Understanding Adoption, Use, and Abandonment Practices in Baby Tracking

Alexandra Papoutsaki
Department of Computer Science
Pomona College
Claremont, California, USA
alexandra.papoutsaki@pomona.edu

Mustafa Taha Dişbudak
Pomona College
Claremont, California, USA
mtdi2024@mymail.pomona.edu

Lily Galvan
Pomona College
Claremont, California, USA
lpga2020@mymail.pomona.edu

Chau Vu
Pomona College
Claremont, California, USA
chvo2022@mymail.pomona.edu

Daniel A. Epstein
Informatics
University of California, Irvine
Irvine, California, USA
epstein@ics.uci.edu

Abstract

New parents often turn to baby-tracking technology to monitor and reflect on the daily routines of their infants. However, we lack understanding of how tracking practices evolve as children grow and develop, with caregivers adopting, using, and eventually abandoning baby tracking. We analyze the logs of 60 parents and 71 children who used the popular baby-tracking app Huckleberry for an average of 12 months, combined with re-analyzing interviews with 20 parents who used various baby-tracking technologies. We find that parents start tracking at different ages, track habitually and intermittently, change and swap what and how they track, and often gradually abandon the practice. Through unpacking why these patterns occur, we find that parents effectively self-manage what data categories are worthwhile to continue tracking. We point out lessons that domains outside baby tracking can take from the evolving, longitudinal process, and present design recommendations to better support caregivers across phases.

CCS Concepts

• **Human-centered computing → HCI theory, concepts and models**.

Keywords

baby tracking, personal informatics, adoption, use, abandonment

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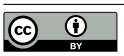

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1 Introduction

The arrival of an infant is accompanied by a number of tasks, such as feeding, diapering, and naps, that need to be repeated multiple times on a daily basis to ensure the baby's well-being. [3, 7, 80]. Such tasks are performed during a stressful period in which parents often experience significant sleep disruptions, fatigue, and the pressure of adapting to new caregiving responsibilities [37]. These challenges can limit their ability to stay on top of tasks and make it harder to notice subtle changes in an infant's behavior that are often crucial for troubleshooting concerns. As such, keeping track of infants' routines is often medically recommended. Accurate records of feeding frequency, milk intake, diaper output, and sleep patterns enable caregivers and clinicians to identify early warning signs such as insufficient feeding, poor weight gain, or dehydration that may otherwise be difficult to detect amidst parental exhaustion. In clinical practice, these logs can serve as the basis for assessing whether an infant is following expected developmental trajectories, and they help guide timely interventions when deviations arise [7]. Given these demands and the importance of consistent record-keeping, caregivers are increasingly turning to technological solutions that support or automate tracking. Baby tracking refers to the use of technology, such as apps and wearable devices, that enable caregivers to monitor and reflect on the daily routines of their infants and young children. A host of commercial baby-tracking apps and devices have emerged to automate the record-keeping process, with popular ones having hundreds of thousands of users [67].

Within HCI, baby tracking is an example of a Personal Informatics (PI) system, or a technology designed to help with tracking and understanding of a person's patterns [27, 56]. A core question in the field of PI is how people use, adopt, and abandon tracking. Understanding people's approaches to using PI technology offers insights into how designers and practitioners can better support people's use patterns and practices. For example, studying why and how people lapse and abandon their health-tracking devices has contributed guidance on how to design to support returning to tracking [31] and how the field should perceive abandonment [18, 28]. However, much of this understanding has been drawn from people's self-reported descriptions of goals changing and the impact of disruptive events [26, 69, 74], and we lack empirical descriptions of

how these long-term practices manifest in practice. Further, PI has also often sought to understand how people's tracking habits persist, evolve, and change over the long term, meaning months or years, with the aim of supporting useful insights [45, 69]. Although baby tracking typically lasts for months to a year or two, the frequency to which minor changes (e.g., sleep-routine or feeding changes) and major changes (e.g., caregiving transitions due to starting daycare) arise offer a glimpse into how people's tracking habits shift over time in other domains, where such transitions happen less frequently, unfold over months to years (e.g., moving or changing jobs) [1, 25], and are therefore harder to observe empirically. We treat baby tracking as a case study for examining adoption, use, and abandonment practices in PI more broadly, as well as offer domain-specific observations and design recommendations.

Prior literature on baby-tracking has identified different motivations for why parents use baby tracking, such as tracking the baby's intake, improving communication among caregivers and with medical providers, and augmenting the parents' memory [22, 61]. Baby-tracking technology often aims to promote behaviors which have been shown to result in positive health outcomes, such as breastfeeding [2] or meeting developmental milestones [91]. Prior work has emphasized how parents use tracked data for reflecting in different short-term windows, such as at the end of the day or immediately after tracking [61], but has largely ignored how parents' tracking behavior evolves from adoption to abandonment. This gap is particularly important given the context in which baby tracking occurs. As previously described, the newborn phase places significant cognitive demands and stress on new parents, heightening the need for reliable information to maintain the baby's well-being. Yet, we lack understanding of why parents adopt these tools, how they rely on them during demanding periods, and adapt their use during different stages of infancy, and why they eventually scale back or abandon tracking. This understanding can therefore help in designing technologies that account for when parents adopt the practice of baby tracking in relation to their baby's age, supporting different and evolving trends in use, and accounting for motivations for gradual or complete abandonment.

We take a two-pronged approach to examine adoption, use, and abandonment in baby tracking, which are three commonly-described phases of PI tracking [32, 56]. First, we sought to understand empirically how people use baby-tracking apps by studying the use of one of the most popular ones, the Huckleberry App. We recruited 60 parents who used Huckleberry to track 71 children for an average of 12 months, generating an average of 13.57 entries per day and 3,270.4 entries overall. We quantitatively analyzed these logs to report on different practices around their adoption, use, and abandonment patterns. We further sought to describe *why people exhibit various baby-tracking practices* by qualitatively re-analyzing interviews previously conducted by Louie et al. [61], where 20 parents used a variety of baby-tracking technologies.

We found that most parents start tracking many categories in the newborn phase, often with the aim of verifying that their child was eating, sleeping, etc., in alignment with medically-recommended thresholds. However, other parents introduced tracking later, finding infancy an unpredictable period where tracking would lead to little benefit. As babies grew older, categories were introduced as needed, often replacing existing ones, such as the adoption of solids in response to developmental milestones. Others were abandoned completely, tapered gradually, or lessened in detail. Some parents exhibited habitual tracking behaviors, tracking categories like milk feeds and diapers for multiple months and at a high intensity. Other categories, like growth and combinations, like medicine and temperature, were tracked more intermittently. Childcare transitions, such as a parent returning to work, the baby going to daycare, or family members or nannies helping out, had an effect on tracking, ranging from increased commitment to gradual or complete abandonment. Finally, parents with more than one child often tracked subsequent children differently, abandoning tracking earlier based on their prior experience.

We discuss how our findings surface how parents make decisions regarding how to track based on the value they derive from tracking, and reflect on how these choices may parallel decisions around when people begin tracking in other health domains. We further discuss how baby tracking pushes back on assumptions on how PI characterizes abandonment, highlighting how tracking can lessen in detail or frequency while still providing value. We conclude with design recommendations for supporting adoption, use, and abandonment practices in baby tracking, such as tailoring reflective features depending on when a caregiver adopts tracking or incorporating technology-supported planning around major transitions, like in childcare.

2 Background

Here, we provide an overview of prevalent medical recommendations within the United States (U.S.) context of our study, and elaborate on the popularity of baby-tracking apps. In the first six months of a baby's life, the American Academy of Pediatrics (AAP) recommends that breast milk or formula be the baby's sole form of nutrition [4, 6]. For newborns, AAP recommends 6–12 feeds, and about 6 wet diapers, and 3–4 stools every 24 hours [3, 68]. Newborns are recommended to get 16–17 hours of sleep, though each sleep might only last 1–2 hours [5]. Baby's needs change following the newborn stage of the first 1–3 months. For example, around 6 months, infants require less frequent milk feeds, at 3–5 times a day [3] as part of their nutrition begins to be covered by solid feeds [4, 19]. Sleep also consolidates to fewer naps [80]. Finally, older babies who get sick may be prescribed medicine, such as painkillers or antibiotics [77].

Keeping track of all these tasks is often medically recommended, especially when there are feeding or weight concerns [7]. Although this was traditionally done using paper logs provided by medical providers (e.g., [100]), baby-tracking apps and devices have become prominent. In 2023, baby-tracking apps were the most widely-used app category for parenting, with a 28.6% market share [67]. Surveys have reported that upwards of 50% of parents used apps to track infant feedings [24] or pregnancy and parenting information [65].

Some apps which have been downloaded millions of times include *Baby Connect* [88], *Baby Tracker* [75], *Glow Baby Tracker* [39], *Huckleberry* [51], *Nara Baby* [73], and *What to Expect* [99]. In many of these apps, caregivers can access multiple tracking options: nursing, bottle feeding, diapers, solid foods, sleep, pumping, growth, medicine, temperature, etc. Some apps, such as *Milky Way* [2] and *Mommy-Be* [94], are tailored to tracking only one category, such as

breastfeeding and pumping [2, 94]. Others, like *Baby Connect* [88] and *BebeCode* [91], are designed to track developmental milestones, such as first steps or words.

3 Related Work

Our work builds on prior baby-tracking literature, theories, and descriptions of practices around PI technology, as well as benefits and principles of long-term tracking.

3.1 Baby Tracking

Baby-tracking technology is a part of a broader space of technology designed to support the transition to parenthood and disruptions that arise with the arrival of a new child [83]. Prior literature has surfaced opportunities for technology to assist with emotional support, such as by providing spaces for new parents to discuss and commiserate [38, 52, 60], or collaborate when co-parenting [46, 59]. Research has also pointed to opportunities for technology to offer more logistical support, such as around domestic tasks [82] or parenting-specific tasks like pumping [23], finding places to feed in public [9], and organizing caregiving responsibilities [50].

Baby-tracking literature has often focused on assessing existing tools and proposing new solutions for tracking and understanding growth trajectories and developmental delays [33, 43]. Parents who used developmental milestone monitoring applications, such as *BebeCode* [91], *BabySteps* [48, 92, 93], and *babyTRACKS* [10, 11], have an increased awareness of their child's development milestones and possible developmental delays, and sharing this data with healthcare providers enhances parent–pediatrician communication. [33, 48, 50, 97, 98].

