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A Lifecourse Model of Multimorbidity Resilience: Theoretical and Research Developments

Andrew V. Wister1, Katherine L. Coatta2, Nadine Schuurman3, Scott A. Lear4, Miriam Rosin5, and Dawn MacKey5

Abstract
The purpose of this article is to advance a Lifecourse Model of Multimorbidity Resilience. It focuses on the ways in which individuals face adversities associated with multimorbidity and regain a sense of wellness through a complex, dynamic phenomenon termed resilience. A comprehensive review of 112 publications (between 1995 and 2015) was conducted using several comprehensive electronic data bases. Two independent researchers extracted and synthesized resilience literature with specific applications to chronic illness. The article outlines five stages of theoretical development of resilience, synthesizes these with the aging and chronic illness literature, builds a rationale for a lifecourse approach to resilience, and applies the model to multimorbidity. Cultivating and maintaining resilience is fundamental to functioning and quality of life for those with multimorbidity. We found that there are a number of gaps in both basic and applied research that need to be filled to advance knowledge and practice based on resilience approaches.

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Keywords
resilience, lifecourse, multimorbidity, multilevel model, aging

In late adulthood, there is an increased likelihood of being diagnosed with chronic illness—conditions that are characterized by a slow progression and lengthy duration, with fluctuating symptoms, disability episodes, and uncertain outcomes (Gill, 2004; Institute of Medicine, 2012). There is also a higher risk of facing multimorbidity with advanced age, which is the co-occurrence of two or more chronic illnesses. For instance, in Canada, approximately 55% of adults 65 to 79 years old and 78% of adults 80 years or older report having two or more chronic conditions (Public Health Agency of Canada, 2010). Multimorbidity compounds the effects of living with individual chronic conditions by magnifying symptom burden and complexity. In recent years, the focus on multimorbidity has grown, due to rising prevalence rates and the potential for pathogenic synergistic effects across diseases that may magnify deleterious effects on quality of life, especially as individuals’ age and experience decline in coping ability (Pearlin, Schieman, Fazio, & Meersman, 2005; Trivedi, Bosworth, & Jackson, 2011). At a structural level, longer hospital stays, increased use of health care resources, and decreased productivity have been associated with multimorbidity (American Geriatrics Society Expert Panel, 2012).

Given that chronic conditions are long lasting, often entail pain or discomfort, and limit activities of daily living and performance of social roles, they are frequently conceptualized as pathogenic processes or limitations. The well-established disablement process, for example, is defined as difficulty accomplishing desired activities in any domain due to health or physical challenges (Verbrugge & Jette, 1994, p.3). In addition, the earlier notion that “successful aging” entailed the absence of disease, physical and cognitive capacity, and social engagement (Rowe & Kahn, 1997), but has been challenged by more recent models that conceive of successful aging as “resiliency to various challenges” even in the face of advanced age, chronic illness, and reduced function (DiPietro, Singh, Fielding, & Nose, 2012, p.1). Growing attention has been devoted to what has been labeled “living well,” “positive deviance,” or “positive valence,” conditions in which older adults maintain high functioning and well-being in the face of multimorbidity (Rybarczyk, Emery, Guequierre, Shamaskin, & Behel, 2012; Sells et al., 2009). The apparent contradiction in these perspectives has led to what is known as the well-being paradox, a term that is applied when subjective life satisfaction or quality of life is maintained in the face of objectively poor health conditions (Netuveli & Blane, 2008, pp.119). The gap between the expected (negative) outcomes of an adverse event and the actual lived experiences of older adults may be indicative of an underlying process of resilience. Ungar (2011, p.1) broadly defines resilience as a dynamic adaptive process through which individual traits, characteristics of their environment,
and their internal and external resources are utilized in the face of adversity. In this sense, it draws attention to salutogenic processes connected to quality of life and well-being, which are distinct from the pathogenic clinical causes and trajectories of psychopathology and disease (Antonovsky, 1996; Wister, 2005; Zautra, Arewasikporn, & Davis, 2010). This distinction encourages the exploration of positive pathways, coping thresholds and adaptive protective processes, multiple types of resources, and interventions that foster resilience. A fundamental aspect of this perspective is the likelihood of cumulative effects (Windle, 2011, 2012), which necessitates a lifecourse approach especially when applying an aging lens. A lifecourse framework is also important since it can link past health and illness experiences with current individual level (e.g., agency, self-efficacy, socioeconomic resources, and cultural identity, beliefs, and experience) and environmental level (e.g., access and availability of health care services, social support networks, health policy, and ethno-cultural) contexts. However, the application of resilience models has been largely confined to psychological resilience at the early developmental phases and has only begun to be applied to the spectrum of aging and health (Hutchinson & Nimrod, 2012). In light of these gaps, this article considers the emerging body of resilience conceptualization and research and applies it to an integrative Lifecourse Model of Multimorbidity Resilience.

