

Life Course Approaches to the Causes of Health Disparities

Reducing health disparities requires an understanding of the mechanisms that generate disparities. Life course approaches to health disparities leverage theories that explain how socially patterned physical, environmental, and socioeconomic exposures at different stages of human development shape health within and across generations and can therefore offer substantial insight into the etiology of health disparities.

Life course approaches are informed by developmental and structural perspectives. Developmental perspectives emphasize how socially patterned exposures to risk factors during sensitive life stages shift health trajectories, whereas structural perspectives emphasize how social identity and position within socially patterned environments disproportionately allocate risk factors and resources, resulting in altered health trajectories.

We conclude that the science of health disparities will be advanced by integrating life course approaches into etiologic and intervention research on health disparities. The following 4 strategies are offered to guide in this process: (1) advance the understanding of multiple exposures and their interactions, (2) integrate life course approaches into the understanding of biological mechanisms, (3) explore transgenerational transmission of health disparities, and (4) integrate life course approaches into health disparities interventions. (*Am J Public Health.* 2019;109:S48–S55. doi: 10.2105/AJPH.2018.304738)

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Life course perspectives demonstrate that current health is shaped by earlier exposures (even decades before) to physical, environmental, and psychosocial factors. Life course approaches, widely accepted by epidemiologists, developmental biologists, social and behavioral scientists, and developmental pediatricians, are also important for all minority health and health disparities researchers to understand the origins, persistence, and transmission across generations of health disparities.^{1–4} Life course approaches encompass at least 2 dominant perspectives—developmental and structural—that offer distinct but complementary theories and methods that can be leveraged to address the problem of health disparities. In this article, we explore how these 2 perspectives emphasize different mechanisms by which health trajectories shift disproportionately downward among socioeconomically disadvantaged and race and ethnic minority populations, providing important insights into the etiology of and intervention targets for health disparities.

DEVELOPMENTAL PERSPECTIVES ON THE LIFE COURSE

Developmental perspectives focus attention on the role of critical and sensitive periods in shaping health over the life course. Critical periods are discrete time points when specific stimuli must be encountered for

normal development to occur. Sensitive periods are similar to critical periods but are less clearly demarcated in time. During critical and sensitive periods, there is a heightened degree of plasticity, and thus social or environmental exposures may have more pronounced effects on development.⁵ Adaptations in response to environmental stimuli during critical or sensitive periods may also be more likely to persist and therefore have the greatest effect on later health.⁶

Developmental perspectives on health disparities emphasize the biological and behavioral mechanisms by which structurally patterned exposures during critical and sensitive periods of the life course result in sustained shifts in health trajectories that may endure despite later intervention.^{1,7} Understanding the mechanisms underlying these periods is of primary

importance, as is establishing the timing of critical or sensitive periods for a broad range of social and environmental exposures. Differential exposure to social and environmental factors during sensitive periods is therefore viewed as a primary driver of population-level health disparities.

According to developmental theory (or more precisely, the theory of developmental origins of health and disease), adverse exposures such as undernutrition during the prenatal period and economic disadvantage during childhood can evoke what are referred to as “predictive adaptive responses” that change physiological and behavioral set points in anticipation that these conditions will persist into the next life stage.^{1,7} Although the evidence for predictive adaptive responses is incomplete, responses to an

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adverse environment can initially appear adaptive but come at a cost for later health, particularly if the environment changes and the adaptation is no longer beneficial. The biological cost of the adaptation itself may also directly contribute to later health outcomes. For example, accelerated differentiation of renal progenitor cells results in earlier kidney development but also decreases renal reserve and leads to earlier onset of renal disease. Some of these adaptations are postulated to be transmitted across generations, potentially through epigenetic factors, resulting in inter- and trans-generational risks.^{1,7}

