According to Miller and Page, a person may be protected is the threshold tip if there is comfort in one's decision based on the same demonstration of personal belief (Miller & Page, 2007). In terms of implications for ST, we are not rational agents though there is an element of peer influence that follows simple rules of engagement. This chapter ends with a discussion of how rationality in decision-making might affect policymaking (Battle-Fisher, 2015e). Using the example of policymaking during COVID-19, policymaking follows rational rules of modern decision theory (Berger et al., 2021). According to ST, components of the complex adaptive system follow simple rules (Amissah et al., 2020). Political strictures and rules govern us but often act to influence social rules.

Battle-Fisher's chapter offers a description of simulation applications of systems thinking to education, policymaking, and prescription opiate abuse (Battle-Fisher, 2015h). Battle-Fisher contended that it is working with the system and not against it that is the way to go (Battle-Fisher, 2015h). The problem with policymaking and the application of ST is that ST is typically not heeded. For instance, social networks can be used in a parsimonious fashion, limiting the model's breadth with meaningful boundaries and parameters that help comprehension (Ennett et al., 2006). In terms of the application of systems dynamics to PH, it is useful in "getting to the structural knowledge behind elements (of a system)" (Battle-Fisher, 2015h, p. 67). Gilbert et al. models for policy should show goodness of fit to the mechanisms at play and account for any context applicable to the policy problem (Gilbert et al., 2018). Gilbert et al. say that "the ability to make 'point predictions', i.e. forecasts of specific values at a specific time in the future, is rarely possible…More possible is a prediction that some event will or will not take place, or qualitative statements about the type or direction of change of values" (Gilbert et al., 2018, p. 14). Making forecasts is unadvised as it is a bounded, *a priori* simulation product of biased creators.

Battle-Fisher introduces a nested network model, the Concentric Model of Health-Bound Networks (CMHN), which visualizes the diversity and change in social support from diverse alters required to navigate chronic illness (Battle-Fisher, 2015j). Muller and colleagues noted that social networks, both in how it is populated and by whom, change drastically as we age, often decreasing due to

the loss of alters (Muller & Ellwardt, 2022). The network of dynamics of support across concentric networks has a specific social support role for the ego (person with chronic illness) (Battle-Fisher, 2015j) .

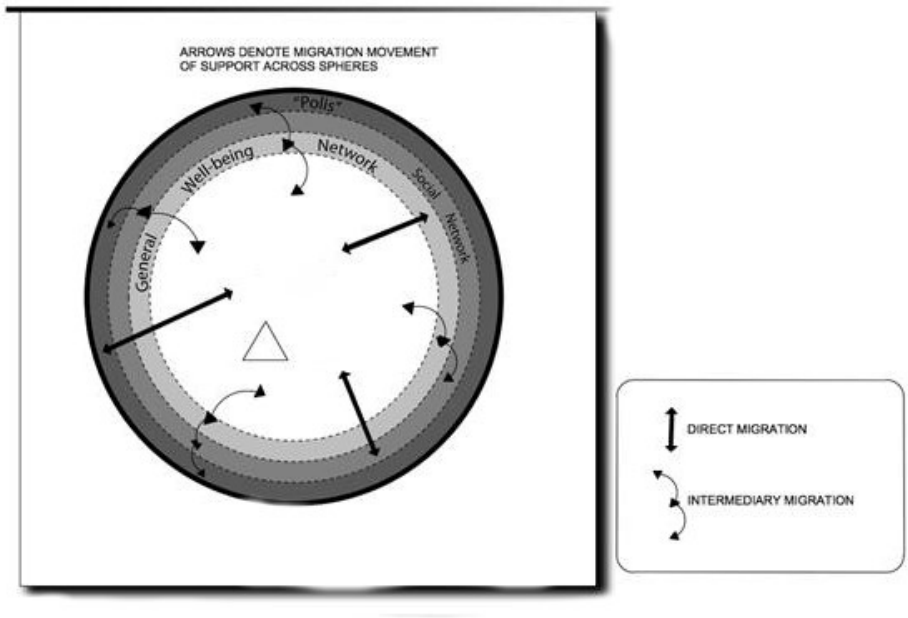

Figure 3-1- Concentric Model of Health Bound Networks (CMHN) (Battle-Fisher, 2015)

