

**Screening for developmental delay in Georgia's family shelters: Formative evaluation of a quality improvement initiative**Marvin So, MPH, CHES<sup>1</sup>, Luisita G. Agbayani, MA<sup>2</sup>, Mariel K. Gutierrez, MD, DrPH<sup>3,4</sup>, and Josef T. Griffins<sup>5</sup><sup>1</sup>Emory School of Medicine, Atlanta, GA; <sup>2</sup>Atlanta Children's Shelter, Atlanta, GA; <sup>3</sup>Greenbriar Children's Shelter, Savannah, GA; <sup>4</sup>Emory Rollins School of Public Health, Atlanta, GA; and <sup>5</sup>Interfaith Hospitality Network, Athens, GA**Corresponding Author:** Marvin So • 1599 Clifton Road NE, Atlanta, GA 30329 • (909) 680-9451 • [mso3@emory.edu](mailto:mso3@emory.edu)**ABSTRACT****Background:** Children in families experiencing homelessness are at elevated risk for cognitive, motor, speech, and other developmental delays. Given the prevalence of family homelessness in Georgia and across the U.S., investigating the feasibility of implementing developmental screeners while families are in shelters is warranted.**Methods:** Three pilot shelters were selected for the development and implementation of Quality Improvement (QI) Teams, who used Plan-Do-Study-Act (PDSA) Cycles to make progress towards universally screening children for delay. We employed a formative evaluation to (1) characterize screening rates and shifts in shelter as a result of QI initiatives, and (2) identify barriers and facilitators to implementing QI interventions in family shelters.**Results:** Screening rates in all three shelters increased over the study period between 13-50%. Primary implementation facilitators included team members with experience in QI principles; having a medical provider on the team; possessing an "improvement culture;" and having diverse perspectives represented. Primary barriers included a lack of time or commitment in QI team leaders; medical providers with limited time in shelter; lack of training on how to represent and discuss QI data; and restrictive organizational policies.**Conclusions:** Family shelters demonstrate promise for implementing developmental screeners for at-risk children. Although challenges have been identified, facilitating factors are prevalent and underscore the importance of QI team preparation, composition, and cohesion. The relative availability, low-cost, and potential for impact of developmental screeners offer credence to their uptake and implementation within shelter clinical contexts.**Key words:** homelessness; quality improvement; child neurodevelopment; mental health<https://doi.org/10.21633/jgpha.6.211>**INTRODUCTION**

Recent literature spanning neuroscience, molecular biology, and the social sciences has proposed that complex interactions between environment, genetics, and social relationships – particularly during early childhood – can pattern learning, behavior and health outcomes across the lifespan (Garner et al., 2011). Expanding upon research on adverse childhood experiences and poor health outcomes (e.g., Felitti et al., 1998), the concept of "toxic stress" has been offered, positing that prolonged activation of physiologic stress mechanisms can re-program the typical development of neural and hormonal processes. In turn, affected children may be less able to self-regulate and engage in normative responses to stressors later in life. Oftentimes, chronic stress responses surface as a result of adversities such as economic hardship or violence, in the absence of buffers including stable relationships with trusted adults (National Scientific Council on the Developing Child [NSCDC], 2014).

**Homelessness and Developmental Delay**

In many ways, homelessness represents the convergence of several of these risk factors, with experiences of intimate partner violence and family separation commonly associated with residential instability (Bassuk, Perloff, & Dawson, 2001; Hoffman & Rosenheck, 2001). This is particularly concerning given that most homeless families possess young children (Solari et al., 2014). The importance of safe, stable, and nurturing environments and relationships for healthful child development is well known (Centers for Disease Control and Prevention [CDC], 2014), yet these elements are sometimes absent in the lives of families who may be more preoccupied with obtaining shelter or food each night.

A range of physical and mental health concerns in homeless children has been documented (e.g., Bassuk, Richard, & Tsertsvadze, 2015; Chiu, DiMarco, & Prokop, 2013), inclusive of developmental problems across cognitive,

motor, speech, and socioemotional domains (Grant et al., 2007). Despite American Academy of Pediatrics (AAP) (2006) recommendations for targeted screening and intervention for developmental delays during a child's early years, only 19% of homeless children are ever screened while in shelter, representing a missed opportunity for this high-risk population (Hicks-Coolick, Burnside-Eaton, & Peters, 2003). However, this may be challenging for homeless families, due to the transient and chaotic nature of their lives. Compared to chronically homeless individuals, families are more likely to occupy multiple temporary living situations and face mobility barriers, limiting opportunities for longitudinal, primary care (Bassuk et al., 1996).

