

This Digital Life: A Neighborhood-Based Study of Adolescents' Lives Online

Jessica A. Pater

School of Interactive
Computing

Georgia Institute of Technology
Atlanta, GA 30332 USA
pater@gatech.edu

Andrew D. Miller

Biomedical & Health
Informatics

University of Washington
Seattle, WA 98105 USA
millerad@uw.edu

Elizabeth D. Mynatt

School of Interactive
Computing

Georgia Institute of Technology
Atlanta, GA 30332 USA
mynatt@cc.gatech.edu

ABSTRACT

In this paper, we present the results of a multi-year study of the social computing practices of 179 adolescents ($M_{\text{age}}=12.4$ years, $SD=1.3$; range: 10-14) living in a majority-minority lower-income urban neighborhood in the Southeast U.S. We investigate shifting social media practices using annual surveys and focus groups. We describe participants' social media use and motivations and show how that use has shifted over time. We show how participants identify social pressures and influences as well as specific behaviors including computer-mediated risky behaviors and self-harm. We discuss the implications of our findings for the CHI research community, including methodological challenges and the need for further study of computer-mediated harmful behaviors in youth populations. By demonstrating how large-scale trends are enacted on the ground, we describe participants' uses, motivations and behaviors as they deal with the increasing influence of technology in their social lives.

Author Keywords

Adolescent, technology trends, social computing, self-harm

ACM Classification Keywords

K.4. Computers and Society

INTRODUCTION

Characterizing adolescents' social lives online is an important but notoriously difficult task. As a population, adolescents—a characterization of individuals from puberty to adulthood [8,41]—interact with social computing technologies in ways distinct from the broader population [17]. Today's adolescents grew up with the Internet already fully in place [37], and are the first generation to deeply integrate mobile computing into their everyday social activities [40].

Computing researchers and others have devoted much attention to understanding the effects of broad ICT adoption

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.
CHI 2015, April 18–23, 2015, Seoul, Republic of Korea.
Copyright is held by the owner/author(s). Publication rights licensed to ACM.
ACM 978-1-4503-3145-6/15/04...\$15.00.

<http://dx.doi.org/10.1145/2702123.2702534>

on adolescent social practices, tracking national trends in use [18,29] and psychological impact [5]. Studies of the local, everyday impact of online socialization in adolescents are less common. Yet this rich context is vital to the CHI community's understanding of youth online, particularly issues such as disparities in access and use, and behavioral concerns such as cyberbullying and self-harm.

In this paper we report findings from a four-year study of online social practices, motivations and behaviors of middle school-aged adolescents from a concentrated geographical area, combining focus groups with annual surveys of use and preferences. Rather than seek out a 'generic' or 'average' school, we studied a population who often finds themselves on the short end of the traditional digital divide in the US: urban students living in a low-income majority minority community in a large US city.

We document our participants' social lives online, describing their overall social media practices and preferences and showing how these practices changed across our four-year study. We describe how our participants deal with social influences and pressures, including computer-mediated risky behavior and self-harm. Finally, we discuss the implications of our findings for the CHI research community, including methodological challenges, disparities in access and literacy, and the need for further study of computer-mediated harmful behaviors in youth populations.

Our work makes several contributions to the CHI community:

1. We survey technology use patterns and online behaviors of an understudied population: early adolescents ($M_{\text{age}}=12.4$ years, $SD=1.3$; range: 10-14) from a low-income urban minority neighborhood.
2. We describe emerging patterns of adolescent social media use while pointing to the upcoming challenges these practices bring for youth-focused social computing research.
3. We highlight initial evidence of behavioral issues that are under-studied in the HCI and social computing community.

RELATED WORK

Researchers in HCI and beyond have long been interested in the effects of information and communication technologies (ICTs) on the lives of youth [2]. In the past several years, rapid technological innovations have changed how people connect and youth have been particularly avid adopters of new social media technologies [18]. However, researchers disagree about the psychosocial impacts of these changes: some studies argue for limiting youth's use of social media because of its potential negative impacts on the way adolescents access and evaluate the world [36], while others argue that the dangers arise not from technology but from larger societal trends [2] and some research falls somewhere in between [28].

Adolescence, Youth & HCI

Adolescence is defined as the transition from childhood to adulthood [8]. Biologically, it begins with the onset of puberty [41], which has shifted from an average age of 16.6 years in 1920 to 10.5 years in 2010 [20]. Psychosocially, Erikson's 8 Stages of development depict this time through the increased importance of peer relationships, and increasing conflicts surrounding identity and role confusion [8]. During adolescence, people's motivation and use of social computing systems change dramatically, including increased social exchanges via new groups and mobile phone use [14]. However, HCI researchers have not coalesced on a common term for adolescent users of technology. boyd, for example, describes her teenaged participants as 'youth,' (high school aged) [2] while Grinter & Palen use 'teens' (ages 14-20) [12]. Others have used 'tweens' for those between 10 and 12 [14], and the Pew Center splits the difference with 'teens and young adults' (ages 12-18) [15,18]. For our research, we rely on a structural social and developmental boundary: the American middle school. In the U.S. educational system, a typical American middle school is comprised of youth ages 10-14, yet most are 11-13—both biologically and (as we will show in this paper) psychosocially adolescents. For these reasons, we describe these participants as 'adolescents' here and in our prior work [21,22].

Related studies

Studies characterizing adolescent digital use typically adopt one of three methods: large-scale surveys [18,29], semi-structured interviews and focus groups [2,36], and domain-specific studies [10]. Quantitative, large-scale surveys [19,27] allow for the analysis and understanding of shifting technology adoption patterns and activities. They also make it possible to understand the adoption and impact of certain technological innovations (such as the rise of smartphones) on teens and youth [15].

