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What Makes an Intervention a Life Course Intervention?

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abstract

OBJECTIVES: To develop an initial list of characteristics of life course interventions to inform the emerging discipline of life course intervention research.

METHODS: The Life Course Intervention Research Network, a collaborative national network of >75 researchers, service providers, community representatives, and thought leaders, considered the principles, characteristics, and utility of life course interventions. After an in-person launch meeting in 2019, the steering committee collaboratively and iteratively developed a list of life course intervention characteristics, incorporating a modified Delphi review process.

RESULTS: The Life Course Intervention Research Network identified 12 characteristics of life course interventions. These interventions (1) are aimed at optimizing health trajectories; (2) are developmentally focused, (3) longitudinally focused, and (4) strategically timed; and are (5) designed to address multiple levels of the ecosystem where children are born, live, learn, and grow and (6) vertically, horizontally, and longitudinally integrated to produce a seamless, forward-leaning, health optimizing system. Interventions are designed to (7) support emerging health development capabilities; are (8) collaboratively codesigned by transdisciplinary research teams, including stakeholders; and incorporate (9) family-centered, (10) strengths-based, and (11) antiracist approaches with (12) a focus on health equity.

CONCLUSIONS: The intention for this list of characteristics of life course interventions is to provide a starting point for wider discussion and to guide research development. Incorporation of these characteristics into intervention designs may improve emerging health trajectories and move critical developmental processes and pathways back on track, even optimizing them to prevent or reduce adverse outcomes.

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The past 2 centuries have seen marked improvements in Americans' life expectancy, from 39 years in 1860 to 78.8 years in 2014, largely because of reduced infant and child mortality.[1] Temporary drops in life expectancy resulted from the Civil War, World War I, and the 1918 influenza pandemic, and a similar negative impact is expected from COVID-19.[2,3] However, since 2015, long before the current pandemic, life expectancy in the United States has shown a small, but significant downward trend[4] especially for poorer and Black Americans.[5] Increasing body mass index, stress, and sedentary lifestyles coupled with midlife deaths due to drug and alcohol use and mental health challenges[6] all contribute to this trend, as do structural and policy factors like gun control and environmental regulation.[7] Although the root causes of these trends remain unclear, what is clear is that many have their initial manifestations in childhood. By adolescence, up to 40% of children have a body mass index associated with adverse health outcomes,[8] 7% report anxiety, 7% have behavior or conduct issues, and 3% have depression.[9] Neurodevelopmental challenges such as attention-deficit/hyperactivity disorder affect $>10\%$.[10,11]

Addressing these issues through intervention is not a simple task. Most of these issues do not have a single cause[12,13] but result from of a series of adverse person-environment interactions starting early in life.[14,15] These person-environment interactions include exposure to excessive stress, poverty, interpersonal and structural racism, modern diet and eating habits, and the increasingly complex demands of our societal and educational systems.[12,16] Simultaneously, changes in the nature of family relationships, family stability, and livelihoods are dislodging the scaffolding that has traditionally supported human health development.[17] As recent experiences with COVID-19 have shown, these factors are not affecting society equally but have a greater effect in low-income communities and communities of color,[18] widening existing health disparities. Current Centers for Disease Control and Prevention estimates revealed that between 2019 and the first half of 2020, life expectancy decreased by 2.7 years for non-Hispanic Black Americans (74.7-72), by 1.9 years for Hispanic Americans (81.8-79.9), and by 0.8 years for non-Hispanic White Americans (78.8-78.0). In male individuals, a Black child born in 2020 can expect to live 68.3 years compared with 75.5 for a non-Hispanic White child and 76.6 years for a Hispanic child.[2] Tackling health equity will require interventions from the start of life and across the whole life course, taking much greater account of social circumstances and lived experiences.