Another prominent focus area in baby-tracking literature has been on how technology can promote parental behaviors that align with medical guidance, for example, in supporting preterm infants [42]. This has been particularly true for public policy efforts that promote breastfeeding among new mothers [2, 86, 94]. Studies have focused on apps that are tailored to breastfeeding and pumping, such as *Milky Way* and *Mommy-Be*, suggesting mothers who used these apps were more efficient in measuring milk output and aware of their mental and nutritional health [2, 94]. Researchers found that most breastfeeding education content was seen as informative and credible in creating community among mothers [86]. Furthermore, involving healthcare providers in app design helps parents follow medical recommendations for infant health more closely [13]. Baby-tracking apps help caregivers manage tasks, such as monitoring feeds and diapers, to ensure that their baby meets medically defined thresholds [22, 61]. New parents also turn to tracking to augment their memory (e.g., remember when they last fed or changed a diaper), reduce anxiety, gain a sense of control, and circumvent the need for direct communication with other caregivers [50, 61, 64, 98].

Meanwhile, researchers have raised concerns that baby-tracking technology can increase parental anxiety or reduce confidence [22, 64, 86], and affect interactions with their child and other caregivers [98]. Prior research has also highlighted risks to children's data privacy risks, including potential user profiling and targeted advertising [53]. Such concerns echo findings from PI that indicate tracking can adversely affect cognitive load, emotional well-being, social acts, and behaviors, while bringing practical challenges [63].

Although studies highlight the benefits and raise concerns about the use of baby-tracking technology, HCI literature has paid less attention to parents' practices around using these apps. Louie et al. underscored that baby-tracking apps are often used for short-term reflection, such as answering questions about how much time has elapsed since a child has napped or how much they have cumulatively eaten in a day [61]. However, we lack understanding about how people adopt, use, and abandon the practice of baby tracking as babies grow older. Understanding these practices can help inform design practices to support new parents and deepen our understanding of how tracking practices evolve over time.

3.2 Theories and Studies in Personal Informatics

How and why people adopt, use, and abandon PI technology are all critical questions when trying to understand how people engage with tracking. Past work has explored these aspects by identifying usage stages and barriers to tracking, and offering design recommendations [32, 56, 74, 85].

Foundational models have established that people engage with tracking in stages, especially Li et al.'s [56] Stage-Based Model, which defined the phases of 'preparation,' 'collection,' 'integration,' 'reflection,' and 'action.' Subsequent work has expanded on this framework, with the Lived Informatics Model by Epstein et al. [32] characterizing the processes of 'deciding,' 'selecting,' 'tracking and acting,' and 'lapsing.' Expanding on these models has highlighted how tracking goals evolve, and has brought attention to possible mismatches between the type of data collected and people's needs at a particular moment [12].

While there exist multiple PI theories on how people track, it is useful to understand people's use of PI tools in different contexts, such as baby tracking. In our work on baby tracking, we have chosen the terms 'adoption,' 'use,' and 'abandonment,' which align, if not perfectly, with prior frameworks but reflect more accurately the tracking practices observed in our study.

For example, we use the term *adoption* to refer to when parents decide to track relative to their infant's age and what categories they decide to track. In Li et al.'s [56] Stage Based Model, 'preparation' occurs before people start collecting data and focuses on people's motivation to collect, what information they determine to record, and how they choose to record it. In the Lived Informatics Model [32], *deciding* is the decision stage to track personal data, and *selecting* is the process to select the tracking technology. Prior literature on adoption has suggested that people often try out different tracking tools to find which one(s) suit their needs [55, 87]. Additionally, researchers have indicated that people begin tracking due to goals, recommendations of peers, or as a response to lifestyle changes [32, 55, 56].

We chose the term 'use,' which is aligned with the stages of 'collection,' 'integration,' 'reflection,' and 'action' from the Stage-Based Model [56], which in turn align with the 'tracking and acting' phase in the Lived Informatics Model [32], which articulates that these stages often happen simultaneously in practice. Prior literature has identified the varying frequency and level of granularity

of collection and reflection [17, 41]. Additionally, PI literature has also largely focused on characterizing the use of activity trackers as 'lived informatics,' people using the information and finding its meaning in their day-to-day lives [32, 84]. Researchers have found that people track using various technologies, and when they achieve a goal or experience a loss of utility in one of these tools, they switch to another one [17, 32].

Finally, we use the term 'abandonment' to capture all practices related to abandonment or lapsing from tracking. A large focus point of PI literature is identifying barriers and facilitators for user engagement with PI systems that lead to abandonment and lapsing [17, 47]. Researchers have suggested that people abandon tracking because the cost of tracking is too high, they learned enough from the process, or they do not like what the data reveal [18, 28, 32, 70]. Lapses occur because people forget to track, skip, temporarily suspend, or do not keep up with upkeep [17, 28, 47]. Research has discussed that technology should frame abandonment as not a point of failure, but rather a design opportunity [28, 32, 70], and designs have been suggested to support those who want to return after abandoning [28]. Although literature has highlighted that people often resume tracking [29], abandonment has mostly been described as a complete discontinuation of tracking. In our work, we observe more nuanced trends, where parents gradually discontinue tracking or abandon tracking some categories but not others.

3.3 Long-term Tracking

PI literature has often sought to understand people's practices around 'long-term' tracking, typically described on the order of months to years of tracked data [30, 35, 69]. Beyond the duration, long-term tracking is characterized by the presence of major changes in tracking habits and needs, with people's tracking needs and behaviors evolving over these long periods of time [45, 69]. Goals especially change, evolving with better self-understanding [26, 74] and as circumstances change [26, 69]. Moreover, people change their tracking practices to match their goals and circumstances, such as tracking less or switching to automated methods. As highlighted by Meyer et al. [69], capturing such data over extended periods is inherently difficult. If tracking burden is high, such as for journaled or logged data, users often disengage after a few weeks or months, leading to incomplete, inconsistent, or fragmented datasets [35, 95]. Long-term tracking, therefore, frequently becomes incidental, happening passively through digital devices, rather than purposefully, which further reduces data quality and control [69]. Long-term tracking has therefore often centered on wearable technologies or other passive sensing approaches [45, 58, 71, 89], where people may continually collect data over longer durations, but may not reflect on it in as much detail. Conversely, manual tracking, which baby tracking is an example of, has been typically associated with shorter durations of tracked data given the high burden associated [16, 32, 47, 54], leaving gaps in understanding how manual tracking practices evolve.

The rapid changes in a baby's development result in frequently changing goals and data needs. For example, over weeks or months, baby-tracking practices shift in response to frequent, more minor changes in infants' sleep routines or feeding habits [4, 19, 80], and more major changes such as caregiver transitions, returning to work, or changing childcare arrangements. The impacts of these sorts of changes on tracking parallel the impacts of common changes in long-term tracking for adults, ranging from minor routine shifts (e.g., adjusting work schedules, temporary health problems) to more major life transitions (e.g., moving or changing jobs), where tracking habits or tracking goals change [1, 25]. However, whereas these changes occur fairly infrequently for adults and often come into focus over months or years, both minor and major changes arise regularly in baby care, compressing long-term tracking dynamics into a much shorter period of time. Baby tracking, therefore, provides a useful case study to examine long-term practices over a shorter timescale.

4 Methods

We used a mix of quantitative and qualitative methods to understand how and why people adopt, use, and abandon baby-tracking apps. Our quantitative analysis centers on participants' use of the Huckleberry App, one of the most popular baby-tracking apps, over time. Our qualitative analysis draws on an interview study to explain why people exhibited the observed use patterns.

4.1 Huckleberry Dataset

To answer our research question about the use of baby-tracking apps, we sought to understand how people's tracking habits evolved over time. We narrowed our focus to Huckleberry, a widely used app whose features were fairly representative of baby-tracking apps more broadly. Further, Huckleberry supported data export, enabling our analysis.

4.1.1 The Huckleberry App. Huckleberry is one of the most widely used baby-tracking apps, ranking in the top 20 of *all* medical apps on the Apple App Store, with millions of downloads on Google Play. Figures 1a and 1b show the *categories* that Huckleberry supports: sleep, milk feeds (nursing and bottles), solid feeds, diapers (and later on potty), pumping, medicine, growth (i.e. weight, height, head circumference), temperature, and activities (e.g., tummy time, brushing teeth, skin-to-skin contact, different forms of play), etc. One log in a given category is classified as an *entry*; as described in section 4.1.2, it is not uncommon for parents to create a dozen or more entries per day and log thousands of entries overall. Daily, weekly, and monthly statistics are offered for each category, such as the average nap length, number of diapers, and total volume of milk pumped. Additionally, Huckleberry supports *secondary information* for many of these categories. For example, Figure 1c shows how logging a mixed diaper can be accompanied by information about the size, texture, and color. Finally, Huckleberry also supports *custom notes* for entries, as seen in Figure 1d for medicine. Users can export all tracked data as a csv file. Excluding popular baby-tracking apps designed for a single category (e.g., breastfeeding or pumping), Huckleberry offers typical coverage of the most common baby-tracking categories.

4.1.2 Participants. We recruited participants throughout the United States. We reached out to multiple local daycare centers and parenting communities near our home institutions, following a snowball

(a) popular categories (b) other categories (c) secondary signals (d) custom notes

Figure 1: Screenshots of the Huckleberry App. (a-b): popular baby-tracking categories. (c): secondary signals for diapers. (d): custom notes for medicine.

sampling approach. We also recruited via online communities related to parenting of young children, Huckleberry, and pumping on Reddit and Facebook, and utilized ResearchMatch.org.

The call for participation stated that we were interested in adult (18+) parents residing in the U.S who have used the Huckleberry App to track their children for at least one month. Interested participants filled out a survey where they disclosed their age, identified gender, race/ethnicity, educational level, and household income, how many children they have, their children's birthday, whether they shared their Huckleberry account with another caregiver, and whether and when any substantial changes had occurred in childcare arrangements across their child's life. They were then provided with instructions on how to obtain Huckleberry's csv export and upload it. Participants received a $10 Amazon gift card upon confirmation of valid data for each tracked child. Our respective IRBs approved the recruitment and data management protocols. We strove to collect minimal information about the minors and anonymize the dataset, such as presenting data in days or months since birth rather than calendar days.

We received 230 responses to our survey, which, after filtering for incomplete responses and spam (e.g., IP filtering, same child's data submitted multiple times), resulted in a dataset of 60 parents and 71 children. Table 1 shows averages, minimum, and maximum values related to the demographics. Of the 18 parents who had multiple children, 10 used Huckleberry to track more than one child (nine used Huckleberry for two children, one for three). Our recruitment focused on parents who tracked for a minimum of one month, as going into data collection, we did not have a clear sense of how long parents would track for. Nevertheless, subsequent analysis showed that most parents tracked for much longer: parents averaged 372.19 days with at least one entry (Table 1). Additionally, forty-eight children had logged at least one entry in the month before uploading their data in our survey, suggesting that their parents were still actively using the app to track.