Evidence for the developmental origins of disease comes from experimental studies in animal models and quasi-experimental and observational studies in humans. For example, exposure to poor nutrition during both gestation and pubertal development affect health outcomes later in life.⁸ Adverse events in early childhood have long-term effects on brain development and cognition and predict increased risk for mental health problems.^{9,10} Early environmental enrichment in animal models as well as nurturing caregiving in studies of humans are able to reshape stress response systems and potentially epigenetic changes.¹¹ However, individual differences exist, and the effects are not equivalent across all systems and pathways. Thus, evaluating the timing of interventions is critical.⁵

STRUCTURAL PERSPECTIVES ON THE LIFE COURSE

Structural perspectives focus on how biopsychosocial

mechanisms translate “fundamental social causes” into different population distributions of health, disease, and longevity.¹² Structural perspectives acknowledge the importance of the timing of exposures across developmental windows, yet emphasize that exposures in young through middle adulthood outside of developmental windows are particularly important for understanding population health inequity.⁴ Mechanistically, the structural perspective focuses on physiological processes that are repeatedly or chronically activated across the life course in disadvantaged groups because of high-effort coping with stressors. For example, the scientific premise of the weathering hypothesis is that cumulative and stress-mediated wear and tear on cellular integrity leads to accelerated biological aging, the dysregulation or exhaustion of important body systems by midlife, and the early onset of chronic diseases of aging, health-induced disability, and excess mortality among marginalized groups.¹³

Population-level health disparities are proposed to be the result of socially structured quantitatively and qualitatively different life experiences, exposure to stressors, and access to coping resources.¹³ Structural models are essential to understand how social structures generate inequity in exposures and resources on the basis of a group’s race/ethnicity, social class, gender, sexual orientation, religion, disability, or immigrant status. Moreover, people’s social identity and socioeconomic position influence their agency and ability to mobilize resources in response to exposures.

Evidence of weathering has been documented in the United States among Blacks, among

Latino immigrants with longer US residence, and among the poorest urban and rural Whites.¹³ Studies have found that racial/ethnic and socioeconomic differences in allostatic load scores—a composite biomarker of stress-mediated wear and tear—increase across early through middle adulthood.¹⁴ The weathering effects of persistent high-effort coping with structural inequity, including at the molecular level, have been suggested in a number of studies.^{13,15}

INCORPORATING LIFE COURSE PERSPECTIVES

In 2015, the National Institutes of Health (NIH) engaged in a 2-year science visioning process for health disparities. A key idea to advance the ability to understand and address health disparities was to integrate developmental and structural life course perspectives more broadly into health disparities research. Four strategies were identified: (1) advance the understanding of multiple exposures and their interactions, (2) integrate life course approaches into the understanding of biological mechanisms, (3) explore transgenerational transmission of health disparities, and (4) integrate life course approaches into health disparities interventions (see the box on page S50).

Multiple Exposures and Their Interactions

Individual and population health risks arise from multiple sources across the life course. Risk factors and adverse exposures are found in multiple domains and often cluster in socially patterned ways that synergistically influence short- and long-term consequences. Most

research designs characterize effects on health outcomes of single exposures and rarely assess the importance of the timing of exposures or influences over time. Although some composite measures of biomarkers assess the cumulative effect of undetermined exposures, direct links between cumulative exposures and specific outcomes need to be clarified.¹⁶ Thus, a gap exists in the ability to examine and measure how exposures are socially patterned, interact, and dynamically change; how timing influences effects; and how exposures cumulatively increase or diminish the magnitude of health disparities. Measures are needed to assess the composite effect of exposures across multiple levels (e.g., individual, interpersonal, community, and societal) and life stages (e.g., gestation, childhood, adolescence, young adulthood, midlife, and old age). Beyond the assessment of the interactive effects of exposures, a need exists to identify protective factors at these same levels that may mitigate or buffer against adverse consequences.

