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Reducing Poverty and Inequality Through Preschool-to-Third-Grade Prevention Services

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The contributions of psychology to the development and evaluation of preschool-to-thirdgrade prevention programs are analyzed with an emphasis on poverty alleviation through implementation of effective services for a greater number of children. The need to alleviate poverty and increase economic success is high. Early childhood programs have been found to be an effective strategy for promoting educational success and economic well-being, but the availability of high quality programs that are aligned and integrated with schools across the learning continuum is limited. Psychology has made major contributions to knowledge and practice in (a) defining and evaluating educational enrichment and (b) understanding mechanisms of behavioral change. As an empirical illustration of these contributions for enhancing economic well-being, we report new midlife income data in the Child-Parent Centers, a preschool-to-third-grade program that integrates the two major contributions to improve life course outcomes. Based on a well-matched alternative-intervention design with high sample retention (86%; N = 1,329), findings indicate that participation was associated with a 25% increase in average annual income at age 34 years (\$22,708 vs. \$18,130; p < .01). Graduates were also more likely to be in the top income quartile (\geq \$27,500; 30.7% vs. 20.2%; p < .01). Most of the main effects were explained by cognitive, school, and family factors, though further corroboration is needed. Implications for strengthening the impacts of early childhood programs as an avenue for increasing well-being and reducing inequality emphasize redressing ecological barriers, improving continuity and alignment with other strategies, and implementing effectiveness elements widely.

Public Significance Statement

Early childhood programs in the first decade of life have benefited greatly from advances in psychology, especially in the design, implementation, and evaluation of diverse models and interventions on education and life course outcomes. Evidence from five decades of research shows that positive benefits on economic self-sufficiency are possible, but programs have not been scaled effectively for optimal impacts. An example from a leading large-scale school-based program demonstrates how learning experiences that are high in quality, comprehensive in scope and intensity, and longer in duration than usual can enhance economic well-being in early midlife.

Keywords: preventive interventions, early childhood, poverty and economic well-being, longitudinal studies, mechanisms and mediators

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The original vision of early childhood programs developed in the 1960s Great Society era was to reduce and ultimately eliminate intergenerational poverty. In announcing the creation of the Head Start preschool program, President Johnson (1965) articulated this goal as follows:

This means that nearly half the preschool children of poverty will get a head start on their future. . . . Five and six year old children are inheritors of poverty's curse and not its creators. Unless we act these children will pass it on to the next generation, like a family birthmark. (para. 6 and 9)

In the 5 decades since the Great Society/War of Poverty, knowledge about the benefits of early childhood programs as a prevention strategy has greatly expanded as have investments at all levels of society. Today 80% of young children participate in some form of center-based preschool and nearly half of 4-year-olds are enrolled in state prekindergarten, locally funded, or Head Start programs (National Institute for Early Education Research [NIEER], 2018). Although increases in mothers' labor force participation, access to public preschool, and higher expectations about the role of early education to school success were major reasons for these changes, the positive long-term effects of early education programs from cohort studies by psychologists and allied scientists also played a large role. Landmark cohort studies of Perry Preschool (Schweinhart et al., 2005), Abecedarian Project (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002), Consortium for Longitudinal Studies (1983), and the Child-Parent Center (CPC) program (Reynolds, 1994) demonstrate life-course effects on wellbeing and reduced inequality through promoting school success, social competence, and educational attainment

(Cannon et al., 2017; Yoshikawa, Wuermli, Raikes, Kim, & Kabay, 2018). Cost–benefit studies also show returns of \$3–\$16 per dollar invested (Cannon et al., 2017; Reynolds & Temple, 2008; Schweinhart et al., 2005). But these benefits are not widespread or sufficient to alleviate poverty and its detrimental effects.

Overview

In this article, we synthesize the contributions of psychology to the development of preschool-to-third-grade prevention (P-3) programs and services for low-income and vulnerable children. We emphasize early intervention approaches to promote developmental continuity and educational enrichment. With a focus on a system of school and family supports to improve long-term well-being by enhancing educational success, P-3 can be an effective poverty reduction strategy. Two contributions of psychology for increasing economic success are discussed: (a) defining and evaluating educational enrichment and (b) understanding mechanisms of behavior change. An empirical example from the CPC program highlights and extends these contributions by testing the relation between P-3 services and midlife economic well-being. Also assessed are family risk moderators and processes leading to impacts. Strategies to reduce poverty and its adverse effects, and improve wellbeing are discussed.

The key importance of poverty reduction and amelioration to early childhood programs is often ignored today when the focus is on shorter-term outcomes such as achievement and school competence. It is through education and achievement-related behaviors that long-term effects on economic well-being are realized. That is why Head Start was originally administered in the Office of Economic Opportunity (Richmond, 1997). However, the near exclusive focus on short- and intermediate-term effects does not address whether early childhood programs directly impact poverty and economic independence as envisioned by President Johnson and the Great Society planners. To achieve the promise of prevention in early childhood, more frequent assessment of impacts well into adulthood is needed. This also enables assessment of intergenerational effects.

Context of Economic Well-Being and Prevention Programs

The need to alleviate poverty and increase economic well-being is as strong today as it was in the 1960s. Although social and economic conditions have shown improvement, the percentage of adults at or below the federal poverty line has risen. In 2015, 12.5% of 18- to 64-year-olds were poor (e.g., income of \$24,250 for a family of four) compared to 10% in 1966 based on income guidelines for that year (Federal Register, 2015; U.S. Census, 2016).



Suh-Ruu Ou

Among children, a similar increase in size occurred; in 2015, 19.7% were poor, 2 points higher than in the 1960s. These patterns remain today.

Large differences by race and ethnicity are evident. Blacks experienced a sizable reduction from 22.6% to 18.7% in poverty over the 5 decades, more so than Whites and Hispanics. Thirty percent of Black children were poor in 2015, down from 40% in 1974 (earliest available data). This rate is over 3 times higher than for Whites (9.5%), though it was 4 times higher in 1974 (U.S. Census, 2016). The greater concentration of economic disadvantage among Black children is also reflected in rates of deep poverty, defined as income relative to family size of up to 50% of the federal poverty level. Although overall 9% of children are in deep poverty, Black children are nearly 3 times more likely than Whites to be in deep poverty (10.8% vs. 4.1%; U.S. Census, 2016) and 5 times more likely to be in persistently deep poverty over childhood (Lei, 2013).

Rising economic inequality and its life course determinants has increased attention to the need for effective prevention and multilevel intervention strategies (Bullock, 2018; Council of Economic Advisors, 2016). This is especially the case for children growing up in poverty and adversity (Huston, McLoyd, & Coll, 1994). Evidence that the etiology of economic disparities is rooted in childhood has heightened the urgency to act (Braveman & Gottlieb, 2014; Council of Economic Advisors, 2016; Power, Kuh, & Morton, 2013). Early disparities of 15 percentage points between high and low-income groups are evident in school readiness, which increase over time in rates of achievement proficiency, delinquency, school completion, and income inequality (Reynolds & Temple, 2019). For example, in the 2017 National Assessment of Educational Progress (NAEP) 20% of 4th graders from lowincome families (up to 185% of the poverty line) were proficient readers compared to 52% of students from higher-income families (NAEP, 2018). This 32-point gap, which has increased by a third over the past decade, indicates that, to be effective, prevention services must be proportionate to identified needs (Bogard & Takanishi, 2005; O'Connell, Boat, & Warner, 2009; Reynolds, 2019). This gap is also predictive of many later economic and health disparities (Belfield & Levin, 2007; Marmot et al., 2008). A 1- or 2-year preschool program, even if high quality, cannot eliminate a gap of this magnitude (Cannon et al., 2017; Council of Economic Advisors, 2016; Reynolds, 2019).