Table 1: The average, minimum, and maximum values for the data disclosed by the 60 parents in the Huckleberry dataset. Parents' age is at the time of survey completion. 'Total days with ≥ 1 entry' captures both parents who stopped tracking before sharing their data, and parents who may have continued tracking after upload.

Category	Average	Min	Max
Parental Age	33.6	24	52
# children	1.35	1	4
# children on Huckleberry	1.22	1	3
Days from birth to first entry	41.63	0	1,512
Total days with ≥ 1 entry	372.19	22	1,478
# categories tracked	5.66	1	13
Daily entries (any category)	13.57	0.22	34.9
Total entries (any category)	3,270.4	98	14,814

Almost all parents, 59 out of 60, identified as female, and one identified as male. The frequencies for race/ethnicity were in decreasing order: White: 46, more than one: 6, Asian: 4, Hispanic or

Latino: 3, and Middle Eastern: 1. Parents were highly educated overall, with over half (32) having a graduate degree and another third (19) having a Bachelor's. Parents were similarly high income, with 46 having an annual household income over $100,000. 16 parents did not share tracking responsibilities, and 44 tracked with their spouse/partner or other parent. 9 also tracked with at least one grandparent, and 2 with a nanny. About half of the parents (32) reported at least one change in childcare arrangements.

4.2 Interview Dataset

To better understand why parents exhibited different baby-tracking use patterns, we re-analyzed the interview dataset collected by Louie et al. [61], where 20 parents used various baby-tracking technologies such as apps (including but not limited to Huckleberry) and wearable devices. Louie et al.'s work [61] provides detailed descriptions of recruitment methods, participant characteristics, and limitations. These interviews did not explicitly probe around adoption, use, and abandonment in depth, as their work focused on the temporality of reflection. However, their interview protocol included questions that allowed us to discern different adoption timelines (e.g., newborn starters, late starters, adopt-as-needed), gain insight into patterns of use, including habitual, intermittent, and category-switching behaviors, and supported our analysis of when and why parents discontinued tracking. Specifically, for adoption, they asked questions such as "Why did you start tracking [category] (e.g., sleep, nutrition, weight/height)?" For use, they asked questions such as "How did you track [category]?," "Were your tracking habits different at this stage?," and "Did your tracking practices change across different baby stages?." Finally, for abandonment, they asked relevant questions, such as "Is there an age at which you expect to stop tracking certain aspects, and what factors influence that decision?" and "Were there aspects you previously tracked but later stopped? If yes, why?"

Although not explicitly asked, 9 interviewees brought up medical concerns related to weight gain and/or feeding difficulties, patterns that are associated with medical recommendations for tracking [6]. In contrast, other than entries related to spiked temperatures and medication related to acute health issues, we could not reliably deduce such health concerns in the Huckleberry dataset.

We note that the original dataset was also collected in the U.S., and that nine interviewees used Huckleberry, more than any other baby-tracking app in the study. The interview dataset has similar trends in the age of the participants (32.8 for first-time mothers in the Huckleberry dataset versus 33.7 in the interview dataset) and dominance of responses by female-identifying participants (98% in the Huckleberry dataset versus 90% in the interview dataset).

4.3 Analysis

As an initial step, we conducted an exploratory data analysis [96] of the Huckleberry dataset logs. We generated graphs for each individual child for up to the first year of life, marking when tracking began relative to the baby's birth and whether the data stopped because the parent had uploaded it for our study or because of abandonment. We created graphs containing all categories the parents tracked, as well as individual graphs per category. Using Miro boards [1], we observed that parents typically tracked for many months to a few years, and began to notice trends around when parents decided to track relative to their child's birth, differences in how they used the app across categories, and variations in how tracking evolved and was abandoned over time. These observations led us to review the concepts of adoption, use, and abandonment described in prior PI literature [32, 56] and characterize these concepts to be used as codes for analysis. As we were more interested in articulating the practice of how people use baby-tracking apps, we opted for these concepts rather than lower-level descriptions of how data are managed and interacted with (e.g., collection, integration, reflection in Li et al.'s model [56]). Similarly, because we took the specific method of tracking (e.g., Huckleberry) as a given, we chose to characterize adoption of the practice rather than the process of deciding how to track described by Epstein et al. [32]. We then used these concepts deductively, establishing them prior to in-depth analysis, to understand both datasets.

With these observations in mind, we re-analyzed the interview dataset. The analysis that appeared in Louie et al. [61] focused on how parents use baby tracking to reflect in the short term, e.g., immediately or within days. We extend this analysis by focusing on the themes of adoption, use, and abandonment. Using thematic analysis [15], two of the authors used these three parent codes (i.e., adoption, use, abandonment) to identify 11 different practices (subcodes) across them, which characterized the different reasons that drove caregivers' tracking behavior behind each practice. These practices were communicated in regular meetings with the entire team, refining code definitions further.

Following this analysis, we returned to the Huckleberry dataset to understand how the trends mentioned in interviews manifested in participants' data. We categorized participants based on the described practices and began to study their usage. We then continued to iterate between quantitatively analyzing the Huckleberry dataset and qualitatively analyzing the interview dataset. We largely leveraged descriptive summary statistics to highlight trends in Huckleberry data, supplemented with t-tests to statistically compare differences in use patterns between newborn and later starters and the first logged child versus subsequent children among parents who used Huckleberry for multiple children. We jointly present quotes and statistics to interpret the data, triangulating our findings.

We reference parents from the Huckleberry dataset as PX, and present quotes from participants from the interview dataset are identified as IX.

4.3.1 Huckleberry Data Processing. In PI, it is well-known that people try different apps or tracking of certain types of information [55, 84]. We discuss such practices in Section 3.2, but sought to limit their influence on our understanding of parents' typical use and adoption practices. When analyzing the Huckleberry dataset, we therefore considered a category as being *consistently tracked* if its usage was above thresholds we chose based on logging percentiles and a typical number of entries per month. For categories where tracking might reasonably be expected to be frequent (i.e., milk feeds, diapers, sleep, solid feeds, and pumping), we set a threshold of at least 15 entries. For categories that are associated with less frequent activities (e.g., growth, medicine, temperature), we set the threshold to at least 3 entries.

[1] https://miro.com/

When analyzing adoption, we reflected on differences between parents who started tracking during the newborn phase and those who started later. We considered the newborn stage as the first sixty days of an infant's life, aligning with medical definitions that range from the end of the first to the third month [20, 78]. When analyzing newborn and later starters, we focused on the first sixty days of the newborn's life and the sixty days after the first entry, respectively, or up to the date parents shared with us their data.

Throughout the results, we present graphs of individuals' data as well as graphs aggregating use patterns across participants. For legibility, we filter categories to the most relevant to highlight a particular trend. In individual graphs of more frequent categories (e.g., feeding, pumping, sleep, diapers), we also smoothed entry counts across a 10-day window to better highlight the trends versus variation in individual days. As a result, entry counts can be fractional (e.g., 6.54 diaper entries in a day). In the aggregate Figure 4a graph, we removed children from the denominator when they reached the week their data was shared with us to not falsely associate missing data post-upload with abandonment.

4.4 Limitations

We note that the racial/ethnic background, family income, level of education, and gender identity are skewed toward white, affluent, and highly-educated female-identifying individuals. This leaves unanswered questions about the use of baby-tracking technology in the broader population of the U.S., which further ignores variations at a global scale. Additionally, our participants were on average older than the first-time mothers in the U.S. (27.4 years for mothers at first birth [79] versus 32.8 years for first-time mothers in the Huckleberry dataset and 33.7 in the interview dataset).

Our expectation is that our Huckleberry dataset skews toward highly active trackers. Requiring at least a month of tracking further removes understanding of participants who tried to track, but abandoned quickly, and/or did not find tracking valuable. Our dataset likely emphasizes mothers who have access to parental leave and might have higher rates of tracking aspects like breastfeeding. Within the U.S., less than 30% of workers have access to paid parental leave [76]. The large number of parents who mentioned parental leaves aligns with their high socioeconomic status; mothers who have access to and utilize parental leaves tend to be older, less likely to be a racial or ethnic minority, have a higher education, and breastfeed for longer [44, 72]. Because socioeconomic status is strongly tied with adverse health outcomes for infants [90] and has consequences across the life course of an individual [14], we recommend caution in generalizing our findings to the tracking experiences of this population. Further research is needed to examine how to support tracking practices of this group, in addition to understanding whether tracking is beneficial to promote. We also acknowledge that although Huckleberry is a typical multifaceted baby-tracking app, and we did not observe any differences in the interviews across users of different apps, it might not perfectly represent all baby-tracking technology, which could affect the observed tracking behaviors. For example, some other baby-tracking apps are uni-faceted, such as supporting only breastfeeding or sleep tracking. These apps may lead to different adoption, use, and abandonment patterns.

4.5 Positionality Statement

The first and last authors have become parents in the three years prior to collecting the Huckleberry dataset. They both used baby-tracking apps, including Huckleberry, extensively, tracking multiple categories such as breastfeeding, pumping, solids, diapers, and sleep for more than one year. They both maintain social connections with new parents who have used baby-tracking apps and have anecdotally shared their experiences. Their experience brought awareness about the nuances of adoption, use, and abandonment in baby tracking and likely shaped how they interpreted the two datasets. One student author previously worked in early-childcare settings and interacted with parents who used baby-tracking apps. The remaining are all students who do not have prior experience with baby tracking.

5 Results

In our findings, we unpack parents' practices of adopting baby tracking, using tracking apps, and abandoning the practice. We describe different common patterns and reasons why parents follow each of the practices.

5.1 Adoption

Most commonly, parents began tracking during the newborn phase of their children's lives. However, for some, the lack of anticipated benefit led them to begin tracking later. Parents often added more categories some time after they began tracking their newborn, typically in response to developmental milestones.

5.1.1 Newborn Starters. While the newborn period is typically defined as the first two months of life, the vast majority of our Huckleberry dataset parents (for 59 out of 71 tracked children, or 83% of the entire dataset) started using the app to track right at the birth of their child or within a few days. Among them, 66.1% had started tracking on the day the baby was born, 88.1% within the first week, and 97% within the first month.

On average, newborn starters tracked 4.8 categories during the first two months of a baby's life (Table 2). Most commonly, parents tracked categories related to their child's intake (e.g., feedings) or output (e.g., diapers), and to a lesser extent, tracked pumping, sleep, and growth. Other less frequent categories included baths, medicine (including daily vitamin D), tummy time, and skin-to-skin contact. Overall, parents tracked rather intensely during the newborn period. On average, newborn starters tracked at least one entry in 91.5% of the first 60 days of a baby's life, averaging 19.55 entries per day across all categories.