### Focus on Georgia

Recent declines in the national prevalence of family homelessness are encouraging, but progress state-to-state has been mixed. Georgia (GA) experienced one of the largest decreases in unsheltered homeless people, with the U.S. Department of Housing and Urban Development Point-in-Time (PIT) Count estimating a decline of 17% from 2014 to 2015. Yet for homeless families, change has been slower, with an estimated 4,118 people in homeless families on a given night in 2014, and 4,088 in 2015 (Henry et al., 2015).

Nearly a third of GA's homeless are in families with children. One in five homeless persons in the state is a minor under 18 years-old (GA Department of Community Affairs, 2015). Though state or county-level data on developmental delay among homeless children is lacking, it is reasonable to presume that a significant portion of such children may experience some type of delay. As in many states, access to services - particularly for behavioral health - is heterogeneous across regions in GA; integrated health system collaborations are needed.

In this paper, we describe a pilot quality improvement model and formative evaluation design used in family shelters in GA serving families and children. The specific aims of the formative evaluation were to (1) characterize screening rates and shifts in rates over the course of Quality Improvement (QI) project implementation, and (2) examine barriers and facilitators to implementation at each phase of the Plan-Do-Study-Act (PDSA) cycle.

## METHODS

### Preliminary Conceptualization of Initiative

We conducted two exploratory focus group discussions (FGDs) with providers who routinely provide services to families. Online focus group software was used to accommodate participants' geographic dispersion. Participants ( $N=16$ ) were purposefully sampled from across GA, and recruited electronically via state professional associations of medical and behavioral health providers. FGDs explored perspectives on channels and clinical approaches that could be deployed for the families with which providers worked. The majority of respondents

suggested that shelter-based health services, often administered by providers from a regional health center contracting with an emergency shelter, are critical for intervention and prevention because families tend to access residential services at least once during a period of homelessness. In addition, respondents identified several considerations for early identification of atypical development, including: (1) training shelter personnel on developmental milestones, (2) educating families on child development while in shelter, and (3) placing screeners in shelter-based clinics.

Five of the participants were then recruited to participate on an Advisory Board, along with six individuals with experience living in family shelters. They met with the research team three times, providing guidance on evaluation design, shelter culture, and shelter regulations.

### Quality Improvement Initiative

FGD recommendations served as the basis for formulating a shelter-based child development initiative. Seeking to pilot the initiative with a small group, we recruited shelters through the personal networks of the first and third authors, with the goal of examining shelters with different sociodemographic characteristics. In consultation with the Advisory Board, we selected a QI approach after considering the evidence on the utility of a rapid, process-oriented model for pediatric health issues in low-resource settings (Homer, Kleinman, & Goldman, 1998). Specifically, PDSA cycles - a common tool in QI practice - were used and consisted of four phases: (1) identify the issue and plan for change, (2) execute the plan, (3) analyze data and discuss implications, and (4) adjust approach based on learning (Speroff & O'Connor, 2004).

We launched independent QI projects at three shelters in January 2016, with shelters representing small rural, large rural and urban census tracts (see U.S. Dept. of Agriculture, n.d.). Authors conducted a two-day training on basic QI principles using an adapted version of the American Board of Internal Medicine's Practice Improvement Modules (<http://www.abim.org/pims>). Each shelter was instructed to assemble a QI team comprising staff representing at least three different roles to foster interdisciplinary planning. Although the overarching objective of this initiative was to reduce the prevalence of developmental delay for homeless children, the means by which that was to happen were left to each shelter's QI team. The purpose of this approach was to enable shelters to devise their own context-specific solutions to an identified problem, and to allow the investigators to examine QI team development, consensus-building, plan conceptualization, and overall PDSA cycle implementation.

### Evaluation Approach

We conducted a mixed-methods formative evaluation aligned with Hulscher and colleagues' (2003) QI process evaluation framework to examine implementation process. A single-case time series study design enabled us to monitor

change over time both within and across individual shelters. The methods and theoretical foundation of this project’s summative evaluation are described elsewhere (So, et al., 2016).

Qualitative methods consisted of structured participant observation, key informant interviews and FGDs. Instruments for each were developed collaboratively by the investigators and the Advisory Board, and cognitively tested with shelter contacts. Methods were selected to permit

assessment of indicators identified from logic model outputs (see Table 1). Quantitative data consisted of the proportion of children receiving healthcare in the shelter who received the QI intervention determined by each site; this was abstracted monthly from each shelter’s electronic health record systems. Triangulation of multiple methods allowed for comprehensive investigation of research questions, offsetting limitations inherent to any single method (Polit & Beck, 2012).

