

# The transition to parenthood in obstetrics: enhancing prenatal care for 2-generation impact



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Obstetrics, the specialty overseeing infant and parent health before birth, could be expanded to address the interrelated areas of parents' prenatal impact on children's brain development and their own psychosocial needs during a time of immense change and neuroplasticity. Obstetrics is primed for the shift that is happening in pediatrics, which is moving from its traditional focus on physical health to a coordinated, whole-child, 2- or multigeneration approach. Pediatric care now includes developmental screening, parenting education, parent coaching, access to developmental specialists, brain-building caregiving skills, linkages to community resources, and tiered interventions with psychologists. Drawing on decades of developmental origins of health and disease research highlighting the prenatal beginnings of future health and new studies on the transition to parenthood describing adult development from pregnancy to early postpartum, we have proposed that, similar to pediatrics, the integration of education and intervention strategies into the prenatal care ecosystem should be tested for its potential to improve child cognitive and social-emotional development and parental mental health. Pediatric care programs can serve as models of change for the systematic development, testing and, incorporation of new content into prenatal care as universal, first-tier treatment and evidenced-based, triaged interventions according to the level of need. To promote optimal beginnings for the whole family, we have proposed an augmented prenatal care ecosystem that aligns with, and could build on, current major efforts to enhance perinatal care individualization through consideration of medical, social, and structural determinants of health.

**Keywords:** brain development, care individualization, cognitive development, expectant parent, fetal development, mental health, neurodevelopment, neuroplasticity, prenatal programming, prenatal stress, reproductive justice, social support, social-emotional development, whole person

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## Introduction

The US prevalence of neurobehavioral problems is staggering<sup>1</sup>—6.1 million children have been diagnosed with attention deficit hyperactivity disorder (ADHD), 4.5 million children have been diagnosed with behavior problems, 4.4 million children have been diagnosed with anxiety, and nearly 7 million children are classified as disabled based on learning difficulties, emotional disturbance, and speech or language impairment.<sup>2,3</sup> To work toward preventing these conditions, 21st-century pediatrics has pivoted to go beyond its traditional focus on physical health; as such, pediatrics increasingly includes science-informed innovations that optimize 0- to 3-year-olds' sensitivity to early psychosocial influences to shape positive development and mitigate the impact of toxic stress. Obstetrics, the specialty overseeing child development before birth and expectant parent health, similarly could be augmented to address the interrelated areas of parents' prenatal impact on future children's development and their own psychosocial needs. Drawing on decades of developmental origins of health and disease (DOHaD) research highlighting the prenatal beginnings of future health through gene-environment interactions and new studies on the transition to parenthood (TtP) describing adult development from pregnancy to early postpartum, we propose that the integration of education and intervention strategies into the prenatal care ecosystem should be tested through rigorous trials and demonstration projects as we predict that results will show returns to society through improved child cognitive and social-emotional development and parental mental health, similar to those accruing from the shift in pediatrics to a coordinated, whole-child, 2-generation philosophy.<sup>1,4,5</sup> Our vision has aligned with, and could build on, current major efforts to enhance perinatal care individualization through consideration of medical, social, and structural determinants of health.<sup>6,7</sup>

## Pediatrics enhanced, why not obstetrics?

At the molecular, cellular, organ, system, and behavioral levels, neurodevelopment is shaped by ongoing adaptations to the psychosocial environment, with heightened plasticity in children ages 0 to 3 years underscoring the public health benefits of improving early childhood experiences. Accordingly, pediatrics pivoted, declaring relational health (the promotion of safe, stable, and nurturing relationships) as necessarily in their purview<sup>8</sup> as well as the child's social-emotional context—including social determinants of health<sup>9</sup> and how these influences translate into cognitive and emotional outcomes. Pediatric care has expanded to include developmental screening, parenting education, parent coaching, access to developmental specialists, brain-building caregiving skills, and linkages to community resources, leveraging new interdisciplinary teams that may include tiered interventions with psychologists. Key targets include supporting children's language and social development, managing challenging child behaviors, and promoting parent mental health—since absent their own mental well-being, parents are much less likely to have a thriving baby and future child.<sup>1</sup> The outcomes include reductions in developmental delays and behavioral problems and improved cognitive development.<sup>10</sup>