The data that parents tracked was often in line with guidance by the American Academy of Pediatrics around the number of feedings and diapers [3, 7]. 87.7% of tracked babies had at least 6 tracked milk feeds, and 43.1% had at least 6 tracked diapers. Although a baby's actual activities may deviate from what parents logged (e.g., the parents may have skipped entries, or data may be inaccurate), we note the difference in tracking intensity across milk feeds and diapers. There are no exact recommendations for sleep for newborns due to the wide range of normal variation in duration and patterns of sleep [5, 80].

Parents who started tracking while their baby was a newborn often monitored their newborn's habits to **ensure alignment with medical guidelines**. In the interviews, parents mentioned that their medical providers asked them to monitor information that they deemed representative of an infant's appropriate growth. For example, I3 mentioned, *"In the beginning, [tracking] diapers is essential. That's the question that doctors will ask you in the first couple of visits: 'How many wet diapers per day?' "* They also mentioned that baby tracking allowed them to be organized and efficient in their communication. For example, I1 stated, *"[Huckleberry] was so helpful because I remember when he was born and we were at the hospital for three days, I hadn't downloaded the app yet. I had a notebook and was not doing a good job keeping track of his pees. And the nurse yelled at me almost. She was like, 'This is really important! You have to keep better track!' So then I started using the app."*

Tracking early on also provided parents **peace of mind**. First-time parents mentioned that tracking in the newborn phase helped ease their anxiety about their baby's well-being. For example, I6, a first-time parent, explained, *"I would say [I am tracking for] peace of mind. Since she's so little, and I don't know what I'm doing, I'm trying to use something that would hold me accountable. Like 'okay, you already fed her, don't feel bad if she's crying because baby's cry is not that she's hungry.' "* Similarly, I16, also a first-time parent, explained why she started tracking sleep early on, *"Initially I felt really overwhelmed and confused about newborn sleep because they spent so much time sleeping and they're awake for such short periods."*

5.1.2 Later Starters. A smaller subset of parents started tracking all categories later in their child's life, after the newborn period. In our Huckleberry dataset, for 17% of children (12 out of 71), tracking began after they were at least two months old. Parents who were later starters varied in when they adopted tracking. P14 used Huckleberry for tracking multiple of her children, and started tracking their eldest child at 1512 days (around 4 years old), which occurred within a week of starting to track their youngest. Excluding this significant outlier, the latest that tracking began was at 384 days (P35, around 12 months). On average, tracking for later starters began at 161.1 days (about 5 months) past birth. Overall, later starters tended to track less than newborn starters, averaging 3.25 categories ($t_{69} = -2.29, p = 0.025$, 95% CI=0.20-2.96 fewer) and 12.64 entries per day ($t_{69} = -2.13, p = 0.037$, 95% CI=0.37-11.55 fewer) in the first 60 days of tracking (summarized in Table 2).

Late starters mentioned that they **did not expect to derive value from tracking during the newborn phase**, since that period tends to be more unpredictable. For example, I13, who did not use any baby-tracking technology during her baby's first three months, introduced sleep tracking later, explaining that sleep *"in the early days doesn't really matter. Sleep is whatever."* I15, who had twins, mentioned how unpredictable the infancy period was with two children, which led her to start tracking late. She explained, *"We didn't track at first with the twins, just because it was too chaotic. We added sleep later when we got a rhythm."*

Sleep was the most commonly tracked category among later starters; all but one tracked sleep. Parents who started tracking later mentioned that it helped them establish a schedule. For example, I4 explained, *"We noticed it is important to have a regular schedule for naps during the day as well. And so we started tracking, and it [sleep] improved a lot."* I14 explained why sleep was the only category they tracked: *"I just wanted to make sure they were getting enough sleep overall, so I didn't track everything, just sleep."*

5.1.3 Adopting Categories as Needed. Regardless of when parents started tracking relative to their baby's age, many adopted additional categories as their child grew older and new needs and priorities arose.

In our Huckleberry dataset, for 46.5% (33 out of 71) of tracked children, at least one category was introduced at least 2 months after tracking began. Out of these, for 55% (18 out of 33) at least 2 categories were introduced, and for 33% (11 out of 33) at least 3. The average number of categories introduced after 2 months of tracking was 2.33, with the maximum being 8.

Solid feeds was the most common category to be introduced late, with 19 parents beginning to track the category after they had already been tracking for 6 months (average of 183 days after starting to track; 200 days for newborn starters, 120 days for later starters). Nine parents who were newborn starters introduced sleep later, averaging 105 days after starting to track (106 days into a baby's life, on average). Categories associated with earlier milestones, such as milk feeds, diapers, and tummy time, were among the least likely to be introduced after two months of tracking. Only two children introduced diapers and tummy time over two months after starting to track, and one child had milk feeds introduced.

In the U.S. context of this study, recommendations are for breast milk or formula to be the sole source of nutrition for the first 4–6 months of a child's life [4]. Therefore, when parents began tracking solids later, it was typically **introduced in response to developmental milestones**. Parents explained that they introduced tracking solids later on to monitor any allergic reactions and understand what foods their children enjoyed. For example, I9 described starting to track solids at around six months, saying, *"We are tracking nutrition of solids to learn and understand allergens. So we will track 'we gave them peanuts today.' Track that for two or three days, 'was there any reaction?' "* I8, who did not have concerns about allergies, tracked solids, saying, *"It's more fun [to track] because it's not just milk. It's like he likes this, he doesn't like this. And the app gives you the opportunity to say 'he loves it, he hates it, he's in between on it.' "*

5.2 Use

While many parents tracked habitually, some adopted more intermittent patterns. Childcare transitions led parents to increase their commitment to tracking or switch which categories they tracked.

5.2.1 Habitual Tracking. Many parents fell into a pattern of tracking habitually, generating many entries in one or more categories. 39% of children (28 out of 71) had a six-month stretch where their parents averaged at least five entries per day across all categories. Sleep and milk feeds were the two longest-tracked categories for 41% of the children (29 out of 71), with an average of 323.8 and 211 days between the first and last recorded entry. Other habitually-tracked categories included diapers, pumping, and solids, with an average of 198.3 days between the first and last recorded entry for diapers, 156.8 days for pumping, and 154 days for solid feeds.

Table 2: The 59 newborn starters created many entries across multiple categories during the first 60 days of life. Over the first 60 days of tracking, the 12 later starters tended to track fewer categories and generate fewer entries than newborn starters. Differing numbers of babies in each category cause the average number of entries in the 'Any category' to differ from the sum of all categories.

Category	% Children		Average % days tracked		Average # daily entries	
	Newborn starters	Later starters	Newborn starters	Later starters	Newborn starters	Later starters
Milk feeds	96.6%	75.0%	89.4%	82%	9.07	6.97
Diapers	86.4%	41.7%	78.9%	66.6%	5.79	3.89
Pumping	64.4%	25.0%	73.8%	54.1%	3.66	2.43
Sleep	62.7%	91.7%	65.6%	92.4%	4.39	5.32
Growth	57.6%	25.0%	12.7%	5.5%	0.13	0.08
Other categories	59.3%	50.0%	44.4%	27.0%	1.04	0.58
Any category	**100.0%**	**100.0%**	**91.5%**	**86.6%**	**19.55**	**12.64**

For habitual trackers, tracking frequency within a day was also high. Figure 4b shows the average daily logs per participant per week since the first entry for a category. Around the 6-month mark of tracking (24 weeks), 65.2% of parents who tracked milk feeds (per Figure 4a) generated, on average, 7.95 entries per day. Other categories, similarly, remained prevalent after 6 months, such as 54.3% of parents who tracked sleep and created on average 4.13 entries, 38.3% created 3.98 diaper entries, 25% created 3.32 pumping entries, and 12.3% tracking solids with 1.98 entries per day.

Figure 2a shows an example graph of a parent, P56, exhibiting habitual use patterns. P56 tracked five categories habitually, with two of them being tracked habitually up to the time that the data were shared with us, when the child was over three years old. Similarly, in Figure 2b, P11 tracked four categories habitually for more than one year, without a lapse longer than a day from her child's birth and onward.

Some parents described habitually tracking because they **enjoyed collecting the information**, gained a sense of **peace of mind and accomplishment**, or had simply gotten **used to the practice**. I15, who still tracked milk feedings for her twins when they were 9 months old, said, *"I still do it probably because I have a little bit of postpartum OCD. I feel like I need to see it through until the end. [...] We'll be continuing to track, just for consistency's sake, or that's a habit that has now been built in, so we continue to do so."* I10, who tracked pumping for over six months, out of habit, mirrored these comments, saying *"Pumping was the thing I tracked the longest. I continued tracking it until I stopped pumping. For no particular reason, not like it was information I needed. I had been doing it, and I had gotten really invested in it."* Sleep was a category that 41% of the parents tracked the longest, for an average of 407.9 days (max: 1378). I4, who at the time of the interview had a 10-month-old baby, predicted that she would continue tracking sleep for peace of mind until her baby went to daycare, saying, *"For sleep, I would keep tracking it. For now, for peace of mind, I just do it. [...] But once he goes to daycare, [...] I would reduce [tracking sleep]."*

5.2.2 Intermittent Tracking. Categories like growth, temperature, and medicine were often intermittently tracked and associated with monitoring a child's well-being. On average, parents waited 34.07 days between any two growth entries and 40.77 days between temperature entries. Excluding daily vitamin D entries, the average gap between days with medicine entries was 33.53 days. When looking up to the first year of a baby's life, growth was logged, on average, 11.95 (min 3, max 65) distinct days, medicine (excluding vitamin D) on 47.39 days (min 1, max 265), and temperature on 9.77 days (min 1, max 25).

Although parents eventually tracked these categories intermittently, they did so more frequently during the newborn phase. During this phase, parents averaged 10.14 days between growth entries, 6.00 days between temperature entries, and 2.08 days between medicine entries (excluding vitamin D).

