Article

Factors Predicating Loss to Follow-Up With Rescreening in Early Hearing Detection and Intervention Programs

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Abstract

Most infants born in the United States are screened for hearing loss prior to hospital discharge in Early Hearing Detection and Intervention (EHDI) programs; however, many infants who do not pass their screening do not return for recommended rescreening and are considered lost to follow-up (LTF). This research addresses this by examining factors related to LTF at the point of rescreening. A prospective longitudinal study tracked 166 families whose newborns were referred for additional testing upon hospital discharge. Analysis identified two factors related to being LTF: parents' perceptions of hearing loss as having the potential to impact their child's future and maternal depression; however, social support moderated the impact of maternal depression. Specific implications for working with families is discussed.

Keywords

structural modeling equation, quantitative research, methods and analytics, infants/children, development across the lifespan, subjects of practice, disabilities/rehabilitation, subjects of practice, hearing screening

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Introduction

Children's hearing is a public-health concern, as hearing loss in childhood can have long-term developmental implications, including impaired cognitive development, deficits in receptive and expressive language, impaired social adjustment, and behavioral difficulties (American Speech-Language-Hearing Association, 2008; Centers for Disease Control and Prevention, 2012; Joint Committee on Infant Hearing, 2007; Young, Tattersall, McCracken, & Bamford, 2004). Between 1.4 and 1.6 of every 1,000 infants are ultimately diagnosed with hearing loss; however, the actual prevalence of congenital hearing loss is estimated to be between 2 and 3 infants per 1,000 (Centers for Disease Control and Prevention, 2015, 2016; Vohr et al., 2008).

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Universal newborn hearing screenings conducted in hospitals and birthing centers throughout the United States are the first step in Early Hearing Detection and Intervention (EHDI) programs, which are present in all 50 states and U.S. territories. In order to mitigate the negative effects of hearing loss for children who have congenital hearing deficits, the Centers for Disease Control and Prevention (CDC) have published national goals for EHDI programs. The first few such goals have become known as the 1-3-6 Plan: Babies should be screened for hearing loss by one month of age, diagnosis for hearing loss should be completed by three months of age, and treatment of hearing loss should commence by six months of age (Centers for Disease Control and Prevention, 2011).

The vast majority of infants born in the United States are screened for hearing loss in the hospital or birthing center to which they are initially admitted upon birth. In 2014, 97.9% of infants were screened for hearing loss, with 96.1% being screened prior to one month of age; however, 1.6% (63,341) did not pass this hearing screening and were referred for additional care. Of those children, 12% (n = 7,591) did not receive an outpatient screen (Centers for Disease Control and Prevention, 2016). To complicate the screening process, in some settings babies who do not pass the initial screening done at birth are often "rescreened" prior to referral to a complete diagnostic evaluation. In those cases, the same type of screening done in the hospital is repeated in an outpatient setting.

Infants who do not return for recommended follow-up care are either lost to follow-up (LTF) or lost to documentation (LTD; Centers for Disease Control and Prevention, 2016). LTD refers to infants whose parents are unable to be contacted when referred for follow-up care. LTF refers to infants whose parents are contacted but do not bring their children back in for follow-up care. In general, the CDC groups these children together because, despite the reasons, these children do not return for recommended care, and it is often difficult to distinguish between the two groups.

One of the goals of EHDI programs is to design interventions that reduce LTF so that infants who may having hearing loss are diagnosed and treated in a timely manner.

Loss to Follow-Up and EHDI Programs

In general, LTF has been problematic in EHDI programs at all points in the 1-3-6 Plan. For example, in 2014, of those infants not passing their most recent hearing screenings, 34.4% (n = 21,819) were LTF at the point of diagnosis and an additional 23.8% (n = 1,467) were LTF at the point of intervention and enrollment in early intervention services (Centers for Disease Control and Prevention, 2016).

