

# A Sensitive Period: Bioethics, Human Rights, and Child Development

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## Abstract

This paper explores complementarities between bioethics and human rights in the ethical analysis of early childhood development (ECD) policies. It is argued that conceptual synergies arising from the integration of these fields are considerable, if underexplored, and best illuminated through application to specific domains of health policy. ECD represents an especially germane case study: it is characterized by rapidly evolving science whose normative implications are complex, emergent, and understudied, yet whose societal impacts are wide-ranging. The paper first charts the disciplinary evolution of bioethics, demonstrating its gradual social turn: from the individual to collective, from the medical to the societal. It then reviews points of theoretical confluence between bioethics and human rights, to assess the value and feasibility of their joint application to health policy analysis. Finally, it maps these complementarities onto issues provoked by the epigenetics of ECD, in the hopes that both the policy domain and the analysis of theoretical synergies are enriched. It finds that the distinctly relational and emergent nature of ECD science and policy demands novel forms of normative inquiry. Only an ethical approach supple enough to adapt to emergent questions, examine issues from varied theoretical perspectives, and assimilate insights across traditional disciplinary bounds will prove sufficient to the task.

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## Introduction: Anticipating complexity

THE SCIENCE OF early childhood development (ECD) continues to evolve rapidly, and policy strains to keep up. The normative dimensions of ECD science and policy have received little attention. What ethical issues are provoked by novel insights into human development? What values should guide social policy related to ECD? These and other normative questions deserve close scrutiny if evidence-informed and socially acceptable early childhood policy is to result.

In addition to posing novel questions, ECD science arguably creates new challenges for traditional paradigms of thought in bioethics. As it has matured over the past half-century, bioethics has alternately expanded and contracted its scope, and has absorbed concepts and methods from a range of disciplines. The role of bioethics in policy analysis is increasing, and has recently fostered the development of a distinct sub-field of health policy ethics.<sup>1</sup> Alongside these developments in bioethics, human rights scholarship and law have extended their reach and sophistication and a considerable literature on the right to health has emerged. Both health policy ethics and the right to health are concerned with, and relevant to, normative issues in health policy. To date, however, these disciplines have operated largely in parallel, with little substantive cross-pollination.

This paper explores complementarities between bioethics and human rights in the ethical analysis of early childhood development (ECD) policies. It is argued that conceptual synergies arising from the integration of these fields are considerable, if underexplored, and best illuminated through application to specific domains of health policy. ECD represents an especially germane case study: it is characterized by rapidly evolving science whose normative implications are complex, emergent, and understudied, yet whose societal impacts are wide-ranging. The paper first charts the disciplinary evolution of bioethics, demonstrating its gradual social turn: from the individual to collective, from

the medical to the societal. It then reviews points of theoretical confluence between bioethics and human rights, to assess the value and feasibility of their joint application to health policy analysis. Finally, it maps these complementarities onto ECD science and policy, in the hopes that both the policy domain and the analysis of theoretical synergies are enriched.

## Through a glass, darkly: Seeing bioethics through the years

Bioethics has undergone a kaleidoscopic shift in the past few decades. A relatively young field within applied ethics, it has both given off and absorbed new disciplinary waves as it has progressed. From initially broad reach into various ethical dimensions of the life sciences, it contracted in the middle part of the 20th century to focus on the ethical quandaries raised by clinical practice and the conduct of human subjects research. Medical ethics was dominated by a circumscribed principle-based approach to ethical analysis, concerned primarily with the intimate and interpersonal dynamics of clinical practice.<sup>2</sup> Research ethics—founded largely on Kantian principles, as instantiated in 20th century human rights regimes—centered on protection of the individual person from injury and exploitation in the name of science.<sup>3</sup>

Resurgence of public health as a core discipline within both biomedicine and public policy has forced bioethics to widen its lens to communities, fostering the development of public health ethics as a distinct field of inquiry.<sup>4</sup> Drawing alternately on liberal, utilitarian, and communitarian principles, it probes the normative dimensions of both core public health activities—including disease prevention and health promotion—and the broader social, political, and economic conditions that shape population health.<sup>5</sup>