Reproduced from Application of Systems Thinking to Health Policy and Public Health Ethics- Public Health and Private Illness, Battle-Fisher, The Concentric Model of Health-Bound Networks, p.92, Copyright 2015.

The following four questions may be explored using the model.

1. Do networks where everyone knows everyone else provide better social support for the patient than networks where the only connection among members is directly to the patient, not to anyone else?

2. What effect does dividing up one's social life into several different tight, possibly concentric subgroups (cliques) have on a person's success in health compared with having one homogeneous network?

3. How does caregiver/physical/ mental stress affect the strength or the longevity of their relationship with the patient?

4. How do personal networks form, and how stable are they over time (considering the Concentric Model for Health Bound Networks)?

There are four concentric levels, called spheres, each having differing roles and natures in support of the CMHN. In Figure 3.1 above are the illness network (called "kidney network" in the figure for the chapter exploring End Stage Renal Disease) or health network, general well-being network, social network, and the polis. Each sphere represents differing degrees of connection in relationship to the ego's (patient "Shirley") illness, with the inner sphere standing for the most help and involvement (Battle-Fisher, 2015j; Newman, 2003). The reason for nesting the spheres was that alters can migrate across spheres based on the nature of involvement with the health network most intense and the polis, least (Battle-Fisher, 2015j). Those not involved at all in the ego's illness are in the polis, but it is a source of new ties and alters due to the changing state of gaining and losing alters across the various social networks (Battle-Fisher, 2015j). People dynamically migrate in and out, supported by structural folds, which connect the overlapping spheres (Battle-Fisher, 2015j).

Support during chronic illness hampers the health of vulnerable "social elastic ties," which can be compromised under the stress and responsibility typically found in the inner, more support-intensive spheres (Battle-Fisher, 2015j). Nodes that are connected to other nodes are meaningful in the network. Under this condition, the integrity of the middle of the social tie becomes compromised due in part to tension between the separating of the two nodes (Battle-Fisher, 2015j). The point is to reduce the tension on the tie to maintain the integrity of the elastic social tie. Battle-Fisher contends that resources that support social support and caregiving for people living with chronic illness can act as a resistance to pulling tension on the tie (Battle-Fisher, 2015j). This is important as migration across spheres and structural folds eruption can be generators of unwanted tension.

Abdel-Hamid et al. is included because it speaks to stock-flow failure and highlights the universal problem of stock-flow failures that can affect understanding health care (clinical) decision-making (Abdel-Hamid et al., 2014). An integral part of the healthcare system is the knowledge to systemic health information. The aim for inclusion here is the implications that faulty heuristics can have a direct influence on health outcomes. While stock accumulation and rate of change reasoning do not assure a negative health

outcome, this research has shown that such failures may have a far-reaching impact on clinical care. This article supports the point that the universality of ST failures can have negative implications for healthcare delivery and understanding complex clinical issues (Abdel-Hamid et al., 2014). Understanding the dynamics inherent to any system requires discernment of the complexity of a system failure.

