Privacy Attitudes of Mechanical Turk Workers and the U.S. Public

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ABSTRACT

Amazon Mechanical Turk (MTurk) is a crowdsourcing platform widely used to conduct behavioral research, including studies of online privacy and security. We studied how well the privacy attitudes of MTurk workers mirror the privacy attitudes of the larger user population. We report results from an MTurk survey of attitudes about managing one's personal information online and policy preferences about anonymity. We compare these attitudes with those of a representative U.S. adult sample drawn from a separate survey a few months earlier. MTurk respondents were younger and better educated, and more likely to use social media than the representative US adult sample. Although they reported a similar amount of personal information online, U.S. MTurk workers put a higher value on anonymity and hiding information, were more likely to do so, had more privacy concerns than the larger U.S. public. Indian MTurk workers were much less concerned than American workers about their privacy and more tolerant of government monitoring. Our analyses show that these findings hold even when controlling for age, education, gender, and social media use. Our findings suggest that privacy studies using MTurk need to account for differences between MTurk samples and the general population.

1. INTRODUCTION

Amazon Mechanical Turk (www.mturk.com) is an increasingly popular platform for conducting behavioral research. It is now widely adopted by researchers in many domains, including psychology [9], economics [18,39], and political science [35]. It is broadly recognized as a fast and inexpensive way to collect data requiring human participation, and provides a level of cultural diversity hard to obtain with other recruitment methods [10,13,35]. MTurk has also become a valuable resource for privacy and security research and is widely used to survey people's opinions on privacy-related issues [5,23,28,29,46]. Researchers have conducted experiments on MTurk to study the effects of framing on information disclosure [6] and the factors influencing people's attitudes toward online behavioral advertising [28]. Others have implemented surveys on MTurk to study users' privacy preferences for mobile apps [29], their privacy concerns on social networking sites [46], and their attitudes about national security [33]. However, none of the

previous work has compared the privacy experiences and opinions of MTurk workers with those of the general public. We do not yet know whether privacy research conducted on MTurk is generalizable to other populations.

We address in this paper the comparability of MTurk worker privacy attitudes and behavior with those of the general population. MTurk workers, as with any self-selected subset of the population, may differ from the general population and these differences can constrain the generalizability of study results. One reason to expect differences in their responses is that the privacy practices, social norms, and default settings of different websites may attract different types of people. MTurk's policy is that "collecting personal identifiable information" is prohibited when requesters recruit workers from the market [2]. Thus it may attract people who particularly value privacy. By contrast, the social networking site Facebook encourages real-name accounts, perhaps attracting people who desire, or at least do not oppose, being known. In addition, most workers on MTurk come from two culturally different countries: the U.S. and India. The two countries' different government policies and cultural backgrounds may strongly affect people's experiences and attitudes, which bring additional challenges to privacy research conducted on MTurk.

Our goal is to contribute to the research in online privacy and security by comparing the privacy attitudes of MTurk workers, assessed online, with those of a representative sample of the U.S. public. Our purpose is to understand how the former group's attitudes reflect or diverge from those of the general public. Our results can help researchers calibrate their findings from MTurk samples, and understand their generalizability to broader samples of the public.

We report here two comparisons--a comparison of a U.S. based MTurk worker sample with a representative telephone sample of the U.S. public that uses the Internet, and a comparison of the same U.S. MTurk sample with a sample of Indian MTurk workers. We studied their comparability with respect to two topics: (1) how they manage their personal information online, and (2) their attitudes and preferences regarding privacy and anonymity online. We tackled these topics because the Internet increasingly exposes personal information about people, not just to their intended audiences, but also to third parties who may be completely hidden to them [38]. Recent news events imply that it is difficult if not impossible to put walls around one's content by communicating anonymously or securing access from unauthorized others [1,3]. Even MTurk, an anonymous platform, may fail to protect personally identifiable information about some

of its workers [27].

2. RELATED WORK

The rise of greater Internet transparency and threats to personal information has prompted considerable research on what Internet users know about their personal information online and how they try, or fail to try, to protect it [e.g., 21]. National polls suggest that many Internet users do not know how much of their personal information is online and open to surveillance from people they have not authorized to see or use it [29]. Many Internet users have only a vague notion of how the Internet works [36] and the potential threats to their privacy [20]; most do not know who has access to information about them or how people get this information [24]. And the public has become more worried. Kang et al.'s [22] interview study revealed a variety of real-life circumstances and goals that led interviewees to seek anonymity or to hide identified content from particular individuals or organizations.

We began this work with the hypothesis that MTurk workers may have more concerns about privacy than the average member of the Internet-using public. First, these workers are a self-selected group that has chosen an anonymous worksite. Second, recent studies comparing MTurk with other samples suggest that MTurk workers are better educated, more liberal, and younger than the general population [35]. In domains other than privacy, researchers have compared MTurk samples with other groups such as representative samples of the U.S. public, examining differences in their demographic characteristics [10,19,33,35,42], personality traits [7,15], and political attitudes and responses to experimental treatments [8]. Berensky, Huber, and Lenz [8] found that MTurk workers are more representative than convenience samples (e.g., locally-recruited students) but less representative than Internet panels or national representative samples. Goodman, et al. [14] argued MTurk sample was not different from a community sample in their demographics except that MTurk has more international participants. Ross, et al. [42] found an increasing proportion of young people, males, and people with lower income in active Turkers. They also found Indian workers on MTurk to be younger than U.S. workers, and have lower incomes and higher education levels. These differences might predispose MTurk workers to be more knowledgeable about threats to online privacy. Martin et al. [32] studied a crowd workers' forum and found that MTurk workers do desire anonymity and tend to avoid surveillance. Lease's survey [26] of 1,000 MTurk workers suggests that they place a high value on the anonymity of their names and home addresses. This prior work raises the possibility that MTurk workers may have a higher level of concern than the general Internet-using public about the privacy and protection of their personal information.