Why Is Multimorbidity Resilience Important?

The potential negative effects of living with long lasting multiple chronic illnesses include physical challenges, such as episodic pain, loss of function, and a potentially reduced life span, as well as social-psychological threats, such as feelings of stress, anxiety, depression and loneliness, increased social isolation, loss of self-esteem, and alterations in social roles (American Geriatrics Society, 2012; Institute of Medicine, 2012). The type, severity, and symptoms of chronic illnesses, and their combination, play a central role in shaping the consequences of multimorbidity. For instance, research has demonstrated that particular configurations of chronic illnesses (e.g., arthritis, heart problems, and cognitive disability) have a significant impact on population attributable risk in areas of function across older age groups and gender (Griffith, Raina, Wu, Zhu, & Stathokostas, 2010). Yet, research suggests that, while many individuals receive treatment, adapt, and cope with the effects of chronic illnesses, others presenting the same conditions experience significant adversity and loss. Some research suggests that resilience actually improves during old age, although the reasons are not entirely clear (Rybarczyk et al., 2012). Although there is a large literature on coping, stress, and health over the lifecourse (Pearlin et al., 2005; Pearlin & Skaff, 1996), as well as general models of resilience (see Hayslip & Smith, 2012), rising life expectancies, compression of morbidity, and the increasing prevalence of multimorbidity occurring in old age begs specification of current models.
Methods

A comprehensive search of literature published between 1995 and 2015 was conducted using AgeLine, PsychInfo, and PubMed databases and the following keywords: resilience, resiliency (or resilien*), chronic illness, chronic condition, comorbid*, multimorbidity, living well, aging, older adult, elder*, lifespan. An environmental scan of the literature was conducted to obtain a broad representation of living well with multiple chronic conditions from a variety of perspectives and disciplines. Two independent researchers identified, extracted, and synthesized 112 publications deemed most relevant to resilience with specific applications to chronic illness and multimorbidity. These were initially summarized in an annotated bibliography (Coatta & Wister, 2013), and papers were selected for this article based on the following themes: (a) identifying how living well has been defined and quantified within the academic literature; (b) conceptual and theoretical perspectives of resilience, in particular, those that address lifecourse or developmental or aging frameworks, and; (c) how basic and applied research may be fostered in the future to address resilience and living well with multimorbidity?

What Is Resilience and How Has It Developed?

Following exposure to significant adversity, resilience has been defined as “both the capacity of individuals to navigate the psychological, social, cultural and physical resources that sustain their well-being, and their capacity individually and collectively to negotiate for these resources to be provided and experienced in culturally meaningful ways” (Ungar, 2008, p.225). In parallel, it has been described as a process of effectively negotiating, adapting to, or managing significant sources of stress by applying resources within the individual, their life, and environment for adaptation and “bouncing back” in the face of adversity (Windle, 2011, p.152).

Historically, resilience research can be traced through four waves that began with applications to children and adolescents drawn from developmental psychology (Masten, 2007; Windle, 2012). During the first, researchers enumerated the resilient qualities within individuals and measured resilience largely in terms of psychological outcomes (Masten, 2007; Richardson, 2002; Windle, Bennett, & Noyes, 2011). The qualities identified were termed risk or protective factors or resources (Luthar & Brown, 2007; Masten, 2001). The identification of these traits has been valuable because they indicate potential correlates of resilience, some of which may be malleable. However, this research does not clarify how individuals access or use these resources to overcome adversity, how the environment interacts with individual traits to promote resilience, or how lifecourse trajectories may affect the accumulation or erosion of resilience (Leipold & Greve, 2009; Ong, Bergeman, & Boker, 2009; Windle, 2012).

The second wave focused on the adaptive or coping processes that facilitate resilience (Masten, 2007; Ong et al., 2009; Richardson, 2002). Resilience
processes and measures were viewed as an evolution of stress theory, in which adaptive and coping are the product of stressors interacting with risk and protective factors. The centrality of environmental factors, including the interactions between individuals and their environment, led to an ecosystemic perspective that acknowledges the interdependence between social and environmental system levels (Pearlin et al., 2005; Stokols, 1992; Ungar, 2011; Wild, Wiles, & Allen, 2013).

The purpose of the third wave of resilience research was to apply knowledge from the first two waves of research to develop effective interventions (Masten, 2007; Richardson, 2002). Research from this period focused on promoting competence and wellness, and preventing psychopathology. Yet, thus far, intervention research based on resilience has been challenged by limited theoretical and measurement development (Ungar, 2011; Windle, 2011, 2012). The fourth wave of resilience research compels researchers to focus on multilevel analyses and understanding of adaptation (Masten, 2007). It has been identified as a means to bridge the concepts of resilience as a trait and resilience as a process, and to build upon the knowledge-base forming the previous waves of resilience research. However, measurement remained largely based on psychological measures such as self-efficacy, mastery, optimism, and so forth, rather than combining social, psychological, and environmental factors in a single model, even though foundational work in gerontology (e.g., Baltes et al. lifespan theory, Latwon et al. ecological model of aging) has emphasized the importance of multidimensionality and multidirectionality of developmental pathways in context.