Given the size of present educational and economic disparities and the limited reach of current models, interventions must be implemented that are longer in duration and more comprehensive than in earlier studies. In addition to addressing individual, family, school, and community needs, they also must have the capacity to scale because few prevention programs go to the population level (O'Connell et al., 2009). Prevention programs in the first decade of life can redress these trends, but links to long-term economic well-being have rarely been assessed. Our focus in the article is children growing up in persistent poverty for whom achievement gaps and barriers to well-being are largest.

Preschool to Third-Grade Prevention

The War on Poverty under the Economic Opportunity Act of 1964 created a broad array of social programs to promote child development, family health, and urban renewal in the most economically disadvantaged areas. In addition to Project Head Start, community action programs (e.g., Volunteers in Service to America), job training (e.g., Job Corps), health and nutrition initiatives, and aid to schools through the Elementary and Secondary Education Act (ESEA) of 1965 began. Few if any programs, however, embraced developmental continuity or the optimal duration of services. Bronfenbrenner (1974) emphasized the importance of the ecological context in sustaining early childhood gains: "the involvement of the child's family as an active participant is critical to the success of any intervention program [without which gains] erode fairly rapidly" (p. 17).

Although Head Start was a preschool program, the planning committee, which included Edward Zigler and Urie Bronfenbrenner, envisioned a longer-duration program. Project Follow Through, which began in 1966, was designed to provide Head Start-like services through third grade but did not achieve this goal due to the operational focus on testing different curricula as planned variations. Around the same time, the Chicago Public School District



Christina F. Mondi

established a CPC program that provided colocated services integrated across P-3 (i.e., CPC P-3), funded through ESEA Title I. Along with Follow Through and Project Developmental Continuity, this approach became a model for comprehensive prevention services in schools leading to a revival of P-3 efforts in the 1990s (Bogard & Takanishi, 2005; Reynolds, 2003; Zigler & Styfco, 1993). By creating a supportive learning environment over many years, gains may be more likely to be sustained.

The poverty reduction goal of early childhood programs, including CPC, should be viewed within the context of economic conditions and barriers in which children grow up. Although the duration and comprehensiveness of P-3 models are designed to induce broad and enduring effects on well-being, they are not expected to counteract many of the effects of poverty. As noted by Zigler and Berman (1983), early education and social programs "cannot inoculate against continuing disadvantages" (p. 898). Although these and other barriers are increasingly recognized (Bullock, 2018; Marmot et al., 2008; United Nations Development Programme, 2014), they can be partly addressed by the opportunities inherent in early childhood programs (e.g., stress regulation, enriching environments, language development).

Promoting Developmental Continuity

Fundamental to P-3 is the concept of developmental continuity. This is the extent to which learning environments are consistent and predictable over time while promoting healthy adjustment, especially during key transitions. We describe this as the P-3 advantage. This is the added value of continuing intervention above and beyond earlier participation. Model (Campbell et al., 2002; Seitz, Apfel, Rosenbaum, & Zigler, 1983) and large-scale programs (Reynolds, Rolnick, Englund, & Temple, 2010; Reynolds & Temple, 1998; Schweinhart & Wallgren, 1993; Zellman & Kilburn, 2015; Zigler & Styfco, 1993) demonstrate this advantage. For example, students in the State of Hawaii P-3 initiative showed gains in reading at the end of the program that exceeded students in control schools (Zellman & Kilburn, 2015). After adjusting for gains in kindergarten, CPC students participating for 4 to 6 years showed significantly greater achievement gains up to 7th grade than those participating for fewer years (Reynolds & Temple, 1998, 2008). P-3 reduced the gap with U.S. seventh-graders by nearly 75%. Although promising, these results have limited generalizability to broader populations and must be followed by long-term studies on economic well-being and related outcomes (Cannon et al., 2017; Council of Economic Advisors, 2016; Reynolds & Temple, 2019).

Due to discontinuities in educational support and philosophy between early childhood and school age settings, improvements in the integration and alignment of services may increase children's early learning that is sustained over time (Takanishi, 2016). Promoting good school transitions may not only have larger effects on development but increase the likelihood of effects on economic well-being. This is consistent with ecological systems (Bronfenbrenner, 1989), risk/protection (Rutter & Rutter, 1993), and psychological learning models (Haertel, Walberg, & Weinstein, 1993).

Given the historic focus on specific elements of reform, including curriculum enhancement and small classes (Reynolds, Magnuson, & Ou, 2010), newer comprehensive approaches are being emphasized. Key principles of school reform from the 1970s have not been utilized in early childhood (Reynolds & Temple, 2019; Schweinhart & Wallgren, 1993; Takanishi, 2016). The development of P-3 prevention services provides a foundation for understanding the contributions of psychology to promoting economic well-being.

Two Major Contributions of Psychology to Preventive Interventions in Early Childhood

We review two major contributions of psychology to understanding the effects of P-3 services on poverty alleviation and economic well-being. These are (a) defining and evaluating educational enrichment and (b) understanding mechanisms and processes of behavior change. Both address how to improve economic well-being as well as mitigate the harmful effects of poverty. From a developmental perspective, early childhood is the stage broadly defined as the first decade of life (0 to 9 years of age). The rationale for a P-3 strategy compared to a more expansive approach is



Alison Giovanelli

threefold. First, third grade is historically considered an end point to the early childhood period, especially—as noted earlier—for helping to sustain the gains from early interventions. For this reason, the planning committee for the Head Start preschool program envisioned a P-3 approach (preschool plus follow through; Richmond, 1997) as did other early education programs (Ramey & Ramey, 1998). Current state and local programs address the kindergarten to Grade 3 period as the key transition point for promoting later success (Takanishi, 2016). Of course, consistent with developmental continuity, services after P-3 complement earlier years as well as can be made more effective by them.

The second reason why P-3 is a distinct age span is that many behaviors and important milestones are established by age 9 and are less subject to change afterward. Reading and math proficiency in third grade are most predictive of later achievement (Belfield & Levin, 2007; NAEP, 2018). Children who are not proficient by this grade have difficulty catching up and are much more likely to have academic and behavioral problems in middle childhood and adolescence (O'Connell et al., 2009; Rutter & Rutter, 1993). Socioemotional skills such as self-control, self-regulation, and cooperation also are established by third grade and set a positive trajectory for later success.

Finally, the cost effectiveness of prevention programs implemented during the first decade of life is higher than for later ages (Reynolds & Temple, 2008). Preschool and other early childhood programs, parenting and socioemotional skills training, reading interventions and small class sizes show this pattern of effectiveness (Aos, Lieb, Mayfield, Miller, & Pennucci, 2014; Temple & Reynolds, 2007). The return on investment is tied to the salience of the benefits of enrichment experiences that promote well-being up to third grade.

Defining and Evaluating Educational Enrichment

Early childhood programs in the 1950s and 1960s were designed to enhance the development of children at elevated risk of poor cognitive, socioemotional, health, and parenting outcomes (Ramey & Ramey, 1998; Zigler & Berman, 1983). Center-based and family focused programs provided intensive educational enrichment from birth to age five to improve foundational skills for school success and social competence (Consortium for Longitudinal Studies, 1983). Influenced by the environmentalism of the times, psychologists emphasized the potential for large cognitive and intellectual effects, especially in IQ scores (Zigler & Berman, 1983). Over time, the scope of outcomes expanded to social competence, school readiness, and the current conception of well-being over the life course (Cannon et al., 2017). This progress represents a major contribution of psychology.