The majority of MTurk workers are from the U.S. and India [10,13,35]. The proportion of U.S. workers and Indian workers on MTurk in a recent study [42] was 57% and 32% among the 573 workers openly recruited. Collecting data on MTurk can help researchers investigate cultural differences, but at the same time might introduce extra noise into their data because of geographic and cultural differences. People's privacy perceptions and preferences are often shaped by the societies in which they live and by their cultural backgrounds [45]. From prior work, we expected differences in privacy attitudes of U.S. MTurk workers and Indian MTurk workers. Americans disclose more in traditional communication settings than people from Eastern cultures (Chinese in [11]). Recent work suggests, however, that Americans disclose less online than face-to-face because they have more concerns about online communication being exposed to others [47]. Indians seem to have a lower degree of privacy concern than Americans [25,45,46], and place more trust in government organizations that collect personal information [25]. Mason and Dupuis [33] compared Indian and U.S. MTurk workers' perceptions about security and their opinions about Edward Snowden's revelations of NSA surveillance. Compared with U.S. MTurk workers, Indians reported greater agreement with statements such as "Snowden's actions have damaged U.S. national security," suggesting that the American workers were more inclined to value Snowden's revelations. Therefore, another purpose of this work was to compare the privacy attitudes and behavior of a U.S. MTurk worker with an Indian MTurk worker sample.

In sum, our research aims to answer two questions: (1) Are U.S. MTurk workers different from the U.S. Internet users in managing their personal information and in their opinions about online privacy? (2) Are U.S. MTurk workers different from Indian MTurk workers in managing their personal information and in their opinions about online privacy?

3. METHOD

3.1 Participants and procedure

We compared responses in two survey studies of privacy and anonymity, one a representative telephone sample of U.S. Internet users and the other (a few months later) an online survey of MTurk workers. Most items for both surveys were the same. We report here only the responses to questions that were identically- or similarly-phrased on both surveys. Because the surveys given to the representative U.S. sample were conducted by phone with voice responses, and the MTurk surveys were conducted online, with typed responses, the response options were never identical. However, as much as feasible, the questions themselves were identical. The survey questions we analyzed in this paper are attached in an appendix.

The first survey was administered by the Pew Research Center's Internet Project (referred to here as "Pew") in July 11-14, 2013. The current authors collaborated with Pew researchers on constructing questions for this survey. The survey items were developed based on the interview questions about anonymity in Kang et al. [22] and questions on privacy that the Pew Research Center fielded in its previous surveys [30,31,37]. Pew surveyed a representative sample of U.S. adults consisting of 1,002 U.S. adults ages 18 and over, with 500 surveys using landline telephones and 500 surveys using cell phones. Respondents were not paid, except any cell phone charges were reimbursed. When conducting the survey, interviewers asked respondents if they would be willing to participate in a confidential and anonymous survey. Participants were then asked a series of questions, first to determine if they were Internet users, and then about their activities online. Of the total participants, 775 said they used the Internet and our analysis is based on responses from these Internet users.

The authors conducted the second survey on Amazon Mechanical Turk. We recruited 418 people from MTurk from February 16-20, 2014. We used the same sampling criteria as in previous studies to increase quality [23, 35], by restricting the participants to those with an approval rate of at least 95% and at least 100 approved HITs. Each participant was paid $1 for completing the survey.

They were told that the survey was about how people use the Internet. Separate HITs were released to recruit participants from the U.S., India and other countries. After accepting the HIT, MTurk workers were directed to a SurveyMonkey survey. The survey was completely voluntary and confidential. Participants could opt out of the survey at any time. Twenty-two responses (5%) were excluded because they failed the attention check questions or entered invalid responses. The dataset we analyze here includes 310 valid responses: 182 from the U.S. and 128 from India.

3.2 Survey items

The Pew survey and MTurk survey posed questions related to privacy and anonymity, and demographics.

3.2.1 Managing their personal information

Both surveys asked respondents to estimate what personal information is online for others to see: "Is any of the following information about you available on the Internet for others to see? It doesn't matter if you put it there yourself or someone else did so." They were asked about their email address, home address, home phone number, cell phone number, employer or company, political party or political affiliation, things they've written with their name on it, photo of themselves, video of themselves, which groups/organizations they belong to, and birth date.

Both surveys also asked respondents whether they had tried to hide their identity online: "Have you ever tried to use the Internet in a way that hides or masks your identity from certain people or organizations?" Those who answered "yes" to this question were coded as having tried to hide their identity.

Internet users may be differently concerned about protecting their personal information when they communicate with different groups. To study whether respondents were selective in hiding content (such as posts) that they had communicated online, the national sample Pew survey asked participants "Have you ever tried to use the Internet in ways that keep ___ from being able to see what you have read, watched or posted online?" They were asked if they had done this to "family members or a romantic partner;" "certain friends;" "people from your past;" "an employer, supervisor, or coworkers;" "the companies or people who run the website you visited;" "hackers or criminals;" "law enforcement;" "people who might criticize, harass, or target you;" "companies or people that might want payment for the files you download such as songs, movies, or games;" "advertisers;" "the government?" In the MTurk survey, we slightly modified the format and combined the responses in our analysis in order to compare them with the national sample. (The different ways in which the questions were asked may matter, so this comparison should be considered only in context of the whole.)

3.2.2 Privacy attitudes and preferences

Both surveys asked respondents, "Do you ever worry about how much information is available about you on the Internet?" The respondents also were asked about their opinions about government policies: "Do you think the laws provide reasonable protections of people's privacy about their online activities?" and their opinions about anonymity: "Considering everything you know and have heard about the Internet, do you think it is possible for someone to use the Internet completely anonymously – so that none of their online activities can be easily traced back to them?" and "Do you think that people should have the ability to use the

Internet completely anonymously for certain kinds of online activities?"

We do not report on additional questions about privacy that were not similar in the two surveys.

4. RESULTS

We used JMP statistical software to conduct multivariate and regression analyses of the survey data. Only a few respondents opted not to answer particular questions so we did not need to adjust for missing data.