As depicted in Figure 1, resilience theorizing has reached a fifth phase of development in which the prior generalized, meta-models are specified to particular problems and contexts. This leaves research gaps with respect to deficiencies in prior waves of theoretical and research measurement of resilience, as well as applications to more focused areas and subpopulations of interest. Some recent examples in gerontology include the following: family resilience and aging (Martin, Distelberg, Palmer, & Jeste, 2015); genetics, physical resilience, and successful aging (Resnick, Klinedinst, Yerges-Armstrong, Choi, & Dorsey, 2015); cultural-specific resilience (Ungar, 2011), and work, retirement, and resilience (Coon, 2012). The overarching questions driving the current application are follows: how does resilience influence adaptation to multimorbidity in later life? And further, how do resilience traits, processes, and resources require a lifecourse dynamic to enhance our understanding?

Theoretical Foundations Underlying Resilience

At a broad developmental level, resilience has its roots in a family of social-psychological, sociological, and socioenvironmental concepts and theoretical models addressing adaptation to individual and environmental stressors. This includes positive and developmental psychological approaches, lifecourse
theory, stress and homeostasis theory, person-environment theory, stress models, and socioenvironmental theory. Due to the expansiveness of these theories, we have outlined a selected subset of theories that elucidate key dimensions of a resilience model, which are also shown in Figure 2.

Starting at the individual level, positive psychology involves the pursuit of the adaptive, creative, and emotionally fulfilling aspects of human behavior (Seligman & Csikszentmihalyi, 2000). Positive change and well-being are determined by the strengths and resources (i.e., individual resilience) of people (Emlet, Tozay, & Raveis, 2011; Seligman & Csikszentmihalyi, 2000). Positive psychology also encompasses salutogenesis, which aims to study the etiology of health and is antithetical to the pathology perspective or medical model (Antonovsky, 1996; Emlet et al., 2011; Stokols, 1992).

Developmental psychology theories are also foundational to resilience in their conceptualization of balancing gains and losses required for optimal development, which vary depending on one’s life stage (Baltes & Carstenson, 1996; Boerner & Jopp, 2007; Leipold & Greve, 2009; Pearlin et al., 2005). Pearlin, Mullan, Semple, and Skaff (1990) classic stress-coping model, for instance, contends that coping and social support can intercede at various points along the stress process to reinstate balance. In addition, the model of assimilative and accommodative coping encompasses two antagonistic coping processes: assimilation, which is the persistent effort to pursue goals through modification of life circumstances, and accommodation, which is the adjustment of goals due to limitations or restrictions (Boerner & Jopp, 2007; Greve & Staudinger, 2006; Hardy, Concato, & Gill,
The model postulates that these dual processes are activated in response to the cognitive appraisal of a discrepancy between the actual and desired states of an individual. For older individuals, it is theorized that there will be increased reliance on the process of accommodation as abilities diminish with age (Boerner & Jopp, 2007). In a study of positive adaptation and valuation of life, Jopp and Rott (2006) found evidence of assimilation and accommodation in the social strategies of resilient older adults who maintained their goal of social connectedness by replacing face-to-face interpersonal contact with telephone contact during functional decline.

Another commonly applied developmental theory in aging is selection, optimization, and compensation (Baltes & Cartenson, 1996; Wild et al., 2013); three interlocking processes that work dynamically to enable positive adaptation. Selection refers to choosing what to focus on, optimization is the recruitment and application of appropriate resources, and compensation is the use of alternate means to maintain function (Boerner & Jopp, 2007). The theory suggests that positive adaptation (a primary component of resilience) is most likely to occur when individuals select goals that align with or optimize their available resources (Baltes & Carstensen, 1996). Wiles, Wild, Kerse, & Allen (2012) found that the most resilient older adults in their study exemplified selective optimization and compensation in their daily activities. Indeed, it was common for the resilient participants to persist with activities that were important to them, even if challenged by multimorbidity.

