Parents Just Don't Understand: Why Teens Don't Talk to Parents about Their Online Risk Experiences

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ABSTRACT

Past research has shown that parents tend to underestimate the frequency with which their teens experience online risks. However, little is known about *whether* and *how* teens communicate with their parents when online risks do occur. In a two-month, web-based diary study of 68 teen-parent pairs, participants provided separate accounts of the teens' weekly online risk experiences. We found that most teens had little or no communication with their parents regarding their online risk experiences, and parents and teens shared very different perceptions and reactions when risks were reported, helping explain why communication was so poor. We discuss the implications of our results and make recommendations for how researchers and designers may work to improve the state of family communication regarding adolescent online risks in the future.

Author Keywords

Adolescent online safety; family communication; diary study; cyberbullying; sexual solicitations; explicit content; information breaches; privacy.

ACM Classification Keywords

K.4.1 [Public Policy Issues]: Ethics, Human safety, Privacy

INTRODUCTION

Research on adolescent risk dynamics has shown that healthy family communication is key in both reducing risk-seeking behaviors and improving teens' health and well-being [1,2,11,19]. For example, the more "open" and "receptive" mothers are in communicating about sex with their teens, the fewer risk-seeking sexual behaviors teens report [11]. In contrast, poor family communication has been associated with a myriad of negative outcomes, including "unhealthy weight control, body dissatisfaction, substance use, suicide attempts, depression, and low self-esteem" [1]. While family communication is clearly critical for adolescent development

in offline contexts, little is known about the role of such processes in the context of *adolescent online safety*.

The online safety of adolescents is a mounting concern as it is estimated that 95% of U.S. teens between the ages of 12 and 17 are online [24]. For the purpose of this research, we define "online" as browsing the web on a computer, through a cell phone, or using a mobile device (iPad, iPod Touch, or other tablets); using instant messaging, text messaging, mobile apps, e-mail, or any other application connected to the internet. Online interactions afford many social benefits to teens but have also been significantly correlated with heightened online risks [15,17,30], including information privacy breaches, explicit content, online harassment, and sexual solicitations [21,39,42]. For example, at least 8% of teens have met a romantic partner online; 57% have begun online friendships [25]. Meanwhile, one in four teens experience unwanted sexual solicitations; one in nine teens report being cyberbullied; and one in four have seen unwanted explicit content online [21].

Pew Research estimates that "94% of parents say they ever talk with their teen about what they should share online, while 92% say they talk with their teen about what constitutes appropriate online behavior towards others" [4 p. 12]. Yet, talking with teens about the generalities of how they "should" behave online is significantly different than discussing specific online risks experience they *actually* have. Therefore, we ask and set out to answer the following research questions:

1. Do teens communicate with their parents regarding their online risk experiences? Why or why not?
2. How do the perceptions of teens and parents differ when they provide separate accounts regarding the online risks teens encounter on a weekly basis?
3. What are the bi-directional, longitudinal, and multi-level trends between teens and parents related to family communication about teens' online risk experiences?

To provide deeper insight into such complex communication processes, we adopted a *family systems approach* [8] and designed a two-month dyadic web-based diary study of 68 pairs of teens and parents; in the survey both parent and teen recounted their perceptions of the teen's weekly online risk experiences related to online information privacy breaches, harassment, sexual solicitations, and explicit content. We

qualitatively characterized the teen and parent reports by three dimensions of risk (risk severity, agency level, and emotions) and five dimensions of family communication (matched accounts, disclosure detail, if the teen told the parent, why or why not, and how the parent mediated the situation). We then performed statistical tests to denote key differences between parent and teen perceptions.

Overall, we found minimal signs of family communication regarding teens' online risk experiences – *even less than what has been reported in past research* – with only 15% of the risk events having a "matched" parental report to the teens' and a mere 7% of these matched reports showing that the parent had the full details regarding what had happened. We also found a considerable gap in the perceptions and reactions of the teens versus their parents. For instance, parents were more likely to report on low risk events (i.e., posing little to no risk to the teen), while teens reported on incidents that were more concerning (i.e., posing a medium level of risk to their safety or emotional well-being). Parents more frequently became upset by the risk occurrence than teens and often went to extremes by characterizing their teens as victims or blaming them for being exposed to online risks, even when the exposure was accidental. We discuss concerns raised by our findings relating to nuances we observed in parent-teen communication, some of our positive findings, and how designers and researchers can work to improve the state of family communication regarding teens' online risk experiences.

BACKGROUND
In recent years, the CSCW research community has been prolific in studying family dynamics regarding technology use [3,5,18,44,46]; however, our community has yet to specifically address family communication when it comes to the actual risk experiences teens' encounter online. Other research domains have examined family communication regarding online risks *indirectly* using three different approaches: 1) Examining differences in parent-teen risk perceptions, 2) studying the effects of parental active mediation on risk exposure, 3) and quantifying family communication as a unidimensional, independent variable associated with risk perceptions and exposure. Below, we summarize this body of work, denote the limitations, and highlight our contribution to the literature.

Families and Technology Use
Technology use in the context of families has long been a topic of interest to the CSCW research community. For instance, back in 2011, Ames et al. [3] conducted an ethnographic study of 22 families and found that socio-economic status had a strong influence on technology values and practices. While middle-class families were more likely to promote limitations on technology, they found that working-class families valued technology access. Related research confirmed that low socio-economic status teens were more likely to work in order to pay for their own mobile technologies, which in turn, led to less oversight by parents [44]. More recent work [5,18,32] has touched on risky online

behaviors of teens, parental perceptions of, and family rules regarding technology use. For example, Pater et al. [32] reported urban teens taking part in sexting, cyberbullying, and self-harm; yet, the authors did not specifically focus on risky behaviors and simply set out to "broadly characterize online social activity" [32 p. 2312] of teens. In all cited cases, CSCW research has historically focused more broadly on technology use instead of specifically focusing on *risk exposure* in the context of use.

Parental Perceptions of Online Risks
Outside of the CSCW community, research has already established that parents generally underestimate the frequency with which their teens have experienced online risks [7,9,26,33]. For the most part, however, this past work has documented this pattern using large-scale, cross-sectional surveys of macro-level measures that quantify the frequency of teens' past risk experiences. For example, Sorbring and Lundin [33] calculated a deviation score between teen and parent risk perceptions related to explicit content and online harassment using a 5-point Likert scale from "has never happened" to "has happened very often." They found that parents significantly under-reported online risk frequencies for both types of risk. Parents who had the greatest insight into their teens' online risk experiences reported higher levels of active parental mediation (e.g., talking to their teens about their online behaviors) [33].

Similarly, Liau et al., [26] surveyed teens and parents, asking for reports of whether the teens had visited inappropriate websites or "met anyone in real life that they first met on the internet." They confirmed parental under-reporting of online risk experiences as well as overestimation of parental monitoring of online safety in their home [26]. Byrne et al. [7] also used a large-scale, paired survey of parents and their children to compare whether the child had or had not "ever" experienced cyberbullying, contact with a potential predator, or been exposed to sexually explicit materials online. They found that more permissive parenting styles, difficulty communicating about online risks, and children having access to the internet from private spaces predicted the likelihood that parents underestimated their child's risk exposure [7]. All three studies called for improvements in family communication regarding online risks.

Parental Active Mediation of Online Risks
Active mediation, first introduced as "instructive" mediation for television, "refers to the process of discussing certain aspects of programs with children," [36 p. 54] so as to help the child evaluate the content of what he or she had seen. It is the closest construct to family communication that has been studied in research examining adolescent online safety. However, the effects of parental active mediation are unclear. Dürager and Livingstone [10] found that when parents talked to their teens about online safety, risk exposure actually *increased*. Wisniewski et al.'s [40] work suggests that the positive relationship between active mediation and risky online behaviors may be because parents use active mediation as a reactive approach for helping teens

once they have already had an online risk experience. However, additional work needs to be done to disentangle the causal effects of parents' active mediation on adolescent online risk experiences because the cross-sectional designs used in these studies are less suited for such tasks.

Family Communications about Online Risks

Very few studies have directly examined family communication in relation to adolescent online risks. Byrne et al.'s [7] work found that for each unit increase in a child's report that "it is hard to talk to my parents about bad things that might happen when I am online" (based on a single 5-point Likert-scale item) [7 p. 7], parents were two and a half times more likely to underestimate if the child had been approached by a worrisome stranger [7]. Yet, the authors could not use their data to explain *why* some children felt that it was hard to talk to their parents. Wallenius and Punamäki [37] conducted a longitudinal survey of elementary and middle school students in 2008 and found that parent-child communication somewhat moderated the relationship between exposure to video game violence and direct aggression. Poor parent-child communication combined with video game violence was associated with higher levels of direct aggression; however, good communication did not necessarily reduce aggression depending on the timing of the communication, gender, and age of the child. They measured family communication based on the Parent-Adolescent Communication Scale (PACS), which contained 14-items rated on a 5-point Likert scale. In their discussion of the limitations of their work, the authors explicitly acknowledge that "diary methods would yield more exact estimates" [37 p. 293] for conceptualizing and understanding situational aspects, such as the "scripts" used in communication regarding teens' online behaviors.

