A conceptual model of social networks and mechanisms of cancer mortality, and potential strategies to improve survival: an invited commentary

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Abstract

In this article, the importance of social factors for cancer survivorship has been theoretically considered and empirically studied. This commentary and Kroenke's narrative review highlight how social network theory and methods may innovatively expand this substantive body of work. First, we add to a new understanding of cancer survivorship through: (a) discussing the delineation and differences between multiple social factors of interest across existing conceptual models; (b) characterizing their relationships to each other and to cancer survivorship through a social network lens; and (c) overall, sharing terminology and strengthening connections within this diverse body of literature. Second, we note opportunities for future research in terms of (a) simultaneous measurement of multiple social factors at different levels and (b) adaptation of designs to leverage and measure the theorized mechanisms. This commentary describes how incorporation of social network research can optimize research, practice, and policy contributions regarding cancer survival and survivorship.

Keywords

Social networks, Cancer survivorship, Cancer survival, Social factors

INTRODUCTION

The significance of social factors for the health and survivorship of patients diagnosed with cancer cannot be understated. They are centrally situated in most theoretical frameworks used to understand cancer burden and survival [1–10]. Several lines of empirical evidence have sought to examine and intervene upon relationships between social factors and cancer survivorship [9, 11–20]. Social network theory and methods have not been well-integrated into this body of work. Further, theoretical frameworks and lines of empirical evidence in cancer survivorship and survival have not leveraged each other's contributions, in that they have honed into one social factor without describing other potential factors (e.g., only social support and only social networks). Kroenke's narrative review provides significant contributions in terms of providing (a) an overarching framework that integrates previous conceptualizations of social factors and incorporates specific social network elements and (b) a list of priorities for future research, including specific gaps

Implications

Practice: Existing approaches to improve the health and well-being of cancer survivors and their networks (e.g., peer supports and patient navigation) may gain from aligning with social network frameworks to optimize healthcare coordination, maximize health-protective spill-over effects, and ensure other positive consequences.

Policy: Conceptual frameworks and empirical research concerning social networks and associated mechanisms may be helpful for specifying targets for policy intervention to reduce populations' cancer burden.

Research: Researchers can contribute innovations to our understanding of cancer survivorship through more precise conceptualization and related simultaneous measurement of multiple social factors at different levels.

in measurement and coordination across different studies.

The objectives of this commentary are twofold. First, I briefly describe a substantial body of conceptual frameworks and empirical research focused on the role of social factors for the survival and survivorship of patients diagnosed with cancer. I consider them separately to highlight the respective gaps in theory and empirical research concerning cancer survivorship and survival. Second, I discuss why Kroenke's review is important for both theory and empirical research in cancer survivorship.

SOCIAL FACTORS AND CANCER SURVIVORSHIP: WHAT HAS BEEN DONE?

Below, we examine what has been done in terms of theory and empirical research concerning cancer outcomes and social factors at micro- and mesolevels. For the current paper, the microlevel addresses social processes and effects that occur at intrapersonal

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(e.g., perceived/subjective norms) and interpersonal levels (e.g., family dynamics) [21, 22]. The meso-level addresses factors and processes occurring at neighborhood, community, and organization levels (e.g., social cohesion and residential segregation) [21, 22]. We focus on these levels and do not consider structural forces at the macrolevel (e.g., history and political dynamics), as they are relatively better represented in empirical research on cancer survival and survivorship.

Conceptual frameworks

Below, I highlight how different frameworks on cancer survivorship and survival have conceptualized social factors at micro- and mesolevels, including how they are defined and potential mechanisms.

Microsocial factors in conceptual frameworks

Microsocial factors in conceptual frameworks have been, historically, well-represented, including in frameworks focused solely on survivorship [1–9] and generic frameworks that have been used to understand survivorship (e.g., Social Cognitive Theory and Theory of Planned Behavior [23–26]).