Qualitative studies, while smaller in number and scope [2,36], typically provide a richer and more contextualized analysis of specific activities, trends, or applications of adolescent life online. For example, in her latest book, danah boyd [sic] focuses on a longitudinal interview-based study examining communication practices of youth online

[2]. While these studies demonstrate findings across a wide geographical and demographic spectrum, online social activities also occur within local contexts [31]. To date, no prominent qualitative study of youth online has focused on the classroom, neighborhood or community.

Domain-specific studies characterize youth reactions to specific social technologies or report on the effects of technology on a specific group [4]. In Grinter's work with teens and instant messaging, technology use was characterized as an emergent feature of teen life and supportive of interpersonal communication in everyday life [12]. Domain-focused analyses inform the community on the potential and the pitfalls of technology adaptations by this segment of the population.

Each method has its advantages: large-scale surveys can give an overall picture of use, and interviews and focus groups can provide depth and nuance. However, connecting large-scale trends to local and situated practices is challenging when these methods are used in isolation. .

Peer influence in social media use

The literature is clear that adolescents are avid users of social networks and online communities [16,28]. Adolescents also have a reputation of experimenting with new platforms and communities [36]. This age demographic integrates social platforms into not just social interactions but into every facet of their daily lives [13].

Research has shown online influences have an impact on offline behaviors [1,37], and that these influences are especially potent during adolescence [26,28]. Social media platforms have become integral to the everydayness of adolescent life – they are integral in online and offline identity development and presentation [26], forcing decisions to be made regarding privacy and audience of one's identity [28]. ICTs may also amplify social pressures and harmful interpersonal behaviors, such as cyberbullying [1] and sexting [30]. Adolescents also use social media to promote and engage in self-harm behaviors like pro-eating disorder communities [9] and online gambling [39].

Theoretical approaches

Researchers have adopted varied theoretical approaches to characterize youth online. Some of the most useful theories and frameworks in contemporary scholarship include networked publics [2]; identity construction & presentation [37]; and the digital native framework [28]. In this research, we have employed these theories where appropriate. However, we have also been influenced by other prominent theories, specifically Cultivation Theory and the Problematic Internet Use Model.

Cultivation Theory (CT) is a social communications theory that describes the psychosocial impacts of media use. Originally developed to understand the effects of television, CT is widely used in the communications literature to explain how media of all kinds impact consumers' conceptions of social reality [24]. CT seeks to explain how

“stable, repetitive, pervasive and inescapable” patterns in media affect an individual’s perception of the world [11,24]. Rather than directly causing specific behaviors, in CT, media exert a kind of “gravitational force” that pulls an individual deeper into the medium [11]—be it television [11,24], a virtual world [38], or a social network like an Instagram feed [32]. We use this lens to analyze the behaviors, themes and attitudes takes place within our population. CT is particularly useful because it advocates a mixed-method, multi-year analysis focused on observing behavior and attitudes as they relate to technology adoption and use.

Understanding Internet use and its influence on the psychosocial well being of an individual, and especially adolescents, was also a key motivator for our work. Problematic Internet Use (PIU) focuses on emotional, cognitive and behavioral issues that stem from online immersion and result in issues within ones offline interactions [5]. Davis describes both a specific pathological Internet use, where people are dependent upon focused and narrow aspects of use and generalized pathological Internet use, which is more common and multi-dimensional in nature [7]. Online socialization is a key component of pervasive Internet use and has been shown to be a key contributor to problematic Internet use [5]. The use characteristics and the ubiquitous nature of access and socialization, as demonstrated above, present serious issues within society [7].

METHODS

Participants

We conducted a multi-year project aimed at understanding technology use of adolescents over time. We partnered with a large urban school district to conduct a series of yearly technology-focused summer camps. We worked with three middle schools in the district that shared similar characteristics: the student populations had high percentages of minority students (majority-minority) and the schools had high free and reduced lunch rate (72%), a common poverty measure. The teachers and administrators met with the researchers to discuss the project and handled all open recruitment procedures in the school. All students who applied to the program were accepted.

There were 179 total participants in the study. Participants’ mean age was 12.40 years (SD=1.30; range=10-14). Table 1 below describes the participants.

Tools

Surveys

We designed and deployed a comprehensive survey to document technologies adolescents use, how they connect to the Internet, what social computing platforms they use (social networks, games, entertainment), the prevalence of certain behavioral issues commonly associated with digital connectivity, and how their connectivity influences their presentations of self to the world.

| | 2010 | 2011 | 2012 | 2013 | Total |
|----------------------------|-------|-------|-------|-------|--------------|
| <i>Avg. Age (in years)</i> | 12.41 | 12.41 | 12.42 | 12.36 | 12.40 |
| <i>Gender</i> | | | | | |
| Female | 44% | 56% | 58% | 56% | 53% |
| Male | 56% | 44% | 42% | 44% | 47% |
| <i>Race</i> | | | | | |
| Caucasian | 7% | 0% | 16% | 12% | 9% |
| African American | 52% | 70% | 79% | 60% | 65% |
| Asian | 31% | 22% | 0% | 20% | 18% |
| Hispanic | 8% | 7% | 5% | 4% | 6% |
| Other | 2% | 0% | 0% | 4% | 1% |

Table 1. Demographic data for participants

Our survey instrument combined validated questions from appropriate national surveys (approximately one-third of the survey) [18,29] with the remaining questions designed by the researchers. We used a combination of open-ended short answer, close-ended multiple choice and yes/no, and partial open-ended questions. We designed the survey to deepen our understanding of the characterization of participants’ motivations for online social interaction, identity online, and behavioral issues like cyberbullying. We provide a copy of the Year 4 survey as a supplementary document to this paper. Two members of the research team coded qualitative data from the open-ended short answer questions. Each researcher coded for general themes and then met several times to discuss findings. Data was then re-evaluated using the shared themes with an inter-rater agreement of over 90%.