In parallel, policy analysis has made gradual turns from instrumentality to ethics. Technocratic

approaches to policy analysis, with disciplinary roots in decision sciences and economics, have given way to more nuanced studies of policy, informed by diverse social sciences.<sup>6</sup> Recognition of the contingent and value-laden nature of policymaking has prompted increasingly sophisticated inquiry into the normative dimensions of health policy.<sup>7</sup> In this context, calls for a distinct and explicit field of health policy ethics have emerged, constituting yet another refraction of the glass of bioethics. Nuala Kenny and Mita Giacomini have argued convincingly that health policy ethics cannot be paint-by-numbers: the diversity of normative issues in health policy demands an ethical palette almost as variegated as the social canvas to which it is applied.<sup>8</sup> Rather than asserting the preeminence of a single moral theory, they advocate development of transposable sets of ethical principles to answer the panoply of normative questions posed by health policies. Recognizing an enduring need for coherence—or at least philosophic civility—within the field, they propose the development of ‘meta-principles’ to referee moral debate in pluralistic societies. In a similar vein, Madison Powers and Ruth Faden eschew rigidly bound theories of justice, opting instead for an approach that seeks broadly to specify the economic and social conditions that render societal inequalities, and the policies that create or sustain them, unfair.<sup>9</sup>

Global health ethics is the newest discipline to emerge in the historical wake of bioethics. It remains an indeterminate field; scholars continue to map its center and boundaries. Global health ethics probes the ethical dimensions of the political, economic, and social structures that condition health disparities.<sup>10</sup> It emphasizes a critical approach, alive to issues of power, to interrogate and understand health outcomes within and across societies.<sup>11</sup> Global health ethics is a composite paradigm, built on and borrowing from work in public health ethics, health policy ethics, and global political economy.<sup>12</sup>

This may seem to some a crowded and disorderly field. But the essence of bioethics’ evolutionary trajectory is arguably found in this move from the individual to the collective, in a critical social embedding.<sup>13</sup> A mounting concern for societies

as a fundamental unit of ethical analysis, and an allied focus on the social determination of health, animates each of the newer faces of bioethics.<sup>14</sup> The expanding discourse within bioethics has also sought to grapple with the implications of this move toward collectivities for the individuals that constitute them.<sup>15</sup>

The relationship between bioethics and human rights—another prominent, if historically and theoretically distinct, approach to normative issues in health—is a fulcrum for this debate. Some note that a focus on the ethical valence of communities conflicts with traditional conceptions of the right to health, which give primacy to the moral worth of individuals, and call for more robust incorporation of the social determinants of health in human rights scholarship as a remedy.<sup>16</sup> Others construe ‘health and human rights’ as an inherently inadequate paradigm for the analysis of the range of issues in an expanding field of bioethics.<sup>17</sup> However, complementarities between bioethics and human rights scholarship that may enrich both fields remain underexplored.<sup>18</sup>

## Bioethics and human rights

The language of traditional bioethics overlaps importantly with the language of human rights, albeit in a bounded way. A certain consonance exists between human rights and the domains of clinical and research ethics, found in their mutual focus on individual moral worth and right to freedom from certain harms.<sup>19</sup> However, the play and power of the full range of human rights, especially the social and economic classes, has received little opportunity to flourish within bioethics.<sup>20</sup> Points of confluence and conflict between human rights and bioethics’ newer disciplines are less intuitive, and poorly mapped. From a disciplinary standpoint, public health ethics and global health ethics have grappled most explicitly with this dialectic.<sup>21</sup> Health policy ethics has focused less on the place of human rights in its deliberations, though groundwork on this front exists. Scholars and advocates straddling the threshold of health policy ethics and human rights see the latter as a bridge to considerations of

equity and social justice, insofar as “the language of rights...is a frequent short expression for articulating the matters of moral significance central to justice.”<sup>22</sup> Arguably, this tests only the fringes of their interaction.