A Family Systems Approach

In the CSCW studies related to family dynamics and technology use cited above, qualitative and longitudinal approaches were often employed to provide a richer and more nuanced context to the research. Such methods help answer some of the *why* and *how* questions, though lack the ability to ascertain statistical relationships and significance. In contrast, a common theme in the adolescent risk literature is that perceptions, parental mediation strategies, and family communication have consistently been operationalized as quantifiable constructs and measured through large-scale cross-sectional surveys. While such designs increase precision and generalizability [31] through statistical analysis of macro-level correlations, they also have a number of limitations. We detail some of these limitations below and introduce our approach, which applies *family systems theory* [8], to address these limitations.

First, quantitative survey studies force a level of aggregation that may render patterns found in the data as less meaningful. For example, studying online risk experiences over an entire "past year" or "ever" obviates the idea that adolescent online safety is a developmental process, in which teens experience and learn from episodic risk experiences over time

[20,38,40,41]. Second, using deviation scores [33] or single-item measures [7] to characterize family communication patterns regarding adolescent online risks breaks with the theoretical underpinnings of communications theory. *Family communication* is a complex, interpersonal process built on "schematic representation of relational knowledge" [22], which includes both declarative and procedural knowledge, as well as "interpersonal scripts." These scripts are prone to intersubjectivity based on repeated experiences and one's individual beliefs [22]. Therefore, trying to quantify family communication as a unidimensional scale based on perceptual measures lacks face validity. Finally, these studies often assume a unidirectional influence of parents on teens (e.g., analyzing parental mediation as an independent variable and teen risk exposure as the dependent variable) instead of acknowledging that parents and teens may influence one another over time [8].

This alternative view comes from *family systems theory*, which arose out of developmental psychology [8]. The three main tenets of family systems theory include: 1) a focus on transactional and bi-directional processes, 2) longitudinal effects, and 3) multi-level analysis (e.g., individual, dyadic, etc.) [8]. Based on these principles, the family systems movement has provided an emerging set of methods for studying families as a complex system. For example, dyadic diary methods are often employed by family systems researchers to study the complex relationships, behaviors, and perceptions between parents and teens as they unfold [14,23,27]. Benefits of diary studies include the ability to study family processes from "a natural setting, such as the home" and the ability to collect event-contingent data over time [8,23]. Through framing our research in this way, we are the first to apply family systems theory to the context of family communication and adolescent online safety.

In the next section, we describe how we conduct a detailed analysis (both qualitative and quantitative*)* to characterize the multi-faceted aspects of family communication and perceptions about these risk experiences, providing deep insights as to *how* and *why* teens do not communicate with their parents about their online risk experiences.

METHODS

Diary Study Overview

Prior to participating in the diary study, a parent-teen pair completed the IRB approved consent process together; to ensure confidentiality, each was provided separate logins to participate in the study. Data collection included a pre-survey, post-survey, and eight weekly diary entries. Each week, teens and parents were asked to report individually on four potential types of online risks (**Table 1**) that the teens may have encountered that week. The prompts used for risk reporting are included in **Appendix A, Table 7** and were asked on a scale from 1 – *Not at All* to 5 – *6 or More Times*, for each week. For our analysis, any risk frequency was recorded as a risk event (i.e., dichotomized to yes and no). As such, participants could report up to four risk events (one

for each risk type) in a given week. A web-based diary portal presented teens and parents with their personal "Diary Dashboard," where they could see past diary entries and complete the current week's entry. The portal was created using PHP, MySQL, and the Qualtrics survey platform [30].

Table 1: Four Main Risk Categories

Risk Type	Definition
Information Breaches (INFO)	Personal information or photos being shared or used online without teens' permission or those shared by teen and later regretted.
Online Harassment (CYBY)	Cyberbullying and any other or negative online interactions that may make teens feel threatened, embarrassed, or unsafe.
Sexual Solicitations (SEX)	Sexting or any requests received by a stranger, acquaintance, or friend that is sexual in nature.
Exposure to Explicit Content (EXPL)	Voluntary or accidental viewing of pornographic (naked photos or videos of people having sex), extremely violent, or deviant (immoral or disturbing) online content.

We explicitly asked teens and parents to base their reports on their own individual perceptions and experiences. Therefore, there was potential for variance between the risk events reported by teens and parents over the course of the diary study depending on the communication that took place between teens and their parents.

Diary Study Questions

We also asked open-ended, follow-up questions related to any reported risk experience (**Table 2**). As much as possible, teens and parents were asked parallel questions in order to set up a one-to-one comparison of their weekly reports. Parent questions were reworded to capture their perceptions of their teens' risk experiences, rather than their own personal experiences.

Table 2: Open-Ended Follow-up Questions

Participant	Questions
Teens and Parents	• What happened? • How did it make you feel? • What actions did you take when this happened? Did they help?
Teens Only	• Did you intend for this event to happen? Why or why not? • What (if anything) did you say to your parents about what happened? • If you told your parent(s), how did he or she respond?
Parents Only	• Do you think your teen intended for this event to happen? Why or why not? • Did your teen come to you about this problem? If so, how? If not, how did you find out it happened?

Our questions emphasized underlying processes of family communication, such as trying to understand whether teens told their parents about the risk event, why or why not, and if not, how the parents became aware of the incident.

Recruitment

To recruit teen-parent dyads, we reached out to approximately 700 youth-serving organizations across the U.S., including public libraries, YMCAs, non-profit organizations, government-funded children and youth service organizations, family-based community centers, churches, clinics, at-risk youth services, youth bureaus, and after-school programs. We sent recruitment mailings to a parent contact list maintained by our university's psychology department. We incentivized participation with a $75 Amazon.com or Walmart gift card, contingent on how much of the study they completed. Participants were sent a $25 gift card after both successfully completed the pre-survey; they earned up to an additional $50 gift card for completion of the study through the post-survey. Data collection was completed at the end of August of 2014.

Data Analysis Approach

To summarize and interpret the diary responses, we carried out a content analysis that was structured, qualitative, and dyadic in nature. We then conducted statistical analyses to highlight significant differences in perception between teens and parents. The first author created an initial codebook to characterize both the risks reports and the family communication patterns that occurred after the risks were reported. She worked with five undergraduate research assistants to iteratively code, re-operationalize the codes, and recode all of the data until an acceptable inter-rater reliability (IRR) had been achieved (**Table 3**). The codes are a mix of concepts found in related literature and through a grounded analysis [34] of our data. We characterized three risk dimensions to describe teens' risk experiences as reported by teens and parents: 1) *Risk Severity* - defined as the level of risk posed to teens by the events; 2) *Agency Level* - the extent to which teens intended for the events to occur; and 3) *Emotions* – how the participant felt after the event occurred.

We identified five dimensions of family communication, which include: 1) *Matched* - whether teens and parents report on the same event; 2) *Match-Detail* – for matched events, the level of disclosure between parent and teen regarding what had happened; 3) *Tell* - whether the teen told the parent the event occurred; 4) *Tell-Why* - why teens chose to tell their parents or not; and 5) *Mediation* - how the parent responded once aware that the event had taken place. Codes for all dimensions were mutually exclusive except for emotions, tell-why, and mediation, where we allowed for multiple codes and double-coded in our analysis. Due to the dependent nature of family communication, diary reports were coded in pairs by examining all of the reports made by each teen-parent dyad as the unit of analysis.

Table 3 summarizes the final IRR metrics and the codes for each dimension of risk and family communication. Most of

our IRR values, calculated based on Cohen's kappa, were well above the threshold of "Very Good" (i.e., 0.80 or greater), and all were considered to have "Good" reliability (0.60 or greater) [16]. In some cases, the lower IRR values are for dimensions that were double-coded or codes that were later merged. For example, when coders were unsure of whether or not the teen and parent were reporting on the same event (i.e., *Matched*), they coded the reports as "Maybe." The first author reviewed these codes and recoded, with a bias toward inclusion. That is, when we thought that parents *might* be aware of teens' online risk experiences, we gave them the benefit of the doubt by coding "Maybe" as "Yes." After finalizing all of the codes, Excel pivot tables were used to uncover patterns within the data, identify interesting case studies, pull out illustrative quotes, and identify the key emergent themes presented in this paper.