A failure in some parts of the system leads to breakdowns and unintended failures in other parts of the system (Boardman & Sauser, 2013). There are systemic failures in the healthcare system. As presented by Jackson, systemic perspectives proposed five perspectives to understand structural system failings. They are:

1. Machine- mutual goal setting with connections of parts toward the efficacy of purpose and efficiency of resources

2. Organism- the viability of systems and subsystems, controlled resistance to turbulence

3. Cultural/political- consensus based on a reflexive challenge to systems that are subject to ineffectiveness and conflict (Battle-Fisher, 2015a)

4. Societal/Environmental- identify stakeholders marginalized in the process

5. Interrelationships- causality with issues of the previous four being interconnected

   (M. Jackson, 2019)

Consequences tied to failure can be negative in terms of public health influence on population health (Clay-Williams, 2022). Clay-Williams noted that unintended effects ripple as the system complexity increases leading to unpredictable results that appear foreign and unexpected accounting for the initial state (Clay-Williams, 2022). The healthcare system is prone to nonlinearity, and it is difficult to predict effects. Therefore, implementation of PH interventions that account for emergence, interdependence, nonlinearity, and unpredictability are required for larger measures of

success. The successes and failures tend to be analyzed using data though the impact of health outcomes may also be discerned qualitatively using ST.

Chapter 4 Discussion

4.1 Research questions

In summary, sixteen published works in Table-1.1 cut across four themes, initially presented in Chapter 1. These themes concentrated on the complexities inherent to PH disparities experienced by BIPOC and SGM communities in the United States.

1. **Systems thinking (ST) and systems science (SS) as perspectives and methods for understanding public health disparities;**

2. **Complex health disparities in the Black, Indigenous, and People of Color (BIPOC) communities;**

3. **Complex health disparities in the sexual and gender minority (SGM) communities;**

4. **Applying ST and SS to health policy and public health (PH) ethics.**

4.2 Key findings

With a theoretical reworking of health policy and PH ethics using ST, Battle-Fisher explores the highly resistant PH problem situations that require an ST approach and an application that is multilateral to capture dynamic complexities (Battle-Fisher, 2015b). The structural realities of PH messes are customarily approached with shortsighted, reductionist policies meant to affect complex problems with past effects that live on in current systems. A reworking of the definition of health policy using ST is presented, imputing ST where reductionist, reactive approaches and perspectives are widely in use. Policymaking is systemic but policy reactions are often blind to complexities that hamper approaching stubborn systemic issues with wide-reaching effects on society. The mental model based on linear thinking based on observations that do not fully capture and blind to complexity and uncertainty, is applied in health policymaking. In terms of implications for ethical deliberation and moral (un)certainties, its calculus is often interpersonal and without accounting of the structural complexities that came to a particular ethical stance.

Battle-Fisher offered a deliberative discussion of the political and ethical implications of the overlap of private illness and public health (Battle-Fisher, 2015d). Fundamental to this discussion is that the public at the macro level is diverse private citizens and their diverse health experiences. In PH, individuals make up the public, but the public or population-based is not composed of homogenous agents with similar health histories. Particularly for the dichotomy of the public and private forces a debate of how the effects of complex agents brought together as a public can be harnessed by PH initiatives. The lack of assurance of predictability in agents' actions to unjust health outcomes and the system's predictable reaction to social uncertainty affect the social system's maintenance in organization. Battle-Fisher stated, "Some of our private has to give for the sake of the public" (Battle-Fisher, 2015d, p. 25). In terms of personal liberty and social utility, while agents in a system do not follow lock-step rules, agents engage in a social play of diverse norms and uncertain actions. PH deals well with unraveling global-level disease but the complexity of humanness requires a sensitivity to the complexity of human engagement and human nature using ST.

Social network analysis as supportive evidence in the policy formation stage of health policymaking is underutilized. Battle-Fisher argues that social relationships and social transactions are fundamental to understanding the state of health policy affairs (Battle-Fisher, 2015c). Risk for HIV among the unhoused is embedded in a complex, network-based social context inherent to being unhoused which differs from the risk context for those stably housed. By outlining the fundamentals of social network analysis, the inherent systemic nature of health issues targeted by health policies requires queries and acknowledgement of adverse network effects that may result from short-sighted health policies. Highlighting the probable connection between risk for HIV and being unhoused, a case study applying social network analysis to "survival networks" is centered on social connection and social embeddedness on contagion of behaviors linked to HIV risk.