During fetal life, one of the most rapid periods of brain development takes place. From gestational weeks 7 to 18, corticogenesis occurs—the cerebral cortex of the brain is formed. Throughout gestation, the interplay of genetic programming along with genetic variation interacts with characteristics of the fetal environment to organize neural elements into complex structural and functional networks known as the connectome. This crucial period of brain development, similar to ages 0 to 3 years, is characterized by tremendous plasticity. The fetal brain is shaped, in part, by adaptation to biological cues related to the pregnant parent's well-being, lifestyle, nutritional status, social factors, and mental health (each of which a co-parent can affect).<sup>11–15</sup> As DOHaD

data demonstrate, parents' psycho-social experiences are embedded in the future child's neurobiology. Parents affect children's neurodevelopment before birth.

During pregnancy and the postpartum period, parents also experience dramatic psychological, behavioral, and neurobiological adjustments as the foundations of parenting are established. How they navigate this period impacts their future parenting, well-being, and, consequently, child outcomes. Typically, practitioners have bracketed these concerns into a narrow focus on perinatal mental health (PMH) and, specifically, psychiatric diagnoses. However, there is a need to move beyond deficit models to address more holistically the totality of the TtP experience, including the social, cultural, and financial contexts in which this transition occurs.<sup>16</sup>

Using a lens of 2-generation development and neuroplasticity, enhanced obstetrical care could help interrupt the intergenerational transmission of disparities and trauma and promote optimal beginnings for the whole family.<sup>17,18</sup> Pediatric care programs can serve as models of change for the systematic development, testing, and incorporation of new content into prenatal care as universal, first-tier treatment and evidenced-based, triaged interventions according to the level of need. As in pediatrics, hybrid approaches to sharing universal, new content with expectant parents could be created and tested that include residents attending trainings to deliver it; social workers, nurses, and paraprofessionals in obstetrics offices taking on the educating role to provide it; links to community groups who provide it; and novel approaches using the Internet and digital health platforms to teach it (with the necessary attention to access issues for marginalized and less literate populations). As we review below, examples of key content areas to develop include brain development before birth and expectations of parenthood. Provider training and system improvements could include actionable changes to ensure equity and address the mental health of expectant parents—since absent their own mental well-being before birth, parents are less likely to have a thriving

baby and future child.<sup>1,19</sup> Potential outcomes include reductions in developmental delays and risk of psychiatric problems and improved cognitive development and, for parents, improved mental health and better adjustment to their new role, which, in turn, promotes positive child development.

### The womb is an influential first home<sup>1</sup> Brain on board before birth

Third-trimester fetuses register, recognize, and differentially respond to varied stimuli measured by heart rate changes during habituation paradigms.<sup>20–24</sup> Of note, 3-day-old infants have shown that they can identify their mother's voice vs another woman's voice,<sup>2</sup> sucking more vigorously on a nonnutritive nipple to elicit hearing it.<sup>25</sup> Newborn recognition of maternal voices vs a stranger's voice has been shown in electrophysiological signals as well.<sup>26</sup> Newborns demonstrate memory from the in utero period for a spoken passage or melody even if produced by an unfamiliar speaker. The preference for the maternal voice vs another woman's voice likely promotes bonding, while transnatal memory (prebirth learning that carries across the birth divide) for language-specific properties may undergird language development.<sup>27,28</sup> New research has suggested that maternal speech shapes the frontotemporal networks associated with language and voice processing.<sup>29</sup> As in the postnatal period, the fetus' social context shapes its brain development. Parents' relationship with their child develops before birth: this relationship and their emerging caregiving role could be substantiated and supported. Prenatal care could be designed to engage future parents in learning about in utero brain-behavior development and the demonstrable impact parents can have on their child in the prenatal period, for example, in relation to maternal mental health.