Underdeveloped in previous theories has been attention to the ways in which contextual processes at the individual and community or societal level are linked
and shaped over the lives of individuals, especially during the latter stages of life, which is consistent with the notion of distal and proximate risk or protective factors. Lifecourse theory bridges the dynamic interplay of structural (i.e., historical, institutional, community, and cohort-related) and individual (i.e., social resources and agency) factors in shaping pathways and outcomes of individuals as they age (Dannefer et al., 2009; Elder & Johnson, 2003; Wister & McPherson, 2014). Key axioms include the following: (a) human development and aging are lifelong processes that are influenced by the timing and intensity of early life experiences, events, and transitions (e.g., health-related childhood traumatic event); (b) individuals employ human agency to shape surrounding structures (e.g., the effect on voting for health care reform); (c) historical events and the size of the age cohorts to which individuals belong influence experiences and trajectories (e.g., economic recession); and (d) lives are lived interdependently such that we affect and are affected by our social networks (e.g., developing early diabetes can create stressful family environments). Furthermore, lifecourse resources or capital available to individuals (education, wealth, genetics, health, social relations, identity, competence) and lifecourse risks (genetics, class, race, ethnic, age, or gender stratification) create opportunities (advantages) or adverse conditions (disadvantages) that influence how we experience stressful events in life (O’Rand, 2006). Similarly, Pearlin and Skaff (1996) note the importance of lifecourse theory in understanding how lives can be restructured due to historical conditions that can create intracohort variation in exposure and adaptation to stress. For instance, Rybarczyk et al. (2012) review several studies in which evidence is provided demonstrating how accumulated life experiences can inoculate older persons to the negative elements of chronic illness. Thus, developmental and lifecourse axioms set the stage for the possibility of a “resilience trajectory” in older age, wherein previous experiences of coping and overcoming illness adversity may enrich one’s ability to deal with the continued challenges of aging with multimorbidity (Clark, Burbank, Greene, Owens, & Riebe, 2011; Windle, 2012). The other side of this argument is that negative experiences and the stress induced by them can erode resilience.

However, the above theories do not fully explain how the individual is interconnected to multilevel environmental spheres. A key perspective that addresses this gap is the socioecological approach, which emphasizes the interrelatedness and interdependency between individuals, social systems, and the environment (Stokols, 1992). It has been characterized by the balance between an individual’s needs and abilities, and the demands of the environment (Greve & Staudinger, 2006; Lawton, 1980; Lewin, 1951). For example, Lawton (1980) refers to the correspondence between the abilities and characteristics of the individual (their competence) in relation to the demands and resources of his or her physical (e.g., housing) or social (e.g., family or friendship network) environment. An assumption of this model is that too much or too little environmental demand may lead to low well-being. It also suggests that elderly persons can...
withstand less environmental press than more resilient younger persons. This theory is useful in resilience research in that it underscores not only the importance of the environment to successful adaptation but also the concept of an optimal zone of development or adaptation. To illustrate the overarching socio-ecological levels, Wild et al. (2013) created a model of six nested domains to reflect contextual and collective dimensions of resilience for persons in later life: individual resilience, household resilience, family resilience and neighbourhood resilience, community resilience, and lastly societal resilience. This model helps one visualize the interconnectedness and interdependence of multiple social realms in which a person exists. The nested spheres of influence provide a useful conceptual framework to understand how resilience is the manifestation of a complex set of interrelated systems. However, absent from this model are dimensions of time or life course, processes of adjustment or adaptation, and specific applications to multimorbidity.

**Applying Models of Resilience to Multimorbidity**

The application of resilience models to multimorbidity may provide a useful conceptual lens for furthering our understanding of the ways in which aging and health intersect. Sells et al. (2009) describe a theory of cascading chronic illness crises in which secondary diagnoses or other challenges that occur while an individual is already in a period of reorganization leads to the experience of compounding illness adversity. The authors provide empirical evidence that the trajectory of multimorbidity typically follows a pattern of disrupted personal identity associated with multiple medical, emotional, and social hardships followed by adaptation. A major theme in their research is loss, including the loss of valued roles, relationships, and independence. Furthermore, positive adaptation requires significant effort to transition out of a disrupted state and is primarily facilitated by the giving and receiving of social support.

Similarly, Paterson (2001) outlined a model of chronic illness in which the perception of reality shapes how individuals respond to their illness, called the shifting perspective model. When illness is in the foreground, an individual is absorbed by the sickness, suffering, and loss that accompany their condition. This perspective serves a protective and utilitarian function, as it allows the individual to conserve their energy and work toward well-being. Conversely, when wellness is in the foreground, individuals experience the opportunity for meaningful change and create consonance between their self-concept and their identity as it has been shaped by disease. This process is relevant to resilience and living well with multimorbidity, since one is able to focus on emotional, social, cultural and spiritual components, and experience growth (Paterson, 2001; Rybarczyk et al., 2012; Ungar, 2011; Zautra et al., 2010). Yet, human agency and learning, as well as adequate resources and capacity embedded in the multispheres of influence, also need to be recognized.
To this end, Richardson (2002) describes a biopsychospiritual model in which resilient qualities are obtained through disruptions and reintegration, and that resiliency can be learned. Furthermore, it upholds the value that disruption (adversity) is necessary for growth and to access latent human potential (Richardson, 2002). The resiliency model proposes four levels of reintegration that may occur following a disruption to homeostasis. The uppermost outcome, resilient reintegration, entails growth, knowledge, self-understanding, and importantly, increased strength of resilience resources (Zautra et al., 2010). Alternatively, individuals may reintegrate back to homeostasis, which is characterized by recovery, healing, and getting past a negative event. Reintegration with loss refers to individuals who give up, and finally, dysfunctional reintegration occurs when a lack of introspective abilities prevent the person from being able to do so.