A number of high-level complementarities between ‘socially embedded’ bioethics and human rights are evident. Human rights scholarship has furnished a substantial literature on the right to health, including articulation of corollary state duties to realize and protect this right among its citizens.<sup>23</sup> It brings the weight of law to the table, tipping the scales toward praxis in discharge of the moral responsibilities articulated in relation to health.<sup>24</sup> Though the instantiation and operation of international human rights law often face political hurdles at the national level, it nevertheless offers an explicit and sophisticated legal framework to articulate normative duties relative to health.<sup>25</sup> A human rights lens maintains focus on the needs of the marginalized, serving as a potential corrective to Mill’s tyranny of the majority.<sup>26</sup> It likewise helps establish social, political, and economic rights as *a priori* determinants of health, tightening the moral links binding individuals to the collectives they comprise.<sup>27</sup>

Conversely, bioethics bolsters and broadens the justificatory framework for human rights theory and international human rights law.<sup>28</sup> It attunes the right to health to institutional power relations; helps confront tensions between individual and collective spheres of protection; and advances claims to collective responsibilities for action to redress violations of the right to health.<sup>29</sup> Crucially, bioethics can serve to correct the widespread neglect in human rights discourse of co-relative duties. An emphasis on duties recalibrates debate to an accounting of ‘who must do what,’ necessitating discussion of social realities, inadequacies, and responsibilities.<sup>30</sup>

While conceptually valuable, enumerating these points of mutual reinforcement between bioethics and human rights does little to suggest their real-world power. Concrete examples of social policy that benefit from analysis at the intersection of human rights and bioethics would add depth to claims that their synergy constitutes ‘a whole greater than the sum of its parts.’<sup>31</sup>

## Bioethics, human rights, and child development

ECD is an area of science and policy that exemplifies the power of a cross-disciplinary approach in bioethics and human rights. The benefits of their integration in the design and evaluation of ECD policy run from conceptual refinements of substantive approaches in health policy ethics to the normative enrichment of legal arguments in defense or critique of policy. Surprisingly, the ethics of ECD science and policy remain almost entirely uncharted territory. Even fewer attempts have been made to explore the synergies of health policy ethics and human rights in this domain. The unique resonance of an integrated approach to normative policy analysis on this issue stems from two distinctive features of ECD: firstly, rapidly evolving science on epigenetics and experience-based brain development; and secondly, the elaboration of international legal mechanisms for ECD policy evaluation grounded in human rights doctrine.

### *The nature of nurture: Epigenetics, sensitive periods, and the social determinants of early childhood development*

Epigenetics, the study of heritable changes in gene function without alterations in DNA sequence, has complicated the classic arithmetic of nature and nurture, supplanting cumulative accounts of development with multiplicative ones. We now know that our genes and environment interact and co-modify, with genetic expression conditioned by stimuli from experience. Illuminating studies of early brain development have demonstrated the capacity for marked neuronal change in response to environment challenge.<sup>32</sup> This plasticity is regulated in part by epigenetic signals, which appear more susceptible to environmental influence during circumscribed ‘sensitive periods’ of early development.<sup>33</sup>

At the population level, various observational and experimental trials have confirmed strong associations between disparities in early childhood milieu and life-course health and developmental gradients.<sup>34</sup> Social risk mitigation in vulnerable

cohorts of children has yielded reproducible developmental gains. Studies of ECD interventions in varied sociocultural and political settings evince sustained linguistic, cognitive, and behavioral benefits from early childhood development interventions.<sup>35</sup> The biology and epidemiology reinforce one another and tell the same story: early childhood experience is generative of health and developmental trajectories across the life-course, and serves as a crucial nidus for disparities therein.

*Normative inquiry into early childhood development policy: Synergies between bioethics and human rights*

Deeper understanding of the interaction between our environment and our epigenome in early life alters paradigms of thought about child health and human development. The knowledge that the social world influences gene expression is transformational. Lifelong and cross-generational

patterns of illness and social inequality may originate and embed during critical periods of brain development. New and adapted modes of ethical inquiry are needed to make sense of this sea change in evolutionary biology.<sup>36</sup>

Both bioethics and human rights scholarship can contribute meaningfully to the normative analysis of ECD science and policy. Indeed, both have, though largely in isolation from one another. The conceptual synergies between these paradigms yield more theoretically robust and institutionally grounded insights than either is capable of alone (Table 1). A crucial challenge posed by emerging ECD science is the breakdown of traditional conceptions of nature and nurture. In light of epigenetic evidence of socially mediated yet heritable patterns of gene expression, the natural/social dichotomy is found wanting. The implications for our understanding of justice in health opportunities and outcomes are profound.

