

Mental Health in the Global South: Challenges and Opportunities in HCI for Development

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ABSTRACT

Mental illness is rapidly gaining recognition as a serious global challenge. Recent human-computer interaction (HCI) research has investigated mental health as a domain of concern, but is yet to venture into the Global South, where the problem exhibits a more complex, intersectional nature. In this paper, we review work on mental health in the Global South and present a case for HCI for Development (HCI4D) to look at mental health—both because it is an inarguably important area of concern in itself, and also because it impacts the efficacy of HCI4D interventions in other domains. We consider the role of cultural and resource-based interactions towards accessibility challenges and continuing stigma around mental health. We also identify participants' mental health as a constant consideration for HCI4D and present best practices for measuring and incorporating it. As an example, we demonstrate how both the process and the lens of aspirations-based design, a recently proposed approach for HCI4D research and design, may benefit from the consideration of mental health concerns. Our paper thus recommends a path forward for considering mental health in HCI4D, potentially leading to new research directions in addition to enriching existing ones.

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COMPASS '19, July 3–5, 2019, Accra, Ghana

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ACM ISBN 978-1-4503-6714-1/19/07...\$15.00

<https://doi.org/10.1145/3314344.3332483>

CCS CONCEPTS

• **Human-centered computing** *HCI theory, concepts and models; Interaction design process and methods; Interaction design theory, concepts and paradigms.*

KEYWORDS

Mental health; HCI4D; ICTD; Aspirations-Based Design

ACM Reference Format:

Sachin R. Pendse, Naveena Karusala, Divya Siddarth, Pattie Gonsalves, Seema Mehrotra, John A. Naslund, Mamta Sood, Neha Kumar, and Amit Sharma. 2019. Mental Health in the Global South: Challenges and Opportunities in HCI for Development. In *ACM SIGCAS Conference on Computing and Sustainable Societies (COMPASS) (COMPASS '19)*, July 3–5, 2019, Accra, Ghana. ACM, New York, NY, USA, 15 pages. <https://doi.org/10.1145/3314344.3332483>

1 INTRODUCTION

As a leading and growing cause of worldwide disease burden, untreated mental illness can be devastating [142], with 14.3% percent of deaths worldwide attributable to a form of such illness [146]. The experience of having a mental illness is unique and complex, and shaped by a confluence of biological, psychological, and social factors [34], including global development scenarios such as human rights violations [117], continued political oppression [40], and rurality [118]. Inversely, challenges pertaining to mental illness are frequently viewed as direct obstacles to successful development efforts [75]. As a result, the impact of mental health concerns on issues like poverty alleviation and access to education forms the basis for the recent inclusion of mental health into the agenda of the United Nations Sustainable Development Goals [119, 145], tying in also with subsequent

reports by the World Bank, International Monetary Fund, and World Health Organization (WHO) [75].

With the growing prevalence and impact of mental illness, mental health is increasingly being pursued as a subject of study in the field of Human-Computer Interaction (HCI), with significant research being done on understanding and predicting how people express mental distress in online contexts [6, 27], understanding the experiences and expectations of stakeholders [83], and the design and support of interventions [93, 120]. However, little work has been done to consider mental health in more challenged, resource-constrained, and “developing” contexts. How mental illness is treated is intensely tied to *where* it is treated [99]; the direct interaction between environment and mental illness makes it impossible to separate the sufferings of an individual with mental illness from the societal structures that propagate these sufferings [96]. Further, the percentage of people with a mental disorder who do not receive treatment exceeds 50% around the world, and this percentage is significantly higher in Low and Middle Income Countries (LMICs), being over 90% in some [85, 97]. The field of Human-Computer Interaction for Development (HCI4D), and the broader field of Information and Communication Technology and Development (ICTD), are uniquely positioned to address this stark treatment gap through studying and designing interventions that factor in complex and intersecting systemic constraints [46, 66, 149].

