

## **When and Why People Conceal Infectious Disease**

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**Abstract:** People sick with infectious illnesses face negative social outcomes like exclusion and may take steps to conceal their illness from others. In ten studies of past, current, and projected illness, we examined the prevalence and predictors of infection concealment in adult U.S. samples of university students, healthcare employees, and online, crowdsourced workers (total N=4,110). About 75% reported concealing illness within interpersonal interactions, possibly placing others in harm's way. Concealment motives were largely social (e.g., wanting to attend events like parties) and achievement oriented (e.g., completing work objectives). Disease characteristics including potential harm and illness immediacy also influenced concealment decisions. People imagining harmful (versus mild) infections concealed less frequently, whereas actually sick participants concealed frequently regardless of illness harm, suggesting state-specific biases underlying concealment decisions. Disease concealment appears a widely prevalent behavior whereby concealers trade off risks to others in favor of their own goals, creating potentially important public health consequences.

**Statement of relevance:** People often experience negative reactions toward others who seem sick with contagious illnesses. To elude such outcomes, sick people may take steps to conceal their illnesses. Indeed, across healthcare employees, university students, and general adult samples, we found a large majority of people report having concealed an active infectious illness. People reported boarding flights, treating patients, and going on dates while hiding signs of sickness. Interestingly, when illnesses were most severe, people currently sick reported concealing even more than people who merely imagined being sick, suggesting a potentially serious public health problem—sick people may be relatively unmindful about the possible harm they could do by interacting with others. As most people in our samples reported concealing for social reasons (i.e., to avoid missing out on activities or upsetting others), novel approaches may be needed to mitigate this harmful concealment behavior.

Have you ever hidden the fact that you were sick with a contagious illness from people around you? Perhaps you stifled a cough during a work meeting or neglected to mention your scratchy throat on a first date. Maybe you even assured others your stuffy nose was merely due to allergies. If you admitted to any such concealment behaviors, you certainly are not alone—in the following studies, around 75% of U.S. adult participants reported concealing infectious illness from others (Table 1). But just because concealment is common does not mean it is costless: masking signs of illness can facilitate interpersonal disease transmission. One survey reported 82% of UK workers believed they had become sick because a co-worker came into the office not feeling well (Calnan, 2014). Anecdotes about concealment during the COVID-19 pandemic include people covering up symptoms to board flights and government officials hiding COVID-positive tests for political gain (Gabriel, 2020; Whitley, 2020). Despite such occurrences, the psychological underpinnings of when and why people conceal contagious illnesses have received little empirical attention.

**\*\*Table 1\*\***

### **Motivations for Disease Concealment**

Why might people want to hide sickness from others? Work on the psychology of disease management highlights a motivational tradeoff between avoiding infectious illness and affiliating with others (Sacco et al., 2014; Sawada et al., 2018). Healthy people tend to avoid, act disgusted by, and even forcefully isolate individuals showing signs of contagious illness (Ackerman et al., 2018; Murray & Schaller, 2016; Oaten et al., 2011; Regenbogen et al., 2017). Thus, from the

perspective of someone navigating social interactions while sick, the costs of their illness are social as well as physical.

These social costs could facilitate concealment behaviors. Consider an example from the animal kingdom. While in isolation, infected zebra finches exhibit *sickness behaviors*, those that help conserve energy and prioritize illness recovery. However, these sickness behaviors are muted when finches reside in social colonies, potentially because appearing unhealthy while in a group could threaten the pursuit of social goals like mating (Lopes et al., 2012). Humans may be similarly motivated to hide signs of illness to preclude negative interpersonal reactions while pursuing other goals. Building from this perspective, we examine the prevalence of human disease concealment in social settings and highlight psychological predictors of concealment.

### **Sickness Characteristics Influencing Disease Concealment**

At least two characteristics make infectious disease concealment unique: factors associated with the sickness itself and factors associated with the individual.

Sicknesses vary in potential harm afforded to others and duration. Illness harm can be represented by two dimensions: *transmission risk* (ease of disease spread) and *symptom severity* (physical impairments a disease causes). Generally, transmissible and severe illnesses are more harmful than illnesses that spread less easily and have mild symptoms. These dimensions also closely map onto general models of risk assessment—people commonly make decisions based on their perceptions of event likelihood and the potential event impact (e.g., Breakwell, 2014). Presuming a general aversion to harming others (e.g., Crockett et al., 2014), people may choose to conceal less when they view their illnesses as more likely to cause interpersonal harm. We predict that, if decision-makers are sensitive to this interpersonal danger, they may use perceptions of illness harm as inputs into the concealment decision process. On top of illness

harm, longer lasting illnesses imply more chance of repeated interpersonal interactions where disease can be spread. People are generally less deceptive when they expect multiple interactions with the same person (Ben-Ner & Hu, 2021), and thus concealment may be less likely for longer-lasting illnesses. Alternatively, because repeated interactions heighten self-presentational concerns (Baumeister, 1982) and the potential for more indirect social costs, like missing out on multiple events as opposed to just one, people may be relatively more likely to conceal longer-lasting illnesses.