Focus groups

The focus group discussions were semi-structured in nature and lasted 60-90 minutes. Each focus group consisted of 9-13 participants, the facilitator, and a member from the survey coding team. Focus groups were conversational in nature: the facilitator began by asking students to talk about their social media use – what platforms they used, when why they used them and the frequency of use. To move the conversation along, the facilitator also asked what makes them want to be social online, what behavioral issues they encounter, and what activities take place online that they would view as “risky” or might get someone in trouble. During two sessions, the facilitator noticed several students who were not contributing and asked for their thoughts related to the discussion. In general, participants were eager to discuss their digital activities and did not require provocation from the facilitator to share their thoughts. A member from the survey coding team took notes during the focus group discussions each year and recorded sessions with a digital voice recorder. As with the open-ended survey questions, session discussions were coded based on general themes and technology use patterns.

Procedure

By using a mixed-methods approach, we were able to not only discern trends, but also contextualize quantitative data with descriptive, situated accounts from our participants. Transportation, materials, and food were provided to all participants for the duration of the camp each year. The

University and the school district’s Institutional Review Board approved the research protocol. All data collection took place during the technology-focused summer camp. The camps took place on a university campus each June from 2010-2013. 179 students participated in the camp over the course of the four-year study. For the few students who attended for more than one year, we only included the data from their first year of participation.

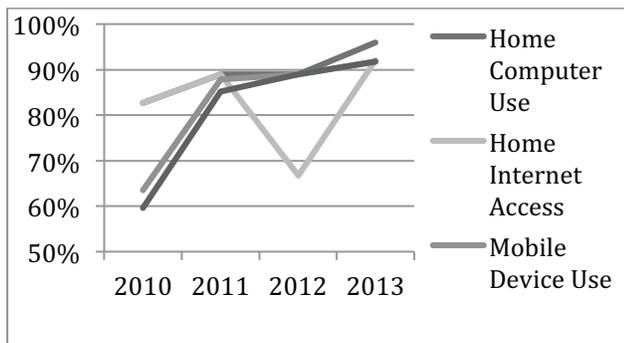
We deployed surveys on the first day of the summer camp each year. We collected 121 unique and complete surveys (67.6%). We deployed the paper-based surveys on the first day to ensure responses would not be influenced by any camp-related activities. We held focus groups during the second week of camp, and 56 randomly selected students participated. Students rotated through camp activities in groups. The teachers associated with the camp divided the students into these groups on the first day, without input from the researchers, thereby establishing which students would be part of the focus groups before the camp began. Teachers first sorted groups randomly, then adjusted for issues like gender representation and personality clash. Six 60-90 minute focus group sessions were held over the four years of the study. Sessions took place in a group setting and were conversational in nature between the facilitator and the participants. We completed initial survey analysis before the focus groups took place. Because of the open-ended nature of the focus groups, we were able to obtain clarifications or engage in deeper discussions related to the ambiguities found in the survey data.

FINDINGS: DIGITAL PATTERNS

Participants’ access to computers and the Internet and their communication preferences mirrored national trends, showing no evidence of a ‘digital divide’ in access. They also increased their time online over the study, although this calculation proved challenging as participants shifted their online activity to smartphones.

Access

We surveyed participants about access related to both hardware and the Internet. The findings reported below are comparable to national trends [18,29]. Graph 1 reports the findings from these survey questions.



Graph 1. Participant access per year

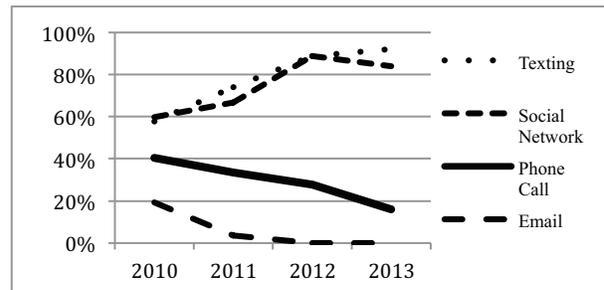
We asked participants to report where they accessed the Internet. 94% reported being at home when they access the Internet and 83% reported being at school. These data are comparable to 93% and 78% (respectively) nationally [18]. Our data shows consistent access reporting between our urban population and representative data from national surveys, in sharp contrast to the prevailing digital divide discourse which highlights that gaps still exist [20].

Communication channels

Moving beyond national surveys, we asked participants about their preferred communication channels. Overall, 74% of participants prefer texting friends, 71% prefer to use social networks, 32% prefer phone calls, and 9% prefer email. These preferences shifted over the course of the study (Graph 2). By Year 3 of the survey deployment, few participants preferred phone calls and none preferred email. This downward trend of phone call and email use by adolescents may surprise some, yet it supports other research findings on mobile communication patterns [16].

Calculation of time “online”

Adolescents are living much of their lives online, without distinguishing between the offline and the online [26]. These trends, combined with the ability to access the Internet via multiple channels, have complicated a simple question like “How many hours a day do you spend online?”



