Using the Precision Paradigm in State-Led Evaluations
HARC Resource on Precision Home Visiting for CSE Awardees

Target Audience: Coordinated State Evaluation awardees and other home visiting research teams who are interested in developing precision home visiting research questions.

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HARC is a national home visiting (HV) research and development platform with core support from DHHS/HRSA/Maternal and Child Health Bureau. Established in 2012, HARC aims to increase the field's use of innovative research to advance the field. More information can be found at www.hvresearch.org.

INTRODUCTION

HARC's Coordinating Center has prepared this guide to support Coordinated State Evaluation awardees and other research teams in designing studies to promote precision in home visiting services and implementation systems. There are four sections: an overview of basic definitions of precision; a description of the five hallmarks of precision home visiting research; introduction to the components of the Precision Paradigm; and an illustrated example mapping specific research questions to the Precision Paradigm.

1. BASIC DEFINITIONS

What is Precision Home Visiting Research?

Precision home visiting (HV) research seeks to broaden and strengthen the impacts of home visiting by answering the question, *What interventions within home visiting work best, for which families, in which contexts, why and how?*[1-3] Although HV has built a deep body of evidence over the past decades, studies of full models have consistently shown small effect sizes. Many studies have shown that HV serves diverse families living in diverse communities. Some studies have shown that small average effects across all families are deceptive because they mask important differences in whether and how family subgroups benefit from home visiting. That is, home visiting might work very well for certain types of families and not as well for other types of families. And this might be because a certain approach to improve a particular outcome works well for some types of families, but not others. And might be more successful in engaging certain types of families, than other types of families.

Precision research **focuses on granular aspects of HV interventions** and **takes moderators and mediators into consideration from the start,** not as an afterthought. The purpose is to learn how to design services to optimize benefits across family subgroups.

What is Precision Home Visiting?

Precision HV is evidence-informed, planned variation in how services are designed and delivered. Precision HV research provides the *evidence* for how to vary services from one family to another and from one setting to another. Precision HV is similar to service tailoring in that interventions are varied in light of differences across families and contexts, with an eye to optimizing benefits. Precision is different from tailoring in that variations are grounded in theory and in empirical evidence of what works best for whom. Precision is different from tailoring also in that variations are systematically applied.

What is Precision Support for Home Visiting Staff?

Precision can be applied not only to services for families, but to supports for service providers to carry out their roles effectively and confidently. Implementation system components such as training, supervision, administrative supports, and performance monitoring are, in essence, interventions to motivate, enable, and provide opportunity for staff to fulfill job expectations. Just as families vary, so do staff members. Thus, specific staff supports might work very well for some types of staff and not as well for other types. Precision support comprises interventions that are purposefully varied in light of evidence about what works best, for which providers, in which contexts.

2. HALLMARKS OF PRECISION HOME VISITING RESEARCH

What are the Hallmarks of Precision Home Visiting Research?

HARC focuses on five hallmarks of precision HV research, shown to the right. The hallmarks are drawn from principles of breakthrough impact research, the science of behavior change, and implementation science.

A Focus on Ingredients	Intervention Coherence	Study Coherence	Study Efficiency	Diverse Perspectives
Specify intervention features such as techniques and delivery methods.	Specify the rationale for the path from intervention to outcome, and for potential moderators.	Align study methods with the path from intervention to outcomes, and with potential moderators.	Begin with current knowledge. Use tools and designs to optimize learning and action.	Promote relevance and usefulness of results by partnering in intervention design and research.

A focus on ingredients means taking a more granular look than focusing on a full home visiting model or a full implementation system. We refer to a specific set of ingredients as an 'intervention' because the intent is to promote outcomes. For home visiting services, a focus on ingredients means considering what providers *do* in working with families. Providers' actions can be defined by the techniques and delivery methods they use. For home visiting implementation supports, a focus on ingredients means considering what trainers, coaches and others *do* in supporting staff such as home visitors. Their actions also can be defined by the techniques and delivery methods used. And for both home visiting services and implementation supports, providers' actions include the substantive focus of their actions, as reflected for example in the content of specific modules of a parenting curriculum or staff training manual.

Intervention coherence means giving a solid, explicit rationale for expecting that an intervention, as designed, will set off a cascade of immediate and intermediate effects that will ultimately result in a better outcome than without intervention. The rationale should be grounded in high quality theory, empirical evidence derived from rigorous research, and home visiting experience.