The primary sickness factor associated with the individual involves illness immediacy—whether decision-makers are currently sick or not. Someone forecasting the possibility of concealing a future infectious illness may not attend to, or consider important, the same information as someone currently gripped by disease. Research indicates that actively experiencing a state can stimulate different psychological processes and consequences versus perceiving that state more remotely (e.g., Kivetz et al., 2006; Trope & Liberman, 2010). For instance, smokers planning to quit often underestimate the misery and difficulty of sticking to this conviction during active cravings (Loewenstein, 2005). In the context of disease concealment, currently sick people may find that the salience of physical symptoms and goal tradeoff pressures (e.g., to continue engaging in social activities) encourage concealing illnesses more than when merely imagining their future decisions.

### **Other Approaches to Concealment**

Beyond infection status, at least two robust literatures in social psychology have focused on the concealment of other kinds of personal information. First, the literature on secret-keeping has identified numerous categories of social information (ranging from sexual infidelity to financial hardship) that people withhold from others, how frequently people hold these secrets,

and the psychological consequences of doing so (e.g., Slepian et al., 2017). Second, the literature on concealable stigmatized identities focuses on when people conceal aspects of their identities they believe will be judged negatively, such as sexual orientation (Newheiser & Barreto, 2014; Quinn & Chaudoir, 2009). These two perspectives help inform some aspects of infectious disease concealment. Considering that the process of secret-keeping begins with the intention to hide information from others (Slepian, 2022), both intentions and acts of actual concealment represent forms of infectious disease concealment. With respect to the content of concealment, drawing on the stigmatized identity literature, we should expect that people will conceal infectious illnesses to the extent that those illnesses trigger negative assessments. For instance, research on concealable stigmatized identities has shown that certain diseases viewed as morally objectionable (e.g., HIV, COVID-19) create identity-threat and heightened motivation to conceal in those infected (Earnshaw et al., 2020; Lee et al., 2002).

But we also expect that disease concealment is distinct from both general secret-keeping and identity-relevant concealment in at least two focal ways. First, the information that disease concealers are hiding involves the potential transmission of pathogenic material. Consider that, of 38 categories of secrets previously identified (Slepian et al., 2017), *none* afford direct physical harm to the person being concealed from. Any harm that occurs from these other forms of concealment is indirect (e.g., emotional harm caused by an extramarital affair), and is notably only realized when the information is revealed. In contrast, infectious disease concealment affords direct, physical harm in interpersonal interactions regardless of the success of that concealment.

Second, though hiding a secret romantic affair or marginalized sexual identity may help concealers avoid moral judgment and mistreatment, people sick with common illnesses are not

typically blamed or stigmatized just for having those illnesses. Indeed, in a taxonomy detailing 93 different kinds of stigma (Pachankis et al., 2018), only one (sexually transmitted diseases) represented an infectious illness, with that category of illness often being judged on moral grounds (Young et al., 2007). Further, because many infectious illnesses are ordinary in the sense that all people suffer from them, sometimes frequently (e.g., the common cold; DerSarkissian, 2022), it is unlikely that such infections will lead to long-lasting reputational damage.

Thus, existing theories of concealment may miss important contexts and characteristics linked with infectious disease. To help make this case, we measure transmission of physical harm in Studies 2 and 4a-b, and identity and stigma concerns in Studies 4a-b to examine whether infectious disease characteristics predict concealment over and above other concerns.

### **Current Research**

We first descriptively examine the general prevalence of infectious disease concealment in two settings where disease spread is salient and reporting illness is encouraged if not mandated: universities and healthcare systems (Study 1). Experiments then target sickness-related factors, including illness harm (Study 2) and duration (Study 3). Finally, we employ novel sampling techniques to recruit participants actually sick with infectious illnesses and compare their decisions to those of healthy participants while also examining factors (e.g., stigma) known to influence concealment of identity-focused information (Studies 4a-b).

Together, these studies pursue two primary goals: document the prevalence of infectious disease concealment and address two factors—those pertaining to the sickness and those pertaining to the individual—relevant to the context of disease concealment. Across studies, samples included U.S. participants varying on age, socioeconomic status, gender, ethnicity, and professional background (e.g., healthcare employees) (see Table S2 for full demographics). All studies were

powered to detect small effect sizes ( $f=0.08-0.18$ ) given a lack of prior research on infectious disease concealment.