4.1 Demographic differences

We first compare the demographic characteristics of the U.S. public sample, the U.S. MTurk sample, and the Indian MTurk sample (Table 1). Our MTurk samples seem similar to MTurk samples in other studies, for instance the 2,912 participants in [28]. Consistent with previous studies [8,23], our MTurk samples are younger and the Indian sample is better educated than the U.S. public sample (81% have a college education or higher, compared with the U.S. MTurk sample, t [308] = 6.29, $p < .01$). Both MTurk samples had more male than female respondents, whereas the U.S. public representative sample had equal male and female respondents. The MTurk samples are also much more likely to use social media. Because social media tends to elicit personal information from people, using social media should predict more

Demographic Characteristics	U.S. Public	U.S. Turk	Indian Turk
N	**775**	**182**	**128**
Age			
18-24	12%	24%	23%
25-34	14%	41%	56%
35-44	13%	23%	12%
45-54	17%	9%	5%
55-64	24%	3%	2%
65+	19%	1%	2%
Mean age	49.8	32.7	30.5
	F [2,1080] = 122.72, $p < .001$		
Gender			
Female	50%	42%	35%
Male	50%	57%	65%
	X^2 [2, 1084] = 11.76, $p < .01$		
Education			
High school or less	26%	12%	5%
Some college	31%	45%	14%
College and more	42%	43%	81%
	F [2,1080] = 24.62, $p < .001$		
Percent who use social media	68%	90%	98%
	X^2 [2,1085] = 97.04, $p < .001$		

Table 1. Demographic characteristics of three datasets: U.S. telephone representative sample (referred to as U.S. public in paper), U.S. Turk sample and Indian Turk sample. Total N = 1085.

concerns about privacy as well [40].

The demographic characteristics of a group of people may be highly predictive of their attitudes. For instance, younger people may be more politically liberal (among many other differences) than older people [8]. This expectation leads us to ask whether any difference in privacy attitudes between MTurk workers and the U.S. general public might be due merely to their being younger, for example, rather than to their being MTurk workers. That is, would any younger group respond the same way as the MTurk sample? To tackle this question, we conducted hierarchical regression analyses. For each of the dependent variables, we first conducted a regression analysis using a dummy variable of the two samples as a predictor variable (Model 1), then added age to the model (Model 2), and finally, we added gender,

education, and social media use to the regression model (Model 3). If demographic variables explain differences in privacy attitudes, then these factors should contribute a statistically significant effect, and the effect of the U.S. MTurk vs. U.S. public samples should become less significant or insignificant.

4.2 Comparing the U.S. Internet-using public with U.S. MTurk workers

In Table 2, we show the results of our comparisons between the U.S. public and U.S. MTurk workers and the hierarchical regressions.

4.2.1 Managing their personal information

The first row compares how much personal information the U.S.

| Dependent variables | Model | Independent variables | | | | | |
		Sample (U.S. Turk=1)	Age	Gender (Male=1)	Education	Use social media	R^2
Managing their personal information							
Amount of available information online (Above median number of items of information = 1)	1	1.25 (.90, 1.74)					.002
	2	.89 (.62, 1.26)	.98*** (.97, .99)				.032
	3	.71 (.49, 1.03)	.98*** (.98, .99)	1.06 (.80,1.39)	1.21***(1.11, 1.31)	3.66*** (2.64, 5.12)	.113
Hide identity (Yes = 1)	1	2.23***(1.52,3.23)					.017
	2	1.79**(1.19, 2.67)	.99**(.98, .99)				.025
	3	1.58*(1.05, 2.37)	.99*(.98, .99)	1.30 (.93,1.83)	1.18***(1.07, 1.31)	2.58***(1.60, 4.33)	.059
Hide online content from people or organizations (Hide content from at least one group = 1)	1	2.37***(1.67,3.42)					.025
	2	1.69**(1.16, 2.48)	.98***(.97, .99)				.054
	3	1.47*(1.00,2.17)	.98***(.98, .99)	1.20 (.91,1.58)	1.11*(1.02, 1.20)	2.79***(2.03, 3.85)	.101
Privacy attitudes and preferences							
Worry about information available on the Internet (Yes=1)	1	1.67**(1.20, 2.35)					.009
	2	1.66**(1.17, 2.38)	1.00(.99, 1.01)				.009
	3	1.55*(1.09, 2.24)	1.00(.99, 1.01)	.80 (.61, 1.04)	1.08* (1.01,1.17)	1.38* (1.01, 1.88)	.022
Think that the laws provide reasonable protections of people's privacy (Yes = 1)	1	.73 (.47, 1.09)					.003
	2	.66 (.42, 1.01)	.99 (.99, 1.00)				.005
	3	.67 (.43, 1.03)	1.00 (.99, 1.01)	1.03 (.75, 1.41)	.94 (.86, 1.03)	1.17 (.80, 1.72)	.007
Think that it is possible to be completely anonymous (Yes=1)	1	.76 (.52, 1.09)					.002
	2	.69 (.46, 1.01)	.99 (.99, 1.00)				.005
	3	.71 (.48, 1.06)	1.00 (.99, 1.01)	1.58**(1.19,2.10)	.87**(.80, .95)	1.14 (.82, 1.60)	.028
Think that people should have the ability to be anonymous online (Yes = 1)	1	3.63***(2.31,5.98)					.039
	2	2.67***(1.66,4.48)	.98***(.97, .99)				.060
	3	2.55***(1.58,4.30)	.98***(.97, .99)	1.73***(1.29,2.33)	1.02 (.93, 1.11)	1.18 (.84, 1.65)	.075

*** $p < .001$, ** $p < .01$, * $p < .05$. Values in the table are odds ratios (95% CI). An odds ratio that is larger than 1.0 indicates positive prediction, and an odds ratio that is smaller than 1.0 indicates negative prediction. If the 95% confidence interval for an odds ratio does not contain 1.0, the association is statistically significant at .05 level. N = 957.

Table 2. Hierarchical logistic regression showing the effects of sample differences (U.S. Turk vs. U.S. public), demographic variables, and social media use on privacy behavior and attitudes.