Developing and evaluating programs. Head Start founders and developmental psychologists established the comprehensive "whole child" vision of early childhood programs as educational enrichment. The four common components include child education, family and parenting support, health services, and social services (Richmond, 1997). These pillars remain today in child-focused and two-generation programs. Individual models also developed curricula and instructional methods that have contributed to children's learning and development more broadly. These include the HighScope curriculum and the Piaget-inspired plan-do-review, Bank Street Readers, Peabody Language Development Kits, activity-based and experiential learning approaches, behavioral systems and teacher-child interactions of skill development, and menu-based strategies of family engagement (Consortium for Longitudinal Studies, 1983; Gray, Ramsey, & Klaus, 1982; Ramey & Ramey, 1998; Reynolds, 2000; Zigler & Styfco, 1993).

Psychology has also played the leading role in the evaluation of early childhood programs. All of the extensive longitudinal studies from the 1960s to 1980s were planned and implemented by psychologists, including the Early Training Project (Gray et al., 1982), Perry Preschool (Schweinhart et al., 2005), Consortium for Longitudinal Studies (1983), Abecedarian (Campbell et al., 2002; Ramey & Ramey, 1998), The Infant Health and Development Program (1990), and the CPCs (Reynolds, 1994, 2000). As the length of follow-up increased, allied health scientists, economists, and educational researchers became involved, contributing to studies assessing crime, social, health, and economic outcomes. These studies were usually conducted in collaboration with psychologists. Hundreds of studies over the years have documented the positive effects of programs implemented during infancy to the early school age. Enduring effects on education, social, and health outcomes have been found for the most intensive and comprehensive ones (Cannon et al., 2017; McCoy et al., 2017). Not all have shown sustained gains, however (Lipsey, Farren, & Hofer, 2015; Puma et al., 2012). Principles and elements of effectiveness have been identified, with major contributions from psychology.

Principles of effectiveness. To summarize one of psychology's contributions, Table 1 provides three common sets of program elements that promote effectiveness in early childhood programs. Programs that meet more of these elements are likely to have larger and more enduring effects than those meeting fewer elements. The elements are organized by six dimensions ranging collaborative leadership to continuity and stability (Reynolds, Hayakawa, et al., 2016, 2017). As the table illustrates, the effectiveness elements identified by Zigler, Gilliam, and Jones (2006) and NIEER (2017) are similar in most respects, with the Zigler framework including parent involvement as a key element. The CPC elements (Reynolds, Hayakawa, Candee, & Englund, 2016; Reynolds, Hayakawa, et al., 2016) also emphasize parent involvement as well as curriculum alignment and continuity across ages and grades. The organizational component of collaborative leadership helps create a positive learning environment that is further enhanced by professional development for staff. These elements and dimensions promote the implementation of high quality programs and good outcomes but cannot completely ensure them (Ramey & Ramey, 1998; Reynolds & Temple, 2019; Reynolds, Vaisarova, Richardson, & Lee, 2018; Zigler et al., 2006).

The last column of Table 1 highlights how these elements align with six key principles of effective intervention described by Ramey and Ramey (1998). Among them are developmental timing, program intensity, and ecological and environmental maintenance of development. They are reasonably represented by the three frameworks, albeit imperfectly. Environmental maintenance of development, which is related to duration, is central to P-3 and developmental continuity but not directly addressed in the others. Although there is substantial evidence that various measures of preschool duration and dosage positively influence learning (Wasik & Snell, 2019), few studies have examined duration and continuity in learning over an extended number of years. Notably however, few programs include all these elements at high levels of quality. This is especially true over P-3, in which less than 10% of children experience features that are evidence-based (Reynolds et al., 2010; Reynolds & Temple, 2019).

Regardless of continuity and dosage, teacher practices and qualifications—which reflect intensity and the learning climate—are critical to program quality as their beliefs and knowledge shape the classroom environment and children's learning (Manning, Garvis, Fleming, & Wong, 2017). Psychologists and education scientists have found that highquality instructional activities and teacher-child interactions link to children's long-term learning (Graue, Clements, Reynolds, & Niles, 2004; Vandell et al., 2010; Wasik & Hindman, 2011).

Expansion and contemporary practice. Psychologists and educators initially developed early childhood programs as efficacy trials to determine whether planned enrichment under controlled conditions could impact well-being. Over time the positive impacts reported in landmark and contemporary studies led to scale-up efforts to larger populations (NIEER, 2017; Yoshikawa et al., 2018; Zigler & Styfco, 1993). Over the decades, the proportion of young children in center-based early education programs has increased from 27% in 1965% to 55% in the mid1980s, and is now 80% (U.S. Department of Education, 2016). Although programs of good quality enhance school readiness and longerterm outcomes (McCoy et al., 2017; Yoshikawa et al., 2018), parallel improvements in access, quality, comprehensiveness, and duration over P-3 have been limited. The lack of alignment between early education and school-age settings, which creates discontinuity in experiences, is due to philosophical and organizational barriers that limit collaboration (Reynolds, Hayakawa, Ou, et al., 2017; Takanishi, 2016).

Increasing the use of evidence-based programs and practices can also strengthen effects as expansion continues. Based on the evidence standards established by psychologists and methodologists such as Donald Campbell (1984; Cook & Campbell, 1979), programs with the highest internal and external validity are categorized as effective and ready to be scaled. The National Research Council's review of evidence-based prevention (O'Connell et al., 2009) described the contributions of psychological and allied sciences to design, implementation, impact assessment, and dissemination. As fidelity to the key elements in Table 1 increases, so would impacts of early childhood programs on well-being. This, in turn, would facilitate broader implementation. Understanding the process of behavior change only furthers the capacity for strengthening effects.

Understanding Mechanisms of Behavior Change

Mechanisms and processes of change, the second major contribution of psychology to early childhood prevention, are central to scientific explanation. As reflected in philosophy of science and theories of human development (Bronfenbrenner, 1989; Rutter & Rutter, 1993), identification of mechanisms enhances causal understanding and provides an approach for describing how key elements of intervention affect behavioral outcomes. Established criteria for evidence-based programs such as the National Registry of Effective Programs and Practices (O'Connell et al., 2009)

		Elements		Key principles
Core dimensions ^a	Reynolds, Hayakawa, Candee, and Englund (2016) ^b	Zigler, Gilliam, and Jones (2006)	NIEER (2017) ^c	Ramey and Ramey (1998)
Collaborative leadership	A team led by head teacher to create a strong learning climate Delegated responsibilities for curriculum, family support	Monitoring system with onsite observation	Continuous quality improvement system	Environmental maintenance of development
Effective learning experiences	Small classes (<18 in pre-K; <26 in K-3) Balance of teacher-directed and child- initiated instruction Extended learning time, including full- day, multiyear programs Teacher has BA; Assistant has CDA, AA degree, or equivalent Engaged in learning and instruction	Maximum of 10 children per teacher or assistant teacher Teacher with BA and EC specialization; Assistant with CDA or equivalent Full-day and 2-year option	Maximum ratio of 10 children per staff member Maximum class size of 20 Teacher has BA Teacher has specialized training in ECE/CD Assistant has CDA or equivalent	Developmental timing Program intensity Direct provision of learning experiences Individual differences in program benefits
Aligned curriculum and practices	Evidence-based curriculum Annual curriculum alignment plan Across-grade teacher collaboration	Curriculum is evidence- based	Supports for curriculum implementation	Implement new curricula for increased effectiveness
Parent involvement and engagement	Menu-based system of home and school support Annual parent involvement plan Parent resource teacher and outreach worker Physically located parent room Needs assessment	Parent involvement plan	Health screening for vision, hearing, and others plus referrals for services	Program breadth and flexibility
Professional development	In-person and online coaching support Site mentors Facilitation, review, and reflection of online learning modules	System of in-service training for all staff Teachers are compensated at rates competitive with schools	Professional development and coaching supports for teachers of at least 15 hr per year	Individual differences in program benefits Program intensity
Continuity and stability	Participation from preschool to third grade Colocation or close proximity Outreach efforts to reduce mobility	Funding levels support high quality of programs	Comprehensive standards that are horizontally, vertically aligned, and culturally sensitive	Environmental maintenance of development
<i>Note</i> . NIEER = National Instit	ute for Early Education Research; pre-K = prekind	ergarten; $K-3 = kindergarten$ to Grad	de 3; BA = bachelor of arts degree; EC	C = early childhood; CDA = Child