Table 3: Dimensions and Inter-Rater Reliability Metrics

Dimensions	Cohen's κ	Codes
Matched	0.75	*Yes, No*
Match-Detail	0.76	*Full, Partial, Guess, N/A*
Risk Severity	0.88	*Low, Medium, High*
Agency Level	0.87	*Victim, Accidental, Willing, Intentional*
Emotions	0.82	*Discomfort, Indifferent, Upset, Good, Embarrassed, Disappointed, Empathy, Anger, Disgusted, Other*
Tell	0.93	*No, Yes, Present, Found, Guess*
Tell-Why	0.77	*(Tell No) NoBig, Negative, Sought, Privacy; (Tell = Yes) Help, Shocked, FYI, Asked; N/A*
Mediation	0.82	*Active, Fix, Lecture, Restrict, Monitor, Nothing, N/A*

After confirming the reliability of our qualitative analysis, we quantified our qualitative codes by count to test the statistical differences between teen and parent reports. For "unmatched" reports (N=211), which occurred when teens and parents did *not* report on the same event, we conducted a chi-square test of independence using a crosstabs analysis and Pearson's Chi-square two-tailed test [47]. When the count of a code was less than five for one of our groups (teens or parents), we used the Fisher's Exact Test to determine significance. For "matched" reports (N=38), where teens and their parents reported on the *same* event, we grouped the teen-parent data and used McNemar's test for paired categorical data [47]. We report all statistically significant differences found within our qualitatively coded data. For the matched reports (N=38), however, we only had enough

power to detect large effects [12]. Therefore, our report relied more heavily on our dyadic-level qualitative analysis to accurately interpret these results.

Pre- and Post-Survey Analysis

The pre- and post-survey instruments gathered demographic information and measured useful constructs drawn from previous literature. For instance, we adapted a scale designed to measure family communication about drug, alcohol, and tobacco use to the domain of online safety. Other constructs included the frequency of online risk experiences in the past year [33,45]; parental mediation strategies (active, monitoring, restriction [29]); and digital literacy for online safety [29,43]. **Appendix A, Table 7** summarizes the items and their psychometric properties. All constructs were measured using 5-point Likert scales. Normality was assessed prior to conducting paired tests [47] to compare parent vs. teen, and pre- vs. post-survey perceptions.

RESULTS

Participants

136 participants (68 teen-parent dyads) completed the diary study. Teens ranged from 13 to 17 years-old (15%, 31%, 24%, 19%, 12% at each age respectively). 62% of the teens were female. The majority of teens identified themselves as Caucasian, but other ethnicities included African-American (15%), Hispanic (4%), Asian (3%), and Other (6%). 60% of our teen participants came from two-parent households; others resided with their mother only (21%), mother and step-parent (15%), or had other living arrangements. These families resided in 13 different states with the largest representation (74%) from Pennsylvania. The parent or legal guardian of our teen participants included 60 mothers, 7 fathers, and 1 grandmother. 85% of these parents or legal guardians were between the ages of 35 and 54 with 9% being younger and 6% older. Most parents (56%) had some college education to a 4-year degree, with others having completed master's level coursework (29%), doctoral or professional degrees (6%), or having no college education (9%). The annual household income of these families ranged from less than $30K (10%), $30,001-$60K (34%), $60,001-$100K (23%), $100,001-$150K (21%), to over $150K (7%).

Pre-Survey Perceptions

Our pre-survey captured the frequency of teens and parents reporting teen online risk experiences over the course of the past year. A Wilcoxon signed ranks test showed that parents reported significantly fewer risks across all four risk categories (Z = -2.36 information breaches; Z = -2.43 online harassment; Z = -2.29 sexual solicitations; and Z = -4.64 exposure to explicit content) than their teens. These results are consistent with the prior studies [7,9,26,33]. Paired-samples t-tests were also conducted to compare teen and parent perceptions of family communication and various parental mediation strategies (**Table 4)**. Parents reported significantly higher levels of family communication regarding teens' online risk experiences than their teens. Parents also reported higher levels of active mediation and

monitoring behaviors. Conversely, teens felt that parents enacted restrictive mediation at higher levels than their parents. Finally, parents reported significantly lower levels of digital literacy for online safety than their teens.

Table 4: Paired-samples t-tests comparing parents and teens

Construct	Mean (Parent)	Mean (Teen)	t-test
Family Communication	3.77	2.88	8.35***
Active Mediation	3.20	2.69	4.91***
Monitoring	2.87	2.18	4.96***
Restrictive Mediation	3.81	4.02	-2.52*
Digital Literacy for Online Safety	2.96	3.27	-2.30*

*p-value < 0.05, ** < 0.01, *** < 0.001*

Weekly Risk Reports

Matched Reports

Next, we compared the weekly risk reports made by teens and parents to assess how many were "matched" vs. "unmatched." A total of 287 total risk reports were submitted, 207 by teens and 80 by parents. Of these reports, 76 reports were identified as matched risk events after comparing the teen and parent accounts. **Table 5** summarizes the counts of teen-only, parent-only, and matched reports.

Table 5: Report Counts and Matched Reports

Matched	Parent (P)	Teen (T)	Total Risk Events	% Total
No	42	169	211	84.7%
Yes	38	38	38*	**15.3%**
		Totals	249	100%

Matched reports were counted as the same risk event

After combining matched reports, parent and teens reported a total of 249 risk events during the diary study. Thus, matched reports represented only 15% of all risk events reported during the study. Recall that matched reports were defined as a parent and teen *plausibly* reporting on the same risk event based on reading both diary entries. Unmatched reports represented 85% of the risk events. These reports often included instances where parents and teens reported on the same risk type in a given week, but the reports were obviously about *different* incidents. For example, the following teen-parent pair both reported on explicit content in week one:

(Unmatched Reports) "My teen and I watch Hannibal on TV weekly. We watch it together. It has violent content." -563 Mother of 15-year-old female (Week one)

"I saw violence in a video of two girls fighting. They looked like young teenagers. They were punching and pulling each other's hair." -563 15-year-old female (Week one)

Match Disclosure Detail

We further analyzed the content of the matched reports to compare what the teen reported versus what was reported by the parent (**Table 6**).

Table 6: Match-Detail regarding the Level of Disclosure between Teens and Parents

Disclosure Detail	% Matched	% Total
Full	44.7%	6.8%
Incomplete	28.9%	4.4%
Generalized	23.7%	3.6%
Lag	2.6%	0.4%

Full disclosure was used to indicate that the parent offered the same level of detail about the risk event as the teen. This was the case in about 45% of the matched reports, representing about 7% of all risk events. *Incomplete* disclosure meant that the parent lacked some key details that were provided by the teen. This was the case for about 29% of the matched reports. For example, there was one teen that participated in our study with her mother. In their matched reports, the teen and mother both reported that the daughter had an incident where the teen sent a picture to a boy at her school who requested it. In turn, he sent this picture to other people at her school, and they cyberbullied her. However, in the diary reports, the mother reported that her daughter sent a "fake" naked picture, while the daughters' entries implied that it was a *real* naked picture of herself. The mother was also not aware of the severity of the cyberbullying that had taken place once the photo was circulated among the teens' peers or of the suicidal thoughts expressed by her daughter. As mandated reporters, this was the only time during our study where we had to break the teens' confidentiality by contacting the mother regarding her suicidal ideation.

(Matched Reports) "A boy at my school had asked me to send him a picture of me. and I regret sending the pictures... [Tell parent?] I just told her how I felt but not what I did." -529 14-year old female

"My child made a decision to send a <u>fake</u> sexual picture of herself to a boy who was pressuring her to do it. Then he showed everyone. The started calling her names." -529 Mother of 14-year-old female

"People [on] path and kik kept calling me a thot and a liar... It made me want to kill myself✂?" -529 14-year old female

Generalized was used to code a matched report in which the parent did not know about a specific risk event but had a general intuition of what was going on. In the case below, exposure to explicit content was coded as a matched event because the mother guessed about the inappropriate content her daughter saw online, even though she was not aware of the specific event reported by her daughter that same week.

(Matched Reports) "I was on instagram and a girl posted a picture of her wrists all cut and she was bleeding pretty bad." -562 15-year-old female (Week two)

"She sees things like this all the time on her newsfeed. ppl talking about drugs, getting high, having sex. there are kids that talk about suicide on their status." -562 Mother of 15-year-old female (Week two)

Finally, *Lag* was used to indicate a time difference between when the teen originally made the report and when the parent reported about the event. In summary, our analysis includes three unique type of reports: 1) *teen-only*, 2) *parent-only*, and 3) *matched*. Even though we found variations in degree of matching between teen and parent reports, we still treated the reports as matched and note the differences in perceptions between teens and parents in our analysis. In the next sections, we organize our results based on these three report types to compare and contrast the trends by risk dimensions and processes of family communication. **Appendix A, Table 8** summarizes the percentages of reports for each code for each dimension.