Quoting Virchow from 1848, although "medicine is a social science, and politics is nothing more than medicine on a large scale,"[19] it is only recently that we have begun to understand the mechanisms through which social determinants of health exert their effects. The Life Course Health Development (LCHD) model[20] reveals how biological, psychological, and environmental factors all contribute to health by acting through contributory pathways that cut across individual, family, and community levels, life stages, and even generations.[21,22] New developments in systems biology and epigenetics point to allostatic load and changing metabolic processes as plausible intermediaries between individual health and a range of environmental influences.[12,23] These influences operate in a dynamic relational environment in which epigenetic and biological processes are affected by current and past family and community environments and relationships and by wider societal influences.[24,25]

Importantly, the LCHD approach draws together aspects that might at first glance appear unrelated but that in fact exert powerful influences on individuals' health trajectories and that need to be addressed for interventions to be successful in improving health. Although a full discussion of the impact of racism on a person's health trajectory is beyond the scope of this article, racism represents the kind of pervasive societal issue that can affect a child's life in a multifaceted way from their lived experience in their community, to the health and well-being of their parents, to their own relational experiences. In attempting to draw together decades, if not centuries, of thought, observation, and research from medicine, social science, psychology, physiology, and genetics into a unifying concept of LCHD, the LCHD approach provides a framework through which different disciplines can integrate their knowledge and shed light on the triggers, pathways, and processes underlying these perplexing conditions. The realization that in some cases potent drivers of these pathways have roots not just in an individual's history but also in previous generations greatly expands the scope of factors that need to be considered in etiologic pathways, and, in turn, the number of potential avenues for interventions. The most effective interventions might not be at the individual level, as has dominated our thinking over the past century, but at family, community, and even global levels.

The term "intervention" means the act of interfering with the outcome

or course of a condition or process, usually as a means to prevent harm or improve functioning.[26] The National Institutes of Health defines intervention as the manipulation of the subject, or the subject's environment, for the purposes of modifying one or more health-related biomedical or behavioral processes and/or end points.[27] The focus of medical interventions has historically been on disease management, later expanding to incorporate illness prevention and health promotion. The notion of an intervention to promote health development goes a step farther, as the acquisition of health as an active process and the key role and function of development is recognized. Developmental processes not only are cumulative but also are dependent on iterative and recursive loops that feed forward and compound changes over time, especially those that occur during critical and sensitive periods. Conceptualization of these pathways to health over long periods allows researchers to logically place the early years as a priority for interventions to change the life course. The goal of these interventions is not just a healthy child or adolescent but also the acquisition of developmental capabilities and health reserves that will enable them to flourish throughout their adult lives.

In this article, we attempt to draw together current thinking both about interventions, whether they be medical, social, educational, or transdisciplinary, and about LCHD to address the central question of what it is that makes an intervention a life course intervention. We focus on the characteristics of the interventions themselves. Recommendations for a research framework in which such interventions can be tested and evaluated are reported in a separate article.[28] The current article is conceptual in nature wherein we aim to provide a starting point for wider discussion and to guide research development in the field.

METHODS

Life Course Intervention Research Network

The Life Course Intervention Research Network (LCIRN), launched in 2019, is a collaborative network of researchers, service providers, family and community representatives, and thought leaders committed to improving life course trajectories and outcomes for children and families. A national coordinating center based at the University of California, Los Angeles, and partner institutions lead 2 research cores (family and community engagement and race, place, class, and gender) and 9 current research nodes (adversity and resilience, attention-deficit/hyperactivity disorder, early childhood mental health, family health development, measurement of family functioning, school health, success after prematurity, youth justice), and youth-led participatory action research. The research core and node leaders comprise the 15-person steering committee, whereas a larger group of content experts, including researchers, practitioners, policymakers, and methodologists, acts as an advisory board.

The LCIRN deliberated over key questions pertaining to life course intervention research. Here, we address the first question: What makes an intervention a life course intervention? Discussions began at a launch meeting in 2019 attended by 40 network members, and all subsequent activities moved online because of COVID-19. The national coordinating center reviewed existing publications related to LCHD,[12,20,29,30] including the LCHD handbook,[31] with the aim of fully articulating the principles of LCHD and applying them to interventions.

Members of the steering committee reviewed this initial list of principles of life course interventions and listed a series of revisions for clarity and important additional themes to incorporate. The result was a revised list of 12 characteristics of life course interventions that then underwent a modified Delphi review.

Approximately 75 active network members were invited to provide input on this list of characteristics, and 29 participated (Table 1). Participants completed a Qualtrics survey, rating the extent to which these proposed characteristics of life course interventions (1) were comprehensive, (2) were useful to researchers, (3) were actionable by researchers, (4) would be effective for life course intervention research if adopted, and (5) had the potential to reduce health disparities.