Core Dimensions and Elements of Early Childhood Programs and Services and Linkage to Key Principles of Effectiveness Table 1

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Development Associate; ECE = early childhood education; CD = child development. Elements in each framework may apply to more than one dimension or serve as one indicator, not necessarily fully representative of the corresponding dimension or principle. Although not listed, the Bill and Melinda Gates Foundation (2015) has identified 15 effectiveness elements for high quality pre-K programs that are consistent with those displayed above. For further details on elements, see Human Capital Research Collaborative (2018), Reynolds and Temple (2019, Ch. 1), and Reynolds, Vaisarova, Richardson, & Lee, 2018.

REDUCING POVERTY THROUGH PREVENTION

and RAND's Promising Practices Network prioritize the assessment of mediators and mechanisms of effects. Mechanisms may vary from a single mediator that accounts for an observed effect to complex systems involving chains of effects through many mediators. Bunge (1997) defined a mechanism as "a process in a concrete system, such that it is capable of bringing about or preventing some change in the system as a whole or in one of its subsystems" (p. 414). We use this systems perspective in understanding the contribution of mechanisms to P-3 prevention, and it has relevance for causal explanation in many social programs and processes (Campbell, 1984; MacKinnon, 2008; Reynolds, 1998).

Early mediator studies. Psychology has contributed significantly to the conceptualization, analysis, and interpretation of mechanisms in prevention (MacKinnon, 2008) and early childhood programs (Consortium for Longitudinal Studies, 1983; Reynolds, Ou, & Topitzes, 2004; Schweinhart et al., 2005; Zigler & Berman, 1983). This has enhanced understanding of how early childhood programs impact life course outcomes. Since the 1970s, three major phases of research have occurred. In the earliest studies representing the first phase, the cognitive advantage hypothesis was found to be the initiator of long-term effects on school achievement, educational attainment, and well-being (Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984; Campbell et al., 2002; Consortium for Longitudinal Studies, 1983). Other mediators were not directly assessed or were conceptualized as secondary influences. In the seminal Consortium for Longitudinal Studies (1983) studies, for example, cognitive skills measured by IQ and school achievement were the primary mediators leading to school competence and education attainment. Thus, the focus was at the individual level.

The second phase, mostly from psychology, added hypotheses to better document the complexity of influences (Barnett, Young, & Schweinhart, 1998; Reynolds, Mavrogenes, Bezruczko, & Hagemann, 1996; Schweinhart, Barnes, & Weikart, 1993; Seitz et al., 1983). Seitz et al. (1983), for example, found that cognitive advantage was partly a function of increased motivation in accounting for the impact of a Head Start program on school achievement. Reynolds et al. (1996) presented evidence that cognitive and family support hypotheses mediated preschool impacts. Zigler, Pfannenstiel, and Seitz (2008) found that increases in third-grade achievement for a state sample in the Parents as Teachers program were initiated by home literacy and school readiness, both of which were influenced by preschool. A combination of cognitive skills, motivation, family support, and parenting skills has also been identified as mediators of achievement and reduced problem behaviors (Barnett et al., 1998; Cannon et al., 2017; Eckenrode et al., 2017; Zigler et al., 2008).

Comprehensive measurement. In recognition of the complex processes at play over time, the current third phase of research has emphasized a comprehensive set of child, family, and school-related mechanisms within a framework of alternative models (Reynolds, 2000; Reynolds et al., 2004). This led to the development of the five-hypothesis model of intervention effects (5HM; Ou, 2005; Reynolds, 2000). Derived from the accumulated early childhood research over 4 decades, the 5HM posits that the effects of intervention are explained by indicators of five paths of influence representing the total ecological context: cognitive–scholastic advantage, family support behavior, school quality and community support, motivational advantage, and socioemotional adjustment. Their influences are complex and operate at the individual to institutional levels.

As shown in Figure 1, these hypotheses contribute to the explanation of long-term effects on adult well-being. Cognitive-scholastic advantage, for example, includes skills in language, numeracy and developed abilities. Early advantages in these skills accumulate to affect a range of later competencies and are critical for benefits into adulthood, including economic well-being (Marmot et al., 2008; Power et al., 2013). Prior studies through young adulthood show good model fit for school achievement, high school graduation, and criminal justice system involvement (Ou, 2005; Reynolds et al., 2004; Reynolds & Ou, 2011). Each hypothesis contributes but this varies by outcome, and has been initially corroborated in CPC, Perry Preschool, and Abecedarian samples (Englund, White, Reynolds, Schweinhart, & Campbell, 2014). The family and school-community support hypotheses, which have less consistent life course evidence, reflect the social contexts influencing the transmission and sustainability of effects. Enhancing parenting and school quality, for example, are key goals of multicomponent programs that influence well-being (Greenberg et al., 2003; Ramey & Ramey, 1998). Elementary school quality is increasingly linked to sustained effects of preschool on achievement and helps account for crime prevention benefits (Braveman & Gottlieb, 2014; Cannon et al., 2017; Reynolds, Ou, et al., 2017; Reynolds & Ou, 2011). We illustrate these processes further in the empirical example section. Also note that the personal, family, and sociostructural influences shown in the upper left of Figure 1 can moderate the effects of prevention programs, with stronger effects in low-resource contexts (Cannon et al., 2017; Giovanelli, Reynolds, Mondi, & Ou, 2016; Greenberg et al., 2003).

Contemporary uses for research and practice. Due to data limitations and relatively few extensive longitudinal studies, comprehensive models have not been tested widely. However, psychologists have increasingly emphasized this direction of research for many processes including the social determinants of health (Braveman & Gottlieb, 2014), transmission of income inequality (Singh-Manoux, Ferrie,



Figure 1. Five-hypothesis model (5HM) paths to adult well-being (links among mediators not shown). The model shows the contributing mediators to the transmission of early childhood prevention programs to adult well-being. Outcomes of adolescence and young adulthood are not shown but would be similar. The magnitude of effects will vary by program attributes and child, family, and environmental context. Long-term direct effects of intervention are expected as a function of program participation positively influencing the five mediator constructs.

Chandola, & Marmot, 2004), developmental cascades (Masten & Cicchetti, 2010; O'Connell et al., 2009), and paths of early experience to adult well-being (Power et al., 2013). Documenting mechanisms of change in prevention and social programs more generally serve three key purposes. First, it improves program design and modification. Research that identifies empirically supported paths can contribute to a variety of efforts to strengthen program effects, as psychology has often emphasized (O'Connell et al., 2009; Ramey & Ramey, 1998; Reynolds, 1998). Second, identifying and understanding mechanisms can increase the external validity of findings. To the extent that findings across studies share a common mechanism, program replication and expansion in different contexts would be more likely to be successful. Finally, identifying mechanisms strengthens causal inferences. Because the length of time between the end of the program and outcome assessment is often extensive, documenting the process through which participation exerts effects is essential, especially for children at risk. This emphasizes the coherence of linkages between program experiences and outcomes as a process of cumulative advantage (Reynolds, Temple, White, et al., 2011; Reynolds & Ou, 2011).