Risk Dimensions

Risk Types
Consistent with our pre-survey results, parents reported fewer total risks than their teens, across all four categories. However, there were no statistical differences in the types of risks reported by parents and teens in unmatched or matched reports. Visually comparing across the two, matched reports had a higher proportion of online harassment and sexual solicitations and fewer explicit content and information breaches than unmatched reports (**Figure 1**). The contrasting proportions of risk types for matched versus teen- or parent-only reports may reflect the types of experiences teens were more likely to reveal to their parents or the level of risk severity inherent to the risk type. For example, teen exposure to explicit content was often accidental and of a lower risk severity; information breaches also tended to be of low or medium risk. Therefore, the teens may not have felt the need to share these experiences with their parents, nor were they escalated to the parents' attention through other means.
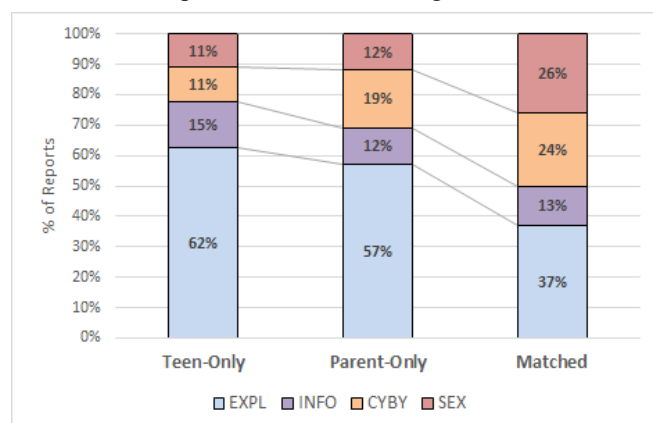

Figure 1: Report Comparisons by Risk Type

Risk Severity
When comparing teen-only to parent-only reports (**Figure 2**), we found that parents reported significantly more (χ^2_1=7.03, p=0.008, Φ=0.18) low risk events than teens (38% parent vs. 19% teen), but teens reported significantly more (χ^2_1=4.25, p=0.039, Φ=0.14) medium level risk events than parents.
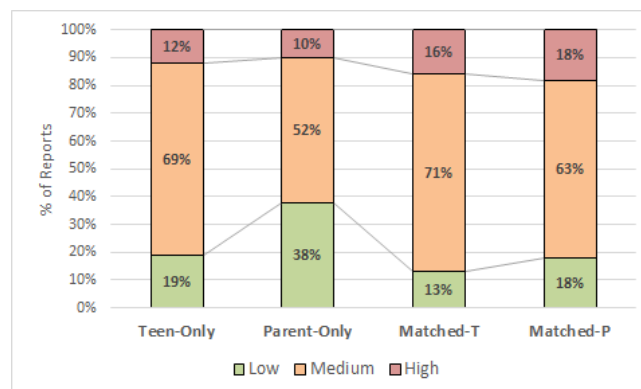

Figure 2: Report Comparisons by Risk Severity

The following example was representative of many of the low risk parental report, which were often related to explicit content that was viewed intentionally or accidentally by the teen.

"[My daughter] saw a vine video where a girl was slapped by two girls as she walked along the street." -577 Mother of 14-year-old female

Similarly, teens frequently reported viewing explicit content, but the nature and potential harm from the content tended to be more troubling than that reported by parents.

"Promotion of eating disorders of self-harm is increasing because on social media you'll see pictures of skinny body imagines that promote young viewers towards eating disorders to achieve the goal of having a perfect body shape that pushes them to lose weight in an unhealthy way." -535 16-year-old female

There were no significant differences in the frequency of high risk reports, which were low overall. For matched reports, we found no significant differences in risk severity, though in 15% of the reports, teens and parent reports reflected different levels of risk. We believe this was often due to the parents not having full details about the experience (see *Match-Detail* above).

Risk Agency
For unmatched reports (**Figure 3**), teens reported significantly more instances than parents that indicated that teens were *accidentally* exposed to risk (χ^2_1=9.66, p=0.002, Φ=0.21). This is likely explained by the large amount of teen-only reports on accidental exposure to explicit content [42] that was less frequently reported by parents. However, we also observed a trend where parents were significantly more likely to dichotomize risk agency by saying that teens were either *victims* or *intentionally* sought out the risk. Meanwhile, teens were significantly more likely to equivocate risk agency by saying that it was *accidental* or that they were *willing* participants (χ^2_1=5.04, p=0.025, Φ=0.16). However, this trend changed some within the

matched reports. When both the teen and a parent reported on the same event, parents were significantly more likely to report that their teens were *victimized* (McNemar Test *p*=0.31), while teens admitted to having a higher level of agency (**Figure 3**).
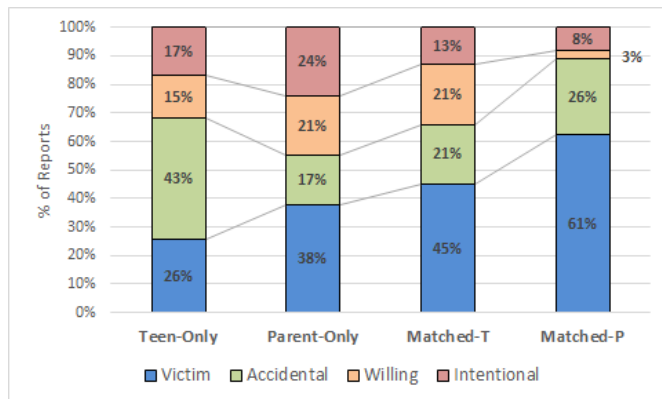

Figure 3: Report Comparisons by Risk Agency

In the dyadic-level data for matched reports, 26% of the reports showed teens reporting higher agency levels than their parents, while only 5% of matched reports showed parents assigning more agency than their teens. Six matched reports, for instance, indicated that the teen was a *willing* participant of the experience even though they did not intentionally seek it out. Meanwhile, their parents reported that they were *victimized*. As an example, recall teen-parent dyad 529, when the teen reported sending a naked picture of herself to a boy. When asked if she intended for the event to occur, she explained that she sent him the photo but did not intend for him to share it with others at her school.

(Matched Reports) "I didn't intend for it to happen. He told me that he wouldn't show anybody and my dumb self beileved him. ??" -529 14-year old female

However, her mother reported that the teen was victimized by the boy:

"No! She wanted him to stop bothering her." -529 Mother of 14-year-old female

Emotions

When teens and parents made separate reports, they expressed very different emotions. Teens reported feeling significantly more *embarrassment* (Fisher's Exact Test *p*=0.027, Φ=0.15) and mild *discomfort* (χ^2_1=8.36, *p*=0.004, Φ=0.20). Meanwhile, parents were significantly more likely to express the stronger emotion of being *upset* by what had happened (χ^2_1=3.94, *p*=0.047, Φ=0.14). As an illustration, the following risk reports of explicit content both involved 13-year-old boys. However, one was made by the teen himself and the other report was made by the teen's parent.

"I was looking on a sight called Reddit, I clicked on a link and it showed pornographic content, this made me feel uncomfortable and awkward." -538 13-year-old male

"My son was watching 'Grand Theft Auto' recorded videos on Youtube. [I felt] disturbed. I do not like this kind of content." -504 Mother of 13-year-old male

Yet, when teens and parents reported on the same event, the emotions of teens were no longer significantly different than that of their parents. The percentages of teens reporting feeling *upset* increased from 12% in unmatched reports to 20% in matched reports. The change in emotions for matched reports may be in part due to the risk type and severity level of these reports. As shown earlier, matched reports were more often related to online harassment and sexual solicitations and of a higher risk severity compared to the unmatched reports. In some cases, however, teens were more upset in matched reports because of their parents' involvement and reactions to the incident instead of the risk experience itself.

"I sent my picture to a friend and my mom got really mad. It was just a head shot. I felt bad that my mom was mad at me." -553 13-year-old female

Family Communication

To Tell or Not to Tell?