**Table 1. Participants, sample sizes, and phase of PDSA cycle assessed for each qualitative method employed in the formative evaluation**

Method	Participants	N	Plan-Do-Study-Act (PDSA) Cycle Phase Assessed			
			Plan QI Team Meetings	Do Conduct of Screening in Shelter	Study QI Team Meetings	Act Adjusting Implementation
Structured Participant Observation	QI Teams	N/A	✓	--	✓	--
Focus Group Discussions (FGDs)	QI Teams	24 (3 FGDs)	--	✓	--	✓
Semi-Structured Interviews	Shelter Healthcare Providers	6	✓	✓	✓	✓
	Shelter Residents	9				
	Shelter Staff	8				
Member-Checking	Advisory Board	11	✓	✓	✓	✓
	QI Teams	22 (3 FGDs)				

Data analysis was iterative and concurrent to data collection. The investigators met monthly to identify tasks for analysis of observation, interview, and FGD transcripts. An immersion-crystallization analytic scheme was used, involving multiple cycles of reading and open coding of transcripts followed by thematic coding to ascertain emergent themes (Borkan, 1999). Each type of transcript was coded by two investigators (MS and MKG) with ongoing intercoder reliability checks (Cohen’s  $k = .87$ ,  $SD = .04$ ). All inconsistencies were resolved through discussion to reach consensus. Basic qualitative and quantitative tabulations were facilitated using Microsoft Excel

(Redmond, WA); qualitative analysis was conducted in nVivo 10 (Burlington, MA). Although generally discouraged in the qualitative paradigm, we used basic counting to facilitate identification of the relative frequency of barriers and facilitators. Finally, in an attempt to optimize confirmability and credibility (Lincoln & Guba, 1985) we member-checked our findings, via FGD, with both the Advisory Board and shelter QI teams, yielding slight adjustments in interpreting results. Our reporting conforms to recommendations outlined in the SQUIRE guidelines (Ogrinc et al., 2008).

**Table 2. Quality Improvement (QI) project operational details and selected developmental screeners at each shelter site**

	Shelter A	Shelter B	Shelter C
RUCA Classification <sup>a</sup>	Urban	Large Rural	Small Rural
QI Team Size	8	11	6
QI Team Composition	<ul style="list-style-type: none"> <li>Executive Director</li> <li>Medical Providers</li> <li>Case Mgmt. Staff</li> <li>Consumers</li> </ul>	<ul style="list-style-type: none"> <li>Medical Providers</li> <li>Case Mgmt. Staff</li> <li>Consumers</li> </ul>	<ul style="list-style-type: none"> <li>Admin. Staff</li> <li>Case Mgmt. Staff</li> <li>Consumers</li> </ul>
QI Team Meeting Frequency	2 times per month	1 time per month	2 times per month
Screening Instrument <sup>b</sup>	ASQ-3	PEDS:DM	BDI-2 NU
Child Age	< 5 years	< 8 years	< 7 years
Domains	<ul style="list-style-type: none"> <li>Cognition</li> <li>Language</li> <li>Motor</li> <li>Personal-Social</li> </ul>	<ul style="list-style-type: none"> <li>Fine Motor</li> <li>Receptive Language</li> <li>Expressive Language</li> <li>Gross Motor</li> </ul>	<ul style="list-style-type: none"> <li>Adaptive</li> <li>Personal-Social</li> <li>Communication</li> <li>Motor</li> </ul>

		<ul style="list-style-type: none"> <li>• Self-Help</li> <li>• Socio-Emotional</li> </ul>	<ul style="list-style-type: none"> <li>• Cognitive</li> </ul>
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<sup>a</sup> RUCA = Rural Urban Commuting Area. Developed by the U.S. Dept. of Agriculture, RUCA codes classify census tracts incorporating measures of population density, urbanization, and daily commuting; <sup>b</sup>ASQ-3 = Ages & Stages Questionnaires®, 3<sup>rd</sup> Edition; PEDS:DM = Parents’ Evaluation of Developmental Status: Developmental Milestones© ; BDI-2 NCU = Batelle Developmental Inventory™, 2<sup>nd</sup> Edition Normative Update.

**RESULTS**

Characteristics of participating shelters are described in Table 2. Shelter names and other potentially identifying information (e.g., eligibility criteria) are not reported, given the small number of GA shelters serving families and the vulnerable status of such families.