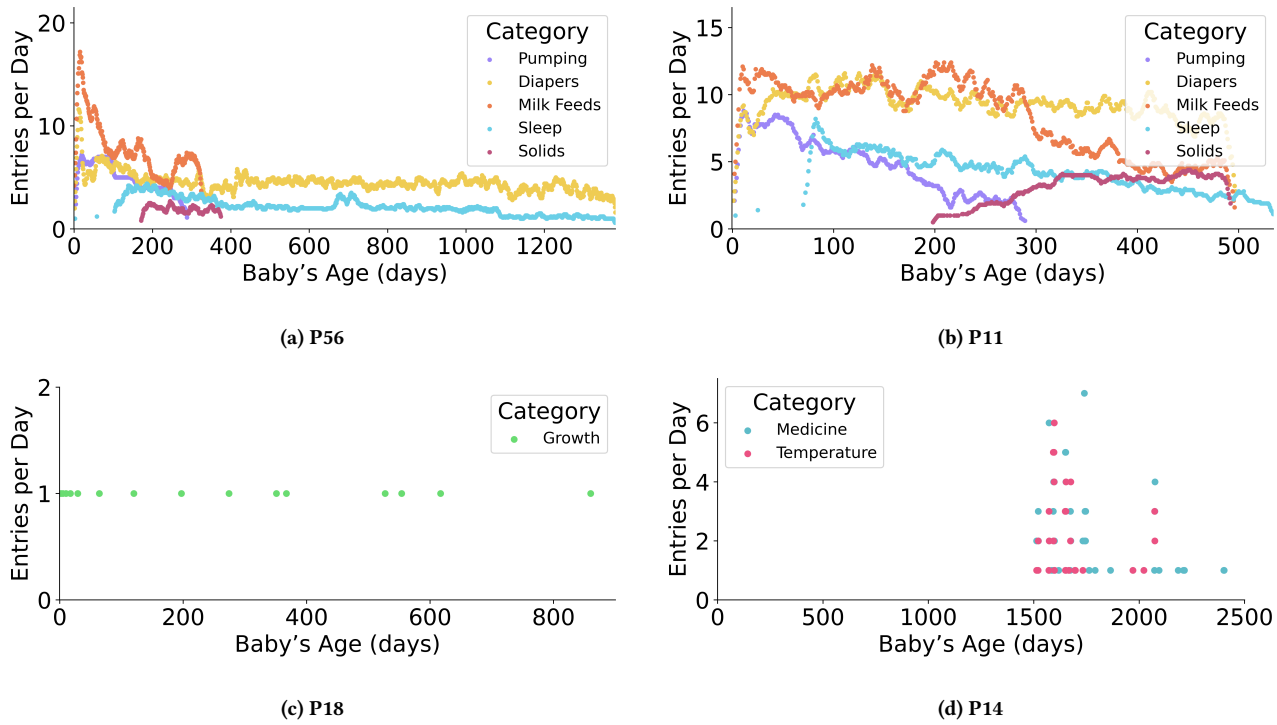
Figures 2c and 2d show two examples of parents, P18 and P14, who tracked intermittently categories like growth, temperature, and medicine. For P18, growth entries were frequent during her baby's first weeks but later became more sporadic. P14 often tracked temperature and medicine together when her child was sick.

Parents described tracking intermittently when an **unusual behavior or medical concern** that might impact their child's health arose. For example, I9 said, *"Yes, [we tracked medicine] when she had a fever, and it was more frequent. [...] for the sake of data collection, we absolutely did note the temperature [too]."*

Parents also commonly mentioned tracking at **irregular intervals during medical visits**, especially growth information such as weight, height, and head circumference. I17 stated, *"When we have her doctor's appointments, we're [tracking growth... The doctor's office] just writes down what her growth is on a little form that has more information on it, and then I put it on the app I use."* I8 similarly mentioned tracking growth mostly during doctors' visits, saying, *"We don't manually track it at home very often because it's not the easiest thing to do. When we go to doctor visits, they take measurements and we put them in Huckleberry."*

5.2.3 Increased Commitment to Tracking. As will be discussed in Section 5.3, parents largely decreased how frequently they tracked as their babies got older. Occasionally, parents became more invested in tracking some aspects of their child's well-being, resulting in more frequent or more complete data entries. This increase was largely driven by **changes in care**, such as a parent returning to work or the baby starting to attend daycare.

Overall, we identified 16 children's data with indications of increased commitment. For example, Figure 3a shows that when P45 returned to work around day 150 (when her baby was about 5



(a) P56

(b) P11

(c) P18

(d) P14

Figure 2: (a-b): Two examples of parents who exhibited habitual use patterns, having started tracking their child at birth, tracking most days, and continuing past the first year of their child's life. (c-d): Two examples of parents with intermittent patterns of use, infrequently tracking growth as her child aged (c) and intermittently tracking medicine and temperature when her child was sick (d).

months old), she began tracking pumping more frequently. This increased commitment to pumping was rare in the Huckleberry dataset; only one more parent, P13, demonstrated it. In the interviews, some mothers also mentioned increasing tracking pumping after returning to work. For example, I20 mentioned, *"When I first returned to work, I was pumping more. I was really tracking closely and trying to make sure that I didn't mess up my supply."* Similarly, I16 explained, *"When I went back to work, that's when I started pumping more, and I used the app to time the pumping session. Now that I'm more consistent with my pumping schedule, it feels more feasible to track how much I'm pumping."*

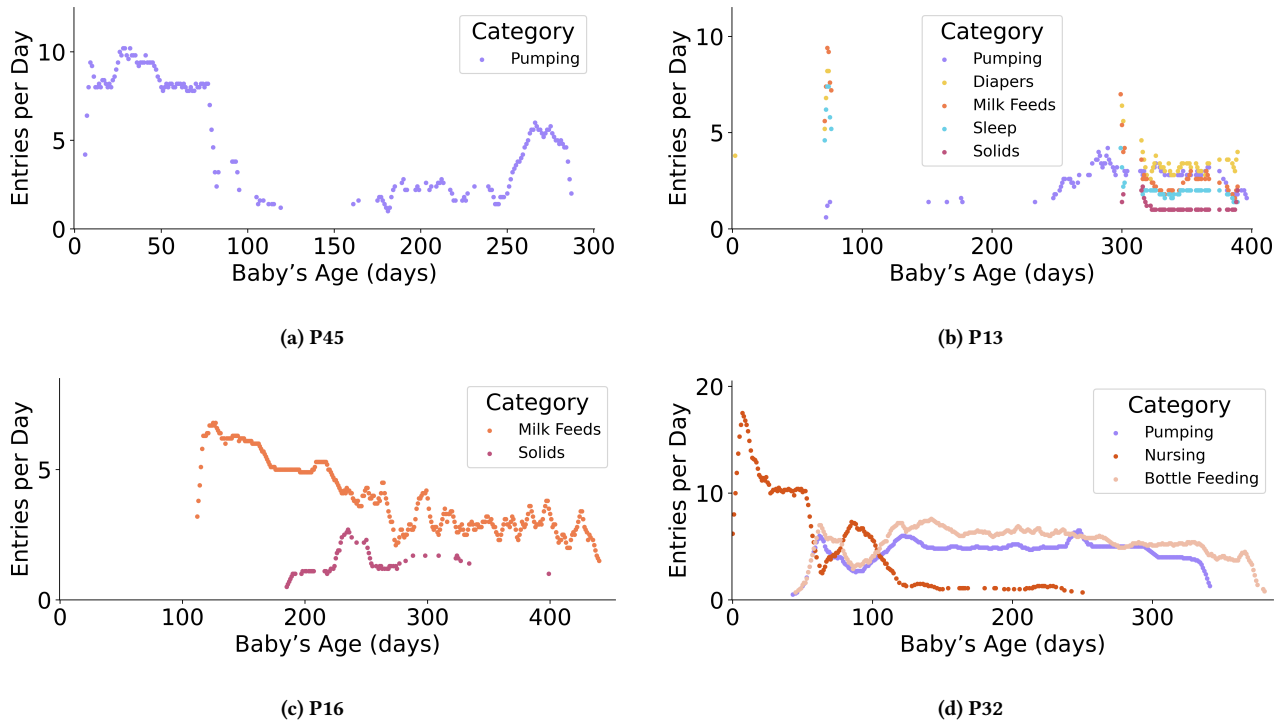
We also observed an uptick in data entries in 4 out of the 22 parents who marked when they introduced another caregiver, like a nanny or daycare. For example, Figure 3b shows how P13's tracking became more consistent when her baby was about 10 months old, coinciding with a nanny beginning to help with childcare.

5.2.4 Switching Tracking Categories. Parents often decreased tracking certain categories about their baby's well-being roughly while introducing other categories. Switching categories was particularly common among mothers who tracked nursing, pumping, and bottle feeding, associated with **changes in care strategies**. For example, Figure 3d shows the data of P32, who switched from exclusively nursing to pumping and bottle feeding the expressed milk when her baby was around 1.5 months old. As pumping and bottle feeding increased, nursing dropped to a single session per day. Overall, this pattern of switching was observed among 25% (11 out of 44) of the children where pumping and milk feeds were tracked.

In the interview dataset, we saw similar experiences, especially among parents who pumped exclusively. For example, I18 switched from tracking nursing to pumping and milk intake (bottle feeding the expressed milk), saying, *"We were breastfeeding for about the first 10 days and then we had some difficulty latching [...] As soon as we switched to exclusively pumping, her weight started to go up more consistently than when we were breastfeeding."* Similarly, I10, another exclusive pumper, stated, *"At some point we switched from me trying to nurse, because it was making me very anxious, to pumping and giving her a bottle because we could track more closely how much she was getting."*

Switching categories was also associated with **adopting developmentally appropriate categories**. Most commonly, this occurred when babies began to transition to solid foods, which the AAP recommends between 4 and 6 months [4]. Parents would begin tracking solids, and the frequency of tracking milk feeds would decrease. For example, Figure 3c, P16 introduced tracking solids when their child was about 6 months old, after which milk-feed entries decreased. We observed such a switching pattern in 31.6% (6 out of 19) of the children who logged both milk and solid feeds.

Parents also occasionally continued tracking a category, but gradually changed the data type they were inputting. For example,



(a) P45

(b) P13

(c) P16

(d) P32

Figure 3: Examples of parents with increased commitment in tracking (a–b) and of switching categories (c–d). Participants increased tracking frequency after returning to work (a) and getting additional childcare support from a nanny (b). Participants switched their feeding methods from milk to solids (c) and nursing to bottle feeding (d).

the AAP recommends that at around one year old, children may transition from drinking breast milk or formula to cow's milk [8]. In our Huckleberry dataset, out of the 15 parents who regularly tracked milk feeds when their child was one year old, 46.7% (7 out of 15) switched the type of milk feeds they logged from breast milk or formula to cow's milk.