### **Open Practices Statement**

Pilot studies, materials, data, code, and preregistrations can be found on OSF ([https://osf.io/r9cug/?view\\_only=6e31bc42ce584a77a31feb8f2407c36b](https://osf.io/r9cug/?view_only=6e31bc42ce584a77a31feb8f2407c36b)) along with additional details in the supplemental materials. Exclusion criteria are reported in the supplement and preregistrations.

### **Study 1: Disease concealment in the face of illness reporting policies**

#### **Methods**

This study (and all others in this paper) were approved by the IRB – Health Sciences and Behavioral Sciences at the University of Michigan to ensure adequate protections of participants. We invited 5,000 students and 6,802 healthcare employees at a midwestern U.S. university through email to participate in exchange for entry into a gift card raffle. 1,473 respondents participated between December 16<sup>th</sup>, 2021 and January 14<sup>th</sup>, 2022. After excluding people who did not report being sick at all during any point of the pandemic or had no in-person interaction with students or co-workers, our final sample included 989 participants (505 students and 399 healthcare employees).

Participants first reported how many days they felt sick with symptoms of an infectious illness since March 2020 (around the start of the COVID-19 pandemic in the United States). Then, participants indicated their frequency of three types of concealment strategies to cover up signs of their sickness using a 7-point scale (1=never, 4=about half the time, 7=all the time), including: (a) active covering up of symptoms from others (commission), (b) coming to campus/work in person without telling others they were feeling sick (omission), (c) coming to



campus/work in person feeling sick without filling out daily symptom screeners that were mandatory for all individuals using campus facilities (e.g., the university's symptom screening app). Finally, in an open-ended format, participants wrote why they covered up the fact that they were sick from others around them. These open-ended responses were coded independently by two groups of research assistants, see supplement for details.

## Results

716 (72.3%) participants reported hiding an infectious illness through commission (actively covering up signs of illness), omission (not disclosing sickness to others), or ignoring a mandatory app-based symptom checker. This included 85% (428 of 505) of students and 61% (243 of 399) of healthcare employees. Only five participants openly reported concealing COVID-19.

Participants explained their motivations underlying concealment decisions in a variety of ways. Thematic qualitative coding revealed that participants frequently concealed because their illness would conflict with their other social goals (e.g., going on a date), but very infrequently cited pressure from institutional policies (e.g., lack of paid time off) as a motivation for concealment (Table 2). This latter finding may be due to the presence of policies supporting sick leave (though such policies are likely to vary by work division and instructor), but it does suggest that disease concealment stems from a variety of motives. Further, despite institutional strategies to encourage illness disclosure, disease concealment appears to be widespread in both settings.

**\*\*Table 2\*\***

## **Study 2: Illness harm (symptom severity and transmission risk)**

### **Methods**

We recruited 947 participants through Prolific Academic on August 1<sup>st</sup>, 2023. After applying pre-registered exclusion criteria our final convenience sample was 946 participants.

The study used a 3 (Symptom severity) X 3 (Transmission risk) between-subjects design. We randomly assigned participants to one of nine conditions in which they imagined being sick while in a social situation with a few strangers. The sickness they imagined being sick with varied on both symptom severity and transmission risk. Symptoms were designated as mildly severe (e.g., having trouble concentrating on work and school), moderately severe (e.g., needing to take days off of work and school), or very severe (e.g., not being able to study or work at all). Transmission risk was designated as low, medium, or high. Participants were told not to imagine COVID-19 as, unlike most common infections, COVID-19 infection may be judged a moral failing and therefore concealed because of anticipated stigmatization (Henderson & Schnall, 2021). A self-reported attention check suggests that 85% of participants (801 of 946) followed these instructions. Adding this attention check as a covariate did not significantly change the primary results (see supplement). Therefore, we report analyses conducted on the full sample of 946 participants.

Participants rated how likely they would be to (1) hide, (2) conceal, and (3) cover up their disease in the situation on a 7-point scale (1=extremely unlikely, 7=extremely likely). The average of the responses on the three items was used as an index of the likelihood of concealment (across vignettes,  $\alpha=.97$ ).