Persons of contact at each shelter were the primary recruiters, and they aimed to include a range of stakeholders on their multidisciplinary QI team. All teams had representation from consumers (i.e., people with the lived experience of homelessness and staying in shelter) and case management staff. Shelters A and B both had medical providers serve on the QI team. Uniquely, an executive director was represented on Shelter A’s team, while Shelter C’s team included an administrative assistant.

In preliminary meetings, QI teams discussed the interventions recommended in the preliminary FGDs using process mapping techniques. At each site, QI teams found the notion of providing education to staff and/or parents compelling, but ultimately felt it was untenable given high staff turnover and the limits of educational interventions for families. Universally and independently, shelters selected implementation of standardized screeners as the intervention of choice. Many QI teams noted the lack of a quick, simple tool to identify at-risk children, despite having robust referral systems to specialist pediatric and social services.

QI teams identified potential screeners using a mix of approaches including inquiring of colleagues (Shelters A, C); searching using an online search engine (Shelter B); and consulting professional guidelines (see AAP, 2006; Health Care for the Homeless Clinicians’ Network, 2009) (Shelters A, B). Each shelter selected a unique screening tool: Shelter A chose the Ages & Stages Questionnaire (ASQ) (Squires & Bricker, 2009); Shelter B selected the Parents’ Evaluation of Developmental Status: Developmental Milestones (PEDS:DM) (Glascoe & Robertshaw, 2008); and Shelter C opted for the Batelle Developmental Inventory, Normative Update (BDI-NU) (Newborg, 2016). Each screening could be completed in under a half-hour, possessed “very good” or higher reliability, and had been empirically assessed for sufficient concurrent and criterion validity.

**First Aim: Characteristics of Screening Rates over Time**

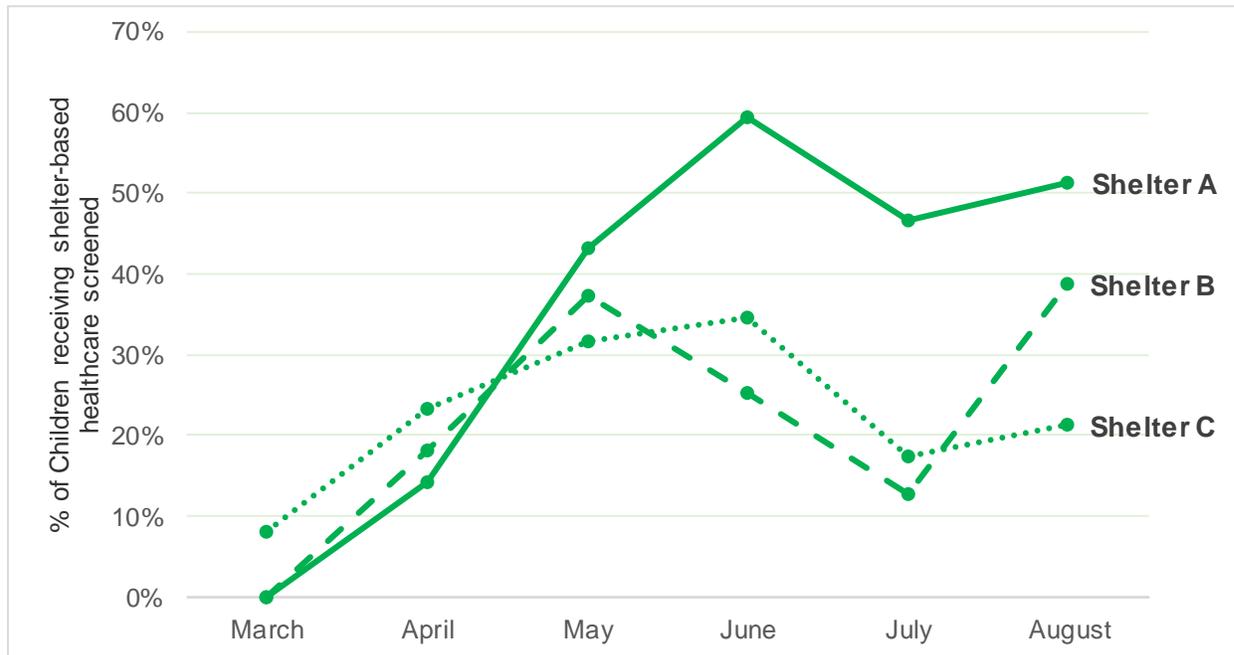
Screening rates for all shelter sites increased over the course of implementation (Fig. 1). At the onset of QI project implementation, Shelters A and B had not been conducting screening at all despite seeing over 100 unique pediatric patients per month. Shelter C had been screening one in every eight patients. These low rates were largely attributable to providers who felt they did not have time to screen children given competing priorities during limited shelter healthcare encounters. Two QI team members explained,