In addition, HCI4D studies have a lot to gain from considering mental health. Though mental health plays a critical role in the expression and communication of wants and needs [111]—a core part of HCI4D research—indicators of mental health are not typically considered when formulating or evaluating studies. Rather, traditional notions of development have tended to place paramount importance on economic and quantitative metrics to assess the success of technology interventions [131], motivating their adoption in HCI4D and ICTD. We follow the lead of scholars within development (such as Sen [113] and Nussbaum [88]) and recent ICTD research [8, 106, 123] that have expanded their range of factors considered for assessing interventions, including sociology metrics [134], non-clinical psychology metrics [41], and notions such as individual freedoms [73, 112], to propose mental health as an important consideration for HCI4D research. As an example, in this work, we show how a framework for design within HCI4D (and ICTD more broadly), Aspirations-Based Design [67, 138], might be augmented by measuring and considering participants’ mental health, in turn leading to more holistic interventions.

Our paper is structured as follows. We begin with an overview of the relevance of mental health to HCI4D. Through analyzing research conducted on mental health in the Global South, we then argue in Section 3 that resource-based and

cultural interactions along with the high prevalence of untreated mental illness in the Global South have significant implications for HCI4D research. Given the impact mental health has on experience and behavior, in Section 4, we highlight the importance of HCI4D researchers and practitioners considering and measuring mental health, both in directly working to address mental health issues as well as in doing research that may not directly engage with mental health but still be influenced by it. To demonstrate what an approach considerate of mental health might look like, we draw on the example of Aspirations-Based Design for HCI4D and enrich it by associating aspirations to mental health [67]. We conclude by presenting best practices for researchers and practitioners when considering the mental health of their study participants, and discuss potential future questions for further exploring mental health in HCI4D.

2 BACKGROUND: MENTAL HEALTH

The fields of HCI and HCI4D are distinguished by a rich history of drawing on knowledge from a variety of disciplines to propose new methods that more closely meet the needs of a population being studied, including fields as diverse as critical race theory [110], anthropology [32, 84], and cognitive science [47]. In this section, we provide contextual information from work in clinical psychology, psychiatry, and public health to discuss what mental illness is, and how it is most commonly treated.

While some work has been done in HCI on mental health, little work has been done in HCI4D addressing mental health directly, with some prospective work done focused around addressing trauma as a result of violence against women [130]. There are significant similarities between mental and physical health issues that have been researched and addressed by HCI4D. Like other health issues addressed via HCI4D research and interventions, such as diabetes [45, 102] or HIV [86, 125], mental illnesses are often chronic [44], but relapse and remit [50], resulting in episodes of distress and ill health. Similar to other chronic illnesses, mental illnesses can thus be framed as managed conditions, mediated via medication taken regularly, psychotherapy, or some combination of the two [132]. Mental health interventions that are centered around the administration of medication are called *pharmacological* interventions, whereas interventions that are centered around improving the environment and thinking patterns of the individual experiencing distress are called *psychosocial* interventions.

Mental disorders are often classified as either common mental disorders or severe mental illnesses, with common mental disorders including “depression, generalised anxiety disorder (GAD), panic disorder, phobias, social anxiety disorder, obsessive-compulsive disorder (OCD) and post-traumatic stress disorder (PTSD)” [37] and severe mental

illnesses including all other diagnoses, such as schizophrenia or bipolar disorder. In the case of many common mental disorders, such as panic disorder or major depressive disorder, it is the combination of psychotherapy (a form of psychosocial intervention) and medication that can yield the most successful mental health outcomes [24]. In LMICs, due to a lack of trained mental health professionals and resource constraints, it is often the case that a solely medication-based treatment is the frontline treatment for mental illness, and common mental disorders go untreated [68, 109].

Terminology. In this work, following Keyes [56], we use the phrase “mental health” to describe the level of emotional, psychological, and social well-being of an individual, including the absence of the sustained mental distress typical to mental illness. We thus use the phrase “mental health work” to describe work done in clinical psychology, psychiatry, and public and community health to improve the level of this well-being. In line with Callaghan et al.’s definition of mental illness [15], we use “mental illness” as a broad term to describe the “full range of diagnosable mental illnesses and disorders,” differentiating between specific disorders when relevant, and “mental distress” to refer to symptoms of mental illness without a specific psychiatric diagnosis.

In this work, we also use the term Low and Middle Income Countries (LMICs) to refer to countries classified as Low or Middle Income by the World Health Organization.