Overall, we detected the most significant differences in teen-parent perceptions when we asked participants if the teen told the parent about the risk experience when it happened. Teens were significantly more likely to say that they did *not* tell their parents about their risk experience (χ^2_1=115.20, *p*<0.0001, Φ=0.74). For example, one teen reported seeing porn on Tumblr. When asked what (if anything) did he say to his parents, he simply said:

"That would be totally ridiculous." -583 16-year-old male

Meanwhile, parents were significantly more likely to say that the teen *did* tell them (χ^2_1=40.09, *p*<0.0001, Φ=0.44), that they were *present* when it occurred (Fisher's Exact Test *p*<0.0001, Φ=0.39), they *guessed* that a risk occurred (Fisher's Exact Test *p*=0.001, Φ=0.28), or that they *found* out about it through some other means (Fisher's Exact Test *p*=0.007, Φ=0.24). For instance, 26% of the time parents were present when the risk occurred. The majority of these reports were related to co-viewing explicit content online:

"We were sitting at the table together and she said mom look at this. We watched the video and commented on how horrible it was." -506 Mother of 14-year-old female

In 10% of the reports, parents guessed that a risk occurred using broad statements instead of reporting on an actual event that occurred. In 7% of the reports, parents found out through some other means, such as through the parents of their teens' friends.

For matched reports, we did not detect any significant differences between teens and parents regarding whether the teen told the parent about the event. However, given that these were matched reports, instances where the teen told the parent were lower than we expected – only 42% of teen reports and 53% of parent reports indicated that the teen had

shared the event with the parent. Over half (58%) of the matched teen reports indicated that teens did *not* tell their parents. According to parents, 47% of the time they were either present, found out through some other means, or guessed. This was consistent with our findings for *Match-Detail* reported earlier.

Tell – Why or Why Not?

Next, we focused on why teens chose to tell or not tell their parent about their experience. In the rarer event that a teen informed a parent (13% of all teen reports and 15% of all parent reports), the primary reason the teen gave for telling the parent was to ask for *help*. This was consistent across teen-only, parent-only, and matched reports. Also consistent across all report types, the instances where a teen told their parent because the parent explicitly *asked* was very low, ranging from 0% (teen-only) to 10% (matched-parent) of all reports.

For unmatched reports, we found one key difference between teen-only and parent-only reports for the rationale behind telling. Teens were significantly more likely than parents to say they told their parent because they were *shocked* by what had happened (Fisher's Exact Test p=0.039, Φ=0.34). By comparing the instances where participants reported the teen telling because they were *shocked* versus telling parents just for informational purposes (*FYI*), a trend emerged (**Figure 4**) that suggests that parents may be underestimating why teens share their risk experiences with them.
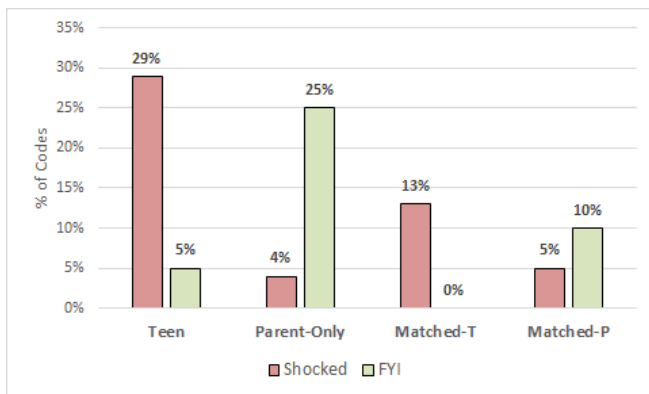

Figure 4: Teen vs. Parent Reports of Why Teens Told Parents, Shocked vs. Information Sharing (FYI)

This trend can be illustrated more clearly within the matched reports below between a mother and her teen daughter:

(Matched Reports) "My Daughter watched a video that had excessive violence and illigal or morally questionalbel behavior. I do not think she was surprised by the content as I think it is something that can oftern be viewed at her and her friends fingertips…" –506 Mother of 14-year-old female

"I was kind of s[h]ocked that this was happening and I didn't know what to do." –506 14-year-old female

Overall, it was more common that teens did *not* tell their parents about what had happened. This was the case in over half (58%) of all the teen reports. Although teens often did

not tell us why they did not share the event with their parents (39% of teen-only and 48% of matched-teen reports), when they did provide a rationale, the most common reason was that they felt like the event was "*no big deal.*" Often teens thought an event was so insignificant that they did not think it was worth talking to their parents or even just forgot. They also often did not know how their parent would react.

"I was helping my BFF with homework online and while I waited I was looking at pages photos and a video had violence and danger in it. [Tell? Why?] No I forgot to tell her about it." -523 14-year-old female

"I was kiking and out of no where he just sent me a picture of his penis. [Tell? Why?] i didnt tell my mom cause it wasnt a big deal. idk how my mom would have acted because i have never told her something like this." -528 14-year-old female

Many teens felt like telling their parents would just cause awkwardness. Here are two such reports from teen 127 during weeks 1 and 2.

"They would probably be like, 'Ok, why are you telling me this...?'" -127 17-year-old male

"They would probably act like it was unusual, because they aren't exposed to it as much. They'd probably follow up on it and it would just be a lot of unnecessary awkwardness over a non-existent problem." -127 17-year-old male

In 17% of teen-only and 24% of teen-matched reports, the next most cited reason for not telling parents was because the teen felt like the parent would react *negatively*, often concerned that the parent would punish them for what happened even if it was not their fault.

"she would probably make me come off of that social network d i think that part of the reason i didn't or would tell her cause i shouldn't b in trouble of have to sacrifice my social network for someone else because they made the wrong choice or mistake." -577 14-year-old female

Some reports indicated that the teen did not tell their parent because they *sought* out the experience or that it just was not any of their parents' business (e.g., *privacy*).

"I said nothing. They don't need to know. Nah we haven't talked about anything internet wise." -514 13-year-old female

Parental Mediation

To provide more context for teens' perceptions that telling their parent would result in negative consequences, we asked how parents actually responded (i.e., *parental mediation*) to a reported risk. Contrary to teens' perceptions, reports of parental *restriction* were relatively low (4%) for the unmatched reports. Instead, the largest percentage of reports across all report types indicated that the parents used *active mediation* to talk about the situation with their teens.

(Matched Reports) "I just told her what my friend said about my clothes and my mom told me it doesn't matter what other people think all that matters is what I like to wear" -558 14-year old female

"she explained that a friend commented on a post she made saying something about her outfit. as always i explained to her that she likes what she likes and not to worry what others think she makes her own choices" -558 Mother of a 14-year old female

The second most frequently reported mediation type by teens was that parents helped them *fix* the problem.

"My friend had me get online because some guy said he was a modeling agency and wanted us to take out clothes off... I told my mom the truth and she dealt with it right away... She told me don't worry and don't get on nothing else she will handle everything and notified her friend that works for the federal department and he took my Facebook down with my mom" -574 14-year-old female

However, we also found that these more positive approaches were often accompanied with a *lecture* where parents reprimanded teens (recall that parental mediation allowed for double-coding). We coded the parental lectures based on the actual content of the report, not on participants' perceptions of their own actions. Therefore, in coding the unmatched reports, we found that parent-only reports had significantly higher levels of *lecturing* (χ^2_1=4.45, *p*=0.035, Φ=0.26) than teen-only reports. It is possible that teens may implicitly perceive parental lectures as a form of punishment even though parents did not enact formal restrictions. In turn, this may correlate longitudinally (though cannot be statistically tested within our dataset) with teens not telling their parents about their future risk experiences. As an example, here are reports where parent 544 lectured her son regarding his viewing of explicit content during weeks one and six.

"We discussed it immediately and why something like that is not funny and why it is hurtful. And I told my son how rude it was and why it was inappropriate." -544 Mother of 15-year-old male (week one)

"I think it is childish and ridiculous. A waste of time. He is actually watching me type this, so he knows how I feel about it." -544 Mother of 15-year-old male (week six)

In week five, the teen reported a more concerning risk event involving exploration of drug use in which he explicitly chose not to tell his parents to avoid getting lectured.