Studies are needed that integrate life course perspectives to advance understanding of the impact and magnitude of acute and chronic exposure to stressors over time in all age groups, differences between objective and subjective perceptions of the valence and intensity of adversities, and what role these factors have in widening health disparities. Too often, health disparities research focuses on individual biological and psychosocial consequences, neglecting implications at the family, community, population, or societal levels. Prolonged and repeated challenges can create intensified vulnerabilities for families and communities that require their own set of adaptations to navigate.^{13,17} Health disparities may

LIFE COURSE RESEARCH PRIORITIES

Advance the understanding of multiple exposures and their interactions	The life course perspective posits that cumulative and interactive exposures over the life span—including in utero exposures—influence the development of health disparities. Thus, a need exists to develop measures to assess the complexity of adversity and protection beyond a single exposure or exposure type, considering other factors such as intersectionality, critical periods, sensitive periods, magnitude of exposure over time, and the impact of cumulative adversity and protective factors across multiple levels (e.g., individual, interpersonal, household, occupational, community, population, and societal).
Integrate life course approaches into the understanding of biological mechanisms	Life course perspectives stress consideration of complex, adaptive, dynamic, and nonlinear relationships. Key scientific questions include the following: Do differential exposures at critical and sensitive periods explain higher rates and severity of disease? What are the periods of greatest susceptibility? Are the biologic consequences permanent or reversible? How do exposures in previous periods affect responses or susceptibility in the current period? Are the social and biological sciences deeply integrated in the research design to identify how structural and biological pathways and mechanisms result in health disparities?
Explore transgenerational transmission of health disparities	Health disparities are transmitted across generations. A need exists for research on dynamic and complex models of multicontext, multipopulation development to understand how health disparities arise over the life course and are transmitted across generations. Moreover, an understanding of the potential for transgenerational exposures to have a differential impact on individuals and populations that is based on both biological and structural processes is needed.
Integrate life course approaches into health disparities interventions	A life course perspective acknowledges that health status reflects cumulative life conditions. Thus, interventions should be tailored to specific developmental stages and take into account the impact of cumulative social and environmental exposures, both positive and negative. Interventions should consider that poor health and many chronic conditions develop over time and across generations, and interventions may have latent (happening several years after intervention ends) or cumulative effects on health, depending on their timing, frequency, and intensity. Moreover, interventions should consider the differential health impacts of social policies across populations resulting from the varying ability of populations to meet policy expectations in light of differences in opportunities, resources, and racialization.

be explained, in part, by socially rooted expectations for specific life stages that place too great a demand on members of disadvantaged populations. One example of a societal expectation for adults in the United States is for adults to be gainfully employed and financially support their families. However, the ability to meet this expectation varies across populations. Some adaptations made by socioeconomically disadvantaged groups to meet this expectation, such as holding down multiple, physically taxing or environmentally hazardous jobs, facing a long work commute, and reduced or disrupted sleep are associated with risk for chronic diseases.¹⁸

Thus, it is important to understand whether cumulative demands on members of disadvantaged populations exceed personal, interpersonal, and community resources to protect or cope with stressors. Both developmental and structural perspectives highlight individual variability in response to stressors. The response of 2 individuals experiencing the same exposure will vary on the basis of their genetic makeup and past experiences as well as their social identity, socioeconomic position, and level of agency. Thus, local social norms, societal expectations, social identity threat, stigma, discrimination, racism, and vigilance are important

considerations when elaborating possible stress-activating exposures. It is important to consider not only whether biologically adaptive responses that initially appear beneficial can result in increased downstream risk,⁶ but also whether unconventional behaviors among disadvantaged populations can be adaptive and decrease downstream risk.^{13,17}

For understanding population-level health disparities, exposures and their effects should be examined through a person's lived experience by incorporating concepts such as social identity, membership in marginalized and discriminated populations, and the impact of

historical and ongoing residential segregation. Structural life course perspectives emphasize that disadvantaged populations are faced with the increased stress of overcoming barriers imposed by social constraints. The personal exertion to alleviate barriers can result in cumulative and enduring physiological costs and adverse health. Thus, later life health reflects both childhood adversity and the compounded chronic strain of meeting challenges as an adult.