3 MENTAL HEALTH CHALLENGES IN LOW-RESOURCE CONTEXTS

While we presented a broad definition of what constitutes mental illness, definitions are complicated by the fact that the expression of symptoms of mental distress are also influenced by identity and society. In this section, we describe interactions between culture, resource constraints, and the experience of mental health in low-resource communities. Through an analysis of case studies that demonstrate the impact of these interactions on how mental health is experienced (with a focus on digital interventions), we argue that these interactions between environment and mental health have implications for doing impactful HCI4D research.

Culture-Based Interactions

Significant work has been done in medical anthropology to understand the impact of culture on how people experience mental distress, with diversity in expression having a tangible impact on how technology is designed for people experiencing mental distress.

In his study of how Havik Brahmin women in Karnataka express distress, Nichter [87] coined the term “idioms of distress,” or the culturally-bound methods that individuals use to express that they are in distress, including using somatic

language to describe symptoms or deviating from behavioral norms within the community. Reflective of this cultural diversity, symptoms of mental distress can be communicated in numerous ways, such as the feeling of nerves beating, language around internal heat or cold, gastrointestinal issues, weakness, and headaches [29]. A greater degree of somatization of mental distress is more commonly seen in LMICs, and is more likely to be seen in people of a lower income or social status within a community [90, 98]. It is theorized that this variation in the presentation of symptoms between cultures might be the result of stigma around expressing any kind of distress that could potentially be viewed as mental illness [16, 104]. Illustrating this point, it has been observed that individuals will express mental distress in psychological terms when speaking with family and friends, but express mental distress in physical and somatic terms when speaking to a medical professional [60], as somatic complaints may be seen as more acceptable by a medical professional. From a medical perspective, it is also theorized that the stress associated with experiencing mental distress may make individuals more predisposed to a sensitivity to pain [114],¹ and that individuals are likely to experience pain as they expect to experience it, or what Kleinman dubs “somatic introspection” [60].

Expanding on Nichter’s work, Kleinman coined the term “explanatory models of illness,” or the beliefs that individuals and those involved in the clinical process have about an episode of distress and its subsequent treatment [59]. It has been frequently seen that the beliefs that an individual has about the distress that they are experiencing impact whether and how they choose to seek help.² For example, Banerjee et al. [10] found that the families of individuals experiencing schizophrenia in India were likely to consult indigenous healers who used the same idioms of distress as the person experiencing distress, and also had an aligned (and often spiritually inclined) explanatory model. It was also found that those who initially consulted indigenous healers were slightly quicker to eventually consult the outpatient department of a local government hospital than those who began their treatment pathway with local doctors that aligned their explanatory model to a medicalized model of mental illness. As Patel [94] and Abbo [1] note, traditional healers also play a large role in mental healthcare in east Africa, making the suggestion that traditional healing methods may be helpful in creating interventions that are more open to use by individuals experiencing mental distress, as a result of the

¹The ability to detect sensations in the body and make sense of them is called interoception [36].

²The process by which individuals in distress and their families navigate available health resources and come to understand them is often called the “pattern of resort” [57, 91].

intervention being aligned with the explanatory model of the individual in distress.

However, the methods that people use to understand their experience of mental distress (as well the words they use to describe what they are experiencing) are not static. Explanatory models are influenced by exposure to varying models of distress, such as medical models. As Okello et al [91] find in their study of the Baganda community in Uganda, patients diagnosed with a depressive disorder complain of somatic symptoms, but attribute the cause of those somatic symptoms to psychosocial stressors, such as general unhappiness or marital strife. As their perception of their distress is medicalized into an illness based on their interactions with psychiatric care, Baganda individuals adopt new models of their distress, blending traditional models with medical models.

Contextual meanings around mental disorders may also be “glocalized” [68, 107]. As Lang [68] finds in her study of local understandings of mental distress in Kerala, terms like “depression” are appropriated based on local understandings and context, and in many cases, a wide spectrum of mental disorders are described as depression. Additionally, in India, words such as “stress” or “tension” are used to describe symptoms usually associated with common mental disorders [20, 147].