### **Results**

Consistent with predictions, a 3X3 ANOVA revealed a main effect of symptom severity,  $F(2,937)=8.10$ ,  $p<.001$ ,  $f=0.13$ , 95% CI [0.06, 0.19], such that participants were significantly

more likely to report concealing when symptom severity was low ( $M=3.69$ ,  $SD=1.95$ ) than when severity was moderate ( $M=3.24$ ,  $SD=1.89$ ),  $t(631)=2.96$ ,  $p=.006$ ,  $f=0.12$ , 95% CI [0.15,0.75] or high ( $M=3.09$ ,  $SD=2.03$ ),  $t(623)=3.77$ ,  $p<.001$ ,  $f=0.15$ , 95% CI [0.29,0.91]. There was no main effect of transmission risk,  $F(2,937)=1.62$ ,  $p=.199$ ,  $f=0.06$ , 95% CI [0.00, 0.12], counter to predictions (but see Studies S2 and S3). However, an interaction between symptom severity and transmission risk,  $F(4,937)=2.89$ ,  $p=.021$ ,  $f=.11$ , 95% CI [0.01,0.16], indicated that low (versus high) symptom severity caused higher concealment likelihoods at low,  $t(204)=2.66$ ,  $p=.025$ ,  $f=0.19$ , 95% CI [0.19,1.27], and medium,  $t(206)=4.23$ ,  $p<.001$ ,  $f=0.29$ , 95% CI [0.62,1.69], levels of transmission risk, but not high levels of transmission risk,  $t(207)=-0.26$ ,  $p=.79$ ,  $f=-.02$ , 95% CI [-0.61,0.47]. Together, these patterns indicate people report being less likely to conceal as symptom severity increased and when transmission risk was very high. Two pilot studies showed comparable effects (with some differences due to use of within-subjects designs). These findings suggest people prioritize the potential for negative interpersonal consequences in their concealment decisions, at least when they are imagining illnesses.

### Study 3: Illness duration

#### Methods

We recruited 603 participants from Prolific Academic on August 3<sup>rd</sup>, 2023. After our pre-registered exclusion criteria, we obtained a final sample of 512. Participants were told to imagine attending a recurring social event that happens about once a week (e.g., weekly classes, volunteering) where they would encounter several other people whom they did not know very well but who were regular attendees. We randomly assigned participants to imagine having an illness with either a short duration (3-5 days) or a long duration (12-14 days). Illness harm was held constant across the conditions, with their illness described as moderately transmissible and

mild symptom severity. Participants were reminded that they would be sick either for a single interaction (for the short duration illness) or multiple interactions (for the long duration illness). Then they filled out the same 3-item concealment measures from Study 2 ( $\alpha=.98$ ) for the *first* social interaction. As in Study 2, participants were asked not to imagine being sick with COVID-19. 93% of participants (474 of 512) self-reported that they followed these instructions; treating this attention check as a covariate did not change the primary results (see supplement). We report analyses conducted on the full sample of 512 participants.

## Results

Contrary to our competing pre-registered hypotheses (longer illness duration makes concealment *more* likely vs. longer illness duration makes concealment *less* likely), people did not differ in their concealment of short ( $M=3.36$ ,  $SD=2.10$ ) versus long ( $M=3.40$ ,  $SD=2.12$ ) duration illnesses,  $t(495)=0.19$ ,  $p=.85$ ,  $f=0.01$ , 95% CI  $[-0.33, 0.40]$ . That is, anticipated illness duration did not influence prospective concealment decisions. We return to possible reasons for this in the Discussion.

### Studies 4a-b: Concealment in currently healthy vs. sick people

Our final area of investigation targeted the illness state of the decision-maker. The immediacy of illness—whether someone is currently sick or not—may alter which factors are prioritized in the decision process. In Studies 4a-b, we therefore recruited both sick people (reporting on their actual, current illness) and healthy people (reporting on an imagined illness, like in Studies 2-3) and compared their concealment intentions as a function of illness harm. This approach allows us to extend this paradigm to individuals who may be actively contemplating infectious disease concealment in their own lives. If both groups report concealment patterns similar to those in Study 2, this would suggest that concealment is prevalent primarily for less

harmful illnesses. Alternately, concealing sickness may be “easier-said-than-done,” with the assessments of costs (e.g., infecting others) and benefits (e.g., pursuit of social goals) associated with concealment depending on whether someone is sick or merely imagining it. To test whether infectious disease concealment is distinguishable from other forms of concealment, we also included measures from past studies of concealable stigmatized identities.

Studies 4a-b used identical methods and followed largely similar preregistration criteria. We combined these studies to improve statistical power and address journal word limits (study was included as a covariate in the analyses). For individual study preregistration details and analyses of each study separately, please see the supplemental materials.