Understanding Biological Mechanisms

Life course perspectives on health disparities propose that

socially patterned environmental exposures influence the development of biological, physiological, and psychosocial systems, including structural and functional changes in the brain. Developmental and structural perspectives on the life course arise from distinct theories that warrant closer integration into research on how biological mechanisms result in health disparities (see the box on page S52). Developmental approaches emphasize the timing of adversity relative to critical and sensitive periods of development. Each life stage has unique biological, physiological, and psychosocial developmental properties that confer differential susceptibility (either elevated or suppressed) to stressors and buffers. Thus, research is needed to consider life stage timing in addition to the intensity and valence of exposures that result in health disparities.

For example, adverse exposures during stages with more rapid growth and neurodevelopment, such as gestation, early childhood, and the pubertal transition, will have greater potential to trigger developmental shifts in underlying biological, physiological, and psychosocial processes. Such shifts can result in either unresponsive or hyperresponsive biological systems. Altered development of one system can create lasting effects across multiple systems because these systems are interconnected. Moreover, exposures during early life stages can affect the maximum capacity for health through the direct alteration of the developing physiological and psychological systems. Exposure to additional adversity later in development would be expected to potentiate these earlier biological deviations and compound health risks. These processes may be synergistically accelerated through the adoption

of negative health behaviors, including substance use, inadequate exercise, and poor nutrition and sleep habits.¹⁹

Stress-responsive systems include the immune system, hypothalamic–pituitary–adrenal axis, the hypothalamic–pituitary–gonadal axis, autonomic nervous system, and cellular stress and oxidative stress pathways.¹⁴ Potential mechanisms by which social and environmental exposures result in later health risks include epigenetic modifications of stress response systems, accelerated cellular aging, and earlier onset of aging conditions and diseases, such as cardiovascular disease, diabetes, and cancer.^{13,20–23} Structural life course perspectives propose that psychosocial and physical challenges to metabolic homeostasis occur with different frequency or intensity across socially unequal populations. Prolonged or repeated challenges among marginalized groups are more likely to cause stress-mediated wear and tear on important biological systems, increasing health vulnerability and disease susceptibility and leading to widening population health disparities from youth through middle age.^{13,22,24}

Structural approaches emphasize that the health capacities, risks, or outcomes attributed to biological or developmental age are also socially constructed and can be markers of differences in life experiences. These life experiences have physiological and psychosocial sensitivities or vulnerabilities that may not be universal across populations and historical periods. Incorrect conclusions can be drawn if key variables are interpreted only as representing biological development. The social constructs for these stages and population-level differences in life experiences up to or during these ages need to be considered.

For example, consider how the construct of adolescence influences the interpretation of the association between adverse pregnancy outcomes and age-at-first-birth in the United States. The pubertal transition and early adolescence reflect biological developmental processes, yet modern Western countries have lengthened the social period of adolescence by expecting their children to obtain higher education (although higher education is not equitable by race, ethnicity, gender, or social class). Some conflate the social extension of adolescence with the biological developmental stage of adolescence, a stage in which one is developmentally immature for healthy childbearing. Thus, because US Blacks are more likely than Whites to start childbearing in late adolescence, some have concluded that adolescent childbearing is an important driver of racial disparities in birth outcomes. However, Black mothers in late adolescence have better birth outcomes than Black mothers in their 20s and 30s.²⁵ Poorer birth outcomes for Blacks are driven by births to mothers in their 20s and 30s, not by adolescent births. The cumulative physiological toll of stressors to which Black women in their 20s and 30s are exposed could explain the relatively better birth outcomes for those aged 18 and 19 years.²⁵

Thus, because many of the developmental life stages also have socially constructed parameters, life stages should be examined for whether they are expected to have universal or unique within-population characteristics and whether health outcomes are best explained by using a developmental perspective, a structural perspective, or a combination of both.