This resilience model is useful to visualize the variety of processes and outcomes that are possible from a reaction to a disruption, such as that imposed by multimorbidity, but it does not provide answers to the question of how resilient reintegration occurs. It has also been criticized for preferentially focussing on the individual rather than environmental contexts. Additionally, disruptions occur in multiple domains (self-identity, function, leisure, relationships, etc.), and this model does not explain that a person may display resilient reintegration psychologically yet reintegration with loss physically (Janssen, Van Regenmortel, & Abma, 2011). This tension between domains is a challenge for older adults, especially those facing multimorbidity coupled with decreased capacity in old age.

Trivedi et al. (2011) add a final layer, specifically conceptualizing resilience in chronic illness as invulnerability in addition to the ability to recover from stress. This model recognizes that measures of resilience change over time, especially during older ages. This conceptualization is responsive to the temporal changes in resilience, which are especially important as a person progresses through their chronic disease trajectory coupled with age-related decline.

Together, these models have helped to inform the development of a Lifecourse Model of Multimorbidity Resilience. Some gaps in prior models addressed include the following: having a better understanding of how chronic adversity impacts the outcomes of resilience, how resilience can be understood as a process (rather than a trait), and how complex resources embedded in the individual, family, neighbourhood, community, and societal spheres interact to shape resilience as a social process. Additionally, the lifespan model of resilience includes a time dimension, wherein previous experiences of adversity and resilience influence subsequent reactions to adverse events.

**Toward a Lifecourse Model of Multimorbidity Resilience**

As depicted in Figure 3, a *Lifecourse Model of Multimorbidity Resilience* represents a complex set of risk or protective traits, resources, and processes that occur over the lifecourse of the individual to promote resilience. The purpose of
the model is to capture the multidimensional, dynamic nature of resilience applied to multimorbidity and disablement processes experienced at the later stages of life.

First, at a broad level, it positions the individual in an interrelated social and environmental context, meaning that resilience experienced at an individual level must be understood within the broader socioenvironmental landscape in which individuals interact. The three overlapping circles in the top left corner represent a well-integrated individual, reflecting the biopsychospiritual homeostasis included in Richardson’s (2002) model. It depicts an integrated sense of coherence (Nygren et al., 2005) embedded within individual, social, and environmental systems drawn from socioenvironmental theory (Stokols, 1992). The integration is also symbolic of the concept of wellness (McMahon & Fleury, 2012), which is the process of achieving one’s potential, as defined by the individual. When one is well, he or she is able to meaningfully engage in their lives, which is a central component of healthy aging.

Second, the model is framed by several cyclical processes, beginning and ending with an integrated concept of individual well-being but recognizing that the stages are not necessarily unidirectional. The beginning stage in the resilience process applied to multimorbidity (top of Figure 3) is the onset of adversity (Windle, 2011; Windle, Woods, & Markland, 2010). For example, illness adversity could stem from the diagnosis of heart disease in conjunction with diabetes. To this extent, the model borrows from stress theory and the

![Figure 3. Lifecourse Model of Multimorbidity Resilience.](image-url)
cognitive appraisal process (Allen, Haley, Harris, Fowler, & Pruthi, 2011), wherein the decision is made regarding the stressfulness of a situation. In the multimorbidity disablement process, the degree of stressfulness would be linked to the degree of disability that the illness confers on one’s daily life.

Next, the appraisal of stressfulness and challenges that are faced due to episodic pain and disability can lead to the disruption of self-concept, behaviors, and worldviews. Kralik, van Loon, and Visentin (2006) state that individuals often experience a feeling of being fragmented when routine behavioral patterns are shattered by the onset or episodic return of chronic illness symptoms, denoted in the model by the three disconnected circles in the upper right corner.

The following phase of the process is the activation of resources. To successfully overcome adversity, the individual must harness resources, which require motivation, energy, and access (Clark et al., 2011; Richardson, 2002; Sells et al., 2009). In reaction to multimorbidity, the activation of resources may be internal or external. The internal activation of resources is an expression of agency—the individual exerts primary control by exploring environmental and social resources, and secondary control through the harnessing of individual resources (Heckhausen & Schulz, 1995). An external activation of resources may include support from a friend or family member, or from cultural capital, identity or coping strategies, or the addition of hand rails in the washroom or an assistive device to facilitate independence.

The resources that a person mobilizes may be a combination of individual, social, or environmental factors (see Table 1). The influence and interaction among these resources are a central component of this model and are therefore represented in the middle of the model using a Venn diagrammatic form. An example of interaction among the domains was identified by Jopp and Rott (2006), who found that high self-efficacy and personal control were related to mobilization of other resources, specifically social support. Ripple effects or positive feedback loops also occur among the resources, fostering a positive spiral toward resilience if they are available and accessed (Sells et al., 2009).