Because of the persistent nature of LTF at all points in the screening, treatment, and diagnosis process, there is a body of literature that has examined the issue from various perspectives. A number of authors seeking to identify factors related to LTF at the point of treatment have found that unilateral hearing loss (i.e., loss in one ear only), conductive losses (i.e., those located in the middle ear and not the inner ear), and insurance type have all been predictive of LTF (Prince, Miyashiro, Weirather, & Heu, 2003; Spivak & Sokol, 2005; Spivak, Sokol, Auerbach, & Gershkovich, 2009). Higher levels of maternal education are associated with timely treatment (Holte et al., 2012).

A prospective study identifying predictors of LTF at diagnosis included race/ethnicity and access to health-care professionals (Zeitlin, Auerbach, Mason, Spivak, & Reiter, 2017). In that study, parents who identified as African American were less likely to return for diagnostic testing than individuals of all other racial/ethnic groups. Additionally, parents who said they had access to more health-care professionals were more likely to bring their infants back for diagnostic testing. Another study found that on-time diagnosis was related to higher maternal socioeconomic status (Holte et al., 2012).

Factors associated with LTF at the point of screening/rescreening include parental per-

ceptions that these screenings are unnecessary and may not be covered by health insurance (Mehringer & Fifer, 2017; Scheepers, Swanepoel, & le Roux, 2014; Spivak & Sokol, 2005). Other researchers found that infants with disabilities, particularly those with multiple disabilities, are more likely to be LTF at this point due to pressing medical problems at or shortly after birth (Holte et al., 2012; Park, Wilson, Stevens, Harward, & Hohler, 2012). Finally, maternal age has been associated with LTF, with mothers 25 years and younger being more likely to be LTF (Engstrom, Fosnight, & Tharpe, 2017).

Despite this, there has never been a prospective study examining which psychosocial factors predict LTF at the point of rescreening. If children are lost to follow-up at this point, they are LTF from EHDI programs and would not return for diagnosis or treatment in a timely manner if they do indeed have a hearing loss. The current research was a prospective design aimed at predicting psychosocial factors related to LTF at the point of rescreening. If a profile of who is most at risk for LTF can be identified, novel interventions can be developed and piloted to reduce this pervasive problem for those most at risk.

Methods

The Institutional Review Boards at the three hospitals included in the study, along with that at Yeshiva University, approved this research.

Sampling

This prospective longitudinal study included interviews conducted over the phone with 203 parents in a large northeastern state that, at the time the data were collected, did not have a statewide reporting EHDI system. These parents' children were referred for additional testing after initially failing the hearing screenings performed in the hospital. Three hearing and speech centers participated in this research, which attracted patients from referring birth hospitals throughout a large metropolitan area.

Families were recruited for inclusion in the study at the same time their newborns were referred for additional testing upon not passing an initial hearing screening done in the hospital. Parents were contacted by telephone shortly after the discharge of their infants from the hospital. The purpose of the study was explained, and parents were invited to participate. Those who agreed provided verbal consent, and they were offered a $25 gift card to compensate them for their time. They then participated in a structured interview in either English or Spanish that took approximately 20 minutes to complete.

For those who agreed to participate in the study, follow-up data were obtained from the referring hearing and speech centers six to nine months after the initial screening to determine follow-up status. Of the 203 parents interviewed initially, we were able to gather complete screening data on 166, including whether or not the children returned for additional screening. Only babies in which complete data were available were included in the sample.

Ultimately, 136 babies (81.9% of the sample) returned for follow-up screening, while the remaining 30 babies did not (18.1%).

Measurement

The structured interview was designed to be comprehensive, tapping into a multitude of characteristics that could impact compliance with recommended follow-up. The breadth of the questions reflected previous research that identified parental characteristics associated with LTF with newborn hearing screening and non-compliance with other health programs. Constructs measured included demographic information, parental perceptions of pediatric hearing loss, an assessment of social supports for parents, and parental depression pertaining to having a child with a chronic health condition or disability.

Parents' perceptions of pediatric hearing loss were assessed by asking a series of five questions on a five-point Likert-type scale, with 1 = *strongly agree* and 5 = *strongly disagree*. Designed by the authors specifically for this study, this instrument sought to measure the impact that hearing loss has, gener-

ally, on children's lives. Examples of these statements include, "Hearing loss can have major consequences on a child's life" and "A child's hearing loss can affect how others see him or her." Coefficient alpha for this scale was 0.73.