## **Methods**

These studies used a 2 (Illness status: sick, healthy) x 5 (Symptom severity: not at all severe – extremely severe) between-subjects design. We recruited 375 participants (184 sick, 191 healthy) from November 10<sup>th</sup>, 2021 to November 11<sup>th</sup>, 2021 (Study 4a) and 525 participants (261 sick, 264 healthy) from December 20<sup>th</sup>, 2021 to December 28<sup>th</sup>, 2021 (Study 4b) via CloudResearch.

We excluded participants who did not match the illness status of the survey (i.e., reported being sick in the survey for healthy participants and being healthy in the survey for sick participants), were presently sick with COVID-19, completed the survey in less than one minute or more than 45 minutes, wrote nonsensical responses to free response questions, or failed two quality check questions. We also excluded sick participants who reported significantly different symptoms at the beginning and end of the survey and healthy participants who reported significantly different symptom severity compared to their assigned severity condition, which led to the final sample of 852 participants (424 healthy, 428 sick).

Two separate surveys were advertised to workers. Each included a pre-screen assessing current illness. In the sick survey, the survey was terminated for participants reporting no such sickness or not responding. Participants indicating they felt sick with an illness that could be infectious, or who were unsure whether their sickness was infectious, reported their symptoms and the type of infectious illness (e.g., respiratory, skin infection, gastrointestinal).

In the healthy survey, the survey was terminated for participants reporting an infectious illness or not responding. Participants who were unsure whether or not they were sick with an infectious illness were excluded from the final analyses. Next, healthy survey participants imagined they were feeling sick with an infectious illness as they responded to the same set of questions used in the sick survey.

*Illness harm.* Illness harm represents a standardized composite of symptom severity and transmission risk. Participants who reported being currently sick indicated symptom severity on a scale from 1=not at all severe to 5=extremely severe. Healthy participants were randomly assigned to one of five severity conditions that approximated the distribution of the sickness severity measure recorded from the first 100 actually sick participants (to allow for this calculation, the first 100 participants in the sick survey were recruited before launching the healthy survey). This resulted in 71% overlapping distributions of severity across illness conditions (see Figure S5, panel B). As a manipulation check, participants in the healthy condition were asked to report their assigned symptom severity level again, and participants in both conditions described the symptoms of their actual or imagined illness.

For transmission risk, participants were asked to think about their current (or imagined) illness and respond to the three following items ( $\alpha=.94$ ): (a) “How contagious do you think your illness is” (1=not contagious at all, 7=extremely contagious); (b) “If you came into close contact

with another person, how likely do you think it is that they would contract your illness?" (1=not likely at all, 7=extremely likely); (c) "How easy do you think it would be for your illness to be transmitted to others?" (1=extremely difficult, 7=extremely easy).

*Stigmatized identities.* Participants evaluated their illness on measures commonly associated with stigmatized identities (illness centrality, salience, and anticipated stigma) (adopted from Quinn & Chaudoir, 2009). For illness centrality, participants responded to four items about how important their current (or imagined) illness is to their identity on a 7-point scale (1=strongly disagree, 7=strongly agree;  $\alpha=.86$ ), and for illness salience, they answered one item about how often they think about their illness (1=almost never, 7=constantly). For anticipated stigma, they indicated how likely they would be to receive seven types of negative feedback if others around them knew about their illness (1=definitely would not occur, 7=definitely would occur;  $\alpha=.91$ ).

*Concealment.* Participants read a vignette (adapted from Ackerman et al., 2020) describing a situation in which the participant was not feeling well but was asked to go to an important in-person meeting with one other individual. The meeting required the participant and the other person to be in a room together for several hours by themselves. After reading the vignette, participants answered the following three questions: "How likely are you to hide[conceal][cover up] the fact that you are currently sick from the other employee?" (1=extremely unlikely, 7=extremely likely;  $\alpha=.98$ ). The vignette approach was chosen to ensure both sick and healthy participants could respond to equivalent situations.

## Results

*Effects of illness status on concealment.* Regressing concealment intentions on illness status and illness harm indicated that sick participants were more likely to conceal than healthy

participants,  $b=0.50$ ,  $t(832)=3.62$ ,  $p<.001$ , an effect qualified by a significant illness status and illness harm interaction,  $b=0.61$ ,  $t(832)=3.64$ ,  $p<.001$  (see Figure 1). Replicating results from Study 2, healthy participants reported being more likely to conceal when the potential harm of their imagined illness was low than when it was high,  $b=-0.64$ ,  $t(832)=-5.76$ ,  $p<.001$ . However, a different pattern emerged for sick participants: they were equally likely to conceal their actual illness from others regardless of how harmful it was,  $b=-0.03$ ,  $t(832)=-0.25$ ,  $p=.80$  (this sick participant result was replicated in Study S4, see supplement). Comparing both groups, at high levels of illness harm, currently sick participants reported concealing more than participants who merely imagined being sick,  $b=1.00$ ,  $t(832)=5.08$ ,  $p<.001$ .