MTurk sample reported having online as compared with the same report of the U.S. public sample. For simplicity of presentation in Table 2, we show how many items of information (e.g., phone numbers, address, photos of self) are above vs. below the overall median number of items reported in both samples (median number = 4). We did not find statistically significant differences (Mean of U.S. MTurk = 4.2, Mean of U.S. public = 3.9, t [951] = 1.35, p = .18), meaning that the two samples did not differ in how many items of information they had online (see Figure 1a, red and green lines). Model 2 adds an estimate of the effect of age and Model 3 adds the additional effects of gender, education, and social media. These results show that younger respondents, those with more education, and those who use social media reported having more personal information online than their counterparts. These findings confirm the important predictive value of demographic factors.

The next row of findings in Table 2 looks at the question "Have you ever tried to use the Internet in a way that hides or masks your identity from certain people or organizations?" We found that U.S. MTurk workers were significantly more likely to seek anonymity than the U.S. public generally (31% vs. 17%, t [939] = 4.30, p < .001). This difference remained significant when we added age (Model 2) and (education, gender, and social media use) into the prediction (Model 3). Thus, we found that younger people, people with higher education levels, and people who use social media were more likely to have ever sought anonymity or hid their identity but even controlling for these factors, MTurk workers were also more likely to have done so (see Figure 1b red and green lines).

Pseudonyms are considered an important method of protecting one's privacy [45]. The U.S. public survey asked respondents if they had posted online using their real names, usernames associated with their true identities, or without revealing who they are. Thirty-three percent of the U.S. public sample said they had posted without revealing who they are. In the MTurk survey, the question was different (therefore not shown in Table 2). We asked respondents if they ever posted using a username that people did not associate with them, and if they posted using no name at all. Eighty-one percent of the U.S. MTurk respondents said "yes" to at least one of these last two choices. Although these questions are not the same across the two samples, the results combined with those in Table 2 suggest that U.S. MTurk workers may attempt to use unidentifiable communications or hide their identity more than the U.S. public.

The third row in Table 2 shows whether respondents try to hide their online contributions or content selectively, from different groups such as friends or employers. Significantly more participants in the U.S. MTurk sample reported having tried to hide content from at least one group than in the U.S. public sample (73% vs. 53%, t [955] = 4.94, p < .001). This difference remained even when adding demographic variables into the regressions. The percent of people who had hidden content from at least one group in the two samples is shown in Figure 1c red and green lines. In delving into this question more specifically, we found that U.S. MTurk workers had tried to hide content from their family members, a romantic partner, certain friends, or coworkers than U.S. public had (54.4% vs. 19.3%, t [954] = 10.24, p < .001); the same is true for their employers, supervisors or companies they work for (26.9% vs. 9.8%, t [926] = 6.26, p < .001); and for law enforcement, government, or companies or people that may want payment for the files that they downloaded (18.1% vs. 10.5%, t [952] = 2.87, p < .01). However, respondents in the U.S. public sample were significantly more likely to report hiding from hackers, criminals, or advertisers than the U.S. MTurk workers (43.6% vs. 28%, t [948] = 3.88, p < .001). The two samples did not show any significant difference in hiding content from people from the past and people who might criticize, harass or target them.

The analyses of the effects of demographic variables showed a similar pattern as the prior question about hiding one's identity:
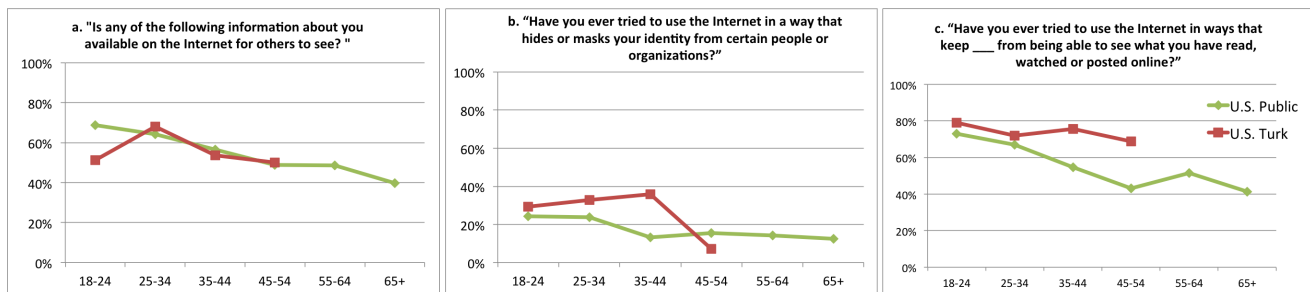

Figure 1. Percent of respondents who said yes to three questions about how they manage their personal information. (MTurk data for those over age 55 excluded due to the few number of respondents in these samples.) Note. The data shown in figure 1a is the percent of people who reported more than the median number of items online.
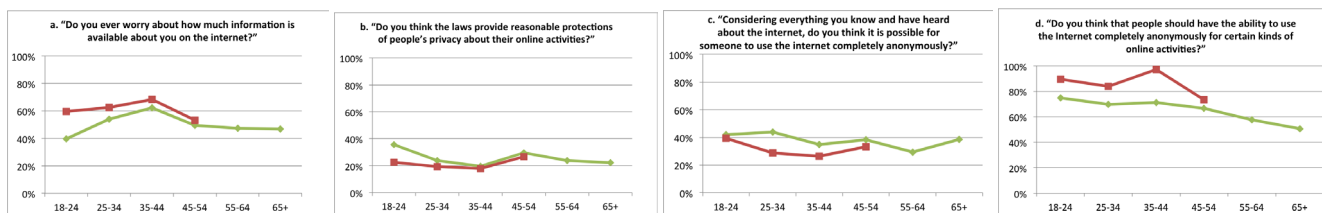

Figure 2. Percent of people who answered yes to each of four privacy preferences questions. (MTurk data for those over age 55 excluded due to the few number of respondents in these samples.)

younger, more educated respondents, and social media users (but not men or women) were more likely to protect their personal information from other people or groups.