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<td>Self-referent beliefs</td>
<td>Family or friendship networks</td>
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<td>Sense of purpose</td>
<td>Social engagement</td>
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<td>Optimism</td>
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Table 1. Individual, Social, and Environmental Resources.
Within this central sphere, the counteracting risk and vulnerability factors must also be acknowledged, which complicate and may delay resilient outcomes (Harris, 2008). Risk factors include a range of known epidemiological influences on chronic illness (e.g., demographic, social, environmental, cultural, lifestyle, behavioral, age, gender, etc.), some of which are mutable (physical activity) and some of which are not (genetics). In their presentation of the disablement process, Verbrugge and Jette (1994, p.8) introduce two other social risk or protective factors: interventions (e.g., medical care, programs, services, technological aids, etc.) and exacerbators (e.g., poor interventions, social isolation due to fear of falling, and age unfriendly environments), which increase the chances of disease and subsequent disability, but which are modifiable. Within our model, as risk and vulnerability factors increase, the ability to rely on individual resources decreases, and social or environmental support becomes more important (Ungar, 2011), which may include cultural resilience, such as observed among some Aboriginal communities (Brasche, 2008).

The activation of resources (on the right side of the model) further engages the protective processes of coping and emotional regulation (on the left side of the model), which result in reintegration of a sense of self and ultimately positive adaptation. Examples of coping include assimilative and accommodative processes of development, as well as selection, optimization, and compensation (Richardson, 2002; Stewart & Yuen, 2011). These processes allow individuals to make positive changes in areas that they can modify. As the resources and processes work synergistically, the individual progresses toward the consequences of resilience, which are wellness, recovery, efficacy, balance, growth, and personal development. Importantly, the re-integrated self is not a direct reflection of the original configuration. The elements may have recombined in a different order or with differing strengths. This is particularly important in multimorbidity research, given that an individual may not recover, but may learn to function better (positive adaptation) with the illness as a result of resilience (Richardson, 2002; Stewart & Yuen, 2011).

The lifecourse time line along the bottom of the model depicts the ongoing dynamic, temporal nature of all of the above processes underlying resilience trajectories. Inclusion of past experiences with illness, cumulative advantage or disadvantage, and human agency to effect change embedded in the lifecourse perspective helps to elucidate aging effects that complicate our understanding of the resilience process. For example, research suggests that there may be cumulative advantage or disadvantage that is carried with individuals over their life-course. For instance, O’Rand (2006) and O’Rand and Hamil-Luker (2005) found that early childhood socioeconomic and environmental disadvantages increase the risk of disability and chronic diseases, such as cardiovascular disease, in old age. On the other hand, coping ability may be enhanced when human agency is learned and reinforced over time. In this sense, lessons learned from one experience of adversity may enable the development of coping skills
needed for subsequent recovery. A “resilience trajectory” is, therefore, the accumulation of previous lifecourse experiences and resources, coupled with nonmutable genetic and less mutable personality factors.

Finally, the model is organized as cyclical and unidirectional, changes in a person’s situation (such as a multiple diagnosis, episodic illness pathway, or increase in severity) may cause further disruption. There is also potential for stagnation as well as bidirectional or reversing effects. For instance, an individual may remain at a particular stage such as multimorbidity disruption or they may reverse from wellness to a stage of partial or complete disruption, which reflects Sells et al. (2009) theory of cascading crises. This coincides with clinical and anecdotal evidence of the episodic nature of experiencing multiple chronic illness symptomology.

**Testing and Applying the Lifecourse Model of Multimorbidity Resilience**

One area in which the Lifecourse Model of Multimorbidity Resilience could be applied is in the area of mapping multiple chronic disease trajectories and coping strategies over the life course. This model would be useful in elaborating how individuals differentially learn from previous life experiences in overcoming later life adversity, and the ways in which they harness potential resources, such as family support systems (Crane, 2010). For instance, a combination of improved self-efficacy to overcome pain and other debilitating symptoms, utilizing successful coping strategies from prior illness episodes, and accessing available support systems may be a successful formula to overcome functional deficits (Jopp & Rott, 2006). The maintenance of social engagement and reduction of illness isolation could, in turn, be fundamental to partial recovery or living well with serious illness (Glass, Moss, & Ogle, 2012). Potential multimorbidity combinations include arthritis, diabetes, heart disease, and COPD.