The two major contributions of psychology to early childhood prevention described previously—defining and evaluating educational enrichment and understanding mechanisms of behavior change–, are illustrated empirically in the next section using data from the Chicago Longitudinal Study (CLS, 2005; Reynolds, Temple, Ou, et al., 2011). CLS prospectively follows a large CPC cohort of low-income, minority children from the mid-1980s. Through early, continuing, and comprehensive educational enrichment for children and families, the program is designed to counteract the adverse effects of poverty on school success and well-being. Mechanisms of change include individual and social context factors, and their interaction.

Not only does the example illustrate the relevance of prevention to psychology but it fills two major gaps in the field of poverty alleviation envisioned by Great Society planners. First, large-scale tests of the long-term effects of ecologically based prevention have been rare, and we are aware of no others of prospectively tracked contemporary programs. As Bronfenbrenner (1974) noted, "what is called for is intervention at the ecological level, measures that will effect radical changes in the immediate environment of the family and child" (p. 17). When begun early and in a sequential manner, "cumulative gains" across education, family, and neighborhoods are possible. Moreover, the focus on developmental continuity and mechanisms of change provides a direct test of the extent to which greater duration enhances economic wellbeing, especially for those growing up in poverty (McLoyd, 1998; McLoyd, Mistry, & Hardaway, 2014). A 662

brief review of existing studies provides a larger context for investigation.

Review of Life-Course Prevention Studies of Economic Well-Being

Although there is evidence that prevention programs can be cost-effective (Aos et al., 2014; Cannon et al., 2017), few studies have investigated impacts on economic well-being. This is primarily due to the lack of follow up beyond age 25, when most adults are entering the workforce. Follow up is resource-intensive. Attrition can greatly influence findings, especially in small samples. The Consortium for Longitudinal Studies (1983) projects had an overall recovery rate at age 19 of 55%, which, adjusted for length of follow up, is comparable to recent evaluations (e.g., Head Start). Attrition can affect the validity of rigorous designs, either randomized or quasi-experimental. Of the few studies assessing economic well-being, findings are inconsistent with two showing positive effects (Campbell et al., 2002; Schweinhart et al., 2005) and two no effects (Consortium for Longitudinal Studies, 1983; Garces, Currie, & Thomas, 2002).

In the Perry study, for example, participants had higher rates of employment and monthly income than the control group at ages 27 and 40, despite no differences in college attainment (Schweinhart et al., 2005). Participants in the Carolina Abecedarian Project were more likely to be in higher skilled jobs than controls (Campbell et al., 2002). Due to small samples, no credible interpretations about subgroup effects are possible. Other follow-ups, including of Head Start in the Panel Study of Income Dynamics (Garces et al., 2002) and the Consortium for Longitudinal Studies (1983) found no differences in economic status, but they each had significant methodological limitations. A CLS cohort analysis at age 27 showed that CPC graduates were more likely to have more skilled jobs and have higher incomes, but many were still pursuing their education or in the justice system (Reynolds, Temple, Ou, et al., 2011; Reynolds, Ou, & Temple, 2018).

Findings are also inconsistent by gender, and differences by child, family, and neighborhood characteristics-which our above review (see Figure 1) suggests is a need-have not been fully assessed. This is due to the predominance of small or homogeneous samples and limited measurement of multilevel risks. No previous studies have assessed income and poverty for large-scale, public programs after the mid20s. Differences by dosage also are underinvestigated. This gap limits understanding of the impact of effectiveness elements described in Table 1 and by Ramey and Ramey (1998). Because postsecondary attainment necessary for good economic well-being among low-income populations

is usually completed by the late 20, midlife follow-up is essential.

CPC P-3, Economic Well-Being, and Mechanisms of Change

In this section we summarize links between CPC P-3 participation and midlife economic well-being. Aligned with the key contributions described earlier, we address whether (a) CPC P-3 participation beginning at age 3 or 4 was linked to higher income by age 34, (b) estimates varied by risk subgroups, and (c) indicators of 5HM accounted for the observed differences.

CPC P-3 is one of the first P-3 programs. It provides comprehensive education and family services to lowincome children in small classes and is structured to enhance school learning experiences and family engagement over extended periods of time. CPC's success in enhancing well-being and yielding positive economic returns is documented in the CLS (Reynolds, Temple, Robertson, & Mann, 2002; Reynolds, Temple, White, et al., 2011). Consistent with developmental continuity and the P-3 approach described in Table 1, the program is guided by the ecological model, engaging children and parents within the family school context to promote learning gains. A program expansion began in 2012 in Midwestern districts (Reynolds et al., 2014, Reynolds, Hayakawa, et al., 2017; Reynolds, Richardson, et al., 2016). This increases the relevance to broader P-3 expansion efforts (Manship, Farber, Smith, & Drummond, 2016).

Program and Longitudinal Study Sample

CPC P-3 in the CLS is a multicomponent program in 20 colocated elementary schools. It opened in 1967 in the city's highest poverty areas, Garfield Park and North Lawndale. Funded by Title I of ESEA, centers are part of the Chicago Public Schools and offer a part-day program at age 3 or 4, followed by part- or full-day kindergarten, and up to 3 years of school-age services. The goal is to enhance well-being through enriching children's education and changing the family school context.

Because of the substantial risk factors present in the neighborhoods growing up, including lower quality schools, limited employment opportunities, exposure to crime, and overrepresentation of youth and adults in the criminal justice system, a comprehensive two-generation program to enhance children's educational success was expected to be most impactful (Sullivan, 1971). Studies have shown that participation beginning in preschool links to improved school performance, increased family support, and reduced involvement and adjudication in the criminal justice system, especially for males (Reynolds, Temple, Ou, et al., 2011; Reynolds et al., 2018). For

663

example, relative to comparison groups, rates of arrest were reduced by up to 33%, whereby over half of participants had justice system involvement (Reynolds et al., 2018).

The CLS sample of 1,539 children was born in 1979 and 1980 and nearly 80% grew up in areas of concentrated poverty. Matching the racial composition of the neighborhoods, 93% of the cohort is Black and 7% are Hispanic. In our analysis below, data are included from birth to age 34 years, 31 years after program enrollment at ages 3–4 years. Data have been collected from birth records, kindergarten to Grade 12 school records, surveys, and administrative records from health to earnings and education.

CLS is an alternative-intervention, quasi-experimental design in which the entire CPC P-3 cohort of 989 children entering in preschool and continuing to kindergarten were followed prospectively into adulthood. The comparison group of 550 children had the usual early childhood services in Chicago. They were from five randomly selected and demographically similar schools with full-day kindergarten. Because CPC P-3 was a large-scale established program, had positive evidence of impact, and was for those most in need, random assignment was impossible. Not only would it have been unethical, as benefits were not uncertain, but noncompliance most certainly would have occurred. The accumulated evidence shows that findings are interpretable as program impacts; estimates are consistent across models, comparison groups, and analytic techniques. These include latent-variable modeling and propensity score weighting (Reynolds, Temple, Ou, et al., 2011; Reynolds et al., 2018; Reynolds & Temple, 1998). Consequently, the study meets the rigorous standards of What Works Clearinghouse and Campbell Collaboration.

At age 34 years, 86% (N = 1,329; 88% excluding deceased) of the original sample had data on economic wellbeing. Duration of participation ranged from 0 to 6 years (M = 4.0 [CPC only]); 553 children completed throughsecond or third grade for 4 to 6 years (only 6 schools had services in third grade). The non-CPC group had significant intervention (see the online supplemental materials). The recovery rate was higher for CPC P-3 (88% vs. 83%) but groups were equivalent on baseline characteristics, including the family risk index, child maltreatment, and economic status. Differences in parent education (age 3) were exclusive to females. Those with continuing services were similar to other participants and had equivalent achievement growth before school-age intervention (Reynolds, 1994). Following prior studies (Reynolds, Temple, Ou, et al., 2011), baseline attributes were taken into account through inverse probability weighting (IPW) of program selection and attrition (Imbens & Wooldridge, 2009; see the online supplemental materials).