5.3 Abandonment

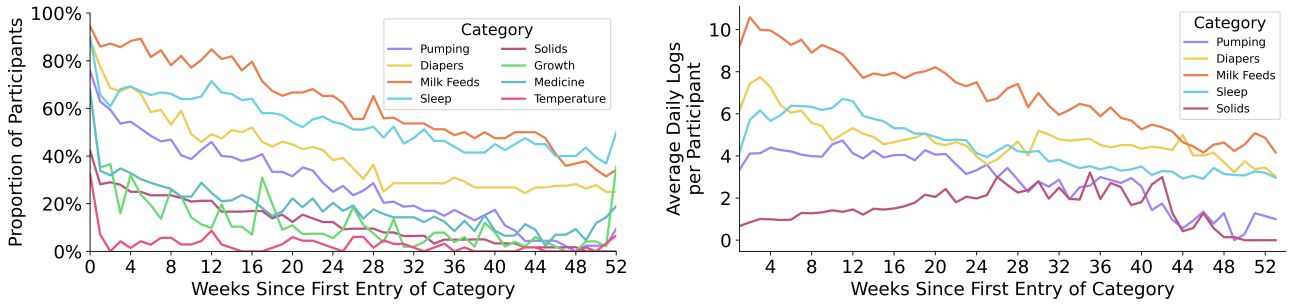
Although it may be fair to assume that all parents planned to abandon tracking their babies at some point, we observed additional trends where parents gradually decreased what and how often they tracked, or trialed different tracking categories.

5.3.1 Dropping Categories Altogether. Similar to abandonment practices in other PI literature [18, 28, 54], parents frequently dropped tracking one or more categories. Figure 4a illustrates the proportion of participants who tracked the most common categories for each week since the first entry of that category. All categories show a decreasing number of parents actively tracking over time, but sleep and milk feeds persisted for longer compared to diapers, solid feeds, and pumping. For example, initially, 89% of all babies had their diapers tracked, but after 3 months, 49.2% were still being tracked. Similarly, pumping dropped from 75.7% to 46%, and solids from 42.3% to 21%. Milk feeds declined but not as steeply, dropping from 94.4% to 84.7%. Sleep also persisted, lowering from 90% to 71.4%. 32.39% (23 of 71) of the babies had no entries in the month that their data were shared with us, indicating complete abandonment. Among them, children were 21.44 months (min: 5.13, max: 79.51) when their parents completely abandoned tracking.

Similar to use patterns in other tracking domains [18, 28], parents described that they abandoned tracking certain categories when the **value of the tracked data diminished** past the point that it was worth the tracking. For example, parents frequently abandoned tracking diapers after the first few months. As I5 stated about tracking diapers, *"after a month or two, it just didn't feel like it was necessary data."* Similarly, I16 started tracked pumping in an app but eventually stopped, instead relying on a simple clock, explaining that at the beginning, *"It felt more feasible and useful to track. [But eventually,] I wasn't as concerned. I just watched the clock."*

After tracking for a while, many participants described that their data patterns became predictable, and therefore tracking was no longer beneficial. For example, I8 stated, *"[Sleep] just stopped becoming worth trying [tracking anymore...] We do know now what his patterns are. So there's no reason to [track]."* I7 had a similar experience, stating, *"Eventually, it did get to where [my baby] was very consistently eating at certain times, and so it was less necessary to [track...]. So it all hit at the same time, and that's where it kind of felt like 'okay, every single day for the past two weeks I've been logging the same exact thing. I think I've got the hang of it now.'"*

Parents also abandoned tracking certain categories after they received **reassurance from medical providers** that their child's growth was appropriate. For example, I13 abandoned tracking milk



(a) Proportion of participants tracking each category per week, for the first year.

(b) Average number of daily logs per participant each week, among participants who logged that category.

Figure 4: (a) Fewer parents tracked most categories as their child aged. (b) Among parents who tracked each category, most reduced how frequently they logged as their child aged.

feeds when her baby was around 1.5 months old, explaining, *"After seeing the pediatrician and seeing their growth, you have peace of mind."* Similarly, I16 stopped tracking diapers, saying, *"After we had established with our pediatrician that he was having plenty of wet and dirty diapers and they weren't concerned about the numbers, I just stopped tracking [diapers]. Because it was just too much."* The reassurance from the pediatrician and the cost of tracking were enough to justify dropping tracking diapers.

For some parents, tracking felt no longer necessary when they **established confidence in their parenting skills**. For example, I8 described, *"I'm more relaxed than I was at the beginning because I see them growing and I see everything being okay. And because when you've done something so many times, you know, if you're tracking it to remember that you're doing it, you don't really need a reminder anymore because it's everyday."*

Some parents, especially mothers, also stopped tracking when they **returned to work or childcare arrangements changed**. For example, I15 initially tracked pumping, but abandoned it once she returned to work because of increased anxiety in this new environment, saying, *"I tracked pumping for seven weeks until I went back to work. And then I tracked for two or three days when I went back to work. But it was causing me too much anxiety to keep track of the amount that I was producing at work, [in comparison to] how much they needed. So I stopped tracking it."* I1 described how she stopped tracking milk feeds because her baby went to daycare, which disrupted the previous tracking routine. She stated, *"we used [to track sleep] and after four months, the key change that happened is that [baby] went to daycare where they're feeding him and they're changing his diapers. We first were like, 'we're going to keep track of the diapers and stuff.' And then, you just don't do it anymore because it's really hard on weekdays versus weekends."*

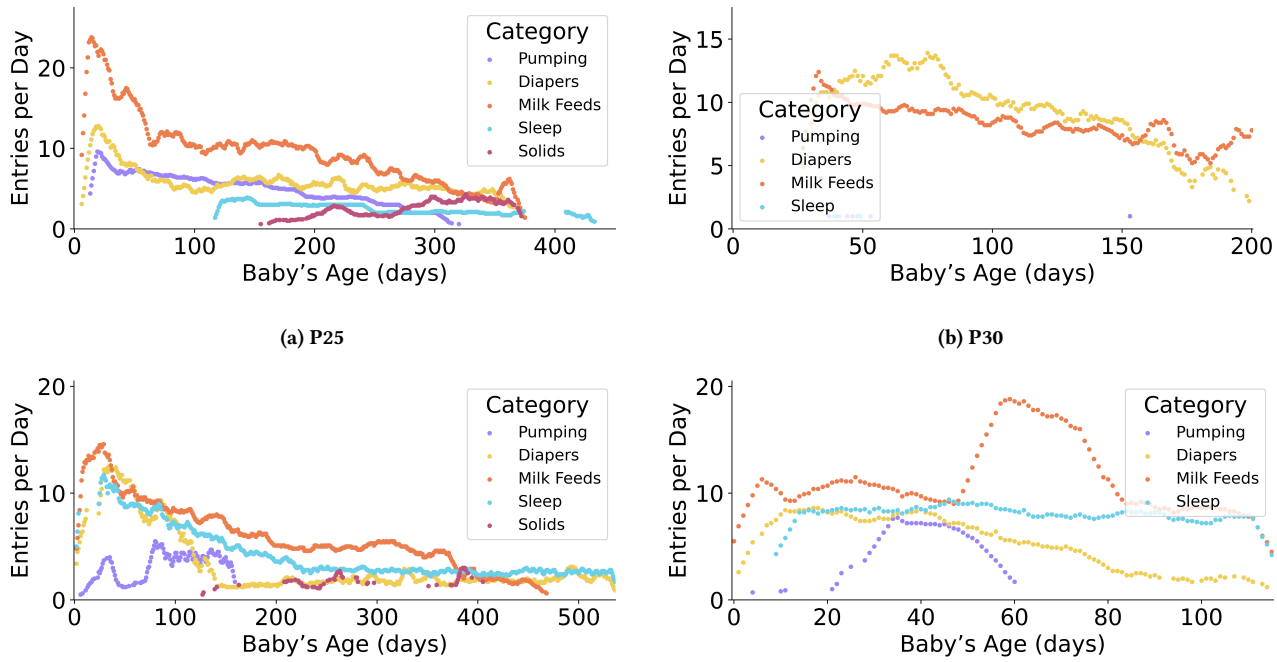
5.3.2 Lessening Tracking Frequency. Beyond outright abandonment of tracking in one category or altogether, parents often gradually decreased how frequently they were tracking. For example, Figure 5a shows how P25 gradually lessened tracking milk feeds, diapers, pumping, and sleep. Figure 4b shows that in most categories, there is a downward trend in the tracking frequency.

Parents typically reduced the tracking frequency of certain categories in response to their baby's **developmental changes**. For example, older babies require fewer naps or feedings and produce fewer diapers, leading to a decrease in these entries. I7 described how the number of milk feeds reduced when her baby slept the entire night, saying, *"We had the period with nighttime feedings and then moved into just making it through the whole night."* I8 described how his tracking of diapers reduced after his infant's outputs changed, saying, *"So early on, you're getting a lot of everything all the time. They're pooping a lot; they're peeing a lot. It's just a lot, all the time. I'd say logging everything early is important. But he's six and a half months now, and he poops maybe once a day."*

Some parents mentioned that they had lessened the tracking frequency of certain categories because they only **continued to get value from a subset of the data** as their baby grew older. For example, I4 initially tracked all diaper types, but as her baby grew older, she only tracked dirty diapers. She explained that initially, *"We were tracking wet diapers, poopy diapers, dry diapers. [...] And then after 3–4 months, it became just logging the poop diaper [...] because we just wanted to make sure that she was staying regular and not getting too constipated."*

As time passed, some parents mentioned they often **forgot to track** some entries, like feeds or diapers. However, they were typically fine with occasional forgetfulness, especially as they grew more comfortable with parenting and their child's patterns. I8 described that when his baby was first born, *"[tracking] was really consistent with the milk and the pumping, and every single thing got logged because it was new. Eventually, we got more accustomed to the routine, and we weren't as worried about forgetting things. We still log quite a bit, if not 90% of the time, but there are times when we forget. 'Oh, it's fine. We know what happened.' "* Similarly, I18 found themselves forgetting to log diapers, which eventually led to abandonment of the category, saying, *"We would forget [to track diapers] frequently. It was one more thing that we had to do, and it was an easy thing to drop."*

Similarly to how **childcare changes** could lead to completely stopping tracking a category, parents also described falling off track with tracking as intensely. For example, I20 described how having her baby go to daycare led to a decrease in tracking, although



(a) P25

(b) P30

(c) P43 Eldest

(d) P43 Younger

Figure 5: (a): An example of a parent, P25, who gradually lessened tracking.(b): An example of trying and dropping certain categories. P30 attempted to track pumping and sleep in the first two months, but quickly abandoned them while continuing to track other categories. (c–d): An example of a parent, P43, who used Huckleberry to track both of their children but abandoned tracking earlier for the younger child.

she still valued seeing the data. She stated, *"Since daycare writes everything down, the record is really good Monday through Friday, and it gets spotty on Saturday and Sunday when it's up to us to exclusively track. [...] Being a little more removed from the day-to-day when he's at daycare, and then not really being worried about any aspect of nutrition or sleep right now, has also led to less concentration on recording. But I still like to see everything."*