Dimension of ECD	Bioethics	Human rights
<b>Epigenetics and heredity</b>	Competing conceptions of equality of opportunity to test the normative and legal implications of blurred social-biological boundaries <ul style="list-style-type: none"> <li>for example, luck-egalitarian, Rawlsian fair equality of opportunity</li> </ul>	Establishment of full range of human rights (political, social, and economic) as <i>a priori</i> determinants of health, and of States' duties to realize the right to health of citizens, implies State role in remediating socially mediated hereditary disadvantage
<b>Sensitive periods</b>	Exploration of positive and negative forms of liberty, liberal theory on capacities for positive freedoms <ul style="list-style-type: none"> <li>for example, Aristotelian capacities, Sen/Prah Ruger on capabilities</li> </ul>	Focus on needs of the vulnerable gives primacy to protection from harm where damage would be greatest
	Sufficiency theories of justice applied to critical junctures in human development and impact on essential dimensions of well-being <ul style="list-style-type: none"> <li>for example, Powers and Faden</li> </ul>	Indivisibility of rights as legal instantiation of justice founded on protection of well-being
<b>(Trans)national disparities</b>	Critical attunement to institutional power relations <ul style="list-style-type: none"> <li>for example, critical public health ethics, feminist bioethics, global health ethics</li> </ul>	IHR law on rights in early childhood <ul style="list-style-type: none"> <li>CRC: General Comment 7 indicators; international assistance and cooperation</li> </ul>

TABLE 1 Synergies between bioethics and human rights for ECD policy analysis

*Bioethics and ECD*

Bioethics supplies a sophisticated and pluralist language with which to unpack these implications. Competing conceptions of equality of opportunity enable us to consider the interdependence of the social and the biological from various angles. The contrast between luck egalitarian and Rawlsian conceptions of equality of opportunity are illuminating in this regard. Luck egalitarians, who make no moral distinction between socially and biologically engendered forms of disadvantage, would interpret the potential heritability of socially determined patterns of ill health as proof of the need to redress any inequality beyond one's control.<sup>37</sup> The luck egalitarian notion of natural disadvantage fits easily with knowledge of the epigenome. John Rawls' 'fair equality of opportunity principle' (FEO), by contrast, does distinguish between social and natural inequalities, finding only the former inequitable.<sup>38</sup> FEO necessitates mitigating social disadvantage to ensure equal life chances for those with similar natural endowments. Insofar as epigenetics blurs the boundaries between natural and social disadvantage, it challenges the classic Rawlsian conception of FEO as applied to ECD. This arguably demands a reformulation of FEO, one that accommodates inequalities stemming from social class "including when social class operates via natural endowments."<sup>39</sup>

However, the epigenetics and social determinants of ECD also complicate luck egalitarian conceptions of equality through their challenge to notions of responsibility. Luck egalitarianism—specifically, its prioritarian incarnation—places moral emphasis on the degree of responsibility borne by an individual for his health state.<sup>40</sup> The mechanisms and temporal characteristics of key determinants of ECD trouble assessment of equality of opportunity founded on individual responsibility for health and social outcomes. Recklessness in parental health behaviors may translate not only into greater initial risk of disadvantage for offspring, but also into perpetuation of the risk behaviors themselves—both throughout the life course and across generations. ECD science thus demands a new account of responsibility for health opportunities and outcomes.