Graph 2. Communication preference trends

In Year 4 we noticed that a majority of the participants reported relatively little average time per day spent online; if the surveys are to be believed, participants actually spent less time online in Year 4 than in Year 1. Looking at the data more closely, we became even more concerned: in the survey, several participants reported spending no time online or less than one hour a day, yet we saw them connected on their phones during the camp, streaming YouTube videos and texting friends. During the focus groups we asked what ‘being online’ meant to them. “When I am online that means I am on a computer and on the Internet” was a typical shared sentiment. To ground this in a tangible example, we asked participants specifically about their use of Facebook, a service accessible through a computer interface, a phone or a tablet. This question puzzled some participants. In a typical response, a Year 4 participant told us “When I am on Facebook on the computer, I am online. When I am on Facebook on my phone, I am on my phone.” After these impromptu

discussions and a clarification of what we meant by “time online”—time spent using traditional or mobile internet to connect to friends, content, or media—we surveyed the participants again, asking them to recalculate their estimated daily time spent online. The average increased from 3.52 hours (SD 2.40) in Year 1 to 8.31 hours (SD 1.89) hours in Year 4.

FINDINGS: SOCIAL NETWORKS/SOCIAL MEDIA USE

Participants diversified their social media use, increasing both the number and type of social networks they used. We saw marked increases in video-based communications and the emergence of hyperlocal app-based social networks.

Preferred social platforms & motivations for use

In our survey, we asked participants to characterize their portfolio of social platforms and online communities that they frequent on a daily basis. We provided participants with a pre-defined list of popular social platforms, and encouraged participants to contribute additional sites through free response. Table 3 depicts the percentage of participants that reported using social platforms each year. The most popular are shown, and for clarity, we have grouped these services by activity.

Rise in video-based communications

In Year 2 and Year 3 we witnessed a rise in self-reported use of video-based communication platforms in both survey results and focus group discussions. In the survey results summarized in Table 3, we saw an increase of reported use of video-based communication channels of 31% between Year 1 and Year 2. We wanted to contextualize what we were seeing in the survey results—30% of students in Year 2 self-reported using the Oovoo platform, and in the focus groups, participants reported that Oovoo was the platform that most of them were using. We asked participants about their use of similar platforms like Skype, Google Hangouts, and FaceTime. These platforms were mainly used for education purposes in the classroom or for connecting to family members; when participants were explicitly asked about the use of Skype, they responded by saying “no because [Skype’s] what my parents use.” When asked why they used video over texting or instant messaging, the popular sentiment was “it’s free and we can use it, so why not?” The following year, Year 3, the use of this platform doubled to 61%.

Diversification of social media portfolio

Based on survey data alone it is evident that our participants managed an extensive portfolio of social platforms. The nature of this use can be described as “bursty” as experimentation of new platforms can sometimes skew or actually increase the size of the portfolio if the new platform is integrated into regular digital practices. We witnessed a burst during Year 3 with participants and the platforms Keek and Kik. Neither of these sites was reported on the survey, yet in the focus group participants discussed how use of the platforms during the spring semester

“exploded” and that most had used these platforms on a daily basis over the last several weeks.

The sophistication in how the participants integrate multi-platform use to serve a discrete task also was discussed in the Year 3 focus group. The participants were asked to describe how Keek and Kik fit into their social media usage. Several of the students shared a story regarding a cyberbullying incident at their school. Participants described using Kik to organize group activities around singling out a female student who had “wronged” one of the other female students. They would use Snapchat to send unflattering images and videos of the target to the rest of the group. They then discussed how fake Facebook, Keek, and Kik accounts were used as an instrument for the actual bullying that took place. This exemplifies how platforms can become truly engrained in the fabric of social media use within a group of users in a short period of time.

Emergence of hyperlocal, anonymous, app-based networks

During Year 4 a rather large technology trend shift presented itself: app-first, semi-anonymous and hyperlocal social networks. The participants showed excitement with regards to talking about Confide and Whisper, new apps they had been using for the past several months: Participants also wrote these apps into the ‘platform’ section of the survey. Collectively, these apps were written in by 33% of the participants. These communities comprise a new type platform: anonymous, hyper local, app-based social networks [33]. At that time, we had heard very little about these apps, but participants quickly enlightened us. The participants shared their favorite aspect: that such a service was only available as an app and could be anonymous if they wanted to be, so their “parents would never know they were using it.” They also shared that it was “cool” that they could talk to random people within a specific geographical distance. These apps also feature the ability to share images, thoughts, ratings, location, and some allow the user to favorite or like posts and search on posts by a given user.

These apps represent a new type of social network with the explicit goal of cloaking the identity of users and keeping communication out of public awareness – relegating it to only a mobile application. The emergence and rapid adoption of these platforms signal that they are either novel, filling a void of neglected needs or wants within social media functions, or a combination of these or other factors.