**\*\*Figure 1\*\***

*Stigma, salience, and centrality of infectious illness.* The same pattern of disease concealment was observed even when controlling for factors related to stigma and identity. We entered anticipated stigma, identity centrality, and identity salience as individual covariates into the primary moderation model. In this new model, all of the illness harm and illness status effects remained: sick people reported concealing more frequently than healthy people and a comparable interaction between illness status and illness harm emerged (see supplement for full results). People also reported being more likely to conceal if they felt stigmatization would result from their illness,  $b=0.39$ ,  $t(829)=5.19$ ,  $p<.001$ , and if they felt their illness was central to their identity,  $b=0.25$ ,  $t(829)=3.37$ ,  $p<.001$ . However, people (especially currently sick people) concealed illnesses even when accounting for these factors, suggesting that other characteristics such as the motivations identified earlier (e.g., social goals, professional goals) continue to encourage concealment. Infectious illnesses also were perceived differently on several



dimensions as compared to stigmatized identities (see supplement for details), highlighting the uniqueness of this domain of concealment.

### **General Discussion**

Sickness is a common experience, but the present studies indicate it is an experience commonly hidden from others. Infectious disease concealment is motivated by personal and social reasons and is particularly likely when the extent of potential harm to others is low. Such findings highlight the tradeoffs people make between societally normative motives (e.g., honesty, not causing harm) and personally desirable motives (e.g., pursuing one's goals, not worrying others). Perhaps most importantly, we observed a state-specific bias such that healthy people imagining being sick reported lower concealment intentions than actually sick people, especially when the illness was harmful. That is, when healthy, we may believe we would not risk severe harm to others, but when sick, we appear relatively insensitive to this exact risk. This insensitivity is especially pernicious considered alongside the contexts where concealment was reported, including healthcare facilities, college classrooms, and workplace environments.

Could people simply refrain from concealing when it is difficult (e.g., with severe symptoms that are hard to mask; when illnesses must be concealed frequently)? This possibility is inconsistent with the present findings. Sick participants, who should be especially sensitive to the relative difficulty of hiding mild vs. severe symptoms, were more likely to conceal severe illnesses than were people imagining illness. Illness duration also did not change decisions. This latter finding was surprising, but it is consistent with some prior research on lying (DePaulo & Kashy, 1998) which showed that interaction frequency is a less reliable predictor of lying than factors such as relationship closeness (we also find relationship closeness to be critical in disease concealment decisions; Study S5).

## Theoretical Contributions

This work makes theoretical contributions to at least two broad literatures. First, research on the psychology of sick organisms (e.g., sickness behavior) has historically focused on intrapersonal processes such as the emotional experience of sickness (i.e., lassitude; Schrock et al., 2020), or changes in neural activity as function of inflammation (Muscatell et al., 2016). In comparison, research on human pathogen management psychology, including models such as the *behavioral immune system*, primarily addresses pre-infection processes (e.g., detecting and avoiding infection threats; Ackerman et al., 2018; Schaller & Park, 2011). The current studies are embedded within the (former) sickness psychology space because they focus on decisions made by infected individuals, but they also bridge a gap between these two literatures by emphasizing the motivations and tradeoffs at play in social interactions that include infected individuals and other non-infected individuals, thereby addressing calls for such intersectional research (e.g., Muscatell & Inagaki, 2021).

Thus, the disease concealment paradigm may help advance theory connecting these two literatures. For example, the motivational tradeoffs producing concealment suggest that people high in affiliative motives or social exclusion concerns (Neel et al., 2016) may be particularly sensitive to the social costs of sickness and thus conceal more often. Conversely, sickness signaling may also function deceptively as a support-seeking device, exaggerating symptoms to facilitate interpersonal care or achieve other goals. Both sickness exaggeration and concealment may act as costly signals (Steinkopf, 2017). For instance, exaggerators risk social exclusion due to others' pathogen avoidance mechanisms, whereas concealers risk social exclusion due to others' cheater detection mechanisms. We expect these deceptive signals to be flexibly employed

based on factors modulating potential costs and benefits such as interactant closeness and motive strength (see also Lasselin et al., 2018; Shattuck et al., 2021; Steinkopf, 2017).