"I saw a list describing the levels marijuana intoxication...I saved the photo of the list...so that I will be able to figure out how intoxicated I will be when the time comes...I believe that if I told my parents, they would say that doing drugs is not something I should be doing at this time." -544 15-year-old male (week five)

For matched reports, parents were significantly more likely to report *active mediation* of the risk experience than their teens (McNemar Test *p*=0.004), which was consistent with our pre-survey results. There were no significant differences among the other parental mediation strategies for matched reports. However, when comparing unmatched to matched reports, we observed that *restriction* did increase. In unmatched reports, only 4% of the teen and parent reports indicated restriction as a parental mediation strategy. In the matched reports, teens reported restrictions 22% of the time, while parental restriction reports increased to 16%. Sanctions included grounding teens, taking away their phones, or telling them they could no longer engage on the website or social media site where the risk event occurred. Often, teens found the restrictions to be unfair or excessive. Recall the report from teen 553 who sent a head shot of herself to a friend. Here is the matched report from her mother as well as the daughter's response regarding how her mother responded:

(Matched Reports) "A kid that I do not approve of asked my daughter to send him a picture, and she did. The picture was not at all sexually suggestive. However, it violated the rule of NOT sending him any pictures." -553 Mother of a 13-year-old female

"She found out I didnt tell he[r]... I had to confess when she saw the KIK message... it was just a picture of me smiling... I am under punishment for 2 weeks - which i think is excessive" -553 13-year-old female

Together, these findings on *lectures* and *restrictions* may help explain why teens' felt that telling their parents about their online risk experiences would result in negative consequences. Finally, *monitoring* was a mediation strategy mentioned by parents but virtually unreported by teens. At the dyadic level, matched parental reports for *monitoring* were often associated with a teen report of *Nothing* or *N/A*.

Risk-Communication Profiles

Thus far, we have compared aggregated trends across teen-only, parent-only, and matched reports, including some dyadic-level analysis for matched reports. However, there is additional nuance that can be found at the dyadic level of each parent and teen pair that we have not yet characterized. To investigate the pairing relationships more deeply, we created dyadic profiles of parent-teen pairs looking across their set of risk reports (**Figure 5**). These profiles vary along two dimensions: 1) ***Teen risk severity level*** and 2) ***Family communication***.

We classified each teen based on his or her highest coded risk severity (*low, medium,* and *high*). For parents, we compared the ratios of parent-only and matched reports to teen-only reports. Classifications for family communication were made manually through establishing a consensus between two coders and comparing the percent distributions across all 68 teen-parent-dyads. *None* meant that the parent submitted no risk reports during the diary study. *Weak* meant that the parent submitted few if any matched reports but possibly some parent-only reports, indicating some level of family communication. *Relevant* indicated that the parent made few matched reports but submitted a considerable number of parent-only reports in the same risk categories reported by the teens (e.g., same risk category, different event). *Moderate* meant that the parent submitted a decent combination of matched reports and relevant reports. *Strong* communication was determined by a high percentage of

matched reports (over 1/3 of all risks reported by the teen) between the teen and parent.

As shown in **Figure 5**, most of the teens were classified as *medium-risk* (53% of teens) with parents who exhibited *no family communication* (38% of parents). A total of 28% of the dyads fell into this intersection of *medium-risk* with *no family communication*. The next largest groups consisted of teens who reported *no risks* during the study (18% dyads) followed by *medium-risk* teens whose parents may not have been aware of the specific risks reported but had some inclination of risk experiences *related* to the experiences reported by their teens (12% of dyads). Next, we will illustrate some of these profiles by providing specific cases of teens and parents who fell into the various profiles.

First, only one teen-parent dyad was classified as *high-risk* with *no communication*. Teen 522 is a 15-year-old male who reported repeatedly seeking our pornography, having sexual relations with his boyfriend online, and being cyberbullied about being homosexual. He reported a total of 15 risk events while his mother reported none. In her post-survey response, she believed her son was at lower risk that other teens:

"His activities do not lend themselves to inappropriate contact. He games with age appropriate friends who stick together. They've been friends for 2- 3 years now. The others are his brothers. So, The risk are minimal." – 522 Mother of 15-year-old male

Next, three teen-parent dyads were considered *high-risk* with *strong communication*. Teen 529 who made the poor decision to share a naked picture of herself with a boy at her school was included in this category because the teen's mother was aware of 67% of the risks that the teen reported during the diary study. Based on her post-survey response,

the mother was fairly aware of her daughter's proclivity towards online risks:

"she is very outgoing so she likes to be surrounding by as much friends as she can get. This opens her up to many risks." -529 Mother of 14-year-old female

In 8 cases, teen-parent dyads were considered *medium-risk* with *relevant* family communication. In all cases, the teens reported exposure to explicit content online as their primary risk behavior. Even though the parent did not always report on the same exact incident, they made related reports of exposure to explicit content. For instance, for dyad 583, the father knew that the teen saw explicit content online (i.e., violence) but was unaware of the teen's frequent (weekly) porn exposure.

(Matched Reports) "Porn came up on my dash in Tumblr. This will happen every week, I'm letting you know now." -583 16-year-old male

"He saw the news online; he does that regularly - which contains violence." -583 Father of 16-year-old male

The largest profile representing 28% of our parent-teen pairs were considered *medium-risk* with *no family communication*. For example, teen 565 reported three medium-risk events, including one exposure to explicit content (viewing self-harm of another), one sexual solicitation (someone requesting a nude photo), and one information breach (sharing embarrassing and possibly revealing photos). Each week, she reported:

(Matched Reports) "I have not talked to my parents about any of my online activity this week." -565 14-year-old female
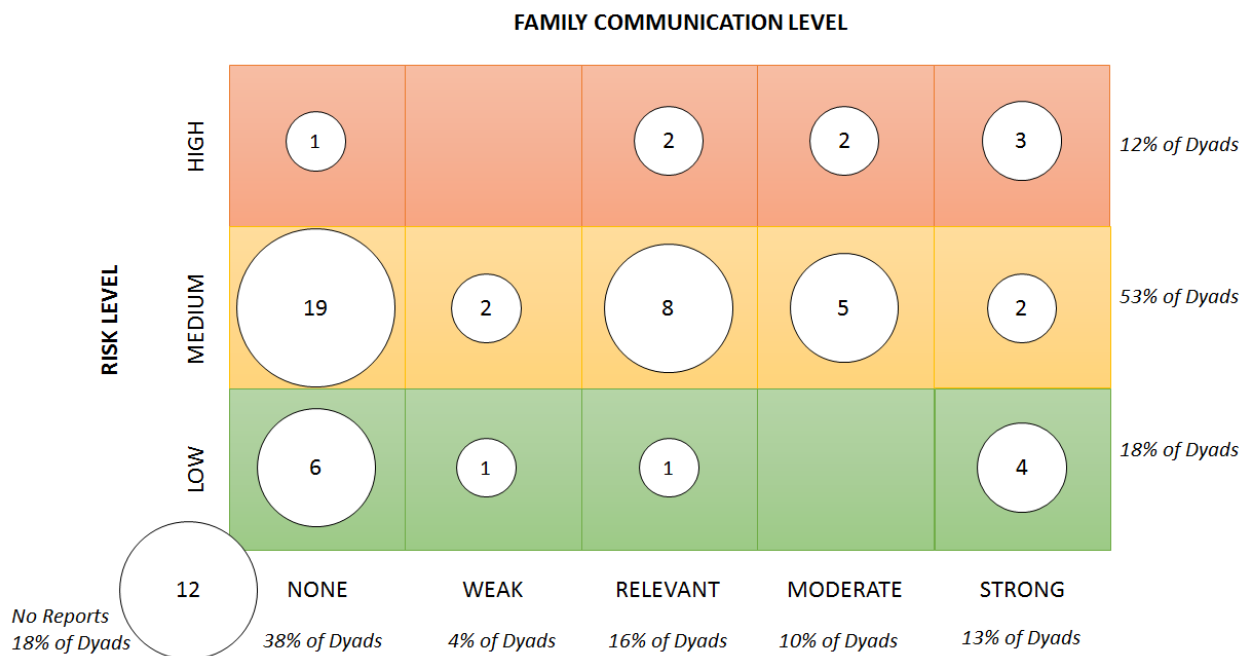

FAMILY COMMUNICATION LEVEL

Figure 5: Dyadic Profiles of Teen Risk Level and Family Communication

Her mother made no risk reports and said the following in her post-survey response regarding whether she felt her teen was at higher or lower risk online than other teens:

"I think my teen is exposed to less risk. Prior to allowing her to be online independently we talked at length about the risks online. Additionally she uses few social sites and does not share out private information on the sites she has (no Facebook, no Twitter, etc.). My daughter also has not cut off family communication." -565 Mother of 14-year-old female

Post-Survey Perceptions
In the post-survey, we asked parents (though not teens) to report levels of perceived family communication after participating in the two-month diary study. Parents reported significantly lower (t=2.23, p=0.03) levels of family communication than in their pre-surveys (M=3.77 pre-survey; M=3.59 post-survey). However, these levels were still higher (t=6.46, p<0.001) than what their teens had reported in the pre-survey (M_t=2.88). At the conclusion of the diary study, many parents and teens seemed to realize that the parents did not have as much knowledge or open communication about the teens' online risks as they had previously thought. For example, when asked to report on what they had learned through participating in the study, dyad 565 (profiled as *medium-risk* with *no communication*) had this to say:

(Matched Reports) "I realized that I have given my daughter a lot of trust online." -565 Mother of 14-year-old female

"That my parents don't really know what I do online, no matter how much they really think that they do know." -565 14-year-old female

DISCUSSION
We uncovered a number of concerning trends regarding family communication about adolescent online risk experiences. Across all risk reports, only 28% of reports indicated that teens told their parent what had happened. Only 15% were matched reports made by both teens and parents. Only 7% of all reports indicated that parents knew the material details about what happened at the time the event occurred. And, only 2% indicated that teens talked to parents because parents specifically asked about their online risk experiences. By comparing the teen-only, parent-only, and matched reports, we uncovered a substantive disconnect between the risk perceptions and reactions of teens versus parents that may help explain some of these unfavorable trends.