Social support arguably is the best-represented microsocial factor. Usually, it is conceptualized at the interpersonal level and represents a series of health-positive interactions with one or more individuals via one-on-one or group interactions. One can delineate social support by type of person or interaction. There is some variation in terms of how the type of person providing support is incorporated into conceptual models. Some, but not all, frameworks have conceptualized social support exclusively or distinguished in terms of family members (e.g., spouses/romantic partners, parents, and children) from other supports, which may be due in part to family members' disproportionate service as caregivers during the cancer experience [3–5, 7]. Models also specify the impact of support from health professionals; however, this type of support from medical providers is not consistently labeled as social support [6, 7]. With regard to type of interaction, most frameworks do not differentiate between emotional, informational, appraisal, and logistic support or focus singularly on emotional support. This may be because the direction of relationships with cancer outcomes is hypothesized to be the same, even if the magnitude may differ. The mechanisms by which social support has been theoretically tied to cancer survivorship have largely been intrapersonal in nature, including (but not limited to) increased self-efficacy and knowledge [5, 6, 24, 26]. The detailed consideration of these intrapersonal mechanisms is a strength of the literature.

Kroenke's review suggests that other microsocial factors (e.g., social isolation and strain/obligations) receive relatively less attention compared with social support. On the one hand, models do not

often explicitly name these factors (see Ref. [3] as an exception). Thus, it may be that these factors and their relationships with cancer outcomes are less often considered in conceptual frameworks relative to the scholarship focused on social support in cancer survivorship and survival. On the other hand, these other microsocial factors may be implicated in some conceptual frameworks as the opposite extreme of experiencing social support [9]. Thus, they may receive the same amount of theoretical consideration as social support, representing different ends of the spectrum (e.g., social support $\longleftrightarrow$ social isolation/strain). A conceptual problem remains, if that is the case. While social factors may have different relationships to cancer outcomes and may seem oppositional, they often occur simultaneously and may need to be theorized as such. There are benefits to such a dialogue, as these factors may not only co-occur as independent factors but may also act as buffers/catalysts (effect modification) or as mechanisms (mediation) to one another. Further, the mechanisms underlying their relationships to cancer survivorship may differ from those related to social support.

Mesosocial factors' inclusion in cancer conceptual frameworks

Mesosocial factors' inclusion in cancer conceptual frameworks has been increasingly common with the advent of multilevel frameworks and the focus on cancer disparities [1–7, 10]. On the one hand, it appears as if mesosocial factors have gained more popularity "in the mainstream", as the importance of understanding vulnerable groups (vs. privileged groups) has increased [3, 5, 10, 19]. Alternatively, the presumed "growth" in mesosocial theory as applied to cancer survivorship may be a result of increasing consensus and explicit labeling of these processes as social.

While increasingly common, conceptual multilevel frameworks for cancer outcomes including mesosocial forces have not often leveraged theory outside of the context of cancer. This represents a gap in the literature; several theoretical frameworks outside of the realm of cancer scholarship have differentiated between mesosocial factors and outlined their relationships to each other and to microsocial processes [27–33]. These frameworks have however less often been leveraged when developing multilevel conceptual frameworks in cancer scholarship, as described below. Overall, mesosocial factors have been conceptualized together, resulting in limited detail about how different mesosocial factors connect to other and to microsocial factors in the context of cancer survival and survivorship.

In the context of theories about cancer survivorship, there is a class of mesosocial factors that can be understood as contemporary consequences of macrosocial processes, including historic and current societal/institutional/structural forces. These

include residential segregation by race/ethnicity, concentrated poverty, and social disorder, which are among the most well-discussed in terms of their independent and cumulative effects [3, 5, 10, 34]. With regard to racial dynamics, the majority of work has focused on mesosocial factors' contributions to the disproportionate cancer burden African Americans face [10]. This focus can be potentially understood with regard to the unique severity and persistence of this burden for this population relative to other racial/ethnic groups as well as the extent to which reliable data are available across time. The mechanisms by which these factors have been tied to cancer survivorship are usually through access issues, mesosocial factors described below, microsocial factors (e.g., family dynamics), and intrapersonal factors (e.g., self-efficacy).