Transgenerational Disparities Transmission

Social disadvantage not only creates health risks in one generation but is also transmitted across generations. Thus, considering exposures only over an individual's life span may not adequately explain health disparities at the population level. A priority area for health disparities research is to determine mechanisms and pathways that lead to intergenerational (2 generations) and transgenerational (3 or more generations) transmission. Adverse exposures that occur during preconception (maternal and paternal), in utero (fetal), and sensitive developmental periods of childhood have been found to enhance vulnerability to diseases in childhood and adulthood, with the potential for transgenerational transmission.^{26,27} For example, disparities in preterm birth, low birth weight, and infant mortality by race and ethnicity persist. Although much emphasis has been placed on the prenatal environment and prenatal care, research has also demonstrated the importance of the preconception health of women and men.²⁸ The dyadic parental relationship, their multilevel stress experiences, and their multilevel resilience resources become intertwined with the biosocial development of the next generation.²⁹ Evidence of epigenetic effects across generations suggests that, at a minimum, 3-generation cohorts are needed to define mechanisms.³⁰

Equally important for transgenerational transmission of health disparities is the understanding that life experiences for each generation may vary across population groups. For example, the experience of social and economic disadvantage and

LIFE COURSE PERSPECTIVES' KEY CONCEPTUAL EMPHASES

	Developmental Life Course Perspective	Structural Life Course Perspective
Strengths of life course perspective	<ul style="list-style-type: none"> • Emphasis on understanding human biological plasticity in response to environmental and social exposures in early developmental windows • Emphasis on capacity for biological adaptation to adverse environmental contingencies in early life to be enduring and maladaptive for health in later life 	<ul style="list-style-type: none"> • Emphasis on health-harming or health-promoting exposures as being historically structured and socially patterned to differentially affect the lived experiences of unequal populations across the full life course • Emphasis on socioeconomic position, social identity, and racialization as dynamic influences on agency, exposures, and physiological responses
Explanations for shifts in health trajectories	<ul style="list-style-type: none"> • Exposures at critical and sensitive periods of development • Adaptation to negative exposures affects later health • Socioeconomic gradient has an impact on magnitude and composition of exposures 	<ul style="list-style-type: none"> • Social standing and context shapes qualitatively different life exposures and responses • Impact of the stress of cumulative inequity
Multiple exposures and interactions	<ul style="list-style-type: none"> • Developmentally sensitive acute and chronic effects • Importance of susceptibility and sensitivity of developmental stages for impact on health over time 	<ul style="list-style-type: none"> • Social standing and context shape types, valence, and intensity of exposures and the ability to respond • Prolonged and repeated challenges for individuals intensify family and community exposures
Biological and mechanism research	<ul style="list-style-type: none"> • Mechanisms for how stress-responsive systems in early life influence health trajectories • Mechanisms for how social and environmental exposures influence stress-responsive systems 	<ul style="list-style-type: none"> • Mechanisms for how structured inequity cumulatively dysregulates, weathers, or exhausts important body systems and accelerates aging and the onset of chronic disease • Attention to universal or unique within-population characteristics of developmental and social life stages
Intergenerational transmission of health disparities Health disparities interventions	<ul style="list-style-type: none"> • Biological mechanisms such as epigenetics and poor development • Psychosocial mechanisms such as family and community • Attention to early intervention, before pathology • Address childhood disparities through 2- and 3-generation approaches 	<ul style="list-style-type: none"> • Health shapes social and economic trajectories • Nonbiological mechanisms, such as cultural, psychosocial, and social mechanisms, also shape intergenerational transmission of health • Anticipate and address differential impacts of social policies across populations and geographic settings on the basis of social structural factors • Recognize social policy as health policy

major traumatic events will vary for different population groups on the basis of factors such as material hardship, historical discrimination, or geographic area of residence. Moreover, because ill health has social consequences, this impact needs to be examined for the individual, families, and future generations.³ To understand how health disparities are transmitted transgenerationally will require a better understanding of how societal forces influence the range and scope of interpersonal, individual, and population transitions and trajectories. To summarize, dynamic and complex models of

multicontext, multipopulation development are needed to understand how health disparities arise over the life course and are transmitted across generations, whether through epigenetic, cultural, psychosocial, behavioral, or socioeconomic pathways.