A second contribution is that these studies distinguish infectious disease concealment from existing perspectives on withholding other forms of information in social interactions, from general secret-keeping (e.g., Slepian, 2022) to stigmatized identities (e.g., Chaudoir & Fisher, 2010) to interpersonal deception theory (e.g., Buller & Burgoon, 1996). None of these approaches center the possibility of directly harming others as a possible outcome of concealment, though they do suggest indirect social harms stemming from associating with stigmatized individuals or morally-laden content (e.g., cheating, illegal activity; Slepian et al., 2017). While we found that people can anticipate stigma from being sick with common illnesses, there are multiple conceptual differences that separate disease concealment from the concealment of stigmatized identities. The concealable stigma literature focuses primarily on self-aspects that are more permanent (i.e., identity) but less prevalent in populations than common diseases. For instance, while not every American holds a stigmatized identity, the average American adult suffers an average of 2-4 colds per year (DerSarkissian, 2022). These qualitative differences between identities and illnesses may produce different psychological experiences: infectious illnesses seem to be salient but not central parts of our identities (see supplement), whereas literature on concealable stigma highlights identities as central but not as salient (Quinn & Chaudoir, 2009). Together, disease concealment involves unique theoretical considerations that stand apart from other domains of concealment as a potentially dangerous decision that every person faces at some point.

## **Practical Implications and Future Directions**

Future work would greatly benefit from examining concealment in other cultural contexts and across time. Our studies focused on U.S. participants, but societies vary in how strictly people adhere to and enforce norms, potentially shaping how diseases are spread (e.g., Gelfand et al., 2021). Applied to concealment, people in tight cultures may be hesitant to hide illness if the punishment for being caught is harsher than goals obtained through successful concealment. Norms may also be codified in regulations. Very few of the healthcare employees we sampled (< 10%) explicitly mentioned regulations (e.g., restricted sick leave) as drivers of disease concealment. This may be because they enjoyed sufficient sick leave, but even in settings where absences are presumably allowed, a majority still reported concealing for other reasons. Further, while our data collection spanned three years, COVID-19 was a known entity for all participants. We took steps to account for the unique historical backdrop of the pandemic (e.g., measuring retrospective concealment across one's life and prospective concealment in future situations, excluding COVID-19 infections in most studies), but it may be that proximity to the pandemic has shaped how people think about concealment. Longitudinal designs may also illuminate more about the experience of concealing illness from others (e.g., mind-wandering and well-being; Slepian et al., 2017). For instance, we expect concealers to experience pre-decision worry and post-decision guilt. However, the target of such mechanisms may differ by concealment domain—guilt is likely to be experienced by disease concealers primarily if they learn that an interactant became sick, whereas guilt should be less tied to the act of concealment itself because of the uncertain nature of the threat. That is, as germs are invisible and transmission is not ensured, concealers may plausibly deny they are dangers to others, thereby minimizing the sense that one's concealment decision is a violation. Future work could attend to at least some of these

possible influences, including how social and institutional pressures change as a function of ecological shocks (e.g., pandemics) and medical advances (e.g., vaccine availability).

Finally, these findings have broad public health implications. Insofar as concealment facilitates illness transmission, it likely adds substantial economic and operational burden to corporate, healthcare, and educational systems (e.g., Hemp, 2004; Mogharab et al., 2022; Ridenhour et al., 2011). The diseases participants reported concealing here were largely respiratory-based (~80% in Studies 1-3), which are both common and financially taxing (the indirect costs of the common cold have been estimated at approximately \$25 billion; Bramley et al., 2002). Considered alongside our finding that 40% of students in Study 1 reported improper use of a daily symptom screener, effective self-disclosure of illnesses appears to require more than simply relying on goodwill. The development of future interventions may target factors identified here as key leverage points. For instance, the relative insensitivity to interpersonal harm shown by sick participants indicates that emphasizing the potentially injurious consequences of concealment may be insufficient. Instead, to the extent that sick people are thinking in concrete, self-focused ways, they may be more receptive to interventions targeting immediate punishments or alternate ways to achieve one's social goals. Though the crafting of effective strategies to prevent infectious disease concealment will first require more foundational research, we hope the current work provides initial insights useful for meeting this challenge.

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Table 1. Percentage of participants who reported engaging in disease concealment.