Theory on the coupling of disadvantages breaks ground in this regard. Powers and Faden describe "densely woven, systematic patterns of disadvantage" that arise from the interaction of deprivation or adverse effects in discrete social determinants of health.<sup>41</sup> Social justice, in their formulation, is contingent on sufficiency in each of six composite elements of well-being: health, security, reasoning, respect, attachment, and self-determination. The resonance of these principles in light of the emergent science of ECD is immediately apparent. The degree to which sensitive period experience in early life constitutively shapes physical, neurodevelopmental, and psychosocial development gives credence to their conception of well-being and the corollary demands for sufficiency in these domains as a prerequisite for social justice. Such empirically grounded, non-ideal theory provides a coherent foundation for ECD policy, applicable at both the state and supranational levels. Where disparities in childhood development are evident at the community or population level, this and complementary bioethical paradigms, such as critical public health ethics or global health ethics, can help make moral sense of inequality through attunement to institutional power relations and systems of political economy.<sup>42</sup>

Theory in the liberal philosophical tradition offers complementary insights into the ethics of ECD policy. Amartya Sen adapts Aristotelian notions of 'capacity' to propose a set of 'capabilities'—namely, 'the substantive freedoms [one] enjoys to lead the kind of life he or she has reason to value'—fundamental to human development.<sup>43</sup> Sen's theory has influenced others to develop capability models centered on health. Jennifer Prah Ruger elaborates a theory of 'human flourishing' that treats health as a foundational capability: freedom from preventable disease and death is cast as essential for human functioning, and deemed ontologically prior to other freedoms.<sup>44</sup> Injustice attaches to health deprivation in the degree to which it limits agency and, by extension, 'human flourishing.'<sup>45</sup> The relevance of liberal approaches to ECD policy is readily apparent. Experience-based brain development is the quintessence of a higher order capability. Our

chances ‘to lead the kind of life we have reason to value’ depend in crucial and enduring ways on early environmental experiences, and the epigenetic changes they induce. Disparities of developmental opportunities and outcomes result from patterned inequalities in early life. Insofar as such theory focuses moral attention on ECD as a substantive and irreducible capability for human development, it offers justification for the promotion of child health and well-being that is qualitatively distinct from adult health.

### *Human rights and ECD*

Human rights theory and law offer distinct but reinforcing contributions to the normative analysis of ECD science and policy. In broad terms, and in contrast to public health approaches, human rights paradigms can serve to focus policy priorities on those most in need of protection.<sup>46</sup> This focus on the needs of the vulnerable gives primacy to protection from harm where damage would be greatest. In this sense, human rights theory is consonant with prioritarian, and to some extent Rawlsian, conceptions of justice, but tends away from their utilitarian emphasis. It therefore trains a natural lens on children, who are reliant on, and sensitive to, the decisions and actions of others to promote their well-being, but comprise a minority of the population. The disproportionate and enduring nature of that sensitivity to early life experiences redoubles the importance of well-articulated and defended child rights.

The indivisibility of such rights likewise takes on added relevance and force in the context of ECD. Human rights are understood to protect imbricated and mutually dependent dimensions of physical and social life. Inadequate protection of any one right risks compromise to the realization of others.<sup>47</sup> In this vein, jurisprudence on the right to health has framed it as part and parcel of an integrated approach to human development, one that attends to both distal and proximal determinants of health.<sup>48</sup> The indivisibility of human rights thus adds legal weight to conceptions of social justice—like that articulated by Powers and Faden—founded on the protection of well-being. Closely related to

this is the growing recognition that human rights themselves constitute *a priori* determinants of health.<sup>49</sup> This coheres with a scientific blueprint of human development as dependent on stable early childhood foundations, where multiple domains of biological and social life are implicated.

Finally, and crucially, the fact that the locus of responsibility for protecting human rights is clearly specified can serve as a conduit between ethics and policy on ECD. Seen in the light of emerging ECD science, States’ duties to realize the health of citizens imply a state role in redressing socially mediated disadvantage, including its heritable forms. This duty has taken explicit form in international human rights regimes. The UN Convention on the Rights of the Child (CRC)—the most widely ratified and substantively inclusive international human rights treaty—provides strong legal footing for a rights-based approach to ECD with corollary state duties.<sup>50</sup> In recognition of the unique developmental needs and vulnerabilities that characterize the early years, General Comment 7: “Implementing Child Rights in the Early Childhood” details the specific application of the CRC to the young children.<sup>51</sup> Its implementation is buttressed by a set of General Comment 7 indicators that assist States parties in tracking, reporting, and assessing their ECD policies and programs in light of CRC principles. The framework includes sets of indicators on civil, political, social, and economic rights that mirror CRC articles, and is based on the CRC’s structured reporting guidelines; it serves as a guide for the preparation of State party reports to the Committee on the Rights of the Child.<sup>52</sup> In keeping with the precept of indivisibility, and in line with ECD science, the Committee treats distinct articles as interdependent and mutually reinforcing when interpreting the obligations of States parties.<sup>53</sup> This is arguably the most transparent and institutionalized method currently available to hold States to account for their ECD policies in the community of nations. Though the capacity for supranational enforcement of CRC principles—as with all human rights—remains weak, their instantiation in an international human rights regime lends the sort of political credence that bioethical theory often lacks.