Participants were also asked to suggest any critical intervention characteristics missing from the list and to identify any places where the list might introduce bias or require rewording to improve clarity. They were also asked to identify redundancy or characteristics that did not belong on the list. Finally, participants were asked to rank the characteristics in order of importance. Open-ended responses were reviewed by 2 members of the research team and grouped into themes using a constant comparative method of qualitative analysis. At least 17 separate individuals provided at least one open-ended comment, with 35 comments received in total, suggesting relatively wide engagement of participants with the process.

TABLE 1 Modified Delphi Participant Characteristics[a]

Characteristic	No.	%
Resides in United States	22	100
Female sex	7	33
Race		
White	19	90
Black/African American	2	10
American Indian/Alaska Native	0	0
Asian	0	0
Native American/Pacific Islander	0	0
Other	0	0
Hispanic	2	11
Education/training		
Master's degree	2	10
Professional degree beyond a bachelor's degree[b]	6	29
Doctorate degree[c]	13	62

[a] $N = 29$. Not all characteristics add up to 29, as some participants only completed part of the survey.
[b] For example, MD, DDS, DVM, LLB, JD.
[c] For example, PhD, EdD.

RESULTS

What Makes an Intervention a Life Course Intervention?

The 7 principles of LCHD that have emerged from previous work are (1) health development, (2) unfolding, (3) complexity, (4) timing, (5) plasticity, (6) thriving, and (7) harmony.[12,16,20] These principles are elaborated in Supplemental Table 1 w ith a brief description, followed by an initial conceptualization of how that principle could be applied to an intervention to make that intervention a life course intervention and the potential for interventions exhibiting that principle to reduce health disparities.

The Iterative Review With Network Leaders Led to 4 Recommendations for Change

Recommendation 1: Use Plain Language to Describe Actionable Characteristics of Interventions

The principles were revised to a list of 6 more actionable characteristics: (1) optimization focused, (2) developmentally focused, (3) longitudinally focused, (4) strategically timed, (5) multilevel or holistic, and (6) vertically, horizontally, and longitudinally integrated.

Recommendation 2: Add Critical New Characteristics

To incorporate all aspects of LCHD and to give these interventions the greatest likelihood of success in improving health trajectories for the whole population, 6 additional characteristics were suggested: (1) addresses emerging health capacities or capabilities, (2) strengths based, (3) collaboratively codesigned, (4) family centered, (5) antiracist, (6) equity focused (Table 2).

Recommendation 3: Use Illustrative Examples

Concrete examples were added for how to incorporate each of the 12 characteristics into interventions (Supplemental Table 2).

Recommendation 4: Explain How Life Course Interventions Differ From Existing Intervention Approaches

Finally, to highlight the contributions of an LCHD approach to intervention development, we chart in Table 3 the evolution of thinking about interventions from historical approaches, through existing approaches, to the types of interventions that could be developed through the application of these life course characteristics. On the basis of a response of strongly agree or agree on a 5-point Likert scale, the majority of the network participants who completed the e-survey endorsed the list of characteristics as (1) comprehensive (87%), (2) useful to researchers (74%), (3) actionable by researchers (74%), (4) effective for life course intervention research (74%), and (5) having the potential to reduce health disparities (70%) (Table 4).

Three Principal Themes Emerged From the 35 Open-Ended Comments Received

Theme 1: Potential for Combining Characteristics

Although respondents appreciated the distinctions among the characteristics, combining or grouping them into a shorter list might provide a simpler rubric that would be easier for researchers to apply to their studies. Importantly, there were no suggestions that any of the characteristics warranted removal.

Theme 2: Cultural Grounding

Respondents appreciated the importance of the antiracist characteristic yet saw a need to incorporate antibias of all types. There was some, but not complete overlap with the concept of research being culturally grounded.