Another class of mesosocial factors can be conceptualized at the community level and understood as dynamics occurring within specific contexts. Some of these factors include social cohesion, capital, resources, and norms [3, 5, 7]. To note, the "community level" is not consistently defined. As such, the boundaries in which these factors operate vary. For some, the community level can be very local and focus on a specific neighborhood and/or geographic area. For others, community level is not necessarily tied to geography, but rather to culture and shared identities (e.g., race/ethnicity, nationality, and language). Another issue concerns how multiple factors are conceptualized. Specifically, social cohesion, capital, resources, and norms represent distinct constructs with different theoretical conceptualizations across socio-behavioral fields. Social capital, for example, is conceptualized at the microsocial level by some scholars and at more contextual levels (meso and macro) by others in other bodies of work [35–37]. Yet, social cohesion, capital, resources, and norms are often grouped together at the mesosocial level and appear conflated in theoretical frameworks for cancer survivorship. A lack of nuance and consideration of these factors within cancer scholarship may result in a less precise conceptualization. How these factors, at the same level, intersect is also less often conceptualized in frameworks pertaining to the health and survivorship of patients diagnosed with cancer. Social cohesion/capital, for example, may result in greater resources or may buffer the impact of residence in a low-resourced setting. In terms of their effects, interpersonal/microsocial and intrapersonal factors described above are often considered the mechanisms by which social cohesion, capital, resources, and norms affect cancer survivorship.

What about social networks in theories about cancer survivorship and survival?

While some frameworks including meso- and microsocial factors have named social networks [3],

relatively little work overall has specified the structure and dynamics of these networks (e.g., structural holes and brokering) in the context of cancer survivorship and survival. This gap may contribute to issues described above, including the existence of multiple co-occurring social factors and a detailed understanding of *how* they intersect. For example, describing the structures of social networks in terms of whether relationships reflect individuals influencing others' behaviors and characteristics (social contagion) or exist because of individuals preferring others who are like them in the behaviors/characteristics of interest (homophily) may help clarify social norms and why support may be more predictive of cancer outcomes than social strain (based on alters' positions to each other and the ego of interest).

Empirical research

Research concerning the role of social factors for cancer survivorship reflects the tendencies, strengths, and limitations of the aforementioned conceptual frameworks. Social factors may be well-studied, but may not necessarily be primary objectives for studies with sufficient sample sizes and "high-quality" designs (e.g., cohort studies and randomized controlled trials). Thus, the ability to measure many social factors across multiple levels simultaneously and the ability to examine relevant associations (e.g., mediation and moderation) may have been and continue to be hampered.

Microsocial factors have been empirically well-studied in the context of cancer survivorship and survival

There is an abundance of observational and experimental studies concerning social support and cancer survivorship [5, 11, 12, 15, 23–25]. There are also studies that have focused on other social factors, including isolation and social strain [9, 38–41]. Some current gaps/opportunities for future research exist. As noted by Kroenke, there are relatively few studies that have simultaneously measured multiple microsocial factors. For example, some research has focused support from specific types of people (e.g., family and providers), but not many have not simultaneously assessed support from multiple types of people (see [38, 42] as exceptions). While it may be possible to make such comparisons via reviews, studies focusing on support provided by healthcare professionals sometimes use different terminology (e.g., information provision [43]) and/or focus on communication styles [44–46] rather than the support provisioned. These differences in focus may make it challenging to compare evidence regarding provider versus nonprovider support. Relatedly, most research has singularly focused on emotional support, although there are studies that have compared its significance to other subdomains of support [42, 47]. Finally, there is relatively limited literature comparing social support with social isolation and social

strain [38, 48]. Second, while mechanisms have often been described in frameworks, they have only recently begun to be measured. Studies also have not empirically examined multiple mechanisms in the same study.

Mesosocial factors have also been empirically measured in the context of cancer survivorship and survival

Factors that have been particularly well-documented as determinants of cancer outcomes are area-level poverty, racial/ethnic segregation, and social disorder [17–19, 49–51]. There are relatively fewer studies empirically assessing the roles of social cohesion, capital, and resources for cancer outcomes [16, 52]. Social norms are among the least studied, despite their representation in most conceptual models. In addition, little empirical work has examined how these mesosocial factors intersect with microsocial factors and other potential mechanisms/moderators. Relatedly, there is a dearth of how these factors connect with macrolevel processes, including those occurring at historical and political levels (e.g., residential patterns/migration).