4.2.2 Privacy attitudes and preferences

Are U.S. MTurk workers more concerned about privacy than the general U.S. public? Our results suggest the answer is yes. Table 2 shows how the two samples differ in their privacy preferences and concerns. U.S. MTurk workers in our study expressed more concern about their information than the U.S. public. Sixty-three percent of the U.S. MTurk workers said they worried about how much information is available about them on the Internet, while only 50% of the U.S. public sample said this (t [948] = 3.04, $p <$ .01). Adding demographic variables and social media use in the models, the effect of the sample difference dropped only slightly and remained significant. This finding suggests that U.S. MTurk workers are more worried about their online information than the U.S. public, regardless of their age, gender, education, and social media use. Additionally, there is a separate effect of education level and social media predicting these concerns. Those with higher education and those who use social media are more likely to worry about their personal information online. Figure 2a shows the percent of people who worry about their information in different age groups.

We were also interested in people's policy preferences. Our analysis showed that U.S. MTurk workers did not differ significantly from the U.S. public in their opinions about whether current privacy laws provide enough protection of their privacy (Figure 2b). Only eighteen percent of the U.S. MTurk workers thought current laws provide reasonable protection of people's privacy, and 23% of the Pew sample said so. None of the demographic variables and the social media use made a difference either.

Prior work suggests most people, regardless of nationality or experience, understand that anonymity has tradeoffs. They believe that anonymity can be misused and can encourage irresponsible behavior without consequences for the perpetrators [22]. And there is evidence that anonymity can encourage negative social behavior [12,44]. On the other hand, anonymity might help people avoid negative online experiences and persons or groups from whom they wish to hide [22]. We wanted to know whether respondents thought anonymity is possible on today's Internet and whether they should have the ability to be anonymous online. We asked: "Considering everything you know and have heard about the Internet, do you think it is possible for someone to use the Internet completely anonymously – so that none of their online activities can be easily traced back to them?" We found that 37% of the U.S. public respondents and 31% of the U.S. Turk sample thought that it was possible to be completely anonymous online and there was no significant difference between the two samples. Male and lower education respondents agreed more strongly anonymity is possible. We also asked, "Do you think that people should have the ability to use the Internet completely anonymously for certain kinds of online activities?" Our results showed that anonymity is embraced among more U.S. MTurk workers (Figure 2c). The percentage of the U.S. MTurk sample who said people should have the ability to be anonymous online was significantly higher than in the U.S. public sample (86% vs. 63%, t [883] = 5.74, $p <$ .01). The difference between the two samples remains significant when we add more demographic information into the model (Models 2 and 3). Separately, demographic factors predicted people's anonymity preferences:

younger people and men preferred more anonymity than their counterparts.

4.2.3 Summary of findings

The results comparing the U.S. MTurk worker and U.S. representative public samples show that on four of seven items, U.S. MTurk workers differed from the U.S. sample, even when demographic variables and social media use were taken into account (Table 2). Although they have the same amount of personal information online, more MTurk workers have tried to be anonymous, they have tried to hide their contributions from more different audiences, are more worried about their online information, and believe they should be able to communicate anonymously online. Their opinion about whether or not it is possible to be completely anonymous online, however, is not significantly different. Another important point is, as shown in Figure 1 and 2, the two samples show similar trends in how their behaviors and attitudes change based on age. Younger people seem to have more personal information online, but also have stronger tendency towards hiding their online identity and content.

4.3 Comparing U.S. MTurk workers with Indian MTurk workers

We analyzed the same set of questions in our survey answered by U.S. MTurk workers and Indian MTurk workers. We conducted analyses shown in Table 3 to compare their responses.

4.3.1 Managing their personal information

On average, Indian MTurk workers reported that more of their personal information was online than U.S. MTurk workers did (M [Indian MTurk workers] = 5.7, M [U.S. MTurk workers] = 4.2; t [308] = 5.35, $p < .001$). The difference between two samples remains significant when we add demographic variables into the model and whether they use social media or not in the model (Models 2 and 3, the first row in Table 3). None of the demographic variables had an effect on their perception of online information, but using social media predicted more personal information online. Figure 3a, blue vs. red lines, shows the comparison between U.S. Turkers and Indian Turkers.

We also found U.S. MTurk workers were more likely to seek to hide their identity than Indian MTurk workers (31% vs. 16%; t [285] = 2.88, $p <$ .01, Figure 3b). As shown in the second row in Table 3, we did not find any significant demographic variables explaining the difference, so we can conclude that, for the variables we have studied, the two groups differ in their anonymity-seeking behavior.

Although more U.S. MTurk workers reported seeking anonymity, they did not name more people or groups they were hiding from than Indians MTurk workers did (73% vs. 76% in each sample named at least one individual or group that they have hidden content from). As shown in Models 2 and 3 in the third row of Table 3, the two samples did not show any difference but younger respondents hid from more groups across both samples (Figure 3c).

When we looked at each sample specifically (Figure 5), we saw that significantly more Indian MTurk workers reported hiding from employers or supervisors than U.S. MTurk workers (42% vs. 27%, t [307] = 2.75, $p <$ .01), and slightly (but not significantly) more Indian MTurk workers hid from people from the past, those who might criticize them, and hackers, criminals, or advertisers