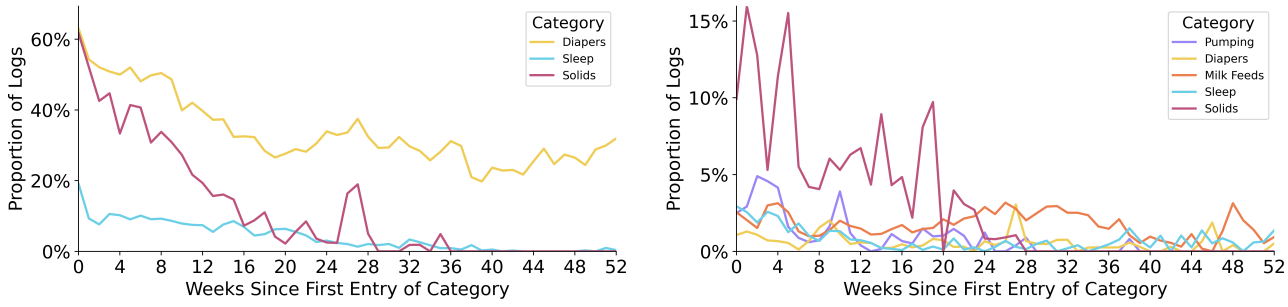
Considering all categories, parents who used Huckleberry to track more than one child tended to track their younger children for fewer days than their eldest ($t_{19} = 02.81, p = 0.11$, 95% CI=162-1115 fewer days). We did not observe significant differences in the number of categories they logged ($p = 0.37$) nor the number of entries they created daily ($p = 0.35$) between the eldest and non-eldest children. Figures 5c and 5d illustrate an example of a parent with two children who tracked their younger child for a shorter period compared to the eldest.

Some parents who tracked more than one child mentioned tracking fewer categories in subsequent children due to an **increase in their confidence** about their parenting skills and a general awareness of what milestones needed to be met. For example, I12, who had four kids, said, *"We were tracking everything she did more carefully because she was the first kid, and we didn't know what we were doing. And we've gotten a little more lax by now."* Similarly, I13, who also had four children, described, *"It had definitely changed from my first to my third. For my first, I was like, 'Oh, look how much I'm tracking. It all looks so pretty. I can like post it on Instagram.' Then you realize it's not sustainable. And I think now with the fourth, I'm like, 'I'll track what I need to track and then I'll let the rest go.' "*

5.3.3 Lessening Entry Detail. Parents in our Huckleberry dataset frequently entered secondary details about their logs, but lessened the level of detail they tracked as time progressed. Almost all parents, 98.3% (59 out of 60), entered at least one secondary signal, most commonly to diaper entries (e.g., stool consistency, color, size; 91.5%), where a child went to sleep (e.g., in arms, in crib; 76.3%), or descriptions of solids entered (e.g., banana, oats, etc.; 39%). 78.87% (56 out of 71) of tracked children had entries with notes in them, most commonly milk feeds (52.8% of notes) or sleep (15.3% of notes).

Figure 6 shows how the number of entries with both pieces of information gradually decreased for the most tracked categories. For example, solid feed tracking initially started with roughly 10% of logs having notes and 61.7% having secondary information, dropping down to 0.8% and 2.5, respectively, %around the sixth month of tracking. Similar trends are observed for sleep, pumping, and diapers. Milk feeds' custom notes slightly increased from 2.5% to 2.9%, suggesting that some parents continued to find value in them.

Parents typically lessened the level of entry detail over time due to the **burden of tracking** and the **perceived lack of utility**. Many parents described being excited to record information initially, but eventually reducing the details. For example, I9 described, *"Early*



(a) Secondary information **(b) Custom notes**

Figure 6: Across all participants, the proportion of logs generated in each week since the beginning of tracking that contained (a) secondary information and (b) custom notes. As their babies aged, parents tended to lessen how frequently they entered both.

on, when we started introducing solid foods, we'd say, 'baby's first banana', 'baby's first avocado.' " He eventually gave up tracking solids in such depth. Similarly, I20 described how they stopped tracking secondary signals for diapers, *"Now, the size, consistency, and color, unless something is abnormal, I don't record it."*

Some parents who tracked more than one child described how their increased confidence enabled them to change the level of tracking detail for subsequent children. For example, I3, a second-time mother, described, *"With my first, I was tracking how many ounces of formula we were giving the baby. But now [...] it's not significant enough for me to mark it."* She then continued contrasting the specificity she used to track, saying, *"For our first kid, we were even making notes of like, when we took the weight, was it after a wet diaper?"* I12, who had four children, mentioned that for her younger children, *"We're not tracking every little detail for months and months. We're kind of doing what feels necessary."* The Huckleberry data partially supported this trend. A marginally higher percentage of entries from younger children contained notes ($t_{19} = 2.00$, $p = 0.060$, 95% CI 0.08% fewer entries - 4.00% more entries), but there was no significant difference in the percentage of entries containing secondary information ($p = 0.157$).

5.3.4 Trying and Dropping Categories. Baby-tracking apps, including Huckleberry, provide many options for what parents can track. Parents often experimented with categories, but dropped some of them within a few days. Two-thirds of the tracked children (47; 67.6%) had at least one entry in a category, indicating that they tried it but did not track it regularly. For example, Figure 5b shows how P30 tried and dropped pumping and sleep, entering 13 and 3 entries, respectively, before dropping both. Among parents who tried and dropped a category (55/71, 77.5%), medication was most commonly tried and dropped (12, 21.8%). Other commonly tried-and-dropped categories included pumping (11, 20.0%), solids (11, 20.0%), sleep (10, 18.2%), and temperature (10, 18.2%).

Some parents described that they were uncertain about what to track in the early days. For example, I9 mentioned, "For those very early weeks, we hadn't figured out as parents how this app works and 'is this information important?' " As time passed, some parents described that they eventually **prioritized to keep tracking manageable**. For example, I7 mentioned, *"For one or two days, I tried to track tummy time, bath time, and everything, and just ended up being very overwhelmed by all of it. I realized that we needed to focus on the things that we needed more regular information about [...] Sometimes you can have analysis paralysis where you have so much information, and what does it actually mean, and how do I use it."*.

Parents also mentioned quickly abandoning categories due to the **emotional burden** of seeing discouraging trends in the data. For example, I3 experimented with tracking pumping, but quickly abandoned it after seeing how much she pumped, saying, *"I think once or twice I tried to keep track of how much I pumped. [...] I never made as much as I wanted, so I was like 'I don't need that depressing data in my app.' "* I10 only tracked weight during doctor's visits: *"I have anxiety, so I intentionally avoided weighing her at home."*

6 Discussion

Our study offers new insights into baby-tracking practices. We situate and extend these contributions within the broader PI literature and conclude with design recommendations for better support of baby-tracking practices.

6.1 Further Insights into Baby Tracking

Our study showed that parents' motivations for tracking aligned with prior baby-tracking literature. For example, parents often adopted categories in response to developmental milestones, such as tracking solids at 4–6 months [49, 91]. These observations provide some evidence that commercial apps are helping parents follow baby-care practices that align with medical guidance. However, our findings further suggest that baby-tracking practices were also shaped by value-driven decisions and challenges with continuing to track.

6.1.1 Value-driven Decisions. Literature on baby tracking has implicitly assumed that parents adopt the practice as soon as their child is born. However, our findings show that even among newborn starters, many parents take a few days to weeks to initiate tracking. This could be because they started tracking on paper, as most birthing hospitals typically get parents started on, explored

different apps, did not realize the value of tracking upfront, or needed some time to settle once they returned home, before they were ready to undertake tracking. Once tracking began, the earliest days were characterized by intensive caregiving demands, including frequent feedings, irregular sleep for both the newborn and caregivers, and constant adjustment to new challenges. Thus, tracking often occurred in an ad-hoc manner in response to these intensive and new needs. During this phase, the value of tracking lay in capturing essential information for day-to-day survival and ensuring that caregivers' record-keeping of this multitude of data aligned with medical recommendations. As babies grew older, the perceived value of tracking changed. For newborn starters, tracking value evolved from allowing them to survive the high-intensity newborn phase to enabling them to identify more stable patterns in the categories tracked and establish routines for their infants. For instance, some parents started tracking sleep later to understand their older babies' patterns to establish a more stable nap schedule.

The presence of later starters further highlights the time gap between birth and the commencement of tracking, which occurred on average 5 months past birth. Parents in this group still derived value from tracking, but believed that early signals on categories like sleep were too volatile to be worth monitoring. This view is consistent with medical literature on early infancy [80]. The value of tracking emerged only once behaviors became more predictable and could help later starters establish routines.

The value of tracking also emerges in less frequent or situation-specific circumstances, like unusual behaviors or signs of illnesses. In these cases, parents adopted tracking to assess what was happening and decide how to respond. For example, parents started tracking temperature and medication in response to their child developing a fever.

Prior work has typically examined baby tracking in siloed categories, for example, in breastfeeding apps [2, 86, 94] or monitoring growth [10, 48, 92]. In contrast, our work highlights that parents' experiences with baby tracking are highly multifaceted, with nearly all parents tracking across many categories. We find that multifaceted tracking enables a greater understanding of the baby's habits. For instance, in the early months, milk feeds and diapers are often tracked together to ensure the infant's adequate intake and output. Further, our work suggests that once the value of tracking has been established, it might also lead to the later adoption of new categories, for example, in tracking solids. Finally, parents also re-prioritized and switched categories; for instance, exclusive pumpers shifted from breastfeeding to pumping and bottle feeding. Although multifaceted tracking is not a novel concept [56, 57], our work shows that parents make effective decisions about when to introduce new facets and how to adapt their priorities. This evolution provides evidence that parents are better supported by multifaceted baby tracking, versus siloing tracking into distinct apps related to breastfeeding, pumping, etc.

6.1.2 Challenges in Continuing to Track. Prior literature often turned to technology to support logistical aspects of being a new parent [9, 50, 82]. Although our work suggests that baby-tracking apps can help fill a similar role, it highlights how routine disruptions can introduce undesired challenges in continuing to track. While past PI work (e.g., [32]) has shown that people make choices to lapse or forget to track, we show that in baby tracking, lapsing is often caused by pressures unrelated to the effort of tracking or the value derived. For example, changes in childcare reshaped parents' tracking habits and led many parents to track intermittently, leaving gaps in their entries despite still desiring to have the data. Especially for mothers, returning to work led to tapering or abandoning certain categories like milk feeds and pumping, consistent with evidence that full-time work is linked to declines in breastfeeding [66]. Conversely, for a small number of mothers, it led to an increased commitment to tracking pumping to maintain a stable milk supply.