FINDINGS: INFLUENCES AND BEHAVIOR

For the purposes of this paper, we report our findings of influences and behaviors in the domains participants discussed the most—privacy, identity, social pressure, and computer mediated risky behavior and self-harm. As with the previous section, we based these themes on the survey data and expanded our understanding through the focus group discussions, including topics beyond the scope of the survey such as the emergence of computer-mediated risky behavior and self-harm.

| Platform | Year 1 | Year 2 | Year 3 | Year 4 | Short Description |
|---|--------------------------------------|--------|--|--------|--|
| Bebo | 25% | 26% | 22% | 20% | Youth-focused social networking platform |
| Club Penguin | 27% | 4% | 6% | 19% | Youth-focused virtual world |
| Facebook | 62% | 93% | 94% | 90% | Social networking platform |
| Gaia | 19% | 0% | 11% | 10% | Anime-themed social networking platform |
| Habbo | 33% | 0% | 0% | 4% | Game-based social networking platform |
| Instagram | 0% | 33% | 50% | 33% | Mobile photo and video sharing social platform |
| MySpace | 37% | 15% | 6% | 0% | Social networking platform |
| Oovoo | 0% | 30% | 61% | 52% | Video chat and instant messaging platform |
| Orkut | 0% | 11% | 6% | 0% | Google-based social network (Now Closed) |
| Poptropica | 17% | 0% | 6% | 5% | Online role playing game |
| Skype | 6% | 7% | 6% | 18% | VOIP, video, and instant messaging platform |
| Tagged | 13% | 4% | 6% | 8% | Social networking platform |
| Tumblr | 10% | 0% | 44% | 43% | Social networking platform and microblog |
| Twitter | 27% | 26% | 44% | 20% | Microblogging platform |
| Vimeo | 2% | 22% | 56% | 48% | Video sharing platform |
| Yahoo Games | 13% | 0% | 28% | 14% | Social gaming forum |
| YouTube | 69% | 48% | 33% | 81% | Video sharing platform |
| Platforms reported in the survey, but discussed in the focus groups | Kik – Mobile instant messaging | | Confide – Off-the-record mobile messaging | | |
| | Keek – Video-based social networking | | Whisper – Anonymous app-based social messaging | | |
| | SnapChat – Photo and video sharing | | Secret – Anonymous app-based social messaging | | |

Table 3. Popular Social Media Platforms

Privacy

How is privacy represented in the adolescent population? What are their privacy strategies and how do their social interactions online reflect the internalization of these strategies? When we asked participants about the privacy of information they post online, we received a myriad of answers – 33% responded that information was not private, 16% felt that it was neutral, 29% felt that it was private and 21% didn't understand privacy as it relates to information online. During the focus groups, we experienced several instances of participants discussing annoyance with people using their information in ways they never thought possible. We mentioned that colleges and schools often search and monitor student activity, and that in some cases employers use them as "informal background checks" when hiring new employees. Several participants shared that this use should be against the law because what they did in their personal life should not play a part in their ability to be appropriate in a professional setting.

The lack of a nuanced understanding of privacy within our participant group was not a shocking finding. The term privacy proved to have different meanings for different participants, consistent with findings from the research community [12]. During focus group discussions the participants took issue with individuals using their information in a manner that the participants did not originally intend. They also lamented the growing presence of authority figures within their social spaces. We elaborate on these tensions later in the discussion section.

Identity

The design of the survey also focused on reporting how the participants viewed their online identity versus their offline

identity: 28% of participants reported that they viewed their online identities as separate or different from their offline identities. Of these participants, only 22% said that their online identities didn't reflect their true self or that they "played a role" online. From the 78% that responded that there was a difference, and that their online identity was a truer reflection of their "real" self, several participants responded why they felt this way.

Several participants explained that the "real" self that was represented through online social interactions allowed for greater control of the reputation that is broadcasted:

"I can't be who I want to be in the real world" P29

"I don't tell them stuff about me I don't like" P69

Others expressed the ability to manipulate personas to meet specific ideals of "popular" or "culturally accepted":

"I can be me, I don't have to be a jock or popular" P33

"My friends are all religious and I have to pretend to be with them, but not when I am in Bebo because they don't use it" P43

We anticipated participants reporting role-playing through their online social personas due to where they are in their emotional and mental development [35]. Based on previous research, we actually anticipated this representing a more prevalent theme in the data [10].

Social Pressure

Do adolescents recognize the impact of social peer pressures upon their behavior and activities? When asked in the survey, 28% of participants reported that at some point, they had felt pressured to share something that they would

not normally share online. When discussing buying or wearing something, saying something, or treating someone a certain way, 44% reported they had been influenced by someone and 23% reported they had tried to influence someone else. When asked about feeling pressure about who they could be friends with online, 19% of participants reported feeling pressured by others while 11% reported directly trying to pressure someone else.

Peer pressure and, in extreme cases bullying, is not a new phenomenon. However, with the increasing use of technology, people have the ability to extend the reach of communication further than ever before. Through the survey, we asked the participants to answer questions related to cyberbullying. We asked if they had ever felt bullied through texting or any online interactions. 30% of participants reported that they had been bullied. Each year of the survey we saw the number of participants reporting cyberbullying decrease. In Year 1, 42% reported being bullied, 27% in Year 2, 23% in Year 3, and 17% in Year 4. The change from Year 1 to Year 4 was statistically significant $X^2(2, N=119) = 4.99, p < .01$. Our findings were congruent with the National Center for Educational Statistics's most recent findings that 27.8% of youth ages 12-18 report being cyberbullied [40]. However, as we discuss shortly, this reported decrease might be deceptive.

When asked if the participants who had been cyberbullied knew their perpetrators, 46% of all participants reported they preferred not to answer the question. Of the remaining participants, 81% reported they knew who was bullying in addition to the 76% whom reported not knowing their perpetrator(s). While this seems illogical, that an individual would report known and not knowing who was bullying them, this is consistent with cyberbullying reporting because victims are usually bullied by more than one person and find themselves knowing the identities of one or more of the bullies, but not all responsible [3]. Regardless if they reported being bullied in the past, 58% reported witnessing cyberbullying.