A second avenue for model application is the understanding of the optimal timing and role of health literacy, health knowledge, and self-care practices central to the recovery process (Chou & Wister, 2005; Glass et al., 2012). Our resilience model points to the need to identify crucial points in the lifecourse and the illness cycle, whereupon individuals are most susceptible to positive coping and lifestyle behaviors. For instance, increased physical activity, improved diet, and stress reduction techniques (e.g., meditation) have been shown to assist in the amelioration of pain and discomfort associated with a multitude of chronic illnesses (McDonald Miszczak & Wister, 2005; Windle, 2012). Although empirical evidence is scarce, the optimal behavioral change points may be during moderate episodic pain and immobility at which point an individual is challenged by their illness condition, but not to the point at which change appears insurmountable. Our model also suggests that strengthening resilience is possible and most likely to be successful under particular conditions. The mechanisms
and dynamics of those conditions require further research in order to identify optimal strategies for success. As these optimal conditions are identified for combinations of disparate illness trajectories, it will be possible to tailor health and illness interventions and better predict long-term outcomes.

Finally, multidisciplinary social science and health research drawn from psychology, sociology, epidemiology, and public health will undoubtedly be needed to uncover the pathways by which individuals recover from different constellations and synergies of illnesses and their symptoms. The application of our resilience model necessitates elaboration of the nexus of the social and individual contexts in order to understand who is more likely to live well with multiple chronic illnesses and who will be more challenged. Furthermore, model application can assist in improving precision or personalized medicine in order to foster more efficient and effective health care modalities.

**Research Gaps and Opportunities**

There are several research gaps and areas of opportunity that may improve interventions and help us understand how resilience influences adaptation and coping among persons experiencing multimorbidity as they age. The first section provides suggestions for a systematic program of research that addresses basic research questions, whereas the second addresses residency-based applied or intervention research.

Although not exhaustive, several developments remain in the realm of basic research. (a) Multidimensional scale development is required to fully capture resilience dimensions. Quantitative scales require analysis of psychometric properties (Martin et al., 2015; Windle et al., 2011). (b) The need to triangulate contextual qualitative data pertaining to meanings and experiences of adaptation and illness coping with empirical quantitative data (Sells et al., 2009). Ethnographic or narrative data may elucidate individual experiences of episodic illness cycles within different socioenvironmental domains (Ungar, 2011). (c) Advance measurement strategies of resilience risk, protective factors, processes, and outcomes applied to multimorbidity, including examination of different combinations of illnesses (Windle et al., 2011; Wister, Levasseur, Griffiths, & Fyffe, 2015). For instance, research into population attributable risk shows that the symptomology, illness trajectory, and effects on population health outcomes of a combined diagnosis of dementia, depression, and arthritis will be different than the combination of an anxiety disorder coupled with cancer (Griffith et al., 2010; Stewart & Yuen, 2011). (d) Identification and examination of several key outcomes. Promising subjective measures include pain perception; well-being, quality of life, life satisfaction; self-efficacy; mastery; self-esteem; optimism; psychological adaptation; social capital; cultural capital; perceived health; loneliness; spirituality; and meaning in life (Rybarczyk et al., 2012). Objective measures include development of additional chronic illness, functional status; mental health diagnoses, such as
clinical depression, anxiety, and so forth; disruption or integration; recovery or “bouncing back”; social engagement; food security; independent or dependent living; and health utilization, including prescription drug use, hospitalization, health care visits, and direct and indirect health care costs (for systematic review, see Stewart & Yuen, 2011). (e) In order to study the lifecourse or temporal nature of resilience and multimorbidity, researchers require longitudinal data (both qualitative and quantitative) that can be connected to illness trajectories (Windle, 2012). (f) Applications of advanced modeling strategies will be needed to combine different levels of measurement, assumptions of nonlinear and reciprocal associations, and so forth. (g) Research is needed to estimate the clinical significance of different levels of resilience, especially with respect to health status change, health care utilization, and productivity (Hayslip & Smith, 2012).