To measure social support for parents, we utilized the Inventory of Parent Experiences, a 54-item instrument. This inventory measures satisfaction with parenting and social support, as well as general life satisfaction. Reported coefficient alphas for the subscales ranged from 0.52 to 0.94 (Crnic & Greenberg, 1983).

Each item in this inventory was measured on an ordinal scale, with lower values denoting lower levels of social support. Specifically, the item, "If you were to become upset, how many people could you talk to?" was coded as 1 = no people, 2 = 1 person, 3 = 2 people, 4 = 3–4 people, and 5 = more than 4 people. The items "How often do you visit with parents on the phone?" and "How often do you talk to or have contact with other family members?" was coded as 1 = never/once or twice a year, 2 = less than once a month, 3 = one or two times per month, 4 = once a week, and 5 = several times a week. Finally, the item relating to the quality of the mother's relationship with her spouse or partner asked, "Do you now have a relationship with a spouse or partner? Do you expect it will continue for the years to come?" Responses to this item were coded as 1 = I don't have a relationship, 2 = I don't expect the relationship to last, 3 = I feel the relationship probably will last, and 4 = I feel the relationship definitely will last (Crnic & Greenberg, 1983).

To measure parental depression, we used items from the Perinatal Grief Scale. This instrument measures grief in three domains: active grief, difficulty coping, and despair (Potvin, Lasker, & Toedter, 1989). Reported reliability for each of the three subscales ranged from 0.86 to 0.92. The scale was modified to measure grief associated with learning that a newborn baby did not pass his or her initial hearing screening. A total of 21 self-reported items were asked to measure this on a 5-point Likert scale ranging from 1 = strongly agree to 5 = strongly disagree. Higher scores indicated lower degrees of grief or depression.

Model Specification

The overall purpose of this analysis was to develop a model that predicted loss to follow-up after recommendations from hospital staff to follow up with additional hearing screenings. Those factors found to be significant predictors in the bivariate analysis were considered for inclusion in the final model, particularly because, theoretically, maternal depression, social support, and beliefs about the seriousness of a health condition should be related to loss to follow-up.

In the current research, structural equation modeling (SEM) was used to generate a model to explain loss to follow-up at the point of rescreening. In general, SEM can be used to strictly confirm a priori models, test alternate models, or generate models (Joreskog, 1993; Kline, 2016). In this case, SEM was used to generate a model that predicted which children would be lost to follow-up at the point of rescreening. The model-generation form of SEM is acceptable when the developed model has three characteristics: it is theoretically sound, it is reasonably parsimonious, and it fits the data well (Kline, 2016).

Data were analyzed for this with MPlus (Muthen & Muthen, 2012). When MPlus estimates regression models with binary outcomes, a probit regression is utilized with weighted least squares estimation, and a logistic regression is estimated using maximum likelihood (Muthen & Muthen, 2012).

Results

Characteristics of the Sample

The sample represents diversity in terms of race/ethnicity and socioeconomic status, which is reflective of the area in which this research was conducted. The families predominantly identified as Latino/a (n = 91; 46.7%), with the next largest group identifying as African American (n = 42; 21.5%). More than half of the respondents were not married (n = 115; 58.4%). The largest group of respondents had family incomes over $50,000 ($n$ = 59; 35.4%), while the next largest group had incomes under $25,000 ($n$ = 54;

32.3%). The remainder of the respondents had incomes between $25,000 and $49,999 ($n$ = 54; 32.3%). The majority of the interviews were conducted in English, at the preference of the participants (n = 142; 88.2%), while the remainder were conducted in Spanish. The largest group of participants indicated that it would take between 15 and 30 minutes to reach the center where the child's rescreening would take place (n = 84; 43.75%), and the largest group (n = 90; 46.15%) said that reaching the center would be very convenient. Over half the respondents had more than one child (n = 111; 56.9%). Finally, the mean age of the parent interviewed was 27.5 years (SD = 5.8).