Integrate Into Health Disparities Interventions

Interventions need to be designed taking into account that health outcomes develop over time and that the interventions may have latent, pathway, or cumulative effects on health depending on when and how

frequently they are administered. From a developmental perspective, interventions need to target when conditions are most responsive to ensure the greatest reduction in, or ideally elimination of, subsequent poor health outcomes, which may be long before the pathology is observable. To address transgenerational disadvantage, interventions need to reach beyond the current generation. A common approach to address childhood disparities is a 2-generation approach entailing a joint focus on the child and the parent, recognizing the primacy of the family. A proposed 3-generation approach builds on

the 2-generation approach by shifting the focus from current families at risk to universal primary prevention, strengthening families and building children's skills through adolescence and young adulthood so that each child reaches his or her potential to be a healthy, engaged, productive citizen with the skills to plan for and parent the next generation.³¹ Thus, incorporating a life course perspective into health disparities interventions needs a multilevel "whole-person, whole-family, whole-community systems approach."^{32–34(p389)}

From a structural perspective, individual-level (person, family, or

household) prevention will not be efficient in achieving population-level prevention because it does not address the social patterning of exposures, opportunities, or constraints on behavior. To address the fundamental causes of health disparities and life course contributors, social and economic policies must be considered as health policies. The health impacts of social policies—family, welfare, housing, environmental, education, labor market, immigration, and transportation policies, as well as health care policy—are expected to have different population impacts on the basis of structured variation in socioeconomic resources, ethnic identity, racialization, and the ability of populations to meet the policy expectations. For example, a natural experiment of a military-style immigration raid on a single meat packing plant in Iowa showed that rates of preterm and low birth weight increased among Latina, but not White, mothers throughout the state.³⁵ This included pregnant Latinas who were legal US residents or US citizens and those not present at the immigration raid, implicating the role of ethnic stigma and stereotyping on the health of Latino/a Iowans as a group.³⁵ Assessing the potential health impacts of social policies for different populations and appreciating the role of policies in creating or diffusing stigma is an evolving way to leverage policies to promote population health over the life course.¹³

FUTURE DIRECTIONS

Health disparities are the result of population-level life trajectories formed as a result of life experiences and exposures within a dynamic multilevel system. Life course perspectives provide important concepts to understand and address the

origins, persistence, and transmission across generations of health disparities. However, challenges limit the feasibility of broad application of life course perspectives. For example, the current siloed approach to research (e.g., biological, psychological, sociological, environmental, anthropological, population health), discipline and funding agency segmentation into disease focus (e.g., mental health, chronic diseases, cancer), and fragmented health care delivery (e.g., obstetrics, pediatrics, internal medicine, geriatrics) limits the ability to integrate life course concepts more broadly to effectively address disparities.³⁴ One solution—increasing interdisciplinary research—although rewarding with the potential for high yield, requires understanding the significant level of effort required to blend disciplines, expertise, and methodology. Often, health disparities research excels in incorporating either biological or social constructs into the research design, conduct, and interpretation of the results, but few integrate both aspects. Resources are needed to support the infrastructure, teams of investigators, effort, and time required for integrative research, particularly for junior scientists. Some strategies include multiple principal investigator research projects, programs, and consortia; integration of ethnographic and community-based research; specific social and biological integrative review panels; and the development of courses and conferences that provide primers and connections to bridge the social and biological chasm.