The following set of research gaps pertain to applied or intervention research. (a) A first priority for effective interventions is to discern critical elements, such as teachable moments or periods of susceptibility to change in relation to episodic illness (Luthar & Brown, 2007). Is it during episodes of the illness symptomology, or dormant periods, in which resilience interventions may be most effective? This also includes evaluating access to available resources and the dynamic interactions among resources, risk factors, and adaptive processes. For instance, should the emphasis be on building necessary resources before engaging interventions aimed at behavioral or social-psychological change to enhance adaptation? (b) In order to use this model in a practical application, an intervention could be used to identify, tailor, and expand individual, social and environmental resources within domains of low perceived availability to enhance resilience. Alternatively, the model could be used to foster areas of individual strength, perhaps through cognitive behavioral therapy (Rybarczyk et al., 2012) or participatory approaches (Kralik et al., 2006). For instance, participants in Nakashima and Canda’s (2005) study used narrative techniques to locate sources of adaptive strength to the dying experience. In addition to discovering the key resources, there is also a benefit to identifying barriers and facilitators to resilience resources. (c) Interventions need to consider interactions among resources, including cascading influences, whereby improving a resource in one area strengthens another resource. This can be seen as antithetical to the “cascading crisis” identified in the chronic illness experience (Sells et al., 2009). Facilitating positive resource cascades or spirals help move a person through adaptive coping processes. The timing of cascading effects over lifecourse trajectories may help to identify when interventions need to be employed to enhance resilience. Individuals may find, for instance, that a social-learning approach to coping mechanisms at early onset may prove more beneficial than approaches geared to those persons already experiencing the full impact of the diseases, especially if they are undergoing normal aging decline in function. (d) The lifecourse model of resilience does not rank the impact of resources; however, if a hierarchy among resources were identified, an intervention could be targeted to ensure that an individual has the most relevant resources to facilitate resilience.
The conceptual and theoretical analysis outlined a number of important resources identified in the literature that could be used to develop a resource hierarchy and to further understand the relative contributions each resource makes to resilience. (e) The interactions between resources and risk factors, which are typically pre-disposing sociodemographic factors (such as gender, SES, culture, and ethnicity), may affect the efficacy of an intervention (Ungar, 2011). [AQ3] For example, some vulnerable ethno-cultural groups may have high multimorbidity risk, but strong cultural resilience (Brasche, 2008). (f) Interventions should consider the dynamic and process-oriented aspect of resilience. On the right hand side of the model, accessing and activating resources are key processes, while coping and adaptation processes appear on the left hand side. An intervention aimed to enhance resilience should consider the research associated with both of these processes. These also include both internal and external components. Internal processes, or agency, include the development of self-care behaviors such as increased physical activity and improved nutrition. For example, in a study of older adults with chronic conditions, leisure was found to strengthen personal and social resources, and increase experiences of success, which had the potential to improve self-esteem (Hutchinson & Nimrod, 2012). By contrast, an external intervention may include modifying the home environment, community, or the local government through policy-driven age-friendly criteria such as improving specialized transportation, sidewalks, or green space in the neighbourhood. Community level resilience has begun to be examined in the context of disasters (Masten, 2007), but applying resilience to larger regional, national, and international contexts is a needed area of research (Wild et al., 2013; Zautra et al., 2010). (g) Using the model as a guide, interventions can be tailored and targeted to the various phases of resilience. This recommendation draws from stage or readiness to change models of health behaviors. Accordingly, an individual in the initial phases of disruption will require different support than someone who is actively coping and beginning to reintegrate. Interventions need to be targeted to individuals who experience inertia within the experience of adversity and are unable to independently reach resilient outcomes. This is referred to as tertiary resilience and may require more intensive interventions. In relation to the stage of resilience, it may also be prudent to target interventions according to the degree of adversity. It has been found that interventions may be most beneficial for those experiencing high adversity (Nygren et al., 2005); although those that focus on prevention are more difficult to prove efficacy. This also includes the clinical significance of tailoring interventions to sensitive periods of multimorbidity. (h) Interventions need to consider and specify the outcomes of resilience that are targeted, whether wellness, recovery, or growth or development. Although each category is not mutually exclusive, there may be subtle differences in how one would approach an intervention for improved function compared to growth (Stewart & Yuen, 2011). (i) Finally, interventions need to consider both intended and unintended consequences on a range of outcomes and over both short- and long-term periods. For older adults, drug therapies may
have side effects especially for frail elderly who may be prescribed several medications and whose resilience is compromised. Also, surgery (knee replacement) may produce iatrogenic results for persons of advanced age for the same reasons. Physical activity programs may be too intense for some older persons and exacerbate their illness symptoms, such as pain.

**Conclusion**

This article has contributed to the literature through a conceptual and theoretical review of resilience. The exploration and integration of research and theories related to resilience, aging, and multiple morbidities has led to the development of The Lifecourse Model of Multimorbidity Resilience. Our model connects multiple sources of resources embedded in the individual, family, community, and society with a series of processes that occur during disruption and reintegration phases of illness trajectories. It recognizes nonlinearity of the resilience process, and the potential for cascading crises that may restrict or delay resilient outcomes or for reversals, all of which are embedded in the lifecourses of individuals. The conceptual and theoretical review identified three valuable consequences of resilience that reinforce the importance and the purpose of the concept. These include the outcomes of wellness, recovery, and growth or development. These factors relate to subjective and psychological well-being and quality of life, and affirm that efforts toward fostering and maintaining resilience have the potential to positively impact the lives of older adults, including those struggling with multimorbidity.

Continued research into the multidimensional, dynamic concept of resilience has the potential to uncover innovative ways to approach living well with multimorbidity. It also helps to understand the well-being paradox, in that individuals facing multimorbidity often redefine their well-being as a coping mechanism embedded in processes of resilience. Interventions need to focus on the most mutable points in the illness resilience cycles to maximize management of competing conditions with the context of multimorbidity. Our model provides initial direction in identifying effective ways to address these issues. The remaining challenge is to test and further develop models of resilience, to develop and test measures, and to evaluate interventions that strengthen resilience, diminish disability, and improve quality of life of older adults.

**Declaration of Conflicting Interests**

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding**

The authors received no financial support for the research, authorship, and/or publication of this article.
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