During one conversation in a focus group on the legal consequences of certain risky online behavior during Year 3, a group of females became very animated and enraged. Female A spoke tersely and loudly at Female B saying, "if I get in trouble from that crap you sent me, I swear to God." The group had discussed the legal issues surrounding sexting and the fact that if any of them took, shared, or had naked images of themselves or others on their phones, in rare cases they could be prosecuted for a felony as an adult. Once this law was discussed, the participants no longer wanted to discuss this topic. During a focus group in Year 4, a group of female athletes discussed an online community they frequently used when needing tips on how to cut weight for their respective sport teams. This conversation took place in the context of a discussion about using the Internet for health advice within a focus group of all female participants. One of the participants added that it

was also a great place to find tips on how to hide not eating from your parents. The researcher asked the focus group if they had used social platforms to access information that supported activities associated with food restriction or body modifications. The participant who had spoken up initially reported that she had never used a site like that, but she had friends who had. This observation helps confirm trends that were reported to the researchers from counselors at schools within the same district several months before the camp.

DISCUSSION

Our goal with this study is to provide a more holistic understanding of the trends associated with adolescents' social lives online. Our results indicate that while our population is demographically different than national trends, comparable access and activity exists. In trying to characterize these trends, several emergent issues became visible within our data sample and analysis, particularly emerging social computing practices and the uncovering of harmful online behaviors.

What's in a neighborhood?

We began this project expecting to see (and help the HCI community address) the digital divide in action and how disparities associated with access were affecting adolescents in the neighborhood we studied. While the digital divide still exists, over the four years of the study we saw many disparities in use and access disappear. Students in our participant population come from an economically challenged urban area, and many live in single-parent homes or transient housing. Where there are national surveys or studies for comparison, students in our study (especially by the third and fourth year) generally match national trends in access and use. We saw evidence of sophisticated Internet practices – from students bypassing school Internet filters to gain access to social media platforms while at school to those who created advanced privacy setting on their Facebook accounts.

And yet these adolescents' online activities were still shaped by their local environment. While we saw little evidence of a profound 'digital' divide, participating students still lived within socioeconomic conditions that inevitably affected their online experiences. For example, many students were self-reported 'latchkey' kids; these students' online activities were rarely supervised by a parent or guardian, and the neighborhood also included transient students and a substantial refugee population.

Our view from the neighborhood gives us cause for both optimism and concern: neighborhood adolescents' online lives appear to be encouragingly *normal*, yet challenges remain in confronting behavioral issues such as cyberbullying and self-harm.

Facebook isn't dead

Adolescents engage in frequent and often quite sophisticated decisions about their social media platforms and practices. One recent example of shifting practices is

participants' changing relationship with Facebook. During the final year of the deployment we began to hear rumblings from the national media regarding the "Death of Facebook" [27] with respect to adolescent use. The media frenzy stemmed from an ethnographic study of family social media practices in the UK [23]. Recent scholarship indicates that youth may not be fleeing Facebook, yet their relationship with the platform is changing [19].

Our discussions with participants highlight this change and offer context to its nature. As parents and older users in the study population increased their use of Facebook, younger participants began shifting to alternative platforms. Adolescents in the study appeared to be reducing their use of more established social network sites like Facebook. Facebook use in our population also seems to have peaked, becoming ubiquitous in 2011 and 2012 (94% reported using the site) but declining in 2013 to 76%. However, when we look at the survey results in combination with conversations with the participants themselves, we found little evidence of widespread abandonment. Instead, we found them navigating a complex web of publics and contexts. For our participants, Facebook is a vital component, but it's no longer the only game in town.

Our participants told us stories about the influx of adults, parents and other authority figures into their Facebook lives. Although this did cause some participants to stop using Facebook, many more told us how they redefined their relationship to Facebook to mitigate what one participant described as "the invasion of grandma." Regarding their activity on Facebook itself, participants reported actively managing their self-presentation through more sophisticated use of privacy controls. When asked if they used privacy before their family members joined Facebook, none of the participants reported that they had modified privacy settings from the default of public. For example, one girl told us

"I never used privacy stuff on Facebook until my mom and my auntie made me accept their friend requests. After that, I made sure they couldn't see any pictures of me at all."

Some participants took this even further, creating multiple Facebook profiles: one for their friends and one for their families. When asked about the frequency of use of both accounts, a male participant offered

"I make sure to update my profile with my parents every couple of days so they think I am actually using it. I will check my other one a few times a day, but not as much as Instagram or Tumblr."

However, new apps and social networks have begun to erode time and attention our participants devote to Facebook. Where once Facebook was "the destination" for photo and video sharing, messaging, blogging about one's life, relationship declarations, playing games, and many other activities, it is no longer the one-stop-shop for our participants. Tools like Instagram, Oovoo, Keek, Kik,

SnapChat, and Whisper have come to share that space. As one participant told us:

"I still use Facebook sometimes, but my friends all post videos and photos on SnapChat so I use that or Instagram. Why post it on Facebook when everyone else is posting it [elsewhere]?"

The simplistic story of adolescents abandoning Facebook in droves is unsupported by our evidence and *much less interesting* than what's actually going on: the relationship between adolescents and the Facebook platform is evolving. Social media is also in its adolescence, and our participants and sites like Facebook are growing up together. Continued, careful, on-the-ground study is needed to see where this relationship is headed next.