Furthermore, the case for transnational action to remediate global health inequalities—and, by extension, disparities in early childhood development outcomes—arguably finds its clearest articulation in the CRC. The health and developmental concerns of children in developing countries are afforded specific attention, and international obligations to assist and cooperate in their protection are made explicit.<sup>54</sup> The CRC is thus the only international human rights treaty that formally extends the ambit of the right to health and its corollary duties beyond national borders. Moreover, a number of other key articles related to ECD, including those on education and children with disabilities, specifically reference the need for international cooperation towards their realization.<sup>55</sup>

*Epigenetics and heredity: Exploring synergies between bioethics and human rights for ECD policy analysis*

The evolving science of epigenetics provides fertile ground for examining policy-relevant synergies between bioethics and human rights. The discovery of epigenetic mechanisms has begun to alter longstanding and deeply entrenched paradigms of thought about evolutionary biology. Epigenetics transcends the Modern Synthesis—the ascendant formulation of evolution, founded on the integration of Mendelian genetics with Darwinian insights into natural selection—and has helped catalyze efforts at an Extended Synthesis.<sup>56</sup> The ontological implications of this knowledge include novel forms of social meaning and connection. A new moral apparatus is needed to apprehend and respond to the emergent social ontology implied by an Extended Synthesis in the human realm.

The epigenetics of parental fostering are a socially resonant case in point. Both human and animal studies have demonstrated that parental fostering behaviors and familial environments can induce lasting epigenetic changes to infant brain development and behavior. Variations in human serotonin transporter genes are now known to predict degrees of resilience in the face of childhood abuse, with corresponding modulation of the risk of

depression during adulthood. Inversely, protective environments in early childhood mitigate increased rates of depression even among those with ‘high-risk’ gene profiles.<sup>57</sup> Maternal neglect has been shown to impair the ability of infants to regulate their brain’s stress axis.<sup>58</sup> Affected infants suffer greater stress reactivity throughout life, with concomitant increases in neuropsychiatric, endocrine, and cardiovascular disease. Crucially, evidence suggests such alterations to brain function recapitulate fostering behaviors across generations, implying heritable dimensions to epigenetic phenomena.<sup>59</sup>

The cross-generational propagation and persistence of epigenetic mechanisms constitutes a revolutionary link between our genes and our social environments. Such knowledge demands attention not only to early childhood environments but also to parental health and social well-being as determinants of child health trajectories. Policies geared toward attenuating social and health risks during sensitive neurodevelopmental periods can only abrogate the deleterious effects of epigenetic changes that either 1) accrue during those periods or 2) pre-exist but remain amenable to environmental influence. Such policies must therefore recognize and target epigenetic phenomena that retain sufficient plasticity or temporal windows for reprogramming through social means. Where such plasticity does not exist—as may be the case with certain antenatal impacts on the epigenome—the locus of normative policy analysis must shift to parental biology and circumstance.