Bivariate Analysis

Initially, bivariate analyses were conducted to determine what factors may be related to LTF at the point of rescreening. Variables that had significant relationships with LTF were ultimately considered for inclusion in the final model. The results of these analyses are displayed in Table 1.

When considering the impact of hearing loss on their child's and family's life, the only significant predictor to being LTF was the item, "Hearing loss can have major consequences on a child's life." Those not LTF had significantly lower mean scores (1.58, SD = 0.84) compared to those who were LTF (M = 1.93, SD =1.14) (t = .94, p = 0.05).

To acquire an understanding of the relationship of LTF and social support, survey respondents were asked to rate a series of questions on this subject. In one question, survey respondents were asked, "If you were to become upset or angry, would you have someone to talk honestly to who is not involved? How many people?" The range of possible responses was as follows: 1 = no people, 2 = 1 person, 3 = 2 people, 4 = 3–4 people, or 5 = more than 4 people. Those not LTF had higher mean scores, indicating more social support in difficult situations (M = 3.83 SD = 1.08) than those LTF (M = 3.30, SD = 0.95). The differences between groups were statistically significant (t = -2.38, p = 0.02). Respondents were also asked, "How often do you visit with your parents on the phone?" For this item the possible responses were coded as follows: 1 = Never/once or twice a year, 2 = Less than once a month, 3 = One or two times per month, 4 = Once a week, or 5 = Several times a week. Those whose infants were LTF had higher mean scores, indicating that those new parents had more phone contact with their own parents (M = 4.87, SD = 0.62) than those whose infants were LTF (M = 4.33 SD = 1.33). The differences between groups were statistically significant (t = -3.23, p = 0.00). Additionally, research participants were asked, "How often do you talk to or visit with family members other than parents?" Like the previous item, possible responses were coded as follows: 1 = Never/once or twice a year, 2 = Less than once a month, 3 = One or two times per month, 4 = Once a week, or 5 = Several times a week. Those not LTF had higher mean scores (M = 3.85, SD = 1.23) compared to those LTF (M = 3.15, SD = 1.54), again indicating that those not LTF had more overall family contact than those LTF. The differences between groups on this item were statistically significant (t = -2.58, p = 0.01). The final item found to be statistically significant was, "Do you now have a relationship with a spouse or partner? Do you expect it will continue for the years to come?" For this item, the possible responses were coded as follows: 1 = I don't have a relationship, 2 = I don't expect the relationship to last, 3 = I feel the relationship probably will last, or 4 = I feel the relationship definitely will last. Those not LTF had higher mean scores, indicating a stronger intimate-partner relationship (M = 3.70, SD = 0.75) than those LTF (M = 3.26, SD = 1.16). The differences between groups were statistically significant (t = -2.51, p = 0.01).

With regard to the relationship between grief and LTF, the item "I feel guilty when I think about my child" showed significant differences between the groups. Those not LTF had significantly lower mean scores (M = 4.30, SD = 0.77) than those LTF (M = 4.63, SD = 0.49) (t = 2.16, p = 0.03). For the item "I feel physically ill when I think about my child," those not LTF had significantly lower mean scores (M = 4.49, SD = 0.63) than those

Table 1. Factors Related to LTF at Rescreening.