Theme 3: Trauma-Informed Care

Principles of trauma-informed care were recognized as potentially important for application to life course interventions. Not all of the comments concurred. For example, some respondents suggested that it might be useful to separate those characteristics that should apply to all good-quality research from those that were more directly related to making the research life course in orientation. However, others expressed a preference for the full

TABLE 2 Actionable Key Characteristics of Life Course Interventions

Characteristic	Description
Initial	
Optimization focused	Aimed at optimizing health trajectories rather than simply preventing or treating specific health problems.
Developmentally focused	Grounded in the knowledge that health development takes place from preconception through adulthood and that each stage affects health development in subsequent stages. Strongly process oriented.
Longitudinally focused	Aimed at improving health reserves and resilience in early life that will contribute to disease prevention later in life.
Strategically timed	Targeted to a critical or sensitive period of development, or a transition or turning point, to intervene with maximum efficacy and impact. Timing is multidimensional, including duration and frequency of intervention, as well as stage of the life course.
Multilevel or holistic	Designed to improve >1 aspect of the ecosystem in which children are born, live, learn, and grow; considers social and cultural context.
Vertically, horizontally, and longitudinally integrated	Aimed at integrating services, programs, and other protective factors, including those outside the medical care sector, at all levels, to create a seamless, forward-leaning, health-optimizing system.
Additions	
Addresses emerging health capacities	Designed to support and enable processes leading to the development of capacities for positive health, not just management or prevention of disease.
Strengths based	Builds on child, youth, family, and community strengths to build health reserves and to create adaptations to circumvent challenges.
Collaboratively codesigned	Designed by stakeholders (individuals, families, communities) and professionals working together.
Family centered	Recognizes and supports the unique role of families as incubators of early health development, with potential to build family resilience and buffer children from adverse experiences.
Antiracist	Incorporates antiracist principles and considers the potential role of and effective responses to racism.
Equity focused	Supports health equity, recognizing that different circumstances and contexts warrant different intensities of intervention. Designed to help the most disadvantaged individuals.

list of 12 characteristics to be retained as a cohesive whole. It was also clear that there was in fact little consensus about which characteristics fell into each category. Consequently, the full list of 12 characteristics has been retained in this first iteration. In Table 5, we show one possible grouping of life course intervention characteristics into 4 broad categories (developmentally focused, health optimization focused, multilevel or holistic, and collaboratively codesigned) together with subcategories representing original characteristics and additions from the themes analysis.

DISCUSSION

Intervention science appears to be at a tipping point, with the focus of evidence-based care shifting from managing disease with diagnosis-specific therapy protocols to intervening early to affect the processes that underlie the development of both health and disease.[32] The LCHD approach is a framework with principles to help to drive this new way of thinking about interventions as it forces researchers to consider the biological, psychological, genetic, epigenetic, and environmental processes that operate across the life span to influence the active development of health. In addition, the health of not only individuals but also families, communities, and the larger society are taken into consideration. LCHD, with its focus on complex developmental ecosystems, links older concepts of the factors that determine health with more expanded notions of how health can develop or be developed within a person, supporting lifelong health.[33–35] This shift in thinking has major implications for the design and conduct of intervention research studies and for the characteristics of the interventions themselves.

The life course intervention characteristics identified through this collective process are grounded in the literature, reflecting both emerging concepts in intervention research and life course principles. The process that the LCIRN undertook to arrive at and organize these characteristics and to begin to articulate their application to interventions has been reported in detail so that the evolution of the group's thinking can be tracked and critiqued. As is inevitable with any new approach, there are tensions to be resolved. A balance has been struck between a desire to retain the important distinctions among the characteristics while producing an actionable list that researchers would find useful rather than overwhelming and impractical. Some reviewers see redundancy, others a