Another challenge is that the discovery of central fundamental pathological pathways is disease specific at the individual level,

rarely considering upstream factors or population health. The NIH classifies US health disparity populations as African Americans/Blacks, Hispanics/Latinos, American Indians/Alaska Natives, Asians, Native Hawaiians and Other Pacific Islanders, socioeconomically disadvantaged populations, underserved rural populations, and sexual and gender minority populations. Variables that are key to understanding health disparities in these populations are considered as moderators in most chronic disease models (e.g., race/ethnicity, sex/gender, nativity status, socioeconomic status, and geography). Thus, many models have limited ability to explain disparities beyond the socioeconomic status gradient for homogeneous populations³⁶ and US Whites.³⁷ More population-specific models are needed that incorporate structural pathways and the mechanisms that influence the lived experience and exposures, as well as the agency and ability to respond to exposures. Research is needed that explicitly addresses fundamental causes of health disparities, such as racism and other forms of discrimination and how these influence population-level health outcomes over the life course and transgenerationally.

A persistent challenge is developing and supporting longitudinal cohorts and data sets that better represent the populations and contexts in which health disparities currently exist in the United States. Barriers include the high level of support needed for sustained periods of time against funding constraints and shifting priorities as well as attention to the effort required to increase the participation of underrepresented populations. Some current approaches may

increase the capacity of scientific research to conduct life course research focused on health disparities. For example, the NIH “All of Us” initiative promotes that one of its core values is achieving “participants that reflect the rich diversity of the US.” This emphasis on and corresponding investment in such a high-visibility large prospective longitudinal cohort will have an impact on the scientific capacity for future large initiatives.

Another opportunity is to leverage the big data initiatives to address minority health and health disparities. Emphasis on inclusion of demographic and geographic variables and social determinants in electronic health records, as well as increasing the capacity for linkage between existing longitudinal research data sets with administrative data could spur additional means of examining population health longitudinally.³⁸ This type of integration of administrative data from many sectors with health records will allow for in-depth examination and comparison of developing trajectories for populations that is reflective of their lived experience across different local environments, policies, or social norms. However, big and diverse does not imply representative. Big data are subject to the same biasing factors as small data and do not inherently address the barriers to participation in research by disadvantaged populations.³⁹ Moreover, public health must continually challenge the biomedical research enterprise to go beyond clinical precision for an individual and press for initiatives and approaches that recognize that upstream factors are key for understanding health.⁴⁰

A central challenge to the support of life course approaches is the tension between resources

to address the immediacy of the public health problem and the presumed decades before a research investment will generate actionable knowledge. Although some decade-long support of longitudinal cohorts and surveys with demographics and social determinants that better reflect the lived experience in the United States will be required, we also argue for strategies to better integrate life course perspectives into biological mechanism and intervention research beyond longitudinal designs. Reducing health disparities requires timely action today. However, the persistence of health disparities, despite the multiple-decade mandate to eliminate them, speaks to the need for a parallel approach to support research to understand how exposures in a dynamic multilevel system influence health trajectories.

In conclusion, life course approaches can lead to etiologic insights into the developmental processes that generate disparities preconception, prenatally, during infancy and early childhood, through adolescence, middle adulthood, older adulthood, and across generations. These approaches also can provide etiologic insights into how social identity and position within social structures influence health trajectories. These approaches also have the potential to inform the design and optimal life course timing and scale of interventions that will target those processes. Moving forward, broader health disparities research should leverage the potential of multiple life course conceptual frameworks to address the origins, development, and manifestation of health disparities at the individual, family, community, population, and policy levels. Thus,

transdisciplinary and interdisciplinary research approaches and fostering interdisciplinary scientific expertise are needed to address the complexity of the factors contributing to health disparities. **AJPH**

CONTRIBUTORS

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The authors have nothing to disclose.

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