As a result, community based interventions such as those from Sangath [100] or the Schizophrenia Research Foundation (SCARF) [136] that train lay healthcare workers from the community have been shown to be quite effective as a result of this local understanding of how people perceive mental health as well as the form of treatment they expect. To better reach rural and isolated areas, as seen in Zambia and Ghana, training for health workers has also been successfully administered digitally as well [140], with data on patients reported digitally in Liberia [150].

It is also well established that mental distress can be experienced as a family affliction in low-income communities [19, 99], which must be taken into account when designing interventions, with the entire family being targeted as the focus of the intervention [49, 124]. Family members can often be caregivers, supporters, and the main way that individuals in distress in low-income communities interact with the health system [19].

Resource-Based Interactions

Living in a community that is resource-limited can also have a significant impact on mental health. As Patel et al. [96] note, the added costs to experiencing symptoms of common mental disorders worsen overall economic condition, and touch every part of the individual’s life, trapping individuals in a “vicious cycle of poverty and mental illness.” Additionally, access to mental healthcare in LMICs is incredibly limited [95], particularly for those who are living in poverty [69].

As a result, significant work has already been done in designing digital mental health interventions for people in LMICs, as noted by Naslund et al [85] in their review of digital technology for treating and preventing mental disorders in LMICs. However, most sustained work that has been done around understanding the needs of people experiencing mental distress has focused on people with high levels of access to technology and education and their specific needs, as opposed to the needs of those with lower levels of income and education. As more and more countries explore digital methods of providing healthcare [3, 26], it is not inconceivable to think that mental health services may be provided via a mobile application. Along these lines, it is important to consider how we might design digital technology for treating mental distress without further exacerbating the treatment gap, designing interventions that are accessible to those who may have lowered access to technology or lower levels of literacy. One method that has been used to design interventions that are accessible for a wider range of people in low-income communities is using the existing phone system as the mode of delivery. One method of doing so is through the use of Interactive Voice Response (IVR) systems, commonly used in ICTD projects. Within the field of mental health, IVR systems have been used in rural Pakistan [43] to help identify families with a child with a developmental disorder, in Bolivia to administer a self-care service to people with moderate depression [53], and in Rwanda to connect young mothers to mental health resources [17].

A lack of education and awareness about mental health, combined with high stigma against mental illness, may also deter individuals in need from getting mental health care [22]. Discreet technologies and mobile applications that connect people to care in safe ways may help dilute some of the impact of stigma on helpseeking, as has been seen in several studies of mobile mental health applications [18, 48].

Designing For Mental Health Interventions

The above interactions between culture, resource constraints, and mental health are particularly important when designing tools to address mental distress among communities of lower socioeconomic statuses. For example, Tuli et al. [139] extended the need to consider the family as a unit of analysis to digital mental health interventions, designing interventions for an entire family of stakeholders rather than just the individual experiencing a severe mental illness. Through focus group discussions done with both people experiencing severe mental illness and caregivers, it was found that caregivers wanted a method of better facilitating cooperation between caregiver and patient, such as a method of checking medication adherence. As a result, rather than solely design an application targeted at addressing the needs of the person experiencing severe mental illness, two applications were

proposed, both for the caregiver and their family member with severe mental illness. In this case, it was important that the family was targeted as the focus of intervention in addition to the individual. Similarly, when designing an intervention for people experiencing depression in urban areas of India, Mehrotra et al. [74] recognize that cultural norms around the sharing of distress can often make it difficult to share distress with family members or significant others as a result of not wanting to be a burden on the family. In response, Mehrotra et al.'s subsequent intervention design included a module on how to ask for support from informal sources. Cultural and socioeconomic norms around how people express and experience distress are incredibly important to consider when designing any kind of intervention that addresses or considers mental health.

When doing work with populations in communities in lower socioeconomic statuses, it is also essential to remember that the potential for accidental harm is high. It is particularly important that interventions are sustainable, as a sudden lack of access to care could be disabling, mental illnesses are often chronic conditions, and the distress associated with it is thus episodic and sustained over the course of an individual's life. In the context of past experimentation done on mental distress without a clear communication of aims [62], it is also important that interventions ensure that methods of data usage and privacy protections are clearly communicated to people with whom an intervention is being tested. This is particularly necessary considering that certain types of technology might exacerbate the symptoms of mental illness [12]. Additionally, it is particularly important that collaborations happen with domain experts from outside of HCI, particularly to know whether an intervention is safe and effective. This ensures that the work is within the broad framework of ethics in human and mental health research within the country in which the research is being done [52].