Income Measures

As part of the midlife phase of CLS, income data were obtained from both survey self-report between 2012 and 2017 and the Illinois Department of Employment Security (IDES, 2014) between 2010 and 2015. The study sample had available data from IDES, the midlife survey, or had known education and crime history. Our primary measures were based on the average annual income from employment over ages 30-34 converted to 2015 dollars. Two indicators were analyzed that combined both sources: (a) average annual income (M = \$19,858; SD = \$18,985) and (b) annual income of \$20,415 or higher (36% at this threshold), which is the average entry salary in Illinois for all categories of work (IDES, 2014). Quartile analyses also were conducted. As a household description, the income to poverty ratio was 1.98 (average income = 40,280), with an average family size of 3.8. We report supplemental analyses of this indicator because it reflects income adjusted for family size.

Main-Effect Results

We focus on impacts for the CPC P-3 group. For all measures examined, participation was associated with significantly higher income levels. After adjusting for potential biases in program selection and attrition through IPW probit or linear regression, the P-3 group participating in 4 to 6 years of intervention had significantly higher average income than the comparison group with less than 4 years of intervention (\$22,708 vs. \$18,130; p < .01). This is an increase of 25% (\$4,578), and is equivalent to three months of earnings. Participants also had a higher rate of meeting the threshold of \$20,415 (41.5% vs. 31.9%, p < .01), a 30% increase over the comparison group (d = 0.27). Among the currently employed, income was also higher for CPC P-3 (\$27,994 vs. \$21,802; p < .001).

Moreover, the P-3 group was more likely to be in the top quartile of income (\geq \$27,500 [M = \$46,599]; 30.7% vs. 20.2%, p < .001; 52% increase; d = 0.34). Because averages can mask important distributional trends, we further examined quartiles differences. Figure 2 shows that two parts of the income distribution were most impacted by CPC P-3: the 2nd lowest quartile (\leq \$14,332) and the top quartile. Participants were less likely to be in lower quartile, which is deep poverty. Considering the two bottom quartiles together, 44% of program participants had incomes in this range compared to 53% for the comparison group having fewer years of intervention (p < .01; d = -0.23).

Finally, as a broader measure, the household income to poverty ratio (e.g., income to needs) significantly favored the program group (2.20 vs. 1.83; p < .01). Their incomes were over twice the poverty line accounting for household size compared to less than twice the poverty line, a 37-point difference (i.e., 220% - 183%). Household income followed a similar pattern, and findings were unaffected by model



Figure 2. Adjusted rates of average annual income quartiles at age 34 years by preschool-to-third-grade prevention (P-3) status. The Child–Parent Center P-3 group had 4–6 years of services (preschool to second or third grade); the comparison group had 0 to 3 years. On the bottom quartile (0-25%, M = \$2,751; range = \$0-\$6,418), the difference between groups was not significant. On the second quartile (26-50%; M = \$10,310; range = \$6,472-\$14,332), the difference between groups was significant at .01 level. On the third quartile (51-75%; M = \$19,876; range = \$14,423-\$27,500), there is no significant difference between groups. On the top quartile (75-100%; threshold = \$27,500; M = \$46,599; range = \$27,623-\$120,454), the difference was significant at .001 level. A significantly lower percentage of the Child–Parent Center P-3 group was in the bottom two quartiles (44% vs. 53%, respectively; p < .01). The percentage in the top two quartiles was the inverse of this difference (56% vs. 47%; p < .01). All values were adjusted through inverse propensity score weighting for attrition and program selection. See text and the online supplemental materials for further information on model specification. See the online article for the color version of this figure.

specification and alternative comparison groups (see the online supplemental materials).

Income differences for CPC preschool were less pronounced. Relative to the non-CPC group and adjusting for IPWs, the preschool group had higher annual income (\$20,490 vs. \$18,066) and were more likely to be at the \$20,415 threshold (37.1% vs. 31.2%) but only at trend levels (p < .10). Among the employed only, the preschool group had higher income (\$25,653 vs. \$21,247; p < .01).

Differences by Family and Neighborhood Risk

Consistent with previous evidence and Figure 1, the patterns indicated that CPC P-3 helped "buffer" the detrimental effects of risk on economic well-being. The largest gains were for those who (a) experienced 4 or more family risk factors by age 3 (e.g., single parent status) and (b) grew up in the highest poverty areas ($\geq 40\%$ below the poverty line). For the former, the impact of CPC was higher for those with four or more risks (31% vs. 16% in top income quartile; p <.01) than fewer (33% vs. 32%; *ns*). The interaction was significant (p < .01; d = .47), but not for neighborhood poverty (d = .24). Impacts for males and females were generally similar (see the online supplemental materials). Findings for preschool followed that of P-3. The high levels of risk experienced by the cohort likely limited differences. Educational attainment shows stronger benefits for the highest risk groups (Reynolds, Temple, Ou et al., 2011; Reynolds et al., 2018).

Mediators of CPC P-3 and Income at Age 34 Years

Following Figure 1, we assessed the contribution of 5HM mediators to the observed main effects using the percentage-reduction metric estimated in regression analysis (MacKinnon, 2008). As with prior studies (Englund et al., 2014; Reynolds & Ou, 2011), indicators of each hypothesis were measured from ages 3 to 24 from many sources: achievement scores in elementary school (cognitive advantage), motivation and school commitment (motivational advantage), classroom adjustment and delinquency (socioemotional adjustment), parent involvement in school and child maltreatment (family support), and attendance in relatively high performing schools and youth school mobility (school support). School remediation by high school and years of education by age 24 were included separately (see the online supplemental materials). Findings are correlational but provide salient comparative contributions.

As shown in Figure 3, each individual 5HM mediator contributed to the estimated effect of CPC P-3 on income at the \$20,415 threshold, one indicator of economic status. As above, estimates are IPW-adjusted. Together, the five me-



Figure 3. Percent reduction in the estimated main effect of Child–Parent Center preschool-to-third-grade prevention program participation (relative to lesser participation) on economic well-being associated with the measured mediators of the five-hypothesis model. Average annual income from employment at age $34 \ge 20,415$ (in 2015 U.S. dollars) is the outcome (N = 1,329). Probit regression estimates are adjusted for differences in attrition and program selection by inverse probability weighting. CA = cognitive advantage (reading achievement scores); MA = motivational advantage (achievement motivation and school commitment); FS = family support (parent involvement and child abuse/neglect); SS = school support (attendance in magnet/high achieving school and mobility); SA = socioemotional adjustment (classroom adjustment in elementary school and juvenile delinquency); Spec. ed & retention \ldots = special education placement and grade retention. Years of ed by age 24 = Years of education completed by age 24. See the text and the online supplemental materials for further details on the measures and model specifications. See the online article for the color version of this figure.

diator constructs accounted for 93% of the main effect of CPC P-3. They also accounted for a large percentage of impacts for average annual income (72%) and being in the top quartile (52%; see the online supplemental materials). Moreover, once the mediators were included in the model CPC P-3 was no longer significantly associated with income. The explanatory power of the model was similar for preschool (see the online supplemental materials). Among the individual mediator constructs, family support, cognitive advantage, motivation, and socioemotional adjustment were most associated with the direct effect of the program. Years of education and school remediation, which were measured at the oldest ages, contributed independently as well. Although indirect effects of these mediators will be important to document, the cumulative pattern of findings suggests that it is a combination of mediators that contribute most to direct effects on income rather than just a few. This is consistent with the ecological focus of the program. Further corroboration and validation are needed.