### The impact of mental health conditions

For almost all parents, pregnancy can bring increased anxiety and uncertainty. In studies of pregnant women, an estimated 30% report psychosocial stress in their daily lives, including job strain and depressive or anxiety symptoms.<sup>30</sup> Approximately 10% to 12% of pregnant women meet the criteria for a PMH condition, most often anxiety or depression. Maternal psychiatric morbidity is the most frequent child-birth complication.<sup>31,32</sup> In the context of structural racism and discrimination, the rates are nearly double for women of color and those experiencing poverty.<sup>33,34</sup> Furthermore, it is estimated that more than 10% of new fathers experience anxiety and/or depression during the perinatal period.<sup>35</sup>

Although many fetuses seem resilient to the potential moderating effects of maternal stress and PMH conditions, children of pregnant women in the top 15% of self-reported prenatal anxiety and depression have an estimated 2-fold increased risk of a mental disorder (eg, ADHD or anxiety). This effect extends from childhood to adolescence.<sup>36</sup> Furthermore, greater maternal prenatal psychosocial stress is associated with small but statistically significant reductions in intelligence quotient (IQ) scores and less advanced language development.<sup>37</sup> A recent task-based functional magnetic resonance imaging (MRI) study showed that newborns of more anxious mothers have greater responses to aberrant stimuli in brain regions related to anxiety disorders in adults (right anterior insula, ventrolateral prefrontal cortex, and cingulate cortex area).<sup>38</sup> Importantly, experimental animal studies that control for shared genes have demonstrated that maternal prenatal stress predicts anxiety like behavior in the offspring related to impaired hypothalamic-pituitary-adrenal (HPA) axis regulation and decreased expression of a brain-derived neurotrophic factor that mediates neural plasticity.<sup>39–41</sup> Excessive maternal stress is transduced to the fetus through maternal HPA axis hormones, immune activation,

and alterations in the maternal-infant microbiome and placental gene expression.<sup>13,31,32,42,43</sup> Finally, untreated mental health problems during pregnancy often continue into the postpartum period, with untoward effects on child development, such as compromised parent-child bonding, decrements in IQ, and risk of depression in adolescence.<sup>19,44</sup> In contrast, health-promoting experiences during pregnancy, such as exercise and social support, are positively associated with levels of maternal, fetal, and infant cardiac control (an early marker of emotion regulation)<sup>45–47</sup> and more adaptive infant stress responses, respectively.<sup>48</sup> Pre-clinical studies with fertilized chick eggs have shown that auditory enrichment (music and noise exposure) reduces a chick's stimulus-based fear response and associated cortisol reactivity.<sup>49</sup>

Alerting all prospective parents to the fact that their well-being and behaviors may impact their future baby could contribute to the prioritization of health that would benefit both generations as the TtP often is a time of great motivation for change.<sup>50,51</sup> Sharing the associations between mental health and prenatal brain development in nonthreatening and supportive ways could facilitate the identification with the parenting role: parents matter before birth. Importantly, there is strong evidence that PMH conditions can be prevented<sup>52–54</sup> and effectively treated through psychotherapy<sup>54–57</sup> and/or pharmacotherapy.<sup>58,59</sup> However, the process of connecting perinatal women and their partners with mental healthcare is often fragmented and inefficient, serving neither patients nor providers well. Obstacles to treatment exist at the systems, provider, and patient levels.<sup>60,61</sup> It is estimated that <50% of women who need it get care<sup>60</sup> and the rate is even lower among women with fewer resources and of color.<sup>62</sup> To support healthy parents and children, access to mental healthcare during the TtP should be dramatically and systematically improved via integrated care approaches, such as Compass at Northwestern, Women's Behavioral Health Service at the University of Rochester, and Women's

<sup>1</sup> David Barker is credited with originating this phrase and using it in DOHaD lectures.

<sup>2</sup> We used gender terms consistent with the research reports we have cited.

Mental Health @Ob/Gyn at Columbia<sup>60,63–67</sup> and federally funded psychiatry access programs enabling frontline providers to screen, assess, refer, and treat pregnant and postpartum women for depression and other behavioral health conditions—including in rural and medically underserved areas that originated as Massachusetts Child Psychiatry Access Program for Moms (<https://www.mcpapformoms.org/>; <https://www.hrsa.gov/about/news/press-releases/hrsa-awards-12-million-maternal-child-mental-health-programs>).