Uncovering harmful behaviors

In this study we uncovered several risky and potentially harmful behaviors of our participants online. We never focused specifically on these behaviors; our aim was simply to broadly characterize online social activity within our population. However, through our focus groups we uncovered participant behaviors that include sharing personal nude images (sexting), cyberbullying, body ideation/restrictive eating, and general depression. With the rise of new social platforms that bring new capabilities (ie. Snapchat and hyperlocal platforms), the potential for negative exploitation is real and already being observed within this population. Surveys will typically not uncover this level of activity. Studies have shown that accurate reporting is challenging because sometimes the behaviors are so sensitive that respondents may not want to report them [3], they may believe that there is a social stigma related to these behaviors and therefore do not truthfully share, or believe that there could be penalized for their involvement after the fact [3].

It is not enough to simply ask an adolescent if they have experienced harmful behaviors, the context of actions and behaviors are also important. For example, we assessed cyberbullying in this study both on the survey and in the focus groups. When looking at the survey data (it showed steady decreases each year of the survey), one might conclude that there has been a general decreased in reported cases—that the prevalence of this problem is on the decline. However when we asked focus group participants about this perceived decline they painted a much different picture. Students shared that they felt the definition of cyberbullying was "overhyped" and that what adults define as cyberbullying, they define as "just dicks being dicks online". One possible interpretation of this tension is that adolescents may be experiencing desensitization toward the negative aspects associated with cyberbullying due to repeated and persistent exposure [1]. Further research is needed to understand if desensitization is taking place, and if it is, to what extent this desensitization of cyberbullying affects similar populations.

One of the most alarming behaviors discussed in the focus groups was the use of websites or communities promoting restrictive eating habits. These communities are often labeled as Pro-Ana (Pro Anorexia) or Pro-Mia (Pro Bulimia). During the focus group in Year 4, several students discussed finding forums that were helpful in imparting tips on quickly dropping weight for track. When this was contributed to the group discussion, another student sarcastically questioned the validity of the forum being used in relation to weight loss specifically for the sport activity. Our previous discussions with guidance counselors from the participants' district corroborate that this type of behavior is indeed taking place and on the rise within the district. For the CHI community, the access to destructive body image communities that support these diseases is an interesting and alarming use of online communities. These communities offer a variety of support for members—tips on how to hide symptoms, instructions on quick weight loss [6], the sharing of “Thinspiration” — media intended to provide inspiration for these types of lifestyle choices [9]. These types of communities are particularly popular as a form of support for socially isolated anorexics [25].

This trend is troublesome. Eating disorders like Anorexia and Bulimia are recognized by the scientific community as a serious illness, as denoted within the DSM published by the American Psychiatric Association. Health care professionals within the schools are also concerned that some parts of the research community posit that Anorexia has the highest rate of mortality of any psychological disorder [34]. As a research community, we need a broader analysis of risky behaviors online. Research focused on risky behaviors online is necessary, but will require interdisciplinary collaborations between developers, HCI researchers, and domain experts such as developmental psychologists, school counselors, parents, and the adolescents that use them.

Appification: winter is coming

As researchers, our ability to accurately capture data on social networks is challenged by an ever more diverse, app-based and mobile online social life. As seen in the ever-expanding list of social media sites and apps used by our participants, youth join, use and abandon social media services with increasing frequency and fluency. These new platforms are not necessarily taking the place of social network giants like Facebook. Instead, youth appear to be using even more apps with specialized features and novel uses. The rise of hyperlocal networks, anonymous spaces, and platforms where data is designed to “disappear” challenges us to redefine the type of activities and resulting data that results from interaction on these platforms.

As a community, we have enjoyed a “digital summer” where access to data from social networks has been relatively accessible for researchers as seen with the easy access of Twitter, Tumblr, and MySpace data. With the rise of anonymous, app-based, and hyperlocal social networks,

access to data will potentially become more difficult, making research—particularly trend analysis—more challenging for the field.

We also found that the types of national surveys, that we have traditionally used to characterize these types of activities, are out of date. As discussed earlier, simply asking about time spent online is no longer sufficient. Due to the pervasiveness of smartphones and the ability to see instantaneously when our friends communicate with us via social networks, text, or video, the current generation indicates that they are always tethered to their social technologies; therefore making explicit distinctions about “online time” versus “offline time” doesn't resonate with how they think about technology use. Without our focus groups, we would have missed a wealth of knowledge about the types of activities taking place, behaviors in play, and new platforms being used.

CONCLUSION

In this paper, we have characterized the preferences, motivations and behaviors of a population of online adolescents from a single neighborhood over four years. By demonstrating how large-scale trends are enacted on the ground, we have shown participants' uses, motivations and behaviors as they deal with the increasing influence of technology on their social lives. This exploration has revealed a breadth of fascinating and critical research to be done in this domain—the rise of hyperlocal, anonymous networks as well as possible harm to adolescents through digitally-based self-harm.. While our results were focused on a specific age group and population, we believe this approach would work for other populations as well, as it could be critical for identifying trends and opportunities for design and research.

ACKNOWLEDGEMENTS

In addition to the educators and participants we worked with over the years, we would like to thank the students and faculty of the Interactive Computing department at Georgia Tech and the Information & Communications Lab at GTRI for the community support given throughout this research. This research is supported by NSF award SHB-1116801.

REFERENCES

1. Bazelon, E. *Sticks and Stones: Defeating the Culture of Bullying and Rediscovering the Power of Character and Empathy*. Random House, New York, New York, USA, 2013.
2. boyd, d. *It's Complicated - The social lives of networked teens*. Yale University Press, 2014.
3. Brener, N.D., et al. Assessment of Factors Affecting the Validity of Self- Reported Health-Risk Behavior Among Adolescents : Evidence From the Scientific Literature. *Jrl of Adol Health* 33, (2003), 436–457.
4. Buhler, T., Neustaedter, C., and Hillman, S. How and why teenagers use video chat. *Proc of the 2013 CSCW Conference*, ACM (2013).