Mental Health as a Constant Consideration

By definition, common mental disorders are pervasive, and as a result, most studies will have some number of participants who meet the criteria for a common mental disorder. Globally, one in every five people meet the criteria for a common mental disorder at any point during the preceding year [129]. Symptoms of common mental disorders can be debilitating, particularly for those living in poverty, a population that tends to be more vulnerable to them [96].

Due to the high prevalence of common mental disorders among low-resource communities, and the broad impact that mental distress has on an individual's life, mental distress must be a consideration in studies that are not primarily about mental health. It is likely that many studies that work with people in difficult socioeconomic circumstances might encounter symptoms of mental illness or mental distress, and

the impact of this distress can have an effect on the success of an intervention.

This above phenomenon can be seen, in particular, in the case of studies targeted at improving the physical health of a population. Mental distress has been shown to have a huge impact on medication adherence for illnesses as diverse as HIV [108], diabetes [54], and heart disease [39]. There is also a high rate of comorbidity between chronic illness and mental distress, with people with chronic illness having a significantly higher prevalence of depression than the general population [21]. Broadly, among people with a chronic illness, people experiencing depression are estimated to be 1.76 to 3 times more likely to be non-adherent [31, 42]. In resource-constrained areas, these effects are likely to be higher, as there is a higher amount of effort required to access treatment for a chronic illness [101]. Mental distress can also be seen as a confounding factor in studies targeted at improving education levels within a population. The symptoms of anxiety and depression have a significant impact on cognition, impacting the recall of new information [58] and the ability to focus attention [92], and are theorized to have an impact on the actual ability to learn among youth [148].

While physical health and education are two examples in which mental health state may have a confounding role, it is likely that the impact of these symptoms can be seen in any study working with people who are living in poverty, simply by merit of the number of people affected by common mental disorders. To gauge the impact of these symptoms, it is important to integrate measures of mental health state (such as scales measuring overall symptoms or distress) into research methodologies, similar to other demographic questions. Understanding the role of mental distress in an intervention could shed light on the reasons for why an intervention may not be working as well as intended.

4 INCLUDING MENTAL HEALTH IN HCI4D STUDIES

Having looked at designing for mental health interventions in the Global South, we now turn our attention to how assessing mental health may enhance HCI4D undertakings. We first describe standard scales from clinical psychology that can be used to measure indicators of mental health. Then, we consider Aspirations-Based Design [67] as one example of a design paradigm recently proposed in HCI4D for shaping technology design, and examine the role that considerations for mental health might play there.

Measuring Mental Health

The integration of mental health research methods into a study can often be logistically difficult—even simply beginning to measure the extent and severity of mental health issues within a population can be difficult, particularly when

considering cultural variation in terms of how people present symptoms of mental health issues [89] and the number of assessment tools that exist [2, 5, 122].

Unlike many physical illnesses, the gold standard for the diagnosis of mental illness is based on a *clinical interview*: either a structured diagnostic interview or a semi-structured clinical diagnostic interview [35]. A diagnostic interview, generally administered by a mental health professional, is used to tease out the specific clusters of symptoms that an individual may be experiencing, and tie those symptoms to a specific diagnosis in the Diagnostic and Statistical Manual of Mental Disorders (DSM) [132] or the International Statistical Classification of Diseases and Related Health Problems (ICD) [128]. These clinical interviews are time-intensive, often taking over an hour on average [35, 38].