There is an oft-ignored relationship between a systemic understanding of health policy and the intricate nature of political discourse and debate in the health policy (Battle-Fisher, 2015a). Using the biological ecosystem, political colonies and the "policy" puffins as metaphors for political arenas and stakeholder policymakers, social relationships are

a key element in policy deliberation (Battle-Fisher, 2015a). By building arguments for the nature of political deliberation using social network analysis principles, homophilous relationships have the potential to impede innovation and stifle ingenuity that could help construct and enact complexity sensitive health policies. In addition, the flow of information within political networks are tied through direct communication ties and influential opinion leading policymakers may serve as bridges between political networks.

Using the example of tobacco policy networks in the U.S. Department of Health and Human Services, ideas can get lost along the ties between agents who are to be influential in tobacco control. There is a structural repercussion for policy due to lapses in network connectivity. It is also illustrated that a policy such as the Family Smoking and Prevention Act attempts to create more preventive distribution, sales, and PH marketing that supports the extinguishment of hazardous smoking behavior while allowing personal choice (Battle-Fisher, 2015a). To decrease population-level tobacco consumption, the systemic conundrum of autonomous personal action of the smoker and prescripts that support public safety are often at odds. The complexity of maximization of public health at the loss of some of the public's autonomy to participate in unhealthy behavior is the epitome of the structural mess taken on by PH.

Battle-Fisher presented the utility of game theory on understanding health system policymaking (Battle-Fisher, 2015e). Using the U.S. game show "The Price is Right" as an illustration of the rules of engagement with odds of success in rational decision-making, the external influence on decision-making is embedded in the structure of the relationship-centered system in which the decisions are deliberated, ratified, and acted upon. Using the example of a Living Organ Donation scheme in the U.S., the argument is presented that everyone is a potential donor who must articulate publicly their wish to be a living organ donor to governmental and medical bodies. Ethical stances on living organ donation are built as a collective, with members of the networks possessing different levels of influence and engagement in the decision to embrace a pro-living organ donor ethic and choice.

Battle-Fisher further builds on the thesis that people are embedded with people, affected by policy rules they did not make, and individuals are obligated to follow them

(Battle-Fisher, 2015f). By presenting the idea of ethical malleability, ethical deliberation is presented as a systemic event that requires ST to understanding how ethical stances are deliberated and agreed upon. Ethical malleability represents changing one's belief system based on current systemic conditions buoyed by endogenous and exogenous factors. Ethics and policy are intertwined. People constantly scrutinize policies and how they act under them as they may or may not presently harmonize with their current ethical stance. Battle-Fisher stated that "people have the right to change ethics and often act upon that right…when these decisions are made, the state of the moral system is thus affected" (Battle-Fisher, 2015f, p. 58).

Ethical deliberation is complex. According to Battle-Fisher, norms are steeped in possibly controversial decisions associated with living organ donation (Battle-Fisher, 2015g). Heteronomy, or network-based norm differences, highlights that ethical stances that are publicly acted upon such as donation are up for public scrutiny. Battle-Fisher presented a four-stage taxonomy accounting for systemic feedback based on potentiality of becoming an organ donor (Battle-Fisher, 2015g). It is also argued that based on inherent sensitivity to scope severity, the framing of collective loss and gain is embedded in a broader scope of effect on the public's health. The overall collective and personal ethic of living organ donation is publicly displayed through gain-frame (reward) and loss-frame (risk). From a systemic perspective, the effect of a health policy is tied to the emergent ethics that affect the supply of viable organs available for transplantation.