*Anyone who works with homeless kids knows what this experience does to them...they can’t communicate, they don’t grow in the same way. Unfortunately, our doctor and nurses have so many health issues to take care of for families that child development is always left behind. (QI Team Member – Case Manager, Shelter A)*

*Yes, this [screening data]...goes against every clinical recommendation for children. But what’s hard to overcome is the fact that the shelter is a completely different environment than your standard ambulatory outpatient clinic. We have limited time...and much of what we do is dictated by shelter legal requirements like TB [Tuberculosis] tests and pregnancy counseling. Families come in and out. (QI Team Member – Medical Provider, Shelter B)*

Notably, these were corroborated by structured observations noting that patient-provider visits rarely broached the topic of developmental milestones or typical development, as well as by several consumer QI team members during interviews. One consumer participant (Shelter C) noted that “*Even though I’m thinking about how [her child] is growing, how he’s walking and talking, there are more important matters I got to take care of.*” Another consumer participant (Shelter B) offered, “*You know, I didn’t even think that was what [the nurse] was here to do. Isn’t his main deal to provide medication?*”

**Figure 1. Proportion of children seen in shelter-based clinics screened at each shelter site according to end-of-month electronic health record data, March – August 2016**



In the first two months (March – May), all shelters increased their screening rates between 8% to 29% from the preceding month. In subsequent months (May – July), trends shifted. Shelter A’s screening rates increased to nearly 60% in June, then decreased to 47% in July. The decline from June to July seemed to be linked to shifts in provider scheduling and patient caseload, as two of the three routine providers were absent this month as noted in structured observations. Shelters B and C also experienced declines during this period; screening rates of 13% and 17%, respectively, were observed at the end of July, which was comparable to rates three months earlier. This may have been attributable to inconsistent use of data to drive decision-making, as documented in structured observations.

In addition, observations and FGDs revealed compelling QI team dynamics during this period at shelters B and C that may have contributed. In Shelter B, QI team meetings seemed to lose focus on the improvement aspects of the PDSA cycle, with the majority of allotted meeting time dedicated to identifying challenges to getting clients screened and referred. In Shelter C, QI team members appeared unable to fully grasp what was happening in the clinic itself. One case manager QI team member (Shelter C) noted, “[the provider] really needs to be here. We can problem-solve all day long but we’re missing a piece of the puzzle.”

The most recent data (July – August) indicated that each shelter increased their screening rates from the preceding month between 4% to 26%. Interviews and observations suggested that an enhanced focus on the *Study* and *Act*

phases of the PDSA cycle may have facilitated recent improvements. Participants shared,

*I’ve definitely had more space to push the child development card. But there were things that just couldn’t be rectified on my own without the overarching QI team saying, fine, that’s fair. Let’s shift things around to help you help our clients. One of the main actions that surfaced was getting [child care staff] to help with more efficient patient scheduling. This really freed me up to have the time to talk the parent through the Batelle screening. (QI Team Member, Medical Provider – Shelter B)*

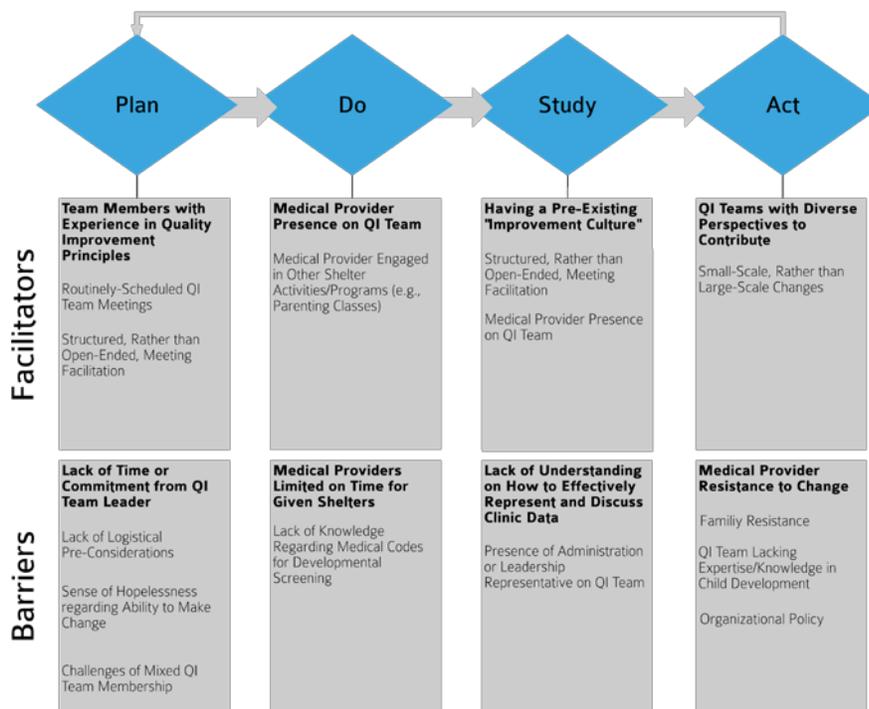
*At that point, so much good had already happened. Kids were getting the help they needed. So we told ourselves, okay, enough. Let’s talk about what we’re seeing in clinic and make sure [the doctor] and [the nurse] have what they need to succeed. Getting together all these folks is not an easy task, so our time together needed to be aimed at our main goal. (QI Team Member, Administrative Assistant – Shelter C)*