	Not LTF		LTF			
Factor (*Indicator Code Used in SEM Diagram*)	*M* (SD)	*n*	*M*	*n*	statistic	*p*
Hearing loss can have major life consequences (*hl2*)	1.58 (0.84)		1.93 (1.14)		t=1.94	0.05
If you were to become upset, how many people could you talk to? (*sup19*)	3.83 (1.08)		3.30 (0.95)		t=-2.38	0.02
How often do you visit with parents on the phone? (*sup25*)	4.87 (0.62)		4.33 (1.33)		t=-3.23	0.00
How often do you talk to or have contact with other family members? (*sup33*)	3.85 (1.23)		3.15 (1.54)		t=-2.58	0.01
Quality of relationship with spouse/partner (*sup37*)	3.70 (0.75)		3.26 (1.16)		t=-2.51	0.01
I feel guilty when I think about my child (*dep6*)	4.30 (0.77)		4.63 (0.49)		t=2.16	0.03
I feel physically ill when I think about my child (*dep9*)	4.49 (0.63)		4.78 (0.42)		t=2.29	0.02
I cry when I think about my child (*dep18*)	4.33 (0.83)		4.67 (0.48)		t=2.03	0.04
Age of mother	27.33 (1.02)		26.07 (0.51)		t=-1.04	0.30
Language of interview:						
English		119		23		
Spanish		15		4	X^2=0.28	0.60
Time to reach the hearing and speech center:						
Less than 15 minutes		59		8		
15–30 minutes		55		11		
31–45 minutes		13		3		
More than 45 minutes		5		4	X^2=6.19	0.10
Convenience of reaching the hearing and speech center:						
Very inconvenient		9		2		
Somewhat inconvenient		17		6		
Somewhat convenient		41		10		
Very convenient		66		9	X^2=2.95	0.40
Race/ethnicity:						
White		18		4		
Latino/a		67		14		
Black		25		7		
Other		22		2	X^2=1.84	0.61

LTF ($M = 4.78$, $SD = 0.42$) ($t = 2.29$, $p = 0.02$). Finally, for the item "I cry when I think about my child," those not LTF had significantly lower mean scores ($M = 4.33$, $SD = 0.83$) than those LTF ($M = 4.67$, $SD = 0.48$) ($t = 2.03$, $p = 0.04$). In these three cases, those LTF had higher indicators (i.e., lower scores) of maternal depression than those not LTF, and these three items were initially indicators from the instrument's grief or despair subscales (Potvin et al., 1989).

None of the demographic variables, including age of the mother, distance to the hearing and speech center, convenience in reaching the hearing and speech center, or language in which the interview was conducted, were related to LTF.

Model Specification Results

Results of the SEM are illustrated in Figure 1. In this diagram, circles represent continuous

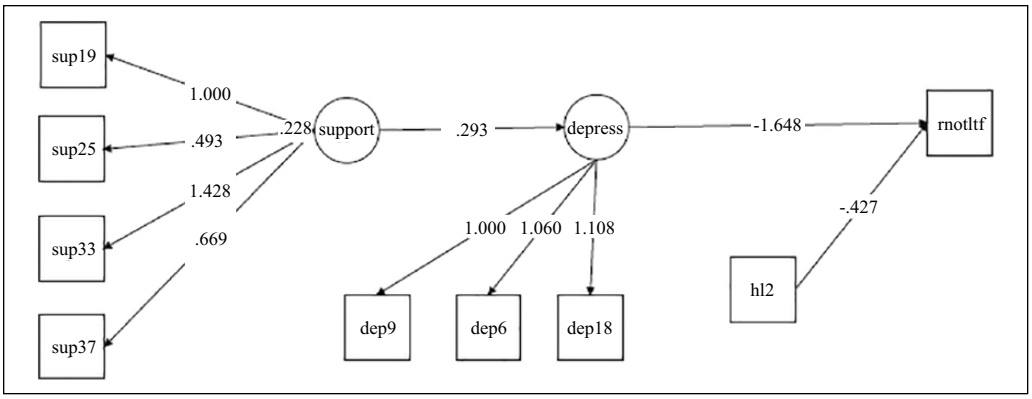

Figure 1. SEM of factors related to not being LTF at rescreening.

latent variables and squares represent observed exogenous variables. Lines connecting variables indicate significant direct effects, and the absence of a line indicates no effect.

In this model, a confirmatory factor analysis (CFA) found that the latent variable *support* was significantly predicted by the four factors found to be significant in the bivariate analysis at the $p<0.05$ level, and the latent variable *depress* was predicted by the three factors found to be significant in the bivariate analysis at the $p<0.05$ level. Indicators for the factors are identified in Table 1.

Additionally, the structural regression (SR) model indicated that social support (*support*) moderated the relationship between maternal depression (*depress*) and not being lost to follow-up when controlling for parental beliefs about hearing loss having serious consequences on a child's life (*hl2*). Model-fit statistics were not reported, as only observed indicators are analyzed within the path model, and thus perfect measurement of observed indicators is assumed (Muthen & Muthen, 2012). In this case, perfect measurement is assumed for the binary outcome variable.