Interpreting the Evidence on Prevention Services and Life Course Well-Being

As observed early in the War on Poverty (Bronfenbrenner, 1974; Zigler & Berman, 1983), effective programs must go beyond 1 or 2 years to more concerted and aligned multilevel efforts. P-3 prevention, including CPC P-3, advances this strategy but is not widely available, and the quality of many programs do not match the effectiveness elements (see Table 1). We interpret the findings from the empirical example with special attention to further advancing the contributions of psychology to P-3 prevention. Implications and future directions for reducing poverty and advancing knowledge are discussed. As noted earlier, programs are not inoculations. Their impacts are limited to the quality of opportunities available present and future, and the extent to which barriers to progress are reduced.

P-3 Prevention as an Avenue for Enhancing Well-Being

As a comprehensive study of a P-3 program, CPC services were linked to greater economic well-being at age 34 for all measures of income and salient thresholds. This included higher (a) individual annual income from employment, (b) income in the top quartile corresponding to middle-class economic status, and (c) household income to poverty ratio. As the first analysis of the program on midlife income, findings extend on previous CLS studies showing that different levels of participation were associated with

higher school performance, educational attainment, and crime prevention (Ou & Reynolds, 2006; Reynolds, Temple, Ou, et al., 2011; Reynolds et al., 2018). Findings also go beyond studies of other programs reviewed earlier in the article (e.g., Consortium for Longitudinal Studies, 1983). P-3 participation for 4–6 years provided an added advantage beyond preschool. This suggests that the P-3 advantage can continue to adult economic status. Findings also showed a stronger pattern of benefits for those at higher risk.

The evidence builds upon major contributions to prevention services of psychology and allied sciences. P-3 prevention is a promising avenue for improving young children's well-being. Enriching experiences that are high in quality, focus on all domains of learning consistent with key principles of effectiveness (see Table 1), and have longer duration through early childhood transitions can directly influence economic outcomes. Investments in effective programs in the first decade that follow key elements and processes of educational enrichment may enhance functional competencies, especially for the most vulnerable groups (Greenberg et al., 2003; McLoyd et al., 2014).

Although the economic gains observed are not large in proportion to need, they are larger than typically found for job training for low-income youth and welfare to work initiatives (Council of Economic Advisors, 2019). Job Corps and similar secondary prevention programs yield increases in average annual income of \$1,000-\$1,500 (8%-10%) over a 3- to 5-year period (Council of Economic Advisors, 2016; Heinrich, 2015). Our findings demonstrate gains that are threefold higher nearly 3 decades later and relatively early on in earnings history. This is encouraging for early childhood programs as an avenue for improved economic well-being. Most contemporary programs show short-term achievement gains with mixed evidence on longer term effects (Cannon et al., 2017), but they lack many effectiveness elements.

Our measures partly reflect wages that are above the poverty line and considered minimally adequate. In the Chicago area where most participants have lived, \$20,415 is the entry wage (\$2,015). It is also roughly the same as the per capita income for Black Chicago-area residents (\$19,260; IDES, 2014). We found that CPC P-3 was associated with a 30% increase in the rate of meeting this threshold. This is an average increase of over \$4,500 per person. Among those employed, differences were larger. But averages can mask important differences. More importantly, we found that CPC P-3 participants showed the largest gains at the top income quartile, which is middle class status. This means the program helped lead many out of poverty compared to what would have been expected in the absence of the program. Although there were reductions in deep poverty, they were smaller. Findings are of practical significance, especially considering that many recently completed their education, but they are not the magnitude needed to dramatically raise their standard of living.

The average annual income from employment of \$22,708 for CPC P-3 participants, while 195% of the federal poverty line for an individual, remains relative low and indicates that more concerted efforts are needed to substantially increase economic status. This is discussed further in the limitations section. More positively, household income for program participants exceeded \$44,000 and adjusted for family size they were 220% of the poverty line (income ratio = 2.2). Factoring in housing costs, whereby participants reported spending 30% of annual income (\$700 per month on average; CLS, 2018), about one third would be in the federal "cost burdened" range of more than 30% allocated to housing (Schwartz & Wilson, 2008). One third of participants also reported significant financial strain in budgeting for housing.

Nevertheless, early midlife income is just one measure of economic well-being. Based on documented differences in educational attainment (Belfield & Levin, 2007; Reynolds et al., 2018; Temple & Reynolds, 2007), lifetime earnings are expected to be sizable, and intergenerational effects warrant further investigation. Total economic benefits of CPC P-3 estimated over the life course substantially exceed costs (Reynolds, Temple, White, et al., 2011; Temple & Reynolds, 2007). The benefits of linking P-3 strategies to other school and community initiatives are important and may promote larger cumulative effects by Great Society planners (Bronfenbrenner, 1974; Richmond, 1997). These can more effectively address major barriers to optimal development.

Economic and Social Barriers to Child Well-Being

While the median wage of CPC participants, almost all of whom are Black, exceeds that the per capita income for Blacks in the state and nationally, it is below the median wage of all workers in Illinois (\$35,484; IDES, 2014). This gap must be understood within the context of the high poverty neighborhoods in which sample participants grew up and their higher behavioral risks. As the mediation analyses revealed (see Figure 3), school quality, educational attainment, and delinquency were key contributors to economic well-being. These mediators focus attention on the barriers faced growing up in poverty, especially for those with the lowest economic wellbeing (see Figure 2).

Consistent with international perspectives (Marmot et al., 2008; United Nations Development Programme, 2014), three economic and social barriers are of particular significance that impede prosperity for low-income individuals in urban contexts. One is neighborhood disadvantage—access to and support from education, social services, health, and

community resources. Those in high poverty neighborhoods experience not only social isolation but lower levels of service access and quality that are detrimental to well-being. The areas where the CLS sample grew up had poverty rates exceeding 40%. As noted previously, the CPC program was designed to counteract these barriers by expanding opportunities, better coordinating services, and increasing resources in the community.

A primary example of neighborhood disadvantage that limits economic opportunity, which is also institutional, is the criminal justice system. Large disparities exist in justice system involvement for low-income and minority groups, which greatly limits employment prospects. Nationally, the cumulative rate of arrest by adulthood is 30% (Brame, Turner, Paternoster, & Bushway, 2012) but it is nearly double in the CLS cohort. Those with arrest histories in either group have substantially lower rates of degree completion than those with no such history (5% vs. 22%). As we found, and consistent with the accumulated research on adversity (Eckenrode et al., 2017; McLoyd et al., 2014), multicomponent programs within the family context can be as effective as existing strategies (e.g., dropout prevention; Belfield & Levin, 2007; Community Preventive Services Task Force, 2015). However, given the limits of any single approach, a continuum of complementary programs is needed most.

The second major barrier to optimal well-being for children in poverty is limited employment opportunities. The unemployment rate in CLS neighborhoods is among the highest in the nation, and only 6% of adults have college degrees. This pattern has not improved substantially since the 1980s. Growing up in disadvantaged contexts not only dims one's economic outlook but reduces opportunity, especially if individuals seek to remain in the neighborhoods to live and work (Lei, 2013). There is evidence the program buffers some of the negative effects of living in these contexts (Reynolds et al., 2001, 2018). In addition, 62% of participants reported in midlife that they were economically better off than their parents, and only 19% worse off (CLS, 2018). Nevertheless, revitalization initiatives remain a need.