To more quickly screen for mental health disorders and approximate their severity, interview scales have been proposed that can be administered by an observer or even self-administered [28]. These scales make use of Likert-style responses to questions about specific symptoms, and are significantly shorter than a clinical interview. One of the reasons for why the administration of a scale is much shorter than a clinical interview is that scales are often targeted at assessing specific mental health disorders such as depression or general anxiety. For example, the nine-question Patient Health Questionnaire (PHQ-9) [63] is used to measure depression symptoms, whereas the seven-question General Anxiety Disorder (GAD-7) [127] scale is used to measure symptoms of anxiety. Such self-report scales are appropriate for getting a general understanding of what psychiatric symptoms and forms of mental distress an individual may be experiencing, and to what degree. As scales are simple to administer in the absence of a mental health professional, they are most commonly used to screen for mental health disorders in LMICs [2, 115], particularly in resource-limited areas, and have also been administered via the Internet [11]. Due to the subjectivity in how people may interpret questions on self-report scales, however, it is necessary to later have a clinical diagnostic interview to formally diagnose someone with a mental illness.

Moreover, given the cultural differences discussed above, it is important to use scales that are both translated to local languages and validated in the cultural context of the country of the researcher, as subtleties in interpretation can have an influence on assessment. Scales are validated for different cultural contexts through a translation by two separate translators from the culture and population being assessed, a check for consistency between both translations, and further validation by external expert committees and translators, as well as tests in the field [28]. The scale most commonly used in LMICs is the WHO Self-Reporting Questionnaire (SRQ-20), which was specifically designed for use in LMIC

contexts [141]. It is available in the public domain, and assesses different forms of psychiatric symptoms and mental distress, including potential somatic symptoms of mental illness [13]. One other scale that can be used is the Patient Health Questionnaire - Somatic, Anxiety, and Depressive Symptoms (PHQ-SADS) [126], which combines questions from the previously mentioned PHQ-9 and GAD-7 with additional questions about panic attacks, as well as a survey of somatic symptoms. These have been used in a variety of studies in LMICs [4, 78, 79, 135], though it is always important to choose scales in consultation with a mental health professional. To reiterate, these scales cannot be used to formally diagnose someone with a mental illness. However, as the cause of mental illness itself is complex and multifactorial, considering these individual symptoms of mental distress is often a method of detecting and addressing an overall illness.

One example of a short scale is the PHQ-2, with two questions; “Over the last 2 weeks, how often have you been bothered by the following problems?” with the problems being “Little interest or pleasure in doing things” and “Feeling down, depressed or hopeless” [64]. Questions from these scales can be used in questionnaires done before and after studies to get an understanding of the extent to which mental distress is being exhibited by a population. These and other similar scales have also been used remotely, including via telephone [103] and online surveys [14, 137].

Augmenting Aspirations-Based Design

Appropriately measuring dimensions of mental health can enrich our understanding of individuals’ contexts. When integrated into HCI4D research and design, such measurements can help analyze the impact of an intervention, and possibly even guide its design. As an example of how understanding mental health can be integral to HCI4D work, we show how a recently proposed framework for aspirations-based design [67] can be augmented by incorporating mental health measurements.

Aspirations-based design. Strengthening and engaging with the capacity to aspire are fundamental to forms of development that seek to support the goals of individuals living in marginalized communities. Appadurai [7], in his essay titled “The Capacity to Aspire”, notes how the capacity to aspire involves thinking about what is needed to navigate towards future goals, thus serving as an important future-oriented counterpoint to the ongoing experience of poverty. Aspirations alone do not address structural constraints in marginalized communities, but offer a complementary approach to designing interventions by incorporating how individuals or communities envision change. Building on this work and emergent discussions on the importance of strengthening the capacity to aspire in development [65, 138], Kumar et

al. [67] outline considerations for operationalizing aspirations in the conceptualization and design of interventions in HCI4D.

The nascent body of work on aspirations and technology design does not currently engage with the connection between aspirations and mental health. A person's state of mental health is a foundation for how they conceptualize their future, and thus, might inform how they aspire. To truly enable HCI4D work to improve the capacity to aspire [67, 138], it is necessary that we consider mental health throughout the process of aspirations-based design. Tools used to measure the symptoms of common mental health disorders (such as the PHQ-SADS [126], the SRQ-20 [141], or the GAD-7 [127]) may be an important way of tracking changes in the capacity to aspire over the course of designing and deploying an intervention, augmenting other more common forms of assessment.