The values displayed on the arrows are the unstandardized coefficients and are thus interpreted as regression coefficients. The dependent variable, *rnotltf*, was dichotomous with *depress* and *hl2* (thinking of hearing loss as having serious consequences on a child's life), resulting in the odds ratio for each as it is regressed on the outcome and controlling for the other covariate.

Statistical outcomes for the SR portion of the SEM are displayed in Table 2. Results from this research indicate that social support moderates maternal depression when predicting loss to follow-up and controlling for the belief that hearing loss can have serious consequences on a child's life. For each unit increase on the depression scale, which indicates a decrease in depression, there was a corresponding 80.8% reduction in the odds of being lost to follow-up. Additionally, for each unit increase in the belief that hearing loss can have serious consequences on a child's life, there was a corresponding 34.8% reduction in being lost to follow-up when controlling for maternal depression.

Effect sizes, which often provide a way to descriptively quantify practical significance, were calculated in Stata 15 after the SEM was finalized to further describe the impact of the predictors on being LTF (StataCorp, 2017). Effect sizes indicated small to moderate effects for each of the predictors between those LTF and those not LTF. Cohen's *d* for considering hearing loss as having major life consequences between the groups was 0.39. Cohen's *d* for social support for those LTF and those not LTF was -0.53, and Cohen's *d* was 0.55 for maternal depression between these same two groups.

Discussion

The results from the SEM indicate that both maternal depression and believing that hear-

Table 2. Standardized Parameter Estimates for SR Model.

Variable	Estimate	*SE*	*OR*	*p*
Support (regressed on Depress)	0.293	0.135	N/A	0.030
Depress (regressed on Not being LTF)	–1.648	0.727	0.192	0.024
Thinking of hearing loss as having serious consequences on a child's life (regressed on Not being LTF)	–0.427	0.210	0.652	0.042

ing loss can have serious consequences for their child's life significantly predicted LTF at rescreening, with social support moderating maternal depression, and effect sizes indicate that these differences may have important practical significance. These results are not consistent with previous research that examined biopsychosocial factors related to LTF at the point of diagnosis, which indicated that LTF was most associated with parents' race/ethnicity and access to health-care professionals (Zeitlin et al., 2017).

Loss to follow-up, as measured by the Centers for Disease Control and Prevention, is at the point of diagnosis and again at the point of treatment. While summary data note the number and percentage of infants who did not pass their inpatient screen and did not return for an outpatient screen, this group is aggregated into the LTF statistics for diagnosis. Comparing the results of this research with previous research indicates that LTF at rescreening and follow-up may be rooted in different factors, and national LTF rates reflect both rescreening and diagnostic activities. It may be helpful to consider rescreening as a discrete activity at a national level since those families LTF at rescreening have infants who will not be diagnosed in a timely manner, if at all. In this regard, interventions designed to reduce LTF at rescreening may keep families in the system longer and thus provide opportunities to diagnose potential hearing loss in their children. As well, since the factors related to LTF at rescreening and the point of diagnosis differ, interventions designed to reduce LTF at each time point should differ and be designed specifically to address those most at risk at each time point.

The results of this research are congruent with other research examining the relationship between social support, postnatal depression, and LTF in maternal care. Buchberg and colleagues (2015) found that low-income women with HIV were less likely to follow up with both postpartum obstetrical care and care for their HIV when they lacked sufficient social support. Other researchers have found that increased social support is related to lower levels of postpartum depression, particularly when the support comes from the baby's father, friends, or the mother's mother (Brown, Harris, Woods, Buman, & Cox, 2012; Leahy-Warren, McCarthy, & Corcoran, 2011; Negron, Martin, Almog, Balbierz, & Howell, 2013). Conversely, social isolation has been related to higher levels of postnatal depression (Letourneau et al., 2011). While this research is not exactly the same as studying postnatal care, parents, and often mothers, are the gatekeepers to children's access to medical care. Therefore, it is logical that factors that may be related to LTF for new mothers may also apply to their children.