Coherence also includes specifying whether and how variations in context and usage are expected to moderate – to increase or decrease – the intervention's immediate and intermediate effects, and thus, its impact on outcomes. Interventions are provided in a particular context. They are offered to certain families, perhaps defined by eligibility criteria, and carried out in certain communities and as part of certain systems of care. A coherent intervention is one that recognizes diversity in participants and settings, recognizes how effectiveness might vary in light of this diversity, and is designed with planned variations to optimize effectiveness across participants and settings. Like the rationale for the intervention itself, the rationale for planned variations should be grounded in high quality theory, empirical evidence from rigorous research, and home visiting experience.

Study coherence means aligning a study's scope and methods with the intervention, its anticipated immediate and inter-mediate effects and intended outcomes, and how the intervention's effects might be moderated by variations in context and in usage. **It is not necessary for a particular precision study to incorporate all of these components** – very few studies are that comprehensive. But the scope and methods of a study should incorporate whatever aspects of intervention, ef-fects, and moderators are implied in the primary research questions it seeks to answer. The fourth major section of this guide will elaborate on this.

Study efficiency means designing research in ways that accelerate the development and use of new knowledge. There are many ways to do this, with the context of the research opportunity influencing which strategies are appropriate and feasible. The following are some options for strengthening study efficiency.

- *Cross-Study Cooperation and Collaboration:* Researchers working in a particular content area can be more efficient if they intentionally conceptualize and measure constructs in ways that promote cross-study learning. They can advance knowledge and evidence-based policy and practice more efficiently when designing studies with comparison of methods and results in mind.
- *Grounding Studies in Empirical Research and Theory beyond Home Visiting:* Studies are more efficient when they push the limits of current knowledge rather than merely confirming what is already known. They are more efficient

when grounded in theory, as this strengthens generalization. Thus, research teams can strengthen efficiency when they begin with a solid review of the relevant literature, including but also extending beyond home visiting research per se. Many of the issues confronted in home visiting are common across other service strategies; it is critically important to build on what is already know from studies beyond home visiting. Research teams can strengthen efficiency also by explicitly citing the underlying theories that support hypotheses and assumptions about the links from intervention to outcomes and about moderation of these links by context and usage.
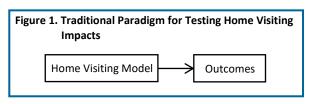
- *Seeing Each Study as Part of a Line of Research:* Each study can be useful not only in answering an immediate research question, but also in providing preliminary data as the foundation for related future studies. Thus, research teams can promote efficiency by designing each study with an eye to what comes next. Particularly for studies involving primary data collection, it is often possible to gather preliminary data with relatively little extra time and effort.

- *Efficient Designs to Test Impacts of Interventions:* Some studies are tests of interventions. Such studies can use rapid cycle designs,[4] which are more efficient than traditional randomized trials because they require smaller samples and a shorter time to learn what works best, for whom. Tests of interventions can also gain efficiency by incorporating the features of pragmatic trials,[4,5] which strengthen translation of results to policy and practice.

- *Open Science:* Open science is the practice of making research methods and results transparent and easily accessible. Research teams can design more rigorous studies by vetting their methods before launching data collection. Vetting of study protocols provides a way to improve on them. Research teams can support replication studies by making their methods, such as data collection instruments, easily available to others. Research teams can promote transparency in these ways and also by sharing study data for analysis by others, within the constraints of research ethics. Research teams can accelerate learning across diverse groups by advocating for and using open access venues for dissemination.

- *Common Framework and Language:* Systematic reviews and meta-analytic studies are structured ways to consolidate research results across many studies. Their value, however, depends on how studies are reported in the literature. Typically, research papers lack the key information needed for systematic reviews and meta-analytic studies. Often, research papers are inconsistent in their terminology. This, too, make it hard if not impossible to do systematic reviews and meta-analyses. Researchers in many fields are developing common frameworks and terminology to promote cross-study learning. HARC is bringing together representatives of all groups with an interest in home visiting to develop the specifics of a common framework and language. Research teams can improve study efficiency by considering how their studies map to this framework and language, which are the focus of the third section of this guide.

Diverse perspectives means working together with varied groups with an interest in home visiting, for example families, program staff, model developers, funders, and researchers. Diversity brings depth and breadth to new ideas. Specific interests might vary, but the need for evidence to guide decisions is common across all groups, and decision-making is improved when it reflects shared wisdom and co-learning by diverse groups. Collaborative partnerships are the key to representing all interests in designing home visiting interventions and implementation systems, and in designing research to inform policy and practice. As the proverb says, "If you want to go far, go together."

3. THE PRECISION PARADIGM

The five hallmarks can be daunting because they have a lot of moving parts. **A paradigm is a pattern that makes it easier to see how the parts fit together**.