The third major barrier to optimal well-being is discrimination, both overt and implicit, associated with ethnic minority status and growing up in high-poverty communities. For example, over half of CLS participants at age 35 reported experiencing discrimination in employment opportunities and over half in involvement with the criminal justice system (CLS, 2018). Given the overrepresentation of participants in the justice system described above and the fact that applications for employment, college, and housing typically include questions on prior arrests, these are major barriers to economic opportunity that increase inequality.

Mechanisms of Influence to Well-Being

The accumulated knowledge on P-3 prevention synthesized in our review and the findings from the empirical example provide initial corroboration of 5HM to economic well-being. Prior studies of school achievement, and crime prevention showed that the mediators accounted for 50-80% of estimated main effects (Reynolds et al., 2004; Reynolds & Ou, 2011; Reynold, Temple, White, et al., 2011). In our analysis, prominent mediators were school achievement, school quality, family support, attainment, and socioemotional learning. To the extent these processes are impacted by elements ranging from small classes to aligned curriculum, well-being may improve (Belfield & Levin, 2007; Ou & Reynolds, 2008). Moreover, 5HM has been found to contribute to attainment and health behaviors in the Abecedarian and Perry projects (Englund et al., 2014).

Based on the analysis of the P-3 prevention field described previously, one interpretation of the evidence of long-term effects is of a cumulative process of advantage, which dovetails with prior syntheses. As Lazar described in the Consortium for Longitudinal Studies (1983):

There begins a system of mutual reinforcement between the parent and child, the teacher and child, and the combination that 'teaches' that academic success is valuable. It is this continuing mutual reinforcement that could be responsible for the long-term effects. . . . [It is a] 'feedback' loop. (p. 463)

In their transactional process model, Schweinhart and Weikart (1980) explained that early education "provides disadvantaged children with a more favorable entry into the success flow of the school, increasing their commitment to the institution as well as their ability to meet its taskoriented demands" (p. 66). Our analyses of a longerduration program suggest that early scholastic advantages lead to social and motivational gains that are followed by reinforcement in higher-quality schools and engaged families, culminating in greater attainment and economic wellbeing. The generalizability of this process in other programs and contexts, and with different economic outcomes remains a critical need (Mondi, Reynolds, & Ou, 2017; Reynolds & Ou, 2011; Reynolds & Temple, 2019). The form and sequence may also vary by program in which complex pathway, cascade, and accumulation (dosage-response) models are corroborated (Masten & Cicchetti, 2010; Matthews & Gallo, 2011; Reynolds & Ou, 2011; Singh-Manoux et al., 2004).

Although there is a long history of research on mechanisms of prevention effects, their validity and generalizability are necessarily limited. As documented by the scientific realism of philosophers Karl Popper and Imre Lakatos, hypothesized mechanisms and theories are corroborated as provisional, not proven true absolutely. 5HM show some empirical support but has not been assessed across populations. Although each mediator may contribute in complex ways to the transmission of effects, the accumulated evidence indicates that the explanation of long-term effects goes well beyond individual cognitive advantage and school adjustment as articulated in prior decades.

Limitations and Future Directions

Our analysis provides a P-3 conceptualization and evidence base for enhancing educational and economic wellbeing. However, three limitations should be addressed to ensure continued progress.

Enhancing program impacts. While P-3 prevention models have a strong conceptual base and the evidence we presented for one program shows impacts of practical significance, the need for greater impacts is high. CPC P-3 enhancements in three areas may strengthen later economic gains to be more commensurate with need. First, better program integration with the later elementary-school grades could give an additional boost to achievement. The transition to middle school is an important milestone and aligning or extending services in the following years could strengthen school quality necessary for increased gains (Reynolds & Temple, 2008, 2019; Takanishi, 2016). Second, broader and more intensive supports for parents and family members would better address community and economic barriers to well-being, Partnerships with public and private agencies for housing assistance, preventive health and mental health services, job training and education, and civic engagement would foster a collective self-efficacy that can lead to improved well-being (Community Preventive Services Task Force, 2015).

Finally, further increases in dosage and intensity of instruction through full-day preschool, summer programming, and teaching practices that promote active learning in small classes would be likely to boost achievement and socioemotional learning gains (Wasik & Snell, 2019). These are key paths of long-term effects on well-being (see Figure 1) and are supported by effectiveness principles (see Table 1). There is a continued need to also examine the impacts of P-3 models at larger scales and in a variety of contexts (Manship et al., 2016). Together, these improvements are consistent with a multilevel continuum of support established in theory (Bronfenbrenner, 1989) and emerging practices (Takanishi, 2016; United Nations Development Programme, 2014). The Every Student Succeeds Act of 2015 and innovative financing approaches like "Pay for Success" are an impetus for improving quality and increasing access to P-3 prevention (Manship et al., 2016; Reynolds, Hayakawa, et al., 2017; Temple & Reynolds, 2015).

Longitudinal follow-up data. The second limitation to be addressed is that, as in all prevention studies, extensive longitudinal data are needed to test key questions. Most

studies do not have this, and very few have assessed links to economic well-being beyond age 30. As generalizability and differential effects increase in importance, larger samples are needed, further increasing the challenges of inference. Accessing administrative data also will help. In the CLS and CPC P-3 expansion, missing data and attrition were fortunately limited, and propensity weighting was used in estimation. Although the design was quasiexperimental, inferences support economic benefits, as groups were well-matched and biases were accounted for. Nevertheless, triangulation across many designs that maximize internal and external validity is needed, especially in assessing scale ups.

Attention to mechanisms for sustaining effects. The final limitation is the need to increase understanding of mechanisms through which interventions and practices promote well-being. Most of the correlational evidence we reviewed relied on relatively small-scale studies that may not generalize to the present context. The expansion of preschool (NIEER, 2017, 2018) and increasing emphasis on P-3 provides an opportunity to document processes of change (NIEER, 2017, 2018), whether to understand main effects or their impediments (Reynolds, Hayakawa, et al., 2017; Reynolds, Ou, et al., 2017). Increased concerns that current programs show a fading in impacts (e.g., Lipsey et al., 2015; Reynolds & Temple, 2019; Puma et al., 2012) will require increased attention to program elements and postprogram environments for sustaining gains. Improved measurement is also needed, as few studies have fully assessed motivation and socioemotional learning (Reynolds, Ou, et al., 2017; Reynolds & Temple, 2019). Classroom measures of school quality will enhance global ones (Manning et al., 2017). This will advance scientific progress and, as noted earlier, may generalize to other life course processes (Singh-Manoux et al., 2004). Applying cumulative models for children at risk also is important given the extensive evidence of prevention benefits (Cannon et al., 2017; Greenberg et al., 2003). How community resources influence this process is just beginning to be studied, and psychology's contributions can increase further.

Conclusion

Psychology has made major contributions to the development and evaluation of P-3 prevention that have advanced research and practice (Ramey & Ramey, 1998; Reynolds & Temple, 2008, 2019; Takanishi, 2016; Zigler & Styfco, 1993). Successful implementation of different models has occurred, and evidence is growing that by increasing the duration and continuity of early childhood programs, reductions in poverty and improvements in economic wellbeing are possible. Although many institutional and societal barriers to progress for young people go well beyond prevention programs, evidence of improved economic wellbeing in our tested P-3 model, especially those at higher risk, provides one avenue for strengthening the continuity of learning. Whether positive impacts are observed in broader populations and over time will depend on faithfulness to elements of effectiveness, supportive public institutions and leaders, and careful monitoring. Further advances in documenting mechanisms through which well-being is achieved will not only strengthen confidence in inferences but translation to policy. Counteracting the multitude of risks that young children face growing up requires concerted multilevel strategies across the entire continuum of learning.

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