There is an underutilization of simulation models in health policymaking as the systemic model often ends with a mental model that has not been rigorously developed and tested. According to Battle-Fisher, "Sometimes we will not like the answer when the modelling…upends our pacifying policy realities" (Battle-Fisher, 2015h, p. 67). By leveraging appropriate points in a system, systems can react in response that supports positive health environments and outcomes. There is the technical art of simulation that is often absent in health policy making process. The power of simulation lies not in the pursuit of complex knowledge for knowledge's sake but in "the application of systemic knowledge that is gained and ideally (applied) with prudent judgement and systemic consideration" (Battle-Fisher, 2015h, p. 74).

Housing policies in the U.S., while enacted to reverse disparities in housing, have entrenched an unfair lack of access to fair housing and created an inadequate quality of housing in resource limited neighborhoods. The unintended consequences in systemic housing environments cannot be divorced from historical discrimination entrenched in U.S. housing policy. While the effects within a system can be unintended, there was intentionality in the social and political mechanisms set forth in the creation and use of unfair housing policies that birthed inequality. According to Battle-Fisher, "Just as a system variable leaves behind a history, so does the veiled history of people of color" (Battle-Fisher, 2015i, p. 79). Calling upon Schelling's Tipping Model to explore social segregation in the U.S., racial tolerance is quantifiable with agent-based models demonstrating certain thresholds of tolerance of racial diversity in neighborhoods, in addition, resilience in urban social networks highlights susceptibility of cohesion to social stratification bolstered by public policy.

Considering lifespan physical and mental changes and concerns, the network of support for the chronically ill matters (Battle-Fisher, 2015j). Morbidity and mortality likely worsen in old age. Maintenance of a social network is key to improving health outcomes in the chronically ill. The Concentric Model of Health-Bound Networks (CMHN) is introduced, modeling a dynamics-sensitive model of social support for egos (patients in an ego network) living with social support-dependent illnesses such as chronic kidney disease (Battle-Fisher, 2015j). The Concentric Model of Health Bound Networks (CMHN) permits the social network complexity to be fundamental to the understanding of the nature of caregiving for chronically ill patients.

Battle-Fisher introduced the "Complexity Ethics" Framework to understand a dynamic social movement (Battle-Fisher, 2020). A novel framework, the Complexity Ethics (CE) Framework, broadens ethics to an iterative process to include people coexisting in a morally challenged world. CE surveys morality in health outcomes with the principles of CS & and provides an external and explicit model representation for bioethics to follow (Battle-Fisher, 2020).

By breaking ethical rules and deliberation using CS and ST, discernment of moral dilemmas better captured how ethics are navigated and negotiated. Health inequity and its social drivers that determine health outcomes make up a socially constructed system

(Battle-Fisher, 2021). Rather than relying on granular analysis that does not dig into the dynamics of a system, ST can be used in this case to sort out the universal patterns of health disparity. Battle-Fisher introduces the Systemic Ethical Disparity Framework as a guide to decipher the systemic factors that can be generally applied to public health issues, including those with intractable ethical dilemmas:

1. Social factors are structural and dynamic over time.

2. The dynamic "how" and "why" are as important as the static "what".

3. Social complexity is not the same as individual situations.

4. Disrupting an unethical system requires approaching systems as dynamic and resistant to forecasting in an expected or assumed social trajectory.

5. Unjust societies bring about unjust action. (Battle-Fisher, 2021)

Abdel-Hamid et al. assessed understanding stock and flow (SF) relationships about the dynamics of weight gain/loss using a stock-flow exercise (Abdel-Hamid et al., 2014). The universality of system thinking failures can have negative implications for health care delivery and understanding complex clinical issues. The experimental task tested lay persons' and healthcare professionals' (HCPs) understanding of dynamic SF relationships in weight gain/loss. The SF task required subjects to determine how body weight (energy stock) and caloric intake (the inflow) relate and vary in a holiday overeating scenario. Out of 621 subjects across 7 countries,76% of lay persons and 71% of HCPs incorrectly understood the impact of energy expenditure and food intake on body weight (Abdel-Hamid et al., 2014). This result supports the presence of this particular stock-flow heuristics failure across countries and cultures within the study sample (Abdel-Hamid et al., 2014).