Dependent variables	Model	Sample (U.S. Turk=1)	Age	Gender (Male=1)	Education	Use social media	R^2
Independent variables							
Managing their personal information							
Amount of available information online (Above median number of items of information = 1)	1	.37***(.22, .61)					.047
	2	.35***(.20, .59)	.99 (.96, 1.01)				.056
	3	.43**(.24, .75)	.99 (.97, 1.02)	1.58 (.94, 2.67)	1.07 (.90, 1.27)	4.79**(1.81,14.25)	.093
Hide identity (Yes = 1)	1	2.36**(1.32,4.38)					.029
	2	2.41**(1.34,4.51)	.98 (.95, 1.01)				.034
	3	3.26***(1.70,6.53)	.98 (.94, 1.01)	1.51(.85,2.76)	1.21 (.99,1.49)	1.48(.49, 5.50)	.052
Hide online content from people or organizations (Hide content from at least one group = 1)	1	.86 (.51, 1.44)					.001
	2	.97 (.57, 1.65)	.96**(.94, .99)				.031
	3	1.17 (.65, 2.09)	.96**(.94, .99)	1.07 (.62, 1.85)	1.15 (.96, 1.38)	1.60 (.58, 4.16)	.041
Privacy attitudes and preferences							
Worry about information available on the Internet (Yes=1)	1	3.01***(1.85,4.95)					.065
	2	2.90***(1.78,4.78)	1.00 (.98, 1.03)				.062
	3	3.17***(1.87,5.50)	1.00 (.98, 1.03)	.70 (.42, 1.15)	1.08(.92,1.29)	1.37(.53,3.58)	.074
Think that the laws provide reasonable protections of people's privacy (Yes = 1)	1	.19***(.11, .32)					.128
	2	.19***(.11, .32)	1.01 (.98, 1.04)				.125
	3	.17***(.09, .30)	1.02 (.99, 1.05)	1.50(.85, 2.69)	.91 (.74, 1.09)	.84 (.28, 2.82)	.135
Think that it is possible to be completely anonymous (Yes=1)	1	.26***(.15, .43)					.095
	2	.27***(.16, .45)	.99 (.96, 1.02)				.093
	3	.29***(.16, .50)	.99 (.96, 1.02)	1.31 (.75, 2.30)	1.14(.95,1.37)	.43 (.16, 1.16)	.108
Think that people should have the ability to be anonymous online (Yes = 1)	1	1.92*(1.03, 3.6)					.015
	2	1.87*(1.00, 3.54)	1.00 (.97, 1.04)				.014
	3	1.97*(1.00, 3.92)	1.00 (.97, 1.03)	.97 (.49, 1.87)	1.08(.87,1.35)	.60 (.09, 2.30)	.017

*** $p < .001$, ** $p < .01$, * $p < .05$. Values in the table are Odds Ratio (95% CI). Odds ratio that is larger than 1.0 indicates positive prediction, and odds ratio that is smaller than 1.0 indicates negative prediction. If the 95% confidence interval for OR does not contain 1.0, the association is statistically significant at .05 level. N = 310.

Table 3. Hierarchical logistic regression showing the effects of sample differences (U.S. Turk vs. Indian Turk), demographic variables, and social media use on privacy behavior and attitudes.

(35% vs. 27%, t [306] = 1.53, p = .13). Their experiences with the other three groups did not show significant difference.

4.3.2 Privacy attitudes and preferences

Although more of their information was online and more of them used social media, Indian MTurk workers were significantly less worried than U.S. MTurk workers about their personal information on the Internet (the fourth row in Table 3; Figure 4a). Sixty-two percent of the U.S. MTurk workers said they worried about how much information was available about them on the Internet, but only 35% of the Indian participants said this (t [289] = 4.66, $p < .001$). Adding demographic variables and social media use in the model did not reduce the significant effect of the sample difference (Models 2 and 3 vs. 1). The finding suggests that U.S. MTurk workers have more concerns about their personal information online than Indian MTurk workers, regardless of their age, gender, education and whether they use social media or not.

We also found consistent significant differences between Indian and U.S. MTurk workers' policy preferences and their opinions about anonymity. U.S. MTurk workers showed more dissatisfaction about how the government protects their privacy than Indian MTurk workers (the fifth row in Table 3): only 18% of the U.S. MTurk workers said current laws provide reasonable protection of people's privacy, whereas 52% of the Indian participants thought their laws provide enough protection of their privacy (t [281] = 6.95, $p < .001$, Figure 4b). Less U.S. than Indian MTurk workers believed that people could achieve complete anonymity on today's Internet (31% vs. 64%, t [259] = 5.51, $p < .001$, the sixth row in Table 3, Figure 4c). More U.S. than Indian MTurk workers said people should have the ability to use the Internet completely anonymously (86% vs. 77%, t [276] = 2.10, p = .04, the seventh row in Table 3, Figure 4d).

Consistent with this finding, a question added to the MTurk survey (that was not posed in the U.S. public survey) asked respondents whether the government should be able to monitor everyone's email and other online activities "if officials say this might prevent future terrorist attacks." Fifty-seven percent of the Indian MTurk workers agreed with this statement but only 9% of
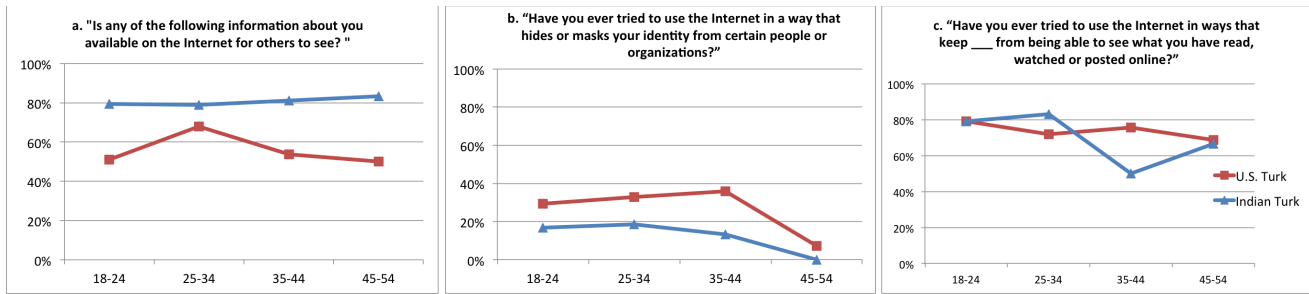
Figure 3. Percent of respondents who said yes to three questions about how they manage their personal information. (MTurk data for those over age 55 excluded due to the few number of respondents in these samples.) Note. The data shown in figure 1a is the percent of people who reported more than the median number of items online.
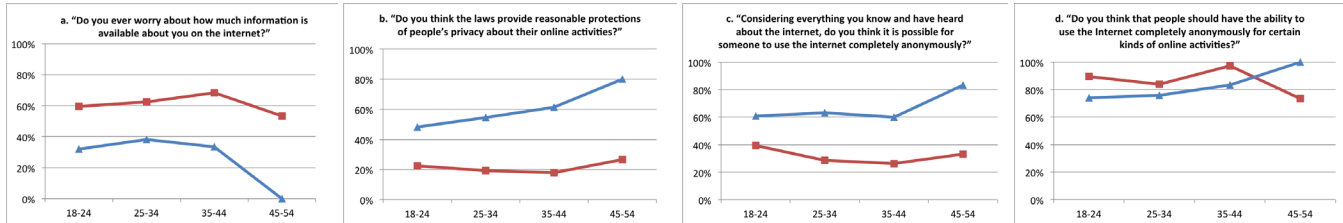