### Unequal beginnings

Annually, 10% of US births are preterm birth (PTB; <37 weeks of gestation), with nearly 400,000 births affected<sup>68</sup> and recent data showing rates rising.<sup>69</sup> PTB is associated with a future risk of poor mental health outcomes.<sup>70</sup> It is estimated that 40% of children born prematurely will experience compromised neurodevelopment, with effects on social, emotional, and physical health.<sup>71</sup> Compared with babies born at or near 37 weeks of gestation, very premature (<32 weeks of gestation) and extremely premature (<28 weeks of gestation) children have 2.25 and 4.04 times the odds, respectively, of receiving an ADHD diagnosis.<sup>72</sup> However, crucially, those who do have PTB should not be subject to negative bias about their child's future especially as not all children are negatively affected.

PTB is not distributed equally across the population.<sup>73</sup> The racial and ethnic inequities are dramatic and independent of socioeconomic status. Overall, approximately 14% of Non-Hispanic Black women give birth before term compared with 9% of Non-Hispanic White women.<sup>69</sup> In a systematic review of 30 studies, Non-Hispanic Black women were found to have a 2-fold increased risk of PTB compared with Non-Hispanic White women.<sup>74</sup> The PTB rates for American Indian or Alaska Native women (11.5%) are higher than for White women.<sup>68</sup>

Our previous work,<sup>75</sup> along with other reports<sup>76–78</sup> but not all,<sup>79</sup> has suggested that psychosocial stress is a factor

associated with the risk of PTB. This association seems particularly strong when looking at first- and second-trimester stress<sup>78,80</sup>; in these studies, women with increased life event stress during the first trimester of pregnancy had 2.40 times the risk of PTB compared with women with average or below-average stress.<sup>80</sup> Other studies show significant associations between experiences of racial discrimination and PTB.<sup>81–83</sup> More specifically, women endorsing experiences of racism vs those without had 1.29 times the odds of experiencing PTB.<sup>84</sup> There is a growing recognition that exposure to racism rather than race itself is a risk factor for adverse maternal health outcomes.<sup>85</sup>

As articulated in 2 recent articles on reproductive justice,<sup>86,87</sup> prenatal care must become equitable and antiracist to interrupt the long arc of discrimination-based stress experiences, which manifest in adverse health, pregnancy, and birth outcomes.<sup>73</sup> Specific recommendations that should be tested and scaled include educating all providers about the history and systems that contribute to the social determinants of health, the early origins of obstetrical research based on the exploitation of the Black female body, how power dynamics impact care, cultural competency and humility, and the new approach of decolonized care that considers individual experiences and social-historic systems of oppression as affecting health.<sup>6,7,87</sup> With training in cultural competency and humility, active listening skills, and shared decision-making, providers can be expected to commit to lifelong self-evaluation and critique to readdress new perspectives on the delivery of prenatal care as it evolves.<sup>86</sup> Although many factors contribute to the racial and ethnic disparities in the PTB rate, the problem will not be solved without promoting an antiracist culture and making equitable, respectful, supportive care routine. Expanding access to group prenatal care can foster provider-patient engagement and thereby reduce clinician bias, build patient trust with providers, lower patient stress, and increase patient social support across diverse populations, positive changes

that can contribute to healthier birth outcomes.<sup>73,86,88</sup>

### The psychological birth of the parent Opportunities and risk during the transition to parenthood

The TtP typically does not garner anywhere near the research and clinical attention as adolescence.<sup>89</sup> However, new parenthood is increasingly compared with our current understanding of the teenage years, even at the brain level. Both periods are transitional, marked by disequilibrium and iterative developmental adaptation, learning, and resiliency.<sup>17,90,91</sup> Recent brain MRI research following female adolescents, first-time pregnant-to-postpartum women, and never-pregnant women for 2 years found that both the adolescents and pregnant-to-postpartum women show comparable reductions in cerebral gray matter and decreases in cortical thickness compared with minimal difference in the never-pregnant group.<sup>91</sup> Elicited by hormonal fluctuations and the evolving role of parenting, these changes reflect neurocognitive adaptations and the brain's plasticity and also indicate increased vulnerability to pathologic alterations. Both adolescence and the perinatal period are times of increased risk of the emergence of mental health problems.<sup>92</sup> In studies comparing men who are fathers and not fathers, the preconception-to-postpartum period also is marked by reductions in cortical volume and thickness.<sup>93</sup> Much less is known about the TtP for sexual and gender-diverse childbearing parents (and partners), single parents, and other nontraditional parenting structures; there is significant urgency to include these other parents in perinatal research to better understand their experiences and better support them.<sup>94</sup> Overall, calling attention to the TtP as comparable to other sensitive periods in brain development and similar to adolescence in its dramatic changes and openness to experience—contributing to both vulnerability and considerable opportunity—could validate expectant parents' experiences and underscore the significance of their emerging parenting roles.