The traditional paradigm, or pattern, for research on home visiting impacts has been experimental studies of full models to

Figure 1. Traditional Paradigm for Testing Home Visiting Impacts

Home Visiting Model → Outcomes

estimate average effects, as shown in **Figure 1**. Early on, as various home visiting models were developed, it was important to answer the question, "Does this model improve its intended outcomes?" That question was answered experimentally, considering the model as a whole, the families targeted for services as a whole, and intended outcomes as a whole.
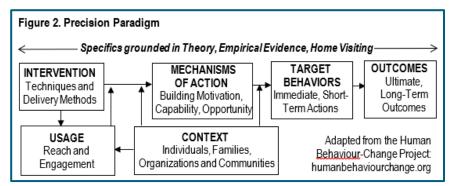
We owe a lot to studies that used that paradigm because they led us to where we are today by establishing the evidence base for many different home visiting models and by providing a way to establish the evidence for promising programs.

But that paradigm fails to reflect that families and communities can be very different from one another in ways that matter for how services are designed and implemented. Decades of research and provider experience show that family engagement is an enduring challenge. Research also has shown that *average* home visiting effects have remained small but that benefits for families can be very different across family and community subgroups.

For home visiting to advance, we must learn how and why there is such variation. We must learn why family engagement and the benefits that families derive varies across families and communities. And we must learn why staff job performance and well-being vary across workers and work settings. In short, we need to answer the question, "What works best, for whom, in which contexts, why and how"?[6] **We need a new paradigm to answer that question so that we can do better for all with an interest in home visiting.**

HARC is working with all home visiting interest groups to build this new paradigm, which we call the Precision Paradigm. **Figure 2** shows its six components and how they relate to one another.

The Precision Paradigm is a generic framework for home visiting research and how we think about home visiting itself. **It is a tool to organize our thinking about how things work**. It is a tool to help us think through how to design new interventions, how to reverse engineer current interventions in exisiting home visiting models, how to think not only of interventions but the systems in which they are embedded, and how to study all of this so that we can do better.

Figure 2. Precision Paradigm

Specifics grounded in Theory, Empirical Evidence, Home Visiting

INTERVENTION — Techniques and Delivery Methods

MECHANISMS OF ACTION — Building Motivation, Capability, Opportunity

TARGET BEHAVIORS — Immediate, Short-Term Actions

OUTCOMES — Ultimate, Long-Term Outcomes

USAGE — Reach and Engagement

CONTEXT — Individuals, Families, Organizations and Communities

Adapted from the Human Behaviour-Change Project: humanbehaviourchange.org

Precision research is not at odds with model fidelity; rather, it is a way to look at the building blocks of models to make it easier to understand them at a granular level.

The Precision Paradigm aligns closely with the hallmarks of precision HV and precision HV research. HARC's Coordinating Center is working with hundreds of home visiting experts to specify each component of the Paradigm, that is, to develop the common language described on page 3.

We are also preparing materials like this guide to help research teams use the Paradigm to design studies of home visiting services and implementation systems. Teams can specify which parts of the Paradigm – which components and the arrows linking them – are the focus of the study they are planning. Teams can use the diagram also to think through how their current study builds on what is already known about other parts of the diagram. They can also consider how future studies would help "complete the picture" by advancing knowledge about other parts of the diagram.

- *Across the very top of the figure*, note that theory, empirical evidence and home visiting experience are the foundation for specifying the six components of the Precision Paradigm and their relationships. These are the sources of existing knowledge for achieving what the second and third hallmarks refer to as 'coherence'. This means that precision home visiting design and research teams must begin with a deep understanding of what is already known in their area of interest.
  - *Theory.* There are hundreds of theories relevant for precision research on home visiting services and implementation systems. HARC is developing resources focused on the theories judged to be high quality and most relevant for home visiting. As we winnow this list, research teams can learn more about such theories from several sources.[7-9] Three theories of behavior change that are certain to be included in our precision research resources are social cognitive theory,[10] self-determination theory,[11] and the social ecological model of behavior change.[12]

- *Empirical Evidence*. There is substantial relevant empirical research on services and implementation systems. Often that research focuses on health, education, and family support services outside home visiting, yet highly relevant for home visiting.
- *Home Visiting Experience*. Home visiting experience refers to the lived experiences of those with an interest in home visiting, another important source of knowledge on these constructs and how they fit together. The relevance of these experiences rests with the meaning they have for those with an interest in home visiting. Collaborative partnership is one way to make sure these understandings are represented in precision intervention design and precision research.