TABLE 3 Evolving Characteristics of Life Course Interventions

Characteristic of Intervention	Traditional Interventions	Existing Interventions	Life Course Interventions
Aim	Manage disease	Manage and prevent disease	Optimize health development
Time frame	Short term	Medium term	Long term
Timing	Based on emergence of disease, weighted toward adulthood and end of life	Targeted just before emergence of disease, often in midlife	Targeted to critical and sensitive periods, transitions, and turning points, many of which occur in childhood and adolescence
Level of intervention	Single level, ie, patient focused	Most single level, some 2 levels, eg, child/adult and family	Multilevel or holistic, involving child/youth, family, community
Degree of integration	Stand alone	Some integration with other services and programs	Integrated with other services and programs, including those from other disciplines; ideally integrated across whole ecosystem
Developmentally focused	Largely unrelated to developmental stage	Considers developmental stage in intervention delivery	Tailors intervention to developmental stage with aim of improving child's developmental trajectory
Emerging health capacities	Not addressed	Partially addressed	Supports and enables emerging capacities for health as a principal focus
Strengths based	Manages illness, largely ignores strengths	Manages or prevents illness, largely ignores strengths	Builds on strengths of individual, family, and community in circumventing/adapting to health challenges
Designer	Designed by professionals	Designed by professionals followed by limited consultation with family and community representatives for feedback	Collaboratively codesigned by families, youth, communities, and professionals in equal partnership
Family centered	Individually focused, not family centered	Most individually focused, with some family involvement	Supports the health development of families as a way to build family resilience and buffer children from adversity
Antiracist	Not considered	Considered if overt racism reported	Racism always considered: Could racism be playing a role, and how does the intervention address this? How does the intervention avoid being complicit in racist systems?
Equity focused	Not considered	Partially considered	Focuses on equity (not the same outcome for all) but acknowledges that some circumstances need more intervention to support life course health equity; interventions designed with equity in mind

need for further expansion. As noted, there has been debate on whether some characteristics are specific to life course interventions or might represent good practice for all types of interventions, as well as on the degree to which it is possible to separate the two. For example, although all good-quality research should have an assurance that it is antiracist, this characteristic is particularly important for life course interventions because unaddressed racism can have a potentially profound impact across the whole life course. The presentations of the characteristics given here represent this first articulation of the group's

TABLE 4 Modified Delphi Results

The 12 Characteristics of Life Course Interventions Are	%
Comprehensive	87
Useful	74
Actionable	74
Effective	79
Having the potential to reduce health disparities	70

Percentages reflect responses of strongly agree or agree.

TABLE 5 Proposed Grouping of Characteristics of Life Course Interventions

Grouping	Description
Developmentally focused	Tailored to the child's developmental stage
	Addresses emerging health capacities and capabilities
	Longitudinally focused
	Strategically timed
Health optimization focused	Aim is to thrive and flourish across all domains of well-being (physical, socioemotional, mental, cognitive, spiritual)
	Strengths based
Multilevel/holistic	Individual-, family-, and community-level interventions integrated or stacked
	Vertically, horizontally, and longitudinally integrated both intrinsically (within the design of the intervention) and extrinsically (designed to align and integrate with existing programs and services)
Collaboratively codesigned	Family centered
	Antiracist
	Antibiased
	Health equity focused
	Culturally grounded
	Trauma informed

thinking and will undoubtedly continue to evolve with further review.

The 12 characteristics are comprehensive and might at first glance appear daunting for researchers. Incorporating all 12 characteristics into a research project in a checklist fashion will be challenging, yet at the same time will hold great potential to improve the quality and utility of life course intervention research. One option as a first step is for researchers to review the list and determine whether there are at least some characteristics that they could readily and immediately incorporate, even if others might require longer-term planning. The characteristics are discussed in detail below (in the order of importance as ranked by survey respondents), of which the top 4 are being developmentally focused, strategically timed, longitudinally focused, and multilevel.

1. Developmentally Focused

Life course interventions are inherently developmentally focused, but simply assigning an intervention to a specific life stage (eg, infancy, school age) is not enough. Tailoring the intervention to the child's developmental stage (which may or may not correspond to biological age) and carefully considering the developmental processes under way during these life stages will more effectively move children toward health. Researchers designing interventions to improve early language acquisition have recently considered how to bring a developmental perspective to intervention design.[36] These types of conceptualizations might help to inform future work to go deeper into the ways in which a developmental focus can be applied to interventions.

2. Strategically Timed

Interventions need to be strategically timed, focus on transitions and turning points in a developmentally appropriate way, intersect with culturally and biologically programmed events such as puberty to strengthen the child's ability to navigate this phase, and overcome vulnerabilities, preferably in a way that leaves them more able to withstand future transitions.