What about the empirical characterization of social networks in cancer survival and survivorship?

Several empirical studies have examined the relationships of social networks and cancer survivorship. However, most of this work appears to be a result of observational studies specifically designed to capture social network data [38, 47, 53, 54]. With regard to interventions, Kroenke highlighted several intervention approaches that leverage social networks/processes, including patient navigation, which leverages networks within healthcare systems; peer social support, which can include adding new individuals who are also patients to patients' networks; interventions leveraging existing networks (e.g., family and religious groups); and communication training to facilitate and optimize social interactions occurring within networks (e.g., patient-centered communication to optimize patient adherence to provider recommendations). These interventions can be framed in terms of Valente's [55] groupings of interventions that focus on social networks. For example, some intervention approaches focus on optimizing the effectiveness of specific individuals engaging patients (e.g., navigator as an opinion leader/critical node and communication training to improve node's influence) and other intervention approaches focus on overall network structure and processes to improve the supportiveness of patients' social environments (e.g., peer supports, religious groups, and family as forms of alteration/induction). Potential theorized effects of how social networks could be used through these interventions to influence cancer survival and/or survivorship include optimal healthcare coordination, due to a strengthened network and spill-over effects through participants' social

networks, due to social contagion. Social network methods and theory however are not often incorporated into the evaluation of intervention approaches (such as those described above) that may improve cancer survival and/or survivorship through social networks (see Ref. [14] as an exception).

SOCIAL FACTORS AND CANCER SURVIVORSHIP IN THEORY AND EMPIRICAL RESEARCH: WHY IS KROENKE'S REVIEW IMPORTANT?

Kroenke's model is important for multiple reasons. First, it offers needed nuance regarding social factors that have previously been difficult to incorporate into larger, overarching models on cancer survivorship. Why is nuance needed? Because we may have areas wherein we are not conceptually consistent (e.g., the relationship between social support and strain; the distinction between social capital, norms, and resources) and/or are not aware of each other's relevant contributions (due to different terminology/framing). Given its focus, we can begin a conversation regarding these issues and begin to understand what terminology may be most useful to standardize to unify a large, diverse body of work. Because of this specificity, we have new explicit hypotheses and directions concerning how micro- and mesosocial factors fit together in terms of cancer survivorship. For example, we can leverage our understanding of social networks when considering social support and structural social forces. We can also specify behavioral and biological mechanisms through a more comprehensive understanding of social factors at multiple levels. This model finally enables conceptualizations about effect modification and mediation between social factors that may elucidate earlier conflicting findings (e.g., differences by stage at diagnosis and differences across cancer sites). Overall, this model serves as an exemplar for how overarching conceptual models focused on outcomes/conditions (in this case, cancer) and domain-specific models (in this case, social factors) may converge to allow for consensus—or at least awareness of disagreements—across a transdisciplinary workforce of researchers, practitioners, and policymakers.

This review is also relevant in terms of priorities for future empirical research. Overall, there is a need to measure more social factors and to do so simultaneously. This involves research that includes meso- and microsocial factors as well as health-protective and health-averse factors. Such work will allow us to compare relationships in terms of direction and magnitude as well as their joint/independent effects. There is also a need to examine mechanisms and effect modifiers. Finally, with regard to interventions, we provide some direction for future intervention planning, adaptation, and evaluation. Leveraging social network theory and methods may also be helpful for both one- and multilevel cancer survivorship interventions, as they

provide a direction in terms of processes underlying intervention success; options for increasing feasibility and sustainability beyond intervention events (e.g., via social contagion/spillover effects); and useful analyses to assess the breadth and depth of intervention effects.

CONCLUSION

This commentary reviews a sizable body of work and describes how incorporation of social network theory and methods can result in future innovations for theory and research regarding social factors and cancer survivorship. Overall, there is a need to strengthen connections throughout the diverse audiences interested in this topic by identifying areas of potential disagreement and standardizing terminology. Leveraging social network methods and theory can help us to elucidate the specific relationships between social factors at different levels and optimize our current efforts in cancer survival and survivorship.

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Compliance with Ethical Standards

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