Feeling and Battle-Fisher explores the holistic nature of unethical disparities for communities experiencing disparate health disparities (Feeling & Battle-Fisher, 2020). For the sake of argument, breast/chest health is an issue of huge concern to lesbian, trans men, nonbinary, same gender loving and gender nonconforming people who have mammary tissue. Possession of mammary tissue requires regular mammograms, but that is not happening for many of those patients, which relates to disparate

breast/chest health outcomes. Inclusive bioethics is authentic to lived experience when health care bases the care on the unique sexual and gender-based complexities.

Under COVID-19, health disparities are present, particularly for minoritized populations. A systemic bottom-up redesign is required when evaluating health disparities experienced by disadvantaged communities (Battle-Fisher, 2024). Adapting to the bottom-up conditions of health is challenging. It requires a new orientation of how healthcare before and after COVID-19 operates. With the "Next Normal", there are challenges inherent to the novelty with COVID-19 that are now acknowledged due to their far-reaching scope of the pandemic on human society (Battle-Fisher, 2024). This commentary discusses the potentially problematic use of the "Next Normal" calling for some changes using ST that would account for the dynamic complexities of PH disparities after COVID-19.

In Arthur et al., a scoping literature review over the last 20 years of breast/chest cancer survivorship experiences among sexual minority women (SMW) uncovered both illuminating findings as well as missed opportunities to support that population affirming through that research (Arthur et al., 2024). From an initial 121 studies, eight qualitative articles passed Joanna Briggs Institute (JBI) quality assessment and ultimately underwent thematic analysis by the paired reviewers. After synthesis, the thematic findings were based on the Sexual & Gender Minority Health Disparities Framework. First, the analysis offered four major themes:

- Individual - appearance and function of the breast/chest; self-image and "womanhood"
- Interpersonal- partnerships and relationships; social support and isolation
- Healthcare System- surgeon level; institutional level
- Sociocultural and Discursive- politics; culture of survivorship after breast/chest cancer (Arthur et al., 2024)

4.3 Contribution to knowledge

In terms of contribution to knowledge, employing ST and SS addresses gaps in the PH knowledge that currently relies on linear thinking and traditional application from reductionist analysis. As presented in this conceptual investigation, ST has not been widely applied to investigating health disparities in the BIPOC and SGM communities.

Framing the marginalizing system as systemic opens the possibility of uncovering the complexity and uncertainties inherent to disparate health outcomes for these populations. There are practical applications of ST to PH research. In this exegesis, it has been shown that there are potential opportunities for multimethodology with PH policy, bioethics and alongside conventional methods such as epidemiology. Retooling approaches to understanding the underlying drivers of BIPOC and SGM health and its application to real-world governance is integral to positioning ST as fundamental to combatting policy reactance and policy missteps.

Second, ST is fundamentally a science of application and doing based on ST. ST challenges assumptions that reductionist methods and approaches lack the acuity to tackle dynamic and complex questions. ST and, to a lesser extent, SS requires buy-in from PH to use and promote its use. Lastly, there are policy implications that translate to linear thinking applied to the complex health disparities of these populations. ST is required for breaking down our understanding of complex, uncertain systems that are lived by real people with complex lives and experiences, which, in this case, may also be marginalized due to group affiliation that equates to social disadvantage in health outcomes.

4.4 Theoretical and practical implications

ST is a theory-based actionable perspective with methods that are based on unmasking complexity inherent to social states. ST is a prime example of how theory directly informs practice. In addition, as lived experience is complex, ST may render discoveries that hold to the specificity of experiences with the health of groups that are historically and currently marginalized. Case in point, the power of simulation offers a visual narrative of a social phenomenon that could then be employed, increasing the probability that health policymaking accounts for complexity. In addition, the triangulation of seemingly opposing methods (multimethodology) results in richer, more inclusive analysis. The “data” resulting from ST may be more equitable and inclusive as the analysis would account for complexity. Data as applied to understanding health disparities may marginalize what is being measured through limitations of the data that may fail to encompass the experience the effects of social drivers of health. ST when coupled with conventionally accepted PH methods may add a way of discerning uncertainty that may be missed by reductionist methods alone.