3. Longitudinally Focused

Being longitudinally focused does not simply mean having a prolonged period of follow-up after an intervention, although this certainly helps with knowledge acquisition. Rather, short-term follow-up studies that reveal early changes in indicators of longer-term trajectories, or proximal transitional states that are precursors of later outcomes, can make important contributions, especially in studying conditions with poorly defined, multifactorial etiology (eg, childhood anxiety).

4. Multilevel or Holistic

Because most states of health result from complex processes occurring in multiple dimensions and at multiple levels and phases over time,[37,38] simple interventions are likely to have limited success. Individuals live and grow in a complex universe in which "intervention A does not predictably lead to outcome B."[39] Tensions and paradoxes are inherent in the system, and relationships comprise clusters of interactions proceeding in multiple directions over time. Each individual is their own complex adaptive system operating within other complex adaptive systems (eg, family, school, community) in a series of interconnecting interactions.[40] Interventions need to address complexity but cannot themselves be so complex as to be impractical and unwieldy. The key is to identify those pivot points within complex systems where well-timed and focused interventions across individual, family, and community levels can have the greatest effect.

5. Strengths Based

Interventions also benefit from being strengths based so that even where there may be a marked problem in one area (eg, physical health), further strengthening mental or socioemotional health could bring lifelong health benefits. Researchers targeting interventions to deficits without building on strengths miss an opportunity to match the intervention to the child's developmental profile. Although the prospect of adjusting interventions to be a better fit with recipients' strengths so as to better meet their needs may seem daunting,[41] the potential of a more individualized approach to creating greater health resilience merits study.

6. Health Optimization Focused

Optimizing health is not a new idea, yet it is at odds with much of clinical practice where the focus is on responding to identified problems in a deficit-driven model. Achieving optimal health and building health resilience and health reserves requires early life interventions, the absence of which almost certainly contributes to health disparities.[42] Interventions designed to optimize all aspects of health development in the early years might appear to be a luxury, but if the processes that trigger pathways leading to early morbidity and mortality are laid in these years and become less mutable with time, then these types of intervention will have the greatest potential to improve life course health and save long-term costs.[43,44] Researchers need to address health optimization as flourishing across physical, socioemotional, mental, cognitive, and spiritual domains.

This approach depends on researchers finding tools, such as ecomapping and measures that can evaluate strengths at the child, family, and community level,[44] and understanding how to harness those functional processes to support other developmental processes that are still in a nascent stage. Teachers and other adults, such as faith leaders and sports coaches, might identify child and family strengths that are not apparent to others.

7. Health Equity Focused

Researchers need to focus life course interventions on addressing health equity if they are to improve the health trajectories of whole populations. Assessing the effects of an intervention on the health of people who are disadvantaged because of one or more social determinants of health,[45] designing interventions so that they are tailored to the most disadvantaged individuals, and partnering with communities throughout the research process to enhance engagement and understanding of community context[46] can all help researchers to achieve equity goals.[47,48] Disaggregating data from intervention trials and analyzing for health equity–related questions may also help with transparency and completeness of reporting.[49]

8. Family Centered

By incorporating family-centered care principles into the intervention design process, researchers acknowledge that parents know their children best, potentially leading to a strengthening of the family support scaffolding surrounding the child with better intervention outcomes.[48] New tools are being developed to measure the family centeredness of interventions that could prove useful in research,[50] whereas efforts are under way to understand more about how to measure family functioning[51] and how to conceptualize family health development.[52]

9. Antiracist

Interventions where researchers ignore the possibility of racism as a contributing factor to contemporary health issues and fail to tackle this important and often structural contributor to health trajectories will be less effective than those where researchers are aware of and respond practically to racism at all levels. This design will involve implicit shared language of antiracism in institutions and the research team, leadership buy-in, ongoing researcher and staff training,[53] and long-term meaningful partnerships with communities of color.[54]

10. Horizontally, Vertically, and Longitudinally Integrated

Similarly, researchers who integrate health interventions with existing programs and policies create possibilities for leveraging or potentiating impact.[55] Interventions need to be horizontally integrated across sectors, vertically integrated across levels, and longitudinally integrated over time,[56] with repeated interventions at different ages and/or across generations.[57]