Related to the circumstances of one's family, we also saw that parents with multiple children tended to track younger babies for shorter durations, though the number of categories and daily entries remained similar. Our findings suggest that these decreased practices may be in response to greater self-confidence in parenting. However, the added challenges of giving birth to additional children [36] point to an opportunity for future research on how to support these multiparous experiences.

6.2 Beyond Baby Tracking

Much of our understanding around how people approach tracking in the long-term has largely drawn from people's self-reported characterization of their goals shifting, habitual tracking, and the impact of disruptive events [26, 69, 74]. Our study helps empirically characterize how these practices manifest in people's tracking experiences, in the case of baby tracking. Although it is often suggested that people's goals change as they track [26], we see that over the long term, parents adopt new practices as they become important towards monitoring their child's well-being and discontinue or lessen other practices when they learn enough. Disruptions, particularly incidents when children get sick, lead to intermittent periods of greater tracking, aligning with episodic use practices [40]. We find that parents often fall into habitual rhythms of tracking, where they continue to collect data not necessarily because they find it useful, but because they appreciate having it [84]. Empirically observing how goals and needs change frequently helps validate prior inclinations about long-term tracking habits. It also surfaces new patterns, such as gradual discontinuation from tracking or increasing commitment in response to external events like changes in care.

For example, we observed variability in the timing of the adoption of baby tracking in relation to the birth of the baby based on value-driven decisions and major life transitions, such as changes in childcare. We suspect that similar tracking adoption patterns may exist in other domains, such as pregnancy tracking or the management of chronic diseases, where tracking may similarly start later than the initial diagnosis or becoming aware of the event, and for similar value-driven reasons. For example, it has been suggested that pregnancy tracking often begins with the confirmation of pregnancy [34], but we suspect that many may derive more value from tracking after miscarriage risks decrease in the second trimester, and therefore may choose to adopt the practice later.

It has been well-documented that fully-manual forms of tracking like journaling are often abandoned fairly quickly, as people

stop continuing to find enough value in the data to justify the process [16, 32, 47, 54]. Although parents often abandoned facets of baby tracking as they became less relevant, our findings show that many parents continued to use the technology and find value in the practice for years, which is atypical of journaling-based tracking technology. We suspect this is because the tracking practice aligns with their priorities and values, in particular, enabling people to do whatever they can for the health and well-being of their children. This suggests that people may be more willing to put in the effort to track if it is also for the benefit of others they care about, rather than only for themselves. We hypothesize that in other high-burden domains, such as food journaling, efforts that additionally center on the value for others, like family informatics approaches [81], could be effective in ensuring that people continue to track and reflect for their own benefit as well. Nonetheless, further empirical work is needed to compare the impacts of such systems on sustained use.

When analyzing how parents abandon baby tracking, we found that abandonment often occurred in more nuanced ways than previously described in PI literature. Parents may reduce the frequency or stop tracking certain categories while continuing others. These gradual or partial forms of abandonment reflect the multifaceted [56] nature of baby tracking, where stopping certain aspects of tracking does not mean ending the practice entirely. In contrast, prior PI literature has largely characterized abandonment as a clean break. We also observed this clean-break pattern in our study, where some parents stopped tracking altogether either because they believed that the cost of tracking outweighed its value [28], or because they felt they had learned enough and developed confidence in their parenting skills [28, 32, 54]. Our findings, therefore, expand on prior characterizations by revealing a spectrum of abandonment rather than a singular endpoint.

These observations suggest a need to think further about how we define abandonment, and what design strategies we use to account for or avoid abandonment. Although our findings align with prior work suggesting that many parents are fully happy to abandon baby tracking [18, 28], there is an opportunity for other PI apps to account for practices like lessening frequency, lessening detail, or tracking intermittently. For example, although people often abandon daily food journaling, they continue to use the apps to learn more about new foods they eat [62]. But, the calorie- and goal-based approach of most food journaling apps does not align with infrequent entries, which would severely undercount consumption [21]. It could therefore be worthwhile for future research to reflect on whether or how tracking apps should support these lessened practices.

6.3 Design Recommendations

With an understanding of parents' tracking behaviors around adoption, use, and abandonment, we discuss design recommendations to better support them in these practices.

6.3.1 Designing for adoption. Our findings indicate that caregivers' use of tracking categories varies based on whether they adopted baby-tracking technology when their child was a newborn or a later starter. Baby-tracking technology could better account for these different patterns of adoption by emphasizing the content that caregivers typically find most critical at that phase, which could help with delivering immediate value while caregivers establish their tracking routine or practice. For newborn starters, the support could be on easy access to recording multiple entries in a day, reflecting on the most recent entries, and providing daily summaries that offer reassurance that the newborn's daily needs are in alignment with medical recommendations. However, such functionality must be designed with caution, as several tensions arise. Especially during the often unpredictable newborn phase, guidance that is too prescriptive, even when intended as helpful, can overwhelm parents with excessive data, induce anxiety, and undermine parental intuition [98]. For later starters, because they began tracking when the baby's behaviors had already started to stabilize, the data they recorded tended to be more predictable, and the value of tracking became more oriented toward helping them establish routines. As such, apps could prompt caregivers to track data for a short period with the goal of providing insights through these data for establishing schedules, e.g., identifying ideal times for the infant to nap or go to sleep for the night, or providing recommendations for a feeding schedule.

Although we find that caregivers tended to adopt tracking new categories in line with common developmental milestones, baby-tracking technology can also serve as an educational resource for how to respond to these milestones, in tandem with the formal medical system. For example, baby-tracking technology could provide time-sensitive guidance for supporting adoption categories as needed to assist with categories related to common developmental milestones, such as introducing solids at six months. At this stage, technology could flag common allergens or recommend to parents how to introduce new food families, such as shellfish or nuts. Nevertheless, developmental milestones vary widely—preterm infants, for example, may reach milestones later than full-term babies—and recommendations may not be universally applicable. Systems could frame guidance as informational aids rather than prescriptive instructions to not substitute for professional medical advice.

6.3.2 Designing for use. From our data, we find that as baby tracking becomes established as a practice and babies grow older, caregivers' values evolve across different stages. We suggest that baby-tracking technology could better adapt to these evolving needs. For example, the three-month mark of a baby's transition from a newborn to an older infant is often when routines start to stabilize, such as having longer sleep stretches and requiring less frequent feedings. At that point, apps could facilitate newborn starters' transition from the highly intensive newborn-tracking period by assisting them in establishing schedules, similar to the experience of later starters. This could translate into recommendations related to the timing of naps and feeds, but is accompanied by the same potential precautions needed that we highlighted earlier.

Our findings show that childcare transitions (e.g., caregiver returning to work, infant going to daycare) can bring significant changes in the existing tracking practices, sometimes in ways that caregivers appreciate (e.g., forcing abandonment of practices which became habitual) but also often before caregivers were ready to forego tracking or the data. Current baby-tracking technologies do not support anticipating, preparing for, and accounting for

the impact of these childcare transitions. We suggest that baby-tracking technology could highlight tracking practices that commonly change for caregivers during this transition point, such as emphasizing a rise in pumping, which may occur during the work-week. Apps could introduce logging shortcuts for pumping, while temporarily hiding or minimizing categories that become less in focus when childcare responsibilities shift, such as diapers or feeding. Baby-tracking apps could also better highlight the impact of such a transition on their baby's habits, such as indicating how transitioning to a daycare nap schedule has an influence on night sleep. Technology could also take into account that after such transitions, tracked data may appear not to follow medical recommendations (e.g., total sleep duration, feeding amount) as caregiver logs become less complete. As such, traditional daily views of totals can offer a misleading picture of a baby's well-being getting off track, which may pose a risk if medical recommendations are tightly embedded in baby-tracking apps.

Finally, we find that caregivers often track intermittently in response to unusual behaviors or medical concerns. Current baby-tracking technologies, however, are designed for continuous, routine logging and present information primarily as a linear timeline with static categories (e.g., feeding, diaper, sleep, medicine), which makes it challenging to capture patterns that emerge in less frequent or situation-specific tracking. This can limit their usefulness when parents are tracking particular concerns, such as medication intake and symptoms during a child's illness. We identify opportunities to improve intermittent use by introducing context-shift modes. For example, common combinations related to medical concerns included temperature/medicine or feeding/diaper. Systems could detect these patterns and provide contextual prompts, such as reminding parents to check the temperature after medicine or suggesting optimal times to log feeding and diaper events together.

6.3.3 Designing for abandonment. Some participants described feeling overwhelmed when baby-tracking apps presented a large number of categories. Parents often tried several categories at first, but quickly abandoned those that they perceived as presenting a high cost of tracking or providing limited value. Technology could aim to guide parents toward prioritizing which categories to minimize frustration and information overload. One approach is to provide recommendations based on the baby's developmental milestones during the onboarding step and allow caregivers to re-filter these settings according to their needs at any later time. We also found that as babies grew older, caregivers' tracking habits often became habitual, without deep consideration of whether the data continued to be useful. Baby-tracking technology could highlight when patterns from the tracked data have remained stable (e.g., similar wake-up times or feeding volume over weeks or months) and suggest discontinuation to alleviate some of the unnecessary burden of tracking when no new information is derived.

Our results also show that caregivers may also lessen the frequency and the level of detail or abandon tracking certain categories due to changing life circumstances (e.g., childcare transitions and returning to work) even though they still find value in tracking. Technology could support these situations by leveraging previously logged data to identify gaps and suggest missing entries, for example, predicting feeding or sleep events based on historical patterns, helping parents stay informed even during periods of intermittent tracking. At the same time, we recognize that reducing or abandoning tracking does not necessarily indicate a failure of the technology. Stepping back from constant tracking may help parents build confidence in their parental intuition and avoid over-reliance on technology [98]. In this way, it reflects adaptive parenting rather than a breakdown in tracking behavior.

7 Conclusion

By studying Huckleberry App logs and interviews of parents who used baby tracking, we uncovered insights into their adoption, use, and abandonment practices. In addition to medical milestones, parents' tracking practices are influenced by value-driven decisions, such as when to initiate tracking and which categories to prioritize, and challenges to continue tracking, such as routine disruptions caused by childcare transitions. Our work highlights that baby tracking practices are not uniform, but varied and dynamic, evolving with parents' circumstances and confidence. We provide design recommendations to support these tracking practices, such as accounting for diverse adoption patterns, providing time-sensitive guidance that adapts to the evolving perceived value of tracking across the baby's different stages, and facilitating selective lessening or abandonment of tracking to reduce overload while reinforcing parental intuition. Future work could examine how similar nuanced practices of adoption, use, and abandonment manifest in other PI domains.

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