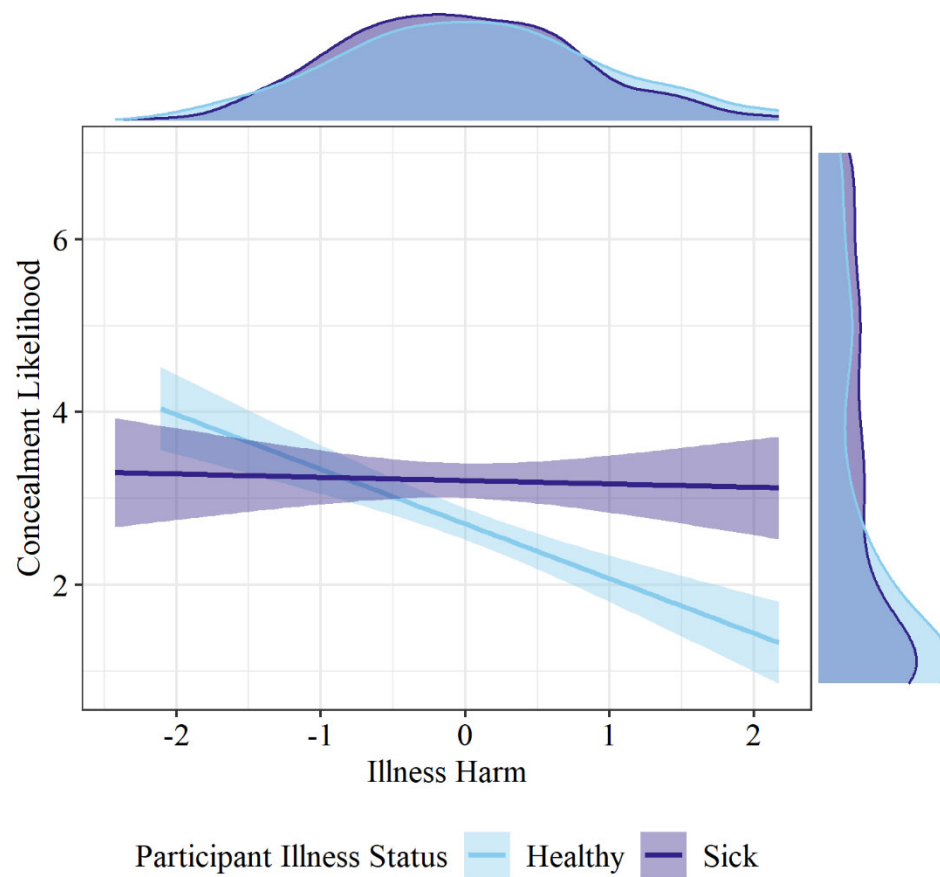
<b>Primary Studies</b>	<b>Percentage Reporting Concealment</b>	<b>Type</b>
Study 1 (N = 989)	85% (Students) 61% (Healthcare employees)	Past Concealment Behavior
Study 2 (N = 946)	79%	Projected Concealment Behavior
Study 3 (N = 512)	73%	
Study 4a (N = 375)	61% (Healthy people) 67% (Sick people)	
Study 4b (N = 510)	53% (Healthy people) 66% (Sick people)	
<b>Supplemental Studies</b>	<b>Percentage Reporting Concealment</b>	<b>Type</b>
Study S1: Exploratory Pilot (N = 121)	84%	Past Concealment Behavior
Study S2: Pilot 1 to Study 2 (N = 187)	82%	Projected Concealment Behavior
Study S3: Pilot 2 to Study 2 (N = 120)	83%	
Study S4: Pilot to Study 4 (N = 158)	83% (Sick people)	
Study S5 (N = 192)	77%	Past Concealment Behavior

Table 2. Motivations for concealment (Study 1)

	<b>Full Sample</b>	<b>Students</b>	<b>Medical Employees</b>	<b>Example Responses</b>
Prioritizing the Self	46%	54%	29%	<p>“Allergies were very common for me since I had housing with cats which I am allergic to, but did not want people to stop interacting with me/not want to socialize with me because of them”</p> <p>“I did not want to miss an appointment that I waited two weeks for”</p>
Prioritizing Others	22%	20%	25%	<p>“I thought it would be best not to worry people around me”</p> <p>“I didn’t want to stress everyone else out by telling them I was sick”</p>
School/Work Issues	46%	46%	45%	<p>“I wanted to attend classes so that I didn’t miss anything, especially near finals season”</p> <p>“We had low reserve for residents available to cover for myself if I was sick”</p>
Policy Requirements	5%	3%	8%	<p>“Two of my classes had attendance policies that said missing more than 10 classes in a semester would be an automatic F”</p> <p>“As a new employee, I don’t have very much [paid time off]”</p>

*Note.* Responses were not mutually exclusive.

Figure 1. Concealment likelihood by illness harm and illness status



*Note.* Illness harm is a standardized composite of symptom severity and illness harm. Marginal plots represent distribution of illness harm (x axis) and concealment likelihood (y axis) by participant illness status.