- *The four components in the top row* show the expected pathway from intervention to outcomes.[13-15] This is the intended behavioral pathway. In services for families, these are the steps from the home visitor's interactions with the family to the achievement of intended outcomes. In implementation systems, these are the steps from staff supports to home visitors' practice and well-being.

  - The *intervention* is what is meant by focusing on ingredients. Many different terms are used, such as core components. In home visiting services, we can define interventions by the techniques that visitors use and by delivery methods.

    There are several generic menus of options for techniques and methods of delivery in the literature. HARC's Coordinating Center is synthesizing and refining these in partnership with those with an interest in home visiting to make them easily accesible and useful for home visiting.

> **How does an intervention improve an outcome?**
>
> The term "intervention" refers to a combination of techniques and methods of delivery designed to promote target behaviors to achieve a particular outcome. An example is direct observation and feedback on parent-child interaction (techniques) provided by the home visitor in the home during a visit (method of delivery) to build skill and reinforce (mechanisms of action) parental responsiveness to a child's cues (target behavior) to promote the child's social-emotional well-being (outcome). Interventions are sometimes referred to by other terms, such as ingredients or components.

  - *Mechanisms of action* are the immediate targets of intervention. Mechanisms of action are the leverage points for promoting actions to achieve intended outcomes. There are many different mechanims of action. They can be categorized into three broad groups – motivation, capability and opportunity. Examples of specific mechanisms of action include beliefs about capabilities, actual skill, and enviromental resources. Theories of behavior incorporate mechanisms of action, that is, they specify what to leverage to promote action to achieve intended outcomes.

    There are generic menus of mechanism of action *options* in the literature.[16] HARC is working with representatives of groups with an interest in home visiting to develop an easily accessible and useful compendium of mechanisms of action appropriate for home visiting.

  - *Target behaviors* are the immediate, short-term actions expected to lead to intended outcomes. These are outcome-specific. Eating a nutritious diet and getting adequate exercise might be target behaviors for promoting cardiovascular health, for example, while responsiveness to a child's distress might be a target behavior to promote the child's social-emotional well-being.

  - *Outcomes* are the long-term, ultimate goals of intervention design and delivery. The ultimate purpose of precision research is to broaden and strengthen the benefits of home visiting services for families and the benefits of home visiting implementation systems for providers.

Precision research focuses on interventions, mechanisms of action and target behaviors, and on the links from one to the next. Generally speaking, research on the link from target behaviors to outcomes has already been established, and so usually is not the focus of precision research. Interventions aim to promote eating a nutritious diet and responsiveness to a child's distress, for example, because prior research has established that these behaviors are positively associated with cardiovascular health and to children's social-emotional well-being. Thus, the focus in precision research are the links from intervention to target behaviors.

The two components in the bottom row show factors that influence how well an intervention works in real life. These influences are what is meant by 'moderation'.

- *Contextual factors* – attributes of families, providers, local programs, and the cultural and community contexts in which they live and operate – can strengthen or diminish the influence of an intervention on mechanisms of action, and on how well changes in mechanisms of action lead to changes in behavior. This is shown by the two arrows going up from the Context component to the arrows from intervention to mechanisms of action and from mechanisms of action to target behaviors.

  HARC is consulting with home visiting interest groups to delve more deeply into how to conceptualize context. The literature on such factors is extensive, and so we are not dealing with a blank slate. Considerable research has focused on the critically important structural and systemic aspects of racism, for example. And within the scientific literature on racism are studies focused on the nature and delivery of health and social services, and thus highly relevant for informing how to achieve greater precision in home visiting. For example, Williams et al. have conceptualized and developed measures of experiences of discrimination,[17] which have been used in studies assessing whether and how experiences of discrimination are associated with the quality of patient-provider communication, satisfaction and adherence to recommendations in health care settings.[18,19] Such studies are informative for designing research to address similar issues in home visiting. Doing so is consistent with the fourth hallmark, which calls for research teams to start their work with a solid understanding of existing methods and knowledge in their areas of interest.

  For research teams interested in structural factors influencing home visiting staff well-being and practice behavior, measures developed for other service strategies could be helpful. An example is a measure of organizational social context developed for mental health services,[20] which has been used in home visiting research on factors influencing family engagement.[21,22] Measures such as this could be useful in assessing how local program culture and climate influence staff morale and other measures of work force well-being.