Although the patterns of family communication between parents and teens seem tenuous at best, there are silver linings. First, the risks that teens experienced during the study were mostly of low to medium risk severity, causing some discomfort but no imminent harm to the teens. Second, the dyadic profiles showed that parents were not completely in the dark about their teens online risk experiences with 39% of the parents in our study at least being aware of some or related risks to those that teens reported during the study. Also, parents were more likely to know about higher-risk events, especially ones related to online harassment and

sexual solicitation. Finally, when parents mediated teens' online risk experiences, there were many instances where parents actively mediated, monitored, or were pivotal in helping their teens fix the situation.

In the sections that follow, we discuss how our work makes unique contributions through our application of family systems theory. Then, we provide actionable recommendations to create partnerships for more effective online safety education programs and design technology solutions using a family systems perspective. Finally, we discuss the key limitations of our work and opportunities for future research.

Applying Family Systems Theory
Our work is the first to apply family systems theory [8,23] within the context of adolescent online safety and family communication. By taking a novel, dyadic diary study approach, we were able to more deeply study the bi-directional processes, longitudinal effects, and multi-level outcomes of family communication about online risks between teens and parents. We were also able to make some methodological contributions by comparing our findings to those within past research.

Past studies have hinted to some of our findings but the cross-sectional and/or purely quantitative nature of these studies were unable to confirm the relationships we uncovered, nor provide enough contextual information to answer how or why these relationships occur. For instance, Blackwell et al.'s interview study [5] found that parents underestimated children's social media use and, alternatively, that children felt that parents only told them about what behaviors they should avoid. Through in-situ reporting over time, we were able to show anecdotal evidence of the interplay between parents and teens. In some cases, we saw parents react judgmentally over a relatively low-risk event, which seemed to prompt teens to not tell their parents about potentially higher-risk events in the future. In other cases, we saw teens who consistently reported that they did not tell their parent of a risk event because their parent would respond negatively. Then in later risk reports, we observed parents finding out about an incident and punishing their teens. In many cases, we saw unmatched reports from teens with no reports from parents. Since our longitudinal design only encompassed a period of two-months, it is possible that a longer time period would have shown consistent patterns that were not captured within the timeframe our study.

As another example, Byrne et al.'s quantitative study [7] found a statistically significant relationship between children reporting that it was hard to talk to their parents and parents' under-estimation that their children had been approached online by a stranger. However, such a study was unable to conclude why it was hard for children to talk to their parents. Our study lends deeper insights showing that parents may get overly upset or blame their teens for risk experiences they did not necessarily intend to have, lecture or punish them for having them, or even underestimate their teens' intentions of

asking for help when their teens do tell them what happened. Our in-depth qualitative analysis was able to more clearly articulate some of these problematic trends in family communication that could not have easily been quantifiably measured and ascertained.

Further, we gained new insights by using a multi-level approach in our analysis. We compared teen and parent perceptions across unmatched risk reports, within matched reports, and at the dyadic level. All three levels of analysis provided different insights than if we used only one vantage point. For example, the trends across all risk reports were highly concerning and showed significant differences in risk perceptions between parents and teens. However, individual reports and dyadic-level data tempered some of these findings. Overall, teens were not experiencing extremely high levels of risk, and at a dyadic level, we only identified one high-risk teen with no family communication.

Finally, a methodological contribution from our diary study is that we confirmed measuring the frequency, perceptions, and reactions of parents and teens at a macro-level ("past year" or "ever") is problematic. Therefore, when measuring perceptions of episodic events through cross-section designs, interpretation of these results should be made with caution. Our pre-survey results mirrored that of past research that found that parents underestimate the frequency in which their teens experience online risks [7,9,26,33]. However, we found that on a weekly basis, the variance between teens' and parents' episodic and contextualized reports was extremely high. Teen and parent reports on the same risk type were often not about the same risk event. Otherwise, when parents and teens reported on the same underlying risk event, their interpersonal scripts and knowledge schemas [22] were significantly different from one another's. In past studies, such as Byrne et al.'s [7], such important differences would have been lost in the way they used dichotomized (e.g., "had ever", "never") parent-child risk perceptions to determine matched and unmatched risk frequencies.

The end result is that past studies have likely *underestimated* the frequency in which parents underestimate their teens' risk experiences. Attempting to aggregate data with such intersubjectivity [22] and, thus, large error variance over months or years causes entropy and masks important patterns. Such approaches lend themselves to *over-estimating* parental perceptions about their teens' online risk experiences by 1) matching truly unmatched reports using naïve algorithms and 2) allowing parental conjecture about teens' risk experiences to count the same as actually knowing about them. In summary, applying a family systems approach helped us gain more nuanced, deeper, and more accurate insights than we could have through other means.

Implications for Research and Design
Finally, as researchers and designers, how can we help improve family communication regarding teens' online risk experiences based on these findings? We already knew that parents underestimate the frequency in which their teens

experience online risks. However, we now have more insight as to why family communication processes may break down, and many of these reasons involve how parents perceive and respond to the risks teens encounter online. Therefore, it would be beneficial to design evidence-based instructive media to educate parents and teens on digital online safety that includes how to help teens resolve negative online situations that *may* occur or *after* they have occurred. This approach would be analogous to providing comprehensive sex education, as opposed to abstinence-only approaches that have proven ineffective [48]. Non-profit organizations, such as the Family Online Safety Institute (FOSI) [13] and Common Sense Media [49] have already made progress toward taking this more comprehensive approach to online safety. However, much of this progress has occurred outside the academic research community and efficacy of such programs in unknown. By combining the skills of researchers, practitioners, non-profit organizations, and governmental agencies, we may be able to promote more positive parenting practices that encourage open and honest conversations between parents and teens about online risks.

We might also reframe online safety and behaviors as joint family responsibilities, making teens and parents accountable to one another as part of a *family system*. Lipford and Zurko [28] conceptualized such a system for family oversight using the analogy of a neighborhood watch, so that a community of individuals (in this case a family) could co-manage security-related behaviors through anomaly detection, increased collective awareness, and through shared social norms. In practice, a system built around this concept might prompt teens to reach out to parents when they experience or seek out online risks. For example, accountability software exists to detect and notify adult peers of lapses of pornography addiction [50]. Perhaps a similar system could intelligently detect teen risk-seeking behaviors, prompt parents to inquire, encourage teens to ask their parents for advice, and even "nudge" [35] teens to change their own behaviors. To close the loop, designers might also build mechanisms to keep parents accountable to teens for upholding the same moral character, teaching teens to "do as I do" instead of "as I say," emphasizing joint accountability over strict and unidirectional parental oversight.

Limitations and Future Research
Similar to other family research that involves parents [5,7,33], our sample was more skewed towards mothers (88%) than fathers who opted to participate in the diary study. Therefore, we can only provide limited insight as to the family communication patterns between teens and their fathers. However, past literature suggests that mothers are more likely to act as heads-of-household and as primary caregivers of their children [7], so this mitigates some of the potential bias in our sample as it reflects typical family roles. Our sample size for matched reports (N=38) also constrained the statistical power in which we were able to detect significant differences between parent and teen reports. As such, we relied heavily on the qualitative analysis to interpret

these results. Overall, the low occurrence for matched reports was a significant finding in itself as we originally anticipated a higher occurrence of matched reports for our analysis.

A final limitation of our research is that we assume our participants attempted to be as honest and complete as possible, but we speculate that at least some risk events went unreported by either side. Therefore, our conclusions are constrained by the data we were able to collect. While unobtrusive means to collect similar data regarding family communication and adolescent online risk experiences would yield more accurate, thus preferable, results, we believe that such methods are not feasible and would likely violate teens' privacy. As such, future research should continue to use a variety of methods to triangulate results of past research and gain valuable insights into the complexities of family communication regarding adolescent online risk experiences.