Figure 4. Percent of people who answered yes to each of four privacy preferences questions. (MTurk data for those over age 55 excluded due to the few number of respondents in these samples.)
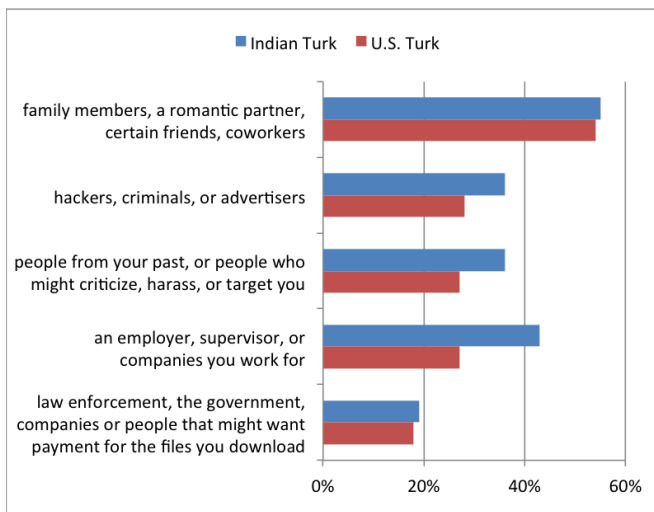
Figure 5. Percent who reported hiding content from certain people or groups.

the U.S. MTurk workers agreed (t [268] = 9.88, $p < .001$). A different national U.S. survey [38] asking the identical question showed somewhat higher agreement among the U.S. public (45%) as compared to the U.S. MTurk workers (9%)..

4.3.3 Summary of findings

Most of the demographics of our Indian Turk sample are similar to the U.S. Turk sample, except Indian MTurk workers reported higher levels of education. Almost everyone from the Indian Turk sample used social media. Indian MTurk workers reported having put more personal information online than the U.S. MTurk workers did. Although we might expect more use of social media and more information online to predict more privacy concerns (see Table 1 for the social media effect in the U.S. samples), this was not the case among Indian MTurk workers. They were less

worried about their information and did not take more actions to protect their identity. Also, Indian MTurk workers showed less positive attitudes about anonymity than did U.S. MTurk workers. The only notable difference in the other direction is that Indian MTurk workers more often hid information from employers.

Indian MTurk workers' policy opinions were very different from those of U.S. MTurk workers. More than half thought their laws provide enough protection to their privacy, and more than half agreed to government monitoring. This difference might be due to cultural differences or a result of different national events or news. Additionally, there is a potential bias in that the surveys were conducted after the Snowden revelations (June 6, 2013 [3]). The news coverage of these revelations in the U.S. may have reduced American's trust in online privacy and government Internet policy and practices.

5. DISCUSSION

Consistent with previous research, our study shows that U.S. MTurk workers are younger than the general U.S. population and differ in other ways. But even controlling for demographic factors, more of these U.S. MTurk workers express worries and concerns about their online information. Moreover, U. S. MTurk workers are more likely to seek anonymity and be in favor of Internet policies that allow anonymity. Indian MTurk workers have weaker concerns about privacy.

One possible explanation for the differences between the U.S. MTurk and the U.S. public samples is that U.S. MTurk workers might be more technical savvy than the general public. We were unable to assess this possibility because the U.S. representative survey did not ask respondents about their knowledge of the Internet, or how much they used it. However, when asked about what information about them is online, the U.S. public sample showed more uncertainty than the U.S. Turk sample about what kinds of information is available about them online (mean pieces of information they are unsure about = 1.6 and 1.1, t [955] = 3.05,

$p < .01$), especially about their contact information (email addresses, phone numbers). This finding might indicate that the U.S. MTurk group has more privacy concerns about their personal information because they are more certain that others have potential access to it.

This work suggests that privacy researchers, in their studies using MTurk workers, may need to take into consideration the heightened privacy attitudes and behavior of the U.S. workers on MTurk. We provide quantitative evidence showing that U.S. MTurk workers often seek anonymity and have a heightened concern with privacy. Our results do not bear on the issue of internal validity of online experiments (e.g., [27]). Indeed prior work [8] suggests that internal validity of experiments using MTurk workers is similar to the validity of traditional lab experiments. What our results do suggest is that descriptive findings of privacy attitudes and behavior based on MTurk samples may not generalize to the broader population (i.e., external generalizability). Research (e.g., [29]) that uses crowds as a privacy evaluation platform should consider the potential sample bias when generalizing MTurk worker privacy preferences to other users.

We also found significant differences in opinions and experiences between MTurk workers recruited from the U.S. and India. Privacy researchers using MTurk should monitor and record the locations of their participants, and examine the effects of these differences.

6. CONCLUSION
The findings of our study suggest U.S. MTurk workers have similar amount of personal information online as the general American population, but they differ from the general public in their behaviors and opinions about online anonymity and privacy,. Indian MTurk workers have more personal information online than the U.S. MTurk workers, but have less preference towards anonymity and are less concerned about their privacy. Research on people's privacy opinions and preferences will need to account for differences between MTurk workers and the general public and perhaps introduce additional control variables to assess how extensive these differences are.