### Managing expectations

The demands on new parents are numerous and often overwhelming, with financial hardship exacerbating these challenges. Challenges include role and time management conflicts; diminished autonomy; shifting identity; increased financial concerns; lower self-esteem, particularly for the pregnant parent facing an altered physical appearance and abilities; and decreased relationship satisfaction as adult relationships become secondary to child-care (as summarized in a 2018 review by Saxbe et al<sup>17</sup>). However, not all new parents respond to the demands in the same way. Studies show that parents' prenatal expectations of these postpartum experiences impact intrapersonal adjustment to parenting and interpersonal couple functioning.<sup>95,96</sup> In a recent qualitative study with heterosexual couples, individuals whose anticipations included "expecting the worst" (often an adaptive cognitive strategy to feel protected from disappointment) reported an easier adjustment once the baby arrived compared with those who treated the impending arrival of their baby as "unknowable" (something for which one could not plan or even envision). Embracing the unknown or tolerating uncertainty as a future parent also is associated with healthy adjustment.<sup>97</sup> Couples who envisioned the changed future with a child necessitating a team effort reported greater marital satisfaction compared with those who assumed the couple relationship would buffer child-related stressors.<sup>96</sup> In another report with heterosexual couples, having higher prenatal expectations relative to experiences once the baby was born (eg, about being a parent, competency as a parent, outside help and emotional support, and satisfactory division of family responsibilities) was associated with greater declines in levels of marital satisfaction after birth.<sup>95</sup>

To promote family well-being and associated healthy infant development, the prenatal care setting potentially offers the unique opportunity to help prepare parents for the social-emotional changes, challenges, and expectations associated with impending parenthood.

New content could include authentic information on the parenting roles and life with a newborn because knowing what to expect and developing constructive mindsets promote a sense of agency and overall adjustment; specific and already-existing evidenced-based approaches to managing and adjusting expectations also could be taught.<sup>95,96,98</sup>

### Planning for daily life

Parenting an infant alters daily routines and complicates the establishment of new ones, particularly in the first months. Again, the context of poverty amplifies these difficulties. Key health behaviors, such as having adequate sleep, eating a healthy diet, and engaging in physical activity, can be frustratingly out of reach.<sup>17</sup> Planning during the TtP for this level of disruption in daily habits and ideally problem-solving in advance can ease the challenges of early caregiving and potentially prevent depression, which is linked to sleep deprivation. Solutions to maintain consistent self-care can include calling on people in one's support network or accessing augmented care, such as a doula (a trained professional who can provide physical, emotional, and informational support before, during, and shortly after childbirth, facilitating opportunities for sleep, exercise, and decompression). Programs to broaden access to doula or similar care are garnering attention in states nationwide (<https://healthlaw.org/medical-aid-coverage-for-doula-care-2021-state-roundup/>). Additional research suggests that educating and preparing birthing people for the postpartum experience and promoting coping strategies can prevent depression among underserved mothers.<sup>99</sup> While feeding and/or pumping schedules can disrupt sleep, for some, anxiety and worrying can add to sleeping difficulties. To help with sleep disruption and insomnia, cognitive behavioral sleep techniques could be taught to expectant parents in prenatal care settings,<sup>100,101</sup> and digital health may be a tool to promote broad dissemination (although outcome data must include attention to access issues for marginalized and less literate populations).

### Intentional reflection on the parenting role

People often parent as they were parented or try to counter these influences. Envisioning and caring for a child are deeply influenced by one's own childhood experiences, even those earlier than explicit memory that nonetheless establish social-cognitive models of, and expectations for, caregiving relationships (as summarized in a 2020 article by Slade et al<sup>102</sup>). In the extreme, children of maltreating parents are 2 times more likely to become maltreating parents themselves, although most children who were abused do not go on to abuse their children.<sup>103</sup> Even before the baby is born, elicited statements about caregiving reflect "internal working models of attachment" and predict qualities of future caregiving.<sup>104,105</sup> For some parents to be, interventions that promote mentalization and perspective-taking—the ability to attend to another's mental states and subjective experiences—concerning their child are associated with more sensitive caregiving.<sup>102</sup> As new content for the prenatal care setting, parents could be asked to reflect on how they were parented, what aspects of care they wish to repeat or change, and what strategies they can use to help them specify and realize their envisioned futures.