Though fluctuations were observed over time, screening rates for all shelters generally followed an upward trend, with immediate increases following intervention initiation. Comparing March to August, improvements ranged from 13% to 50% in screening rates.

**Second Aim: Barriers and Facilitators to PDSA Cycle**  
 Barriers and facilitators identified from interviews, FGDs, and observations are reported in Fig. 2, and described below for each PDSA cycle phase. Primary barriers/facilitators

constituted concepts that emerged at least 5+ times; secondary barriers/facilitators were those that emerged 2-4 times.

**Figure 2. Barriers and facilitators to the Plan-Do-Study-Act (PDSA) cycle emergent from qualitative analysis**



*Note.* Primary barriers/facilitators listed in bold type-face, and secondary barriers/facilitators listed in regular type-face.

**Plan**

Planning for change occurred through scheduled QI team meetings at each shelter. The primary barrier observed in this phase was a lack of time or commitment from the QI team lead. In Shelters B and C, QI team leads noted the challenge of “adding another task to [their] workload” (as expressed by the Shelter B team lead), despite their vested interest in the project. As a result, these meetings tended to start late, lacked clarity regarding expectations and roles, and produced less substantive discussion, particularly in early months. In Shelter A, however, the team lead was able to carve out time from their workday to appropriately plan for meetings.

Secondary barriers included a lack of logistical pre-considerations (e.g., reserving rooms in advance); a sense of hopelessness about the QI team’s ability to create change in shelter (e.g., “Is there really anything we can do? Every time we try something new here it just reverts to the same old processes. – QI Team Member – Case Manager, Shelter B); and challenges inherent in having participants from varied roles collaborate (e.g., consumers would often ask medical providers to explain the acronyms or terminology they were using).

Facilitators were less-commonly reported or emergent for this phase. The primary facilitator was having at least one team member with experience in QI principles. In Shelter C, this was the QI team leader, but both Shelters A and B had at least one team member with previous knowledge of tools which served to, as one team member noted, “get everyone on the same page and thinking in a cyclical manner. This isn’t how we normally approach problems at [that shelter], so that was sorely needed” (Administrative Staff, Shelter C). Secondary facilitators included having meetings routinely scheduled in advance, and facilitating meetings using a structured, rather than free-form or open-ended approach.

**Do**

Implementing the screener intervention took place in shelter-based clinics at each site. Notably, the presence of a medical provider was present on the QI team, and the degree to which the provider was engaged in other aspects of shelter programming, seemed to play an important role for this phase. In Shelter C, the QI team was often stymied by a lack of understanding of the typical clinic workflow and where a screener could be feasibly employed; this primary

facilitator was described both in interviews and FGDs. A secondary facilitator was whether the provider was engaged in other shelter activities, as it allowed for broader dissemination of the child development message. One participant articulated,

*It would have been very easy for this project to live and die in isolation, separate from everything else. We have the technology room where moms are trying to find jobs, we have addiction programs and safety concerns...and how does the kid fit into the picture right there, aside from playing with them? You see, [the medical provider] doesn't just help families in clinic. He gets out there, goes door-to-door...The families see him and his commitment, and so child development becomes part of how this shelter breathes. (QI Team Member, Executive Director – Shelter A)*

Relatedly, barriers inherent to the *Do* phase included primarily the commitment of medical providers, both in time and energy, to a given shelter. Shelters in which providers were physically present in-clinic for less than five hours a week had a full clinic caseload whenever they were in. One medical provider (Shelter B) noted, “*If families are lining up outside my door, you can bet this is the first thing that gets dropped. It ends up being a priority list*”; another (Shelter C) noted a similar trade-off: “*Screening kids is unfortunately not as vital as making sure a family can get the shots they’ll need for school in the fall*”. The secondary barrier reported was a lack of knowledge of medical codes for developmental screening (e.g., “*I got the code down, but I’m still learning when it’s appropriate to report this as preventive medicine services*” – *QI Team Member – Medical Provider, Shelter A*).