5. Caplan, S.E. Problematic Internet use and psychosocial well-being: development of a theory-based cognitive-behavioral measurement instrument. *Computers in Human Behavior* 18, 5 (2002), 553–575.
6. Christodoulou, M. Pro-anorexia websites pose public health challenge. *The Lancet* 379, (2012), 110–112.
7. Davis, R. a. A cognitive-behavioral model of pathological Internet use. *Computers in Human Behavior* 17, 2 (2001), 187–195.
8. Erikson, E.H. *Childhood and Society*. WW Norton & Company, 1993.
9. Fleming-may, R.A. and Miller, L.E. “ I ’ m Scared to Look . But I ’ m Dying to Know ”: Information Seeking and Sharing on Pro-Ana Weblogs. *Proceedings of the 2010 ACM ASIST Conference*, ACM Press (2010).
10. Forman, A., Baker, P., Pater, J., and Smith, K. Beautiful to me: Identity, disability, and gender in virtual environments. *IJEP* 2, 2 (2011), 1–17.
11. Gerbner, G., Morgan, M., and Signorielli, N. Living with Television : The Dynamics of the Cultivation Process. In *Perspectives on media affects*. 1986, 17–40.
12. Grinter, R.E. and Palen, L. Instant Messaging in Teen Life. *CSCW '02*, ACM Press (2002), 21–30.
13. Ito, M. *Hanging out, messing around, and geeking out: Kids living and learning with new media*. MIT Press, 2010.
14. Kaare, B., Brandtzaeg, P., Heim, J., and Endestad, T. In the borderland between family orientation and peer culture: the use of communication technologies among Norwegian tweens. *New Media Society* 9, (2007), 603–624.
15. Lenhart, A., Purcell, K., Smith, A., and Zickuhr, K. *Social Media & Mobile Internet Use among Teens and Young Adults*. Millennials. Pew, 2010.
16. Lenhart, A. *Teens, smartphones & texting*. Pew, 2012.
17. Livingstone, S. Taking risky opportunities in youthful content creation. *New Media Society* 10, 3 (2008), 393–411.
18. Madden, M., Lenhart, A., Duggan, M., Cortesi, S., and Gasser, U. *Teens and Technology 2013*. Pew, 2013.
19. Madden, M. *Teens Haven't Abandoned Facebook (Yet)*. Pew, 2013.
20. McKie, R. Onset of puberty in girls has fallen by five years since 1920. *The Guardian*, 2012. www.theguardian.com.
21. Miller, A.D. and Mynatt, E.D. StepStream : A School - based Pervasive Social Fitness System for Everyday Adolescent Health. *Proc. of the ACM CHI 2014*, (2014), 2823–2832.
22. Miller, A.D., Pater, J., and Mynatt, E.D. Design strategies for youth-focused pervasive social health games. *Pervasive Health 2013*, IEEE (2013), 9–16.
23. Miller, D. *Global Social Media Impact Study*. 2013.
24. Morgan, M. and Shanahan, J. The State of Cultivation. *Journal of Broadcasting & Electronic Media* 54, 2 (2010), 337–355.
25. Morris, B. A Disturbing Growth Industry: Websites that Expose Anorexia. *New York Times*, 2002.
26. O’Keeffe, G. and Clarke-Pearson, K. The impact of social media on children, adolescents, and families. *Pediatrics* 127, 4 (2011), 800–804.
27. Olson, P. Here’s Where Teens are Going Instead of Facebook. *Forbes*, 2013.
28. Palfrey, J.G. and Gasser, U. *Born Digital: Understanding the first generation of digital natives*. Basic Books, New York, 2008.
29. Rideout, V., Foehr, U., and Roberts, D. *Generation M(2) - Media in the Lives of 8-18 year-olds*. 2010.
30. Sacco, D. and Al., E. *Sexting: Youth Practices and Legal Implications*. 2010.
31. Sandelowski, M., Docherty, S., and Emden, C. Focus on qualitative methods, Qualitative metasynthesis: issues and techniques. *Research in Nursing and Health* 20, (1997), 365–372.
32. Schrock, A. Examining social media usage: Technology clusters and social network site membership. *First Monday* 14, 1 (2008).
33. Shieber, J. Anonymous Social Messaging Discovers Location Matters. *Tech Crunch*, 2014.
34. Simon, H. *Report: Eating Disorders*. 2013.
35. Steinberg, L. and Morris, A.S. Adolescent Development. *Journal of Cog Ed and Psyc* 2, 1 (2001), 55–87.
36. Turkle, S. *Alone Together: Why we expect more from otechnology and less from each other*. Basic Books, 2012.
37. Wellman, B., Haase, A.Q., Witte, J., and Hampton, K. Does the Internet increase, decrease, or supplement social capital? Social networks, participation, and community commitment. *American behavioral scientist* 45, 3 (2001), 436–455.
38. Williams, D. Virtual Cultivation: Online worlds, offline perceptions. *Journal of Comm*. 56, 1 (2006), 69–87.
39. Xu, Q., Wan, Y., Zhang, Y., Liu, Y., and Sun, Y. Internet usage and teens’ psychological well-being in China. *2011 International Conference on E-Business and E-Government (ICEE)*, Ieee (2011), 1–4.
40. *Student victimization in US Schools: Results from the 2009 School Crime Supplement to the Naitonal Crime Victimization Survey*. NCES, 2011.
41. Puberty. *U.S. Office of Adolescent Health*, 2015. <http://www.hhs.gov/>