7. ACKNOWLEDGMENTS

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[2] https://www.mturk.com/mturk/help?helpPage=policies

[3] http://www.theguardian.com/world/2013/jun/06/nsa-phone-records-verizon-court-order

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APPENDIX

SURVEY QUESTIONS

Note: We only show the questions analyzed in this paper. Questions that were the same in the two surveys are numbered only (without any letters preceding the numbers). Questions that were different in the two surveys are marked using letters before the number (e.g., Pew survey items are designated "PEW", MTurk items are marked as "MTURK").

MTURK 1. Do you ever use a site like Twitter, Facebook, LinkedIn, Google Plus, or another social networking site? ☐Yes ☐No

PEW 1. Please tell me if you ever use the Internet to do any of the following things. Do you ever use the Internet to_____?

	Yes	No
Use a social networking site like Facebook, LinkedIn or Google Plus	☐	☐
Use Twitter	☐	☐

2. Is any of the following information about you available on the Internet for others to see? It doesn't matter if you put it there yourself or someone else did so.

	Yes, it's online	No, it's not online	Not sure	Does not apply
Your email address	☐	☐	☐	☐
Your home address	☐	☐	☐	☐
Your home phone number	☐	☐	☐	☐
Your cell phone number	☐	☐	☐	☐
Your employer or a company you work for	☐	☐	☐	☐
Your political party or political affiliation	☐	☐	☐	☐
Something you've written that has your name on it	☐	☐	☐	☐
A photo of you	☐	☐	☐	☐
Video of you	☐	☐	☐	☐
Which groups or organizations you belong to	☐	☐	☐	☐
Your birth date	☐	☐	☐	☐

Other information (please specify)

3. Do you ever worry about how much information is available about you on the Internet, or is that not something you worry about? ☐Yes, worry about it.   ☐No, don't worry about it.   ☐Not sure

4. Considering everything you know and have heard about the Internet, do you think it is possible for someone to use the Internet completely anonymously – so that none of their online activities can be easily traced back to them? ☐Yes ☐No ☐Not sure

5. Have you ever tried to use the Internet in a way that hides or masks your identity from certain people or organizations?
☐Yes ☐No ☐Not sure

MTURK6. Do you ever post comments, questions, or information on the Internet using the following types of names?

	Yes	No	Not sure
Your real name	☐	☐	☐
A username or screenname that people associate with you	☐	☐	☐
A username or screen name that people do not associate with you	☐	☐	☐
No name at all	☐	☐	☐

PEW5. Do you ever post comments, questions, or information on the Internet _____?

	Yes	No
Using your real name	☐	☐
Using a username or screen name that people associate with you	☐	☐
Without revealing who you are	☐	☐

MTurk 7. Have you ever tried to use the Internet in such a way that <u>your family members, a romantic partner, certain friends, coworkers</u> would be unable to see what you have read, watched, or posted online? ☐Yes, I've done this. ☐No, I haven't done this.

MTurk 8. Have you ever tried to use the Internet in such a way that <u>an employer, supervisor, or companies you work for</u> would be unable to see what you have read, watched, or posted online? ☐Yes, I've done this. ☐No, I haven't done this.

MTurk 9. Have you ever tried to use the Internet in such a way that <u>people from your past, or people who might criticize, harass, or target you</u> would be unable to see what you have read, watched, or posted online? ☐Yes, I've done this. ☐No, I haven't done this.

MTurk 10. Have you ever tried to use the Internet in such a way that <u>law enforcement, the government, or companies or people that might want payment for the files you download such as songs, movies, or games</u> would be unable to see what you have read, watched, or posted online? ☐Yes, I've done this. ☐No, I haven't done this.

MTurk 11. Have you ever tried to use the Internet in such a way that <u>hackers, criminals, or advertisers</u> would be unable to see what you have read, watched, or posted online? ☐Yes, I've done this. ☐No, I haven't done this.

PEW 7. Have you ever tried to use the Internet in ways that keep _____ from being able to see what you have read, watched or posted online?

	Yes, did this	No, did not
Family members or a romantic partner	☐	☐
Certain friends	☐	☐
An employer, supervisor, or coworkers	☐	☐
The companies or people who run the website you visited	☐	☐
Hackers or criminals	☐	☐
Law enforcement	☐	☐
People who might criticize, harass, or target you	☐	☐
Companies or people that might want payment for the files you download such as songs, movies, or games	☐	☐
People from your past	☐	☐
Advertisers	☐	☐
The government	☐	☐

12. Thinking about current laws, do you think the laws provide reasonable protections of people's privacy about their online activities? ☐ Yes, they provide reasonable protection   ☐ No, they're not good enough   ☐ Not sure

13. Do you think that people should have the ability to use the Internet completely anonymously for certain kinds of online activities? ☐ Yes, should have the ability   ☐ No, should not have the ability   ☐ Not sure

MTurk 14. Do you think the government should be able to monitor everyone's email and other online activities if officials say this might prevent future terrorist attacks? ☐ Yes, should monitor   ☐ No, should not monitor   ☐ Not sure

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These following questions are for statistical purposes only.

15. What is your gender? ☐ Male   ☐ Female   ☐ Other

16. How old are you (years)? _____

17. What is the highest level of school you have completed or the highest degree you have received?

☐ Less than high school (Grades 1-8 or no formal schooling)
☐ High school incomplete (Grades 9-11 or Grade 12 with NO diploma)
☐ High school graduate (Grade 12 with diploma or GED certificate)
☐ Some college, no degree (includes some community college)

☐ Two year associate degree from a college or university
☐ Four year college or university degree/Bachelor's degree (e.g., BS, BA, AB)
☐ Some postgraduate or professional schooling, no postgraduate degree
☐ Postgraduate or professional degree, including master's, doctorate, medical or law degree (e.g., MA, MS, PhD, MD, JD)
☐ Not sure

MTurk 18. Where were you born?

☐ China
☐ India
☐ United Kindom
☐ United States
☐ Other (please specify)_____

MTurk 19. Do you usually access the Internet from these locations?

	True	False	I'm not sure
China	☐	☐	☐
India	☐	☐	☐
United Kingdom	☐	☐	☐
United States	☐	☐	☐

Other (please specify)_____