**Study.** This phase involves effortful examination of data to examine patterns and trends. The primary barrier, particularly at the beginning of the study, was a lack of ideas on how best to present effective discussions of data. This was noted uniformly across all shelters, and was reconciled as time progressed and QI team leaders began to feel comfortable. Interestingly, the secondary barrier was having a leadership representative present. From interviews and structured observations, it appeared that having an executive-level staff member on the team served to impinge upon fully transparent, and sometimes critical, discussion. One respondent shared, “*We’re lucky to have the voice of a leader here at the table. But at the same time, it makes me feel like I need to hold my punches when talking about what could be improved around [the shelter].*” (*QI Team Member – Case Manager, Shelter A*)

Relatedly, the primary facilitator was the presence of what a participant from Shelter A described as an “improvement culture”. In other words, for shelters that did not already routinely take stock of the successes and challenges of their programs and activities, the *Study* phase was a particularly

novel concept that required staff effort and time to accept. For those that did possess such a culture, the *Study* phase was described with phrases connoting familiarity, such as “*this is what we always do*”, and “*it’s how we run the ship around here.*”

Moreover, facilitators described in previous phases, including having QI experience on the team and having a medical provider on the team, were also salient secondary facilitators in this phase. In particular, applied project management and facilitation tools (e.g., issues logs and responsibility charting) allowed for more effective group-based examination of the data and subsequent identification of challenges. Although these were not covered in the initial QI training, pre-existing knowledge was particularly valuable in this phase.

### **Act**

The final phase of the PDSA cycle involves taking what was discussed and interpreted in the *Study* phase to course-adjust. What seemed to overwhelmingly facilitate this component of the process was having QI teams with diverse perspectives. As shared by nearly all participants in FGDs and interviews, making change was an often difficult task in an organization with its own norms and standardized procedures. As one participant noted,

*The catalyst to overcoming the standard of practice is throwing a case manager, some [shelter] guests, and a doctor in the same room. You know how often that happens? Never. But in this case, it made all the difference – [the doctor] was able to tell us what he needed to accomplish with each of his patients in clinic, while the guests were quick to advocate for their and their kids’ own needs...I was there, providing the case management perspective. I think moving the needle could only really have happened with all of us there. (QI Team Member – Case Manager, Shelter B)*

The diversity of thought described by this participant was reflected in the innovative solutions that emerged from those discussions, which seemed to balance competing interests. These approaches included appending some time for developmental screening to group parenting classes (rather than limited time in clinic), and building connections between medical providers and child care workers to be mindful of potential developmental concerns. Making smaller-scale adjustments also seemed to be effective, as one participant noted,

*If we’re going to be making a large shift, that means more people have to be brought to the table, we have to weigh the pros and cons, all of that. That doesn’t seem to be aligned with what we’re trying to do here – rapid movement, without being afraid to make mistakes.” (QI Team Member – Consumer, Shelter C)*

The primary barrier described was medical provider resistance to change. Changing clinician behavior is a key challenge in improvement research (Grimshaw, et al., 2002), which was well-corroborated by provider QI team members in Shelters A and B. Several respondents described their training in the “medical model” as partially to blame; one recounted that *“when [she] was in school, we never really thought about systems, or about continuously improving the way we conducted our clinical practice. It was very much identifying symptoms and providing treatment.”*

An additional barrier reported was a lack of child development expertise, as providers in this study were predominantly generalists. Family resistance to an adjustment in the patient-provider relationship was another prevalent comment offered by consumers across shelters, although this discomfort tended to wane over time (e.g., *“At first I was confused why [the doctor] was doing things differently – I usually see her for my depression. But I was happy when she started asking more about [my kid]”* – QI Team Member – Consumer, Shelter A). Finally, shelter organizational policies also seemed to play an obstructive role for enacting identified changes. For instance, participants in Shelter C felt it was contradictory to try and address each child’s entire social ecology to provide holistic services, while simultaneously upholding policies barring male caregivers from residence in shelter.