4.5 Limitations and Recommendations

There are limitations to this analysis. The works included in this exegesis were existing, previously published works taken over nearly ten years. While this is a common thread of PH scholarship over the works, the scholarship does cover a journey of research progression that was not previously mapped out in preparation for this exegesis. The bias/subjectivity of the researcher in the research is acknowledged. The researcher is a self-identified marginalized person studying two distinct categories that are within marginalized systems of which they are personally a member. However, it is to be noted that the investigation is based on ST and SS methods, the researcher intentionally chose, and judged questions based on their accepted approach and research experience in the issue of health disparities. Other limitations are the bounded reality of the researcher and the bounds of the systemic view to make sense of a system. Applying the systemic view is retrofitted to positivist outcomes in a traditionally reductionist discipline. It is further acknowledged that there is a reconciliation of systemic analysis with positivist outcomes. To be added to the PH literature as a viable option to complement reductionist methods, there is a responsibility placed on the ST researcher to gain their place and prove that worth since it appears to counter conventional wisdom and approaches. Lastly, the possession of ST knowledge may not translate to systemic action.

In terms of recommendations, more ST and SS is needed in PH research, to demonstrate systemic phenomena through mapping and simulation. In addition, the use of multimethodology that pairs ST and SS with conventional analytical methods, accepts the place of systemic modelling that goes beyond mental models. More research is required to discern the complexity of the social drivers of health disparities among BIPOC and SGM people. Further, it is recommended that ST and SS intentionally apply ST to applied PH issues such as disparate health outcomes among marginalized groups.

4.6 Future research and concluding statement

In terms of future research, ST has the potential to be actionable in the pursuit of equity which is an aspirational goal of PH. PH needs to acknowledge the benefits of ST in doing the work of PH. Moving the exploration of health disparities to include ST and SS, answering dynamic questions regarding their complex causes and effects is more likely possible. What must be determined is not solely why research is useful but how it can be practically used by the communities in dire need of complex levels of intervention.

The study of health disparities is not new; but it has been largely reductionist in approach therefore missing opportunities to elucidate its complex nature. To impact the science of PH, openness to innovation in praxis and epistemology is necessary. The test of real-world PH is the states of morbidity and mortality. Traditional methods do not fully explain them and have concentrated on outcomes rather than upstream causes. There are lives living what the data finds. Capital T truth brings to the discussion whose truth is being measured. With ST, what is inherent is the ability to accept the fact that we are all agents of the dynamic social system. And PH is no different.

The PH investigation centers on interdependent states of being required as innovation offered by SS. This exegesis supports the need to dissect the systems for real-world impact. In addition, because PH is a practical discipline, ST is built for practical application. To conclude, the published works based on the themes address the necessity of an evolution for PH research and practice, one that harnesses complexity and systems to discern dynamicism of health disparities.

4.7 Personal reflection

Dynamic questions that require a radical reimagining of PH. Dynamic questions need answering. This work does not replace but rather complements traditional methods and paradigms. The scholarship in this exegesis radiates from three epistemological perspectives: public health in practice, the use of the humanistic, lived lens within the social environment, and the application of SS and ST. The use of ST opens many opportunities to join transdisciplinary teams exploring public health implementation and effectiveness.

4.8 Closing remarks

There is potential in engaging and delving into the nature of health experienced by BIPOC and SGM communities purposely taking a systemic lens and methods in policy and bioethics. While many of the studies in PH do not explicitly take up hypotheses or questions discerning complexity in applied policy, employing ST in PH, whether alone or in combination with conventional PH methods, can fill the gap.

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