- *Usage* of the intervention in real life, that is, how well the intervention reaches and engages intended recipients also influences its impact. For home visiting services, the issue is how well home visiting reaches and engages families. For implementation systems, the issue is how well supports reach and engage staff members. It is important to think of engagement as attentitiveness to and acceptance of specific interventions within home visiting and implementation systems, not just engagement in a full model or implementation system. It is important as well to consider how intervention techniques, including those around relationship building,[23] and methods of delivery[24] influence attentiveness and acceptance.

  Usage moderates how well the intervention leads to intended changes in mechanisms of action. Equally important, usage itself is influenced by context and by features of the intervention. This means that a solid understanding of context, coupled with intervention design to promote reach and engagement in light of context, can be powerful in broadening and strengthening family engagement and intervention impact.

3. USING THE PRECISION PARADIGM TO POSE AND ANSWER PRECISION RESEARCH QUESTION

Having described the components of the Precision Paradigm, we now explain how the Paradigm can be used to pose and design studies to answer precision research questions. This section will focus on an example – research to inform policy and practice for strengthening referrals for families in light of families' past, vicarious or anticipated experiences of discrimination by community service providers.
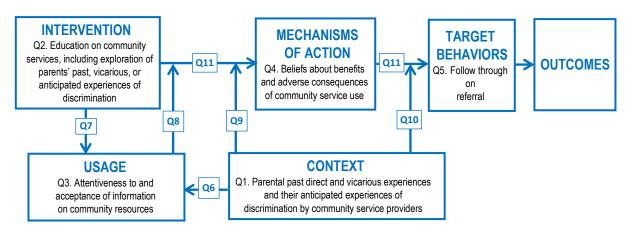
As you will see, this simple example alone includes 11 different questions of varying complexity. Together, these questions examine the issue of parental experiences of discrimination by service providers and how these experiences might influence parental engagement when home visitors provide education about community services, parental beliefs about the pros and cons of following through on recommended referrals, and parental follow through on referrals.

A precision study can focus on <u>any</u> of these questions, as long as it is building on what is already known, rather than reinventing the wheel, and as long as the intent is to work toward understanding the full picture, so that home visiting services can be redesigned accordingly and so we advance the science of service design and implementation in general.

The first ten questions can be addressed through descriptive and analytic research on one or more parts of the Paradigm. The last question would be answered using a rigorous experimental or quasi-experimental design to test the effectiveness of a specific enhancement to current referral education practice.

Applying the Paradigm to a Parallel Issue involving the Implementation System. One could also "translate" this paradigm using home visitor practice as the target behavior – do home visitors explore parental experiences of discrimination by service providers? Is their practice behavior regarding this influenced by their own experiences of discrimination in general? How do their own or vicarious experiences of discrimination influence whether they even make referrals to a specific community resource? To community resources in general? How might coaching modify home visitors' practice behavior? What mechanisms of action are most commonly in play and therefore the best foci for intervention to improve practice? What coaching techniques and methods of delivery do visitors prefer? Which are most effective?

Mapping Research Questions to the Precision Paradigm
An Example Using Parental Experiences of Discrimination by Service Providers

Descriptive Studies
1. *Have parents experienced discrimination by service providers directly or vicariously, in what ways, and with what implications for anticipating such discrimination in the future, for example in community sites recommended by their home visitor?*
2. *What is current home visitor practice in providing education on community services? On exploring parents' experiences of discrimination by community service providers?*
3. *How attentive to and accepting of information on community services are parents?*
4. *What do parents expect will happen if they follow through on a referral?*
5. *How often do parents follow through on referrals?*

Analytic Studies of Influences on Usage
6. *How does parental experience of discrimination influence attentiveness to and acceptance of information on community services?*
7. *How does home visitor's exploration of parental experiences of discrimination influence parents' attentiveness to and acceptance of information on community services?*

Analytic Studies of Moderation by Context and Usage
8. *How does parental attentiveness to and acceptance of information on community services moderate the impact of education on parental beliefs about the benefits and adverse consequences of community service use?*
9. *How does parental experience of discrimination moderate the impact of education on parental beliefs about the benefits and adverse consequences of community service use?*
10. *How does parental experience of discrimination moderate the impact of beliefs about benefits and adverse consequences on follow through with referral to community services?*

Observational Study or Intervention Trial to Test Assumed Links from Intervention to Target Behaviors
11. *Does a home visitor's exploration, acknowledgement and responsiveness to parental experiences of discrimination influence parents' beliefs in the benefits and consequences of following through on a recommended referral? Their actual follow through?*

Interested in Learning More?

CSE awardees with additional questions should contact their CSE TA providers. Others with questions should contact HARC's Coordinating Center director, Kay O'Neill, at koneill@jhu.edu.

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