### How to make change: designing and testing augmented prenatal care

Obstetrical visits typically last under 20 minutes; however, those with nurse-midwives are slightly longer.<sup>106</sup> Until recently, these sessions have been frequent (12–14 prenatal visits), with a call for added fourth-trimester sessions. Pandemic modifications may build on already existing initiatives to reduce the number of in-person prenatal visits for healthy pregnancies (<https://www.acog.org/education-and-events/creog/curriculum-resources/cases-in-high-value-care/expanding-prenatal-care-options-for-low-risk-patients>). Nonetheless, the TtP is a period of unprecedented frequent contact with health providers and the move to convenient, remote monitoring and text-based communication for some visits could align with stress-

reducing plans and other added information modules to help future parents and positively impact child outcomes during pregnancy and the fourth trimester of pregnancy.

The information we reviewed could form the basis for the development and testing of new content to be incorporated as routine, first-tier treatment for all birthing people using varied approaches. For example, the Mount Sinai Parenting Program (<https://parenting.mountsinai.org>) leverages web-based, parent-directed content, classes, and pediatric resident training to provide parenting information during routine well-child visits. A community resource, the Program for Early Parent Support (PEPS; <https://www.peps.org/about>), in Washington State, facilitates parent groups focused on practical information related to feeding and sleeping and parent wellness. To address social determinants of health, structural racism, mental health conditions, the prevention of postpartum depression, or the effects of chronic stress and trauma on perinatal individuals and their children would necessitate new provider training, interdisciplinary collaborations, and the development, testing, and incorporation of evidenced-based, triaged interventions based on level of need as exemplified by HealthySteps in pediatrics (<https://www.healthysteps.org>), which engages different behavioral health experts to provide psychosocial care for children and parents, or efforts to scale up existing evidenced-based approaches, such as Mothers & Babies (<https://www.motherandbabiesprogram.org/providers-interventionists/>); Reach Out, Stay Strong, Essentials for mothers of newborns<sup>52</sup>; and Practical Resources for Effective Postpartum Parenting.<sup>107,108</sup>

There is not yet an initiative to coordinate these types of programs, or to include the education and intervention strategies we described here based on DOHaD and TtP research, into a demonstration project testing augmented prenatal care models.<sup>109</sup> But, there should be.

Based on decades-long program development, implementation, and testing,<sup>10</sup> healthcare systems are evolving to

support whole-person, 2-generation efforts in pediatrics. California recently became the first state to pay for dyadic care, dedicating \$800 million to cover HealthySteps for the 5.4 million children who have Medicaid insurance ([http://www.physiciansnewsnetwork.com/la\\_county/california-could-be-first-state-to-implement-dyadic-care/article\\_7cf46842-e34a-11eb-8d68-1f0d8edb9934.html](http://www.physiciansnewsnetwork.com/la_county/california-could-be-first-state-to-implement-dyadic-care/article_7cf46842-e34a-11eb-8d68-1f0d8edb9934.html); [https://cachildrenstrust.org/wp-content/uploads/2020/05/Dyadic\\_final\\_May2020.pdf](https://cachildrenstrust.org/wp-content/uploads/2020/05/Dyadic_final_May2020.pdf)). Pediatric care programs can serve as models for change in the perinatal care ecosystem, illustrating potential solutions to the myriad implementation challenges, such as provider time constraints, prioritization of patients' needs, budgetary challenges, and translation of knowledge into realistic practice guidelines.<sup>110</sup> Pragmatic clinical trials (<https://rethinkingclinicaltrials.org>) and demonstration projects could be established to develop and test approaches to expanded education, intervention, prevention, and interdisciplinary services in prenatal care and generate evidence-based outcomes relevant to funding and scaling up these initiatives. To promote healthy families, we need to enhance healthcare at its origins—in obstetrics during the TtP. ■

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