The relationship between social support and postnatal depression appears to have lasting effects for new mothers. Mothers with high levels of social support at birth are more likely to have lower levels of postnatal depression more than three months post-birth (Leahy-Warren et al., 2011). It has also been found that social support from a child's father is related to lower levels of maternal depression five years after giving birth (Leahy-Warren et al., 2011).

Finally, there is some evidence that high levels of postnatal depression are linked to poorer health outcomes in infants. Mothers with higher levels of postnatal depression have fewer interactions with their babies and are less responsive to the babies' needs. There may be long-term consequences to these

behaviors, including hyperactivity and anxiety in the children (Letourneau et al., 2011; Manuel, Martinson, Bledsoe-Mansori, & Bellamy, 2012).

Implications for Practice

The findings from this research have implications for audiologists and other health-care professionals, such as social workers, working with new mothers and/or their children. All parents should be presented early on with the implications of hearing loss on a child's life and the need to follow up with recommended screenings. In many EHDI programs, in an effort to not cause alarm, parents whose babies do not pass their hospital hearing screenings are not told that their children "failed" the screening; rather, they are informed that their babies "need to be rescreened." Often, little or no information about the implications of congenital hearing loss is presented to parents at that time (K. Aveni, personal communication, August 3, 2017). That is, those with untreated hearing loss are more likely to have cognitive delays, delays in expressive and receptive language, social problems, and behavioral difficulties (Auerbach, Mason, Zeitlin, Schudrich, Spivak, & Sokol, 2013). This is particularly important at the point of rescreening, where there is a direct relationship between understanding the implications hearing loss can have on a child's life and LTF.

Mothers who show signs of postnatal depression or those who may be in a weak relationship with the child's father may need additional encouragement and support in returning for recommended screenings. Social workers and health-care providers who see new mothers regularly can screen for these by asking new mothers about postnatal depression symptoms and the quality of the relationship they have with the child's father. Additionally, and as recommended elsewhere, interventions such as connecting new parents to "family navigators" may be particularly useful to those with no or low social support (Mehringer & Fifer, 2017).

Loss to follow-up has primarily been addressed by audiologists and social workers who may work in EHDI programs and hearing and speech centers serving children. The findings from this research indicate that pediatricians and OB/GYNs, who have close contact with mothers shortly after a child's birth, are well suited to identify new mothers who may be at risk for LTF or compromised child care due to lack of social support, postnatal depression, or both.

Interventions to bring infants in for follow-up care may need to differ depending upon where in the screening/diagnosis/treatment process families are, and it is likely beneficial, from a public-health perspective, to look at each of these points differently in order to minimize LTF throughout the care continuum.

Limitations

While we initially interviewed parents of 203 infants who did not pass their initial hearing screenings in the hospital, we were only able to obtain final data on 166 of them, and only 30 were actually lost to follow-up. This resulted in a relatively small sample. Because of this, we recommend replicating this study with a larger sample.

Additionally, parents who agreed to participate in this study were aware that the researchers were going to collect follow-up data on their children. It is possible that, because they knew they were being observed, subject parents acted differently than those not participating in the research; however, and somewhat reassuringly, the LTF rate in our study was similar to those in recent population-based studies (Thomson & Yoshinaga-Itano, 2018; Tran et al., 2016)

Postnatal depression is related to prenatal depression, which we did not measure in this research (U.S. Department of Health and Human Services, 2016). Future research should consider whether prenatal depression impacts LTF. If this were the case, additional "early maternal intervention" services may be put in place to help these at-risk mothers transition successfully to parenthood.

Finally, while we measured grief as it relates to having a child with hearing loss, findings from this research indicate that a more salient measure of depression may be a validated postnatal depression scale. Therefore, we recommend inclusion of this type of measure in a replication of this study.

Conclusion

The findings from this research, combined with prior research findings, indicate the need for further investigation into factors related to LTF. For example, follow-up research could focus on replication with larger samples to flesh out LTF at different points in the screening/diagnosis/treatment process and interventions designed to remediate these.

Declaration of Conflicting Interests

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