The implied breakdown of social and biological boundaries creates novel challenges for both bioethics and human rights scholarship, but also provides novel opportunities for synergy. Unique complementarities between these disciplines emerge in the realm of epigenetics by testing relevant bioethical principles against human rights theory, and vice versa. Human rights theory and law that establish the full range of human rights as *a priori* determinants of health are arguably crucial to a consistent and effective realization of the individual right to health. They provide justification for attending to the role of political and social institutions in conditioning individual health

chances and outcomes.<sup>60</sup> Human rights impact assessments are a practical instantiation of this scholarship at the policy level.<sup>61</sup>

However, insofar as these rights apply at the individual or bloc level, their ability to address familial and intergenerational patterning of epigenetic risk is limited.<sup>62</sup> Bioethics holds the potential to recast the unit of ethical analysis vis-à-vis epigenetics from the individual to the family. As alluded to above, the application of luck egalitarian notions of equality of opportunity could bridge this divide, transporting insights on the intergenerational demands of justice into theory and jurisprudence on rights indivisibility and interdependence.

Where patterns of social disadvantage driving epigenetic change are seen to operate in aggregate, bioethics can extend the ambit of the right to health still further, into the space of communities and societies. The work of Powers and Faden illustrates this potential synergy. They elaborate a non-ideal theory on social justice that understands inequity as a product of interwoven social, political, cultural, and economic disadvantage. Children occupy a morally distinct place in this rendering of justice for two reasons: they are largely free of responsibility for creating the disadvantages they face; and these disadvantages exercise a disproportionate burden across the life course, particularly if embedded early.<sup>63</sup>

Though it does not explicitly consider the role of epigenetics in patterning health inequalities, one could readily extend their theory to encompass the social mediation of heritable disadvantage. The foundational conception of justice as sufficiency of well-being, and corollary concern with the impact of societal institutions thereon, train a lens on the social embedding of disadvantage within families and communities across generations. In light of such theory, the role of social structures in conditioning and recapitulating parental fostering dynamics becomes the clear province of normative policy analysis. It demands the assimilation of discourse on the individual right to health with collective claims on justice.

Efforts among human rights scholars to elaborate a collective right to health buttress such ethical theory and advance its claims. Cognizance of the limitations of individual rights in the protection of public goods has prompted arguments for collective human rights to domains as varied as development, humanitarian assistance, environmental protection, and public health.<sup>64</sup> The recognition of public health as a collective good contingent on social policies and conditions has spurred theory on a collective right to public health that addresses “the collective social factors that underlie the onset and spread of disease, requiring states to impose societal interventions through broad public health systems.”<sup>65</sup> In addition, the responsibilities of States towards collectives are afforded explicit recognition in General Comment 14, which states that “States Parties are bound by both the collective and individual dimensions of [the right to health]. Collective rights are critical in the field of health; modern public health policy relies heavily on prevention and promotion which are approaches directed primarily to groups.”<sup>66</sup> Taken together, bioethics and human rights furnish mutually reinforcing arguments in support of collective, contextual, and socially embedded conceptions of justice in child health and development. The fruits of this synergy are an enhanced capacity for normative policy analysis in response to evolving epigenetic knowledge.

### Conclusion: Complex ethical systems

ECD is an archetypal instance of complexity in social policy. Complex systems are defined by the interdependence of their component parts: alteration of the interaction between constitutive elements radically challenges or reconfigures system behavior.<sup>67</sup> One must attend to the relational character of its parts to make sense of the whole. Complex systems also admit of recursive causality and emergence. Recursive causality implies bidirectional or cyclical causal pathways; emergence speaks to ceaseless adaptation to dynamic changes in environment, with consequent flux in patterns of behavior and meaning.<sup>68</sup>

The distinctly relational and emergent nature of ECD science and policy demands novel forms of inquiry and conceptual insight. The ethics of ECD are no exception. Only an ethical approach supple enough to adapt to emergent questions, examine issues from varied theoretical perspectives, and assimilate insights across traditional disciplinary bounds will prove sufficient to the task. The potential for cross-pollination between bioethics and human rights is significant in this regard. The complementarities explored above serve to ground ECD policy in the firm legal and institutional soil of human rights, whilst retaining a broad set of ethical tools to dig into and around the thing as it grows. Notions of justice as sufficiency of well-being are buttressed by rights indivisibility; faced with disruptive scientific knowledge, the right to health is given further specificity through exposure to varied conceptions of equality of opportunity; liberal theory on capabilities reinforces the ontological priority of a right to health. These and allied synergies may hold similar promise in other areas of health and social policy, and deserve further exploration.

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