11. Collaboratively Codesigned

Codesign is defined as collective creativity across the design process, potentially resulting in interventions that are more engaging, satisfying, and useful. Moving beyond user consultation and engagement, youth, family, and community representatives work as equal partners with transdisciplinary teams[47,48] to jointly explore and find solutions to issues through fashioning interventions. This new methodology requires a shift from traditional practice[28] and skills in team building and team leadership[53]) and can bring challenges in terms of ethics and institutional review board approvals.[58]

12. Addresses Emerging Health Development Capabilities

Possibly the characteristic that most sets life course interventions apart, yet one that is perhaps the most challenging to articulate, is addressing emerging health development capabilities. Individuals are not simply passive recipients of the forces they encounter; rather, they participate in a dynamic relational process during which characteristics or capabilities take shape over time and determine health trajectories.[24] Just as individuals have developmental stages, so too do families who progress through formation, turning points, expansion (birth of a child), and permanence or dissolution. Communities also are not static, and their development can be observed and mapped and be the target of an intervention. Understanding more about these developmental processes operating at all levels, the developmental interplay among them, and the best ways to match interventions to the individual, family, and community's developmental stages will have major implications for future research, programs, and public policy.

Interventions are needed that are designed to promote, at the child, family, or community level, adaptive capacities for the development of health. Sen[59] has conceptualized capabilities as what people can do and be and see the furtherance of individual capabilities as a component of social justice goals. Application of a capabilities lens to child development reveals that supporting children's abilities to navigate their changing environment and changing life stages through the promotion and reinforcement of adaptive pathways and processes can improve their long-term health and have positive secondary effects on family and society.

Additional Considerations in Intervention Design

Interventions benefit from being culturally grounded, that is, tailored for the populations they are designed to benefit in ways that require a thorough cultural understanding. Similarly, there is increasing recognition that interventions need to be trauma informed,[60] which could be particularly important in circumstances where, for example, an intervention has a different impact than the one intended, with the difference in part explained by a history of adverse childhood experiences in the recipient population.

STRENGTHS AND LIMITATIONS

This list of characteristics represents just the first step in attempting to articulate what makes an intervention a life course intervention? The list is the product of a broad transdisciplinary process, is tailored to be applicable in the field, and has been judged comprehensive, useful to researchers, actionable by researchers, and potentially effective for life course intervention research. Limitations include its more modest ratings on having the potential to help researchers to reduce health disparities and its generation by a relatively nondiverse group largely comprising academics. Next steps will need to incorporate an iterative vetting process with a diverse group of life course intervention research stakeholders across the United States, including a substantial number of youth, family, and community representatives and researchers who are more diverse with respect to race and ethnicity, educational background, and other characteristics than the present sample. The list of characteristics will also need to be continually revised as life course interventions research gets under way throughout the LCIRN and the results start to reveal which characteristics are most important and effective. Finally, there is still considerable work to be done to fully articulate what is needed to fashion interventions to reduce persistent health disparities over the life course.

CONCLUSIONS

Life course intervention research is an emerging discipline within the field of life course health science, with an aim to improve health trajectories by discovering ways to support positive health development that enables children and adolescents to thrive. By starting to articulate the characteristics of what constitutes life course interventions, we hope to encourage researchers to incorporate them into their intervention approaches and to encourage funders to consider using these characteristics to assess whether a proposed intervention incorporates at least some attributes of a life course perspective.

A focus on community interventions means that everyone benefits and moves closer to a state of positive health. Members of traditionally underserved groups might benefit from more intensive intervention approaches in the early years that address and support the emerging molecular, epigenetic, and neurobiological processes that underlie the development of optimal health trajectories, contributing to health equity. By paying particular attention to those emerging pathways and processes most relevant to prevalent adult patterns of illness and developing effective ways to address them, researchers can use life course interventions to move health trajectories back on track and even optimize them before the emergence of clinically recognizable symptoms. These interventions must be developed in

collaboration with community members, incorporating and addressing their unique historic and social context. Next steps must include a wider review process with diverse groups of stakeholders and continued revision of these characteristics as concepts are refined. The LCIRN welcomes debate and feedback on this initial list of characteristics from researchers in the field and from youth, family, and community representatives so that future revisions of the list will benefit from this diverse experience.

ABBREVIATIONS

LCHD: Life Course Health Development
LCIRN: Life Course Intervention Research Network

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