## DISCUSSION

This study explored the implementation process of piloting a quality improvement initiative within a non-traditional setting: homeless shelters for children and families. We found that in our three pilot sites, interdisciplinary QI teams that received basic training in QI concepts were able to measurably increase screening rates for children being seen in shelter-affiliated clinics within a half-year. In addition, using the PDSA Cycle as a framework, we identified factors unique to shelters at multiple levels that could help or hinder similar initiatives. Our findings underscore the importance of the QI team itself – its management, cohesion, and composition. Whether or not pre-existing QI expertise, a medical provider, a child development expert, or a member of shelter leadership were present made an impact on how effective teams were in accomplishing several steps of the PDSA cycle.

Our findings were consistent with extant research on QI initiatives. Similar to Solomons and Spross’ (2011) review of barriers and facilitators of evidence-based programs linked to QI frameworks, we found influential factors at both individual (e.g., staff availability and personal factors) and institutional (e.g., organizational policy) levels. Research both specific to and beyond child behavioral health services has increasingly recognized these multi-level influences on intervention uptake (Proctor et al., 2009). However, our findings also exposed important trade-offs

meriting consideration, such as the role that shelter leadership can play on QI teams and the time necessary to allow providers to conduct screenings – potentially diverting attention away from other medical needs.

Study findings must be interpreted in light of their limitations. First, we engaged a small number of sites - all of which were interested and felt capable of taking on such a project. This potentially limits the external validity of findings. Second, the use of the single-case time series design - while more rigorous than a pre-post approach - may have been subject to Hawthorne effects (i.e., heightened sensitivity due to awareness of study participation). Strategies to address this bias could have included starting measurement earlier to assess baseline stability, and/or using a control condition instead of using a historical control. Nonetheless, this design did afford us strengths, particularly the continuous assessment of an outcome following the introduction of an intervention. Third, challenges surfaced from the QI approach used in this study. Although PDSA Cycles are often noted as a basic tool in improvement science, findings may not be generalizable to other prominent QI models that shelters may want to test. Moreover, while outcome and process measures were assessed, we did not examine balancing measures. This is often an important aspect of QI projects (Randolph, et al., 2009), assuring that introducing a novel strategy doesn’t yield negative outcomes for other important clinical outcomes. Finally, although diligent efforts were made to enhance credibility through triangulated methods, a predominantly qualitative approach is always, in part, limited in external validity.

These limitations notwithstanding, to our knowledge this is the first study to describe the process of implementing evidence-based screening tools for families in shelter. Equally novel is the QI approach employed. Contingent on additional outcome evidence, as Hulscher et al. (2003) wrote, evaluating implementation “can throw light on the mechanisms and processes responsible for the result”. Through this effort, we provide insights that can help shape QI interventions with a greater likelihood of adoption and integration into shelters.

Although the use of developmental screening in shelters is limited to less than a handful of studies (e.g., Chiu & DiMarco, 2010), the literature on developmental screening in community settings more broadly suggests that a key challenge may be the resource-intensiveness involved in assessing needs for, planning, and executing efforts to promote child health and development (Domitrovich & Greenberg, 2000). Thus, QI models may be a pragmatic solution in their emphasis on leveraging existing resources to shift current practices to best practices. This is particularly true given that clinical judgment alone is often used to identify potential developmental problems, despite the fact that validated developmental screening tests are much more effective in identifying such disorders.

The degree to which positive impacts were sustained is promising, as the capacity of QI interventions to engender durable change in community organizations has been a topic of concern (Kritchevsky & Simmons, 1991). Although we observed fluctuations, the general trend was positive. Future initiatives should aim to enhance identified facilitators to promote the likelihood that programs and affiliated impacts will be maintained long-term. Specifically, ensuring that teams are properly trained in QI principles and tools, have members with a clinical perspective, and give attention to organizational factors will be important considerations to negotiate in unique contexts. In addition, examining the extent to which developmental screening in shelter translates into valid identification of delay and appropriate referrals to care is an important area for future research.

## CONCLUSIONS

Although the compounding risk factors associated with homelessness pose a threat to child development, early identification can help to reduce and even completely eliminate the long-reaching arm of early childhood disadvantage (NSCDC, 2014). While many have called for fundamental expansion of affordable housing access as a social determinant of health (e.g., Cutts et al., 2011), public health practitioners can also work along other sections of the health impact pyramid to prompt more proximal change within their typical scope of professional practice. For community-based medical and behavioral health providers, developmental screening is a feasible, low-cost intervention that can be undertaken immediately to address atypical child development in the shelter environment.

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