CONCLUSION

Teens need help navigating the online risks that they face so that they can learn from and overcome them. Yet, unless teens feel like they can confide in their parents for help, they will ultimately have to handle these risks on their own. Open and understanding family communication between teens and parents regarding teens' online risk experiences is not the norm for most families. This is largely because parents fear networked technologies [6] and do not understand that these technologies are an *everyday* part of their teens' lives. Dealing with this new, digital reality is now an unavoidable part of good parenting and needs to be embedded in family communication processes. This includes pre-emptive discussions about appropriate online behaviors, but more importantly, conversations that take place once real risks present themselves.

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APPENDIX A

Table 7: Pre- and Post-Survey Constructs and Reliability Metrics

Construct	Items Measured*	Cronbach's α (Teens)	Cronbach's α (Parents)
Information Breaches (INFO) **	1. Someone else shared my personal information or a photo of me that I didn't want him/her to post. 2. I shared my personal information or a photo of myself that I later regretted sharing. 3. I have been the victim of what I felt was an improper invasion of privacy or misuse of my information in some other way.	0.72	0.77

Construct	Items Measured*	Cronbach's α (Teens)	Cronbach's α (Parents)
Online Harassment (CYBY) **	1. I was treated in a hurtful or nasty way online (cyberbullied). 2. Someone made rude or mean comments about me or threatened me in some way online. 3. Someone tried to spread a mean rumor about me online. 4. There are other types of negative and unwanted interaction that hurt my feelings, and made me feel embarrassed, or unsafe.	0.85	0.93
Sexual Solicitations (SEX) **	1. Someone I know sent me a sexual message ("Sexting"). 2. Someone I know asked me to send them a sexual message, revealing, or naked photo of myself. 3. A stranger asked me to meet them offline. 4. There are other types of sexually suggestive interactions that made me feel even a little uncomfortable.	0.71	0.93
Explicit Content (EXPL) **	1. I saw online stories, images or videos that were pornographic (naked or sexual in nature). 2. I saw online stories, images or videos that contained excessive violence. 3. I saw online stories, images or videos of illegal or deviant (morally questionable) behavior. 4. I saw online content that promoted self-harm (such as eating disorders, cutting, suicide, etc.). 5. I saw other online content that made me feel uncomfortable some way.	0.82	0.91
Family Communication	1. My parents create a safe environment for me to approach them about my concerns. 2. My parents initiate family meetings to discuss problems or issues I might be dealing with online. 3. My parents talk to me about family rules about what I do online. 4. My parents talk to me about how to resist peer pressure to do inappropriate things online. 5. My parents talk to me about how to engage safely with others while online.	0.87	0.81
Active Mediation	*Have either of your parents ever done the following things with you?* 1. Talk to you about what you do on the Internet. 2. Sit with you while you use the Internet. 3. Explained why some websites are good or bad. 4. Suggested ways to use the Internet safely. 5. Suggested ways to behave towards other people online. 6. Helped you in the past when something has bothered you on the Internet.	0.85	0.87
Monitoring	*Does either of your parents sometimes check any of the following things?* 1. Which websites you visited. 2. Your profile on a social network or online community. 3. Which friends or contacts you add to your social networking profile(s). 4. The messages in your email or instant messaging account. 5. The text messages you send/receive on your cell phone.	0.91	0.88
Restriction	*For each of these situations, please specify how restrictive your parents usually are:* 1. Give out personal information to others on the Internet. 2. Upload photos, videos or music to share with others. 3. Download music or films on the Internet. 4. Have your own social networking profile. 5. Watch video clips on the Internet. 6. Use instant messaging.	0.81	0.84
Online Safety Skills	*How well do you know how to do each of the following activities online?* 1. Block someone online that you don't want to hear from. 2. Change privacy settings on a social networking profile. 3. Identify whether or not a website is safe to use. 4. Delete the record of which sites you have visited. 5. Filter out unwanted email messages. 6. Manage virus attacks by installing antivirus software. 7. Manage browser's privacy and security options. 8. Uninstall spyware and adware from your computer.	0.88	0.94

Construct	Items Measured*		Cronbach's α (Teens)	Cronbach's α (Parents)
	9. Keep your personal information secure. 10. Prevent strangers from contacting you online.			

* Item wording shown above was used for the teen participants and reworded to be applicable to parents' perceptions

** Items were used to measure past risk experience over the course of the past year in pre-survey and as the risk prompts in weekly diary

Table 8: Weekly Diary Response Qualitative Data Summary**

Dimensions	Teen-Only Reports	Parent-Only Reports	Matched Reports	
			Teens	**Parents**
# Reports	169	42	38	
Risk Type	62% - EXPL 15% - INFO 11% - CYBY 11% - SEX	57% - EXPL 12% - INFO 19% - CYBY 12% - SEX	37% - EXPL 13% - INFO 24% - CYBY 26% - SEX	
Risk Level	19% - LOW **69% - MEDIUM*** 12% - HIGH	**38% - LOW*** 52% - MEDIUM 10% - HIGH	13% - LOW 71% - MEDIUM 16% - HIGH	18% - LOW 63% - MEDIUM 18% - HIGH
Agency	26% - VICTIM **43% - ACCIDENT*** 15% - WILLING 17% - INTENT	38% - VICTIM 17% - ACCIDENT 21% - WILLING 24% - INTENT	45% - VICTIM 21% - ACCIDENT 21% - WILLING 13% - INTENT	**61% - VICTIM*** 26% - ACCIDENT 3% - WILLING 8% - INTENT
Emotions	**16% - DISCOMFORT*** 15% - INDIFF 12% - UPSET 11% - GOOD **9% - EMBARRASS*** 7% - DISAPPOINT 7% - EMPATHY 6% - ANGER 4% - SCARED 2% - DISGUSTED 10% - OTHER	0% - DISCOMFORT 9% - INDIFF **23% - UPSET*** 13% - GOOD 0% - EMBARRASS 9% - DISAPPOINT 2% - EMPATHY 15% - ANGER 17% - SCARED 4% - DISGUSTED 9% - OTHER	2% - DISCOMFORT 11% - INDIFF 20% - UPSET 4% - GOOD 11% - EMBARRASS 0% - DISAPPOINT 7% - EMPATHY 9% - ANGER 11% - SCARED 9% - DISGUSTED 16% - OTHER	9% - DISCOMFORT 2% - INDIFF 23% - UPSET 9% - GOOD 0% - EMBARRASS 11% - DISAPPOINT 7% - EMPATHY 11% - ANGER 7% - SCARED 5% - DISGUSTED 16% - OTHER
Tell	**86% - NO*** 12% - YES 2% - PRESENT 0% - FOUND 0% - GUESS	0% - NO **57% - YES*** **26% - PRESENT*** **7% - FOUND*** **10% - GUESS***	55% - NO 42% - YES 0% - PRESENT 3% - FOUND 0% - GUESS	0% - NO 53% - YES 3% - PRESENT 18% - FOUND 26% - GUESS
Tell-Why (Tell = Yes)	62% - HELP **29% - SHOCKED*** 5% - FYI 0% - ASKED 5% - N/A	46% - HELP 4% - SHOCKED 25% - FYI 4% - ASKED 21% - N/A	75% - HELP 13% - SHOCKED 0% - FYI 6% - ASKED 6% - N/A	60% - HELP 5% - SHOCKED 10% - FYI 10% - ASKED 15% - N/A
Tell-Why (Tell = No)	32% - NOBIG 17% - NEGATIVE 10% - SOUGHT 2% - PRIVACY 39% - N/A	*N/A – NO REPORTS*	19% - NOBIG 24% - NEGATIVE 0% - SOUGHT 10% - PRIVACY 48% - N/A	*N/A – NO REPORTS*
Mediation (Tell = All except No)	48% - ACTIVE 20% - FIX 8% - LECTURE 4% - RESTRICT 0% - MONITOR 8% - NOTHING 12% - N/A	54% - ACTIVE 7% - FIX **23% - LECTURE*** 4% - RESTRICT 2% - MONITOR 9% - NOTHING 2% - N/A	33% - ACTIVE 28% - FIX 17% - LECTURE 22% - RESTRICT 0% - MONITOR 0% - NOTHING 0% - N/A	**41% - ACTIVE*** 9% - FIX 11% - LECTURE 16% - RESTRICT 14% - MONITOR 9% - NOTHING 0% - N/A

* *Codes that are bold and denoted with an asterisk (*) occur significantly more frequently (p< 0.05) within that participant role (teen or parent) than the alternative. Statistical comparisons, however, were only made within the matched and unmatched reports, not between matched and unmatched reports.*

** *For comparison purposes, percentages reported in this table are standardized to 100% of the report count for each column (i.e., teen-only, parent-only, and matched reports).*