Aspirations and mental health. We extend the aspirations-based design framework by recommending that we attend to the impact of mental health on abilities to conceptualize futures and aspire. Specifically, drawing on past work in clinical psychology on how mental health affects individuals' ideas about their future [30, 33, 70, 70, 81], we analyze the relevance of mental health to understanding three aspects of aspirations as described by Kumar et al. [67]: *temporal*, *embedded*, and *mutable*. These three aspects convey that aspirations can vary from being short-term to long-term, are influenced by sociocultural and environmental contexts, and can change over time.

Mental Health and Temporality. In aspirations-based design, the time frame that aspirations are bounded by is important: perhaps they center around a future that is 10 years away or 10 days away [67]. To design for an aspiration, it may be important to break down far-off goals into more tractable steps. However, prior work shows that common mental disorders complicate not only how people conceptualize their future³, but also how they set concrete goals. For example, MacLeod et al. show how individuals experiencing anxiety [70], depression [71], or symptoms from both disorders [70] anticipate positive future events less and negative future events more, while Morina et al. additionally show that individuals with these symptoms have more difficulty *vividly* imagining positive future experiences [81]. Breaking aspirations down into goals may also be complicated due to the cognitive deficits associated with common mental disorders that make adaptive and specific goal-setting difficult [30, 33]. Thus, it is important for HCI4D researchers and

designers to be aware of mental health state when both understanding and working with individuals in reaching their aspirations—it may be possible that aspirations are temporally restricted in specific ways due to mental health state.

Mental Health and Embeddedness. Aspirations are shaped not just by the individual, but also by long-standing power structures and their effects on the wider community that an individual is part of [67]. Recognizing embeddedness of aspirations helps us understand both supporting and limiting factors in the agency of individuals to achieve their aspirations. If we then factor in mental health concerns, we can see that embeddedness is linked to the association among culture, mental health, and conceptualizations of the future. For example, in their study of cultural understandings of Post-Traumatic Stress Disorder (PTSD) among communities in Nepal, Kohrt et al. describe the belief that women are considered to have been less pious in a past life, and thus more likely to endure traumatic events as a result of karma [61]. Authors also describe similar community justifications around caste, such as the belief that people of lower castes had poorer karma in a past life, and are more likely to have negative events in their future. These culturally sanctioned beliefs around the types of futures accessible to individuals have an impact on how individuals in mental distress justify their suffering, and thus draw limits to their aspirations. Aspirations-based design, then, may consider not just how aspirations are embedded but also how mental health concerns, if present, are situated.

Mental Health and Mutability. Another characteristic of aspirations is mutability, or how aspirations can change over time [67]. Accordingly, designs to support aspirations may need to change course and adapt as well. This characteristic prompts us to consider how change in aspirations might be linked with change in mental health. Research on mental health has started uncovering a symbiotic relationship between mental health state and aspirations—prior work has found there can be shifts towards a positive outlook via cognitive therapy [51], though it is unclear if the shift *causes* or is caused *by* symptom improvement [55]. Several therapies and counseling strategies, nevertheless, are founded on improving future outlook, pointing to the importance of considering mental health in formulating and reaching aspirations over time. For example, in future-directed therapy [143, 144], individuals with depression are taught to pay special consideration to the way they approach the future, with a focus on progressively achieving goals and coping in a healthy and resilient way when encountering disappointments. Similarly, in the strengths-based approach to counseling, individuals are taught to embrace strengths they may have when encountering adversity in the pursuit of higher goals [121].

³The term most commonly used for how people conceptualize their future in cognitive psychology literature is “mental time travel” [133] or “(episodic) future thinking” [9].

In aspirations-based design, as individuals formulate aspirations, an important question for future work is whether working towards aspirations has an effect on mental health, and considering mental health through the deployment of an intervention can help us learn more about the connection. Promisingly, the two-way relationship between aspiration and mental health state has been explored by recent work in development studies. In their study of whether increased social interactions lead to higher aspirations in the context of increasing household investments, Macours et al. [72] use the Center for Epidemiological Studies Depression scale as one metric to understand whether views towards the future have shifted based on an increase in social interaction. Through a controlled study, they find that aspirations do improve as a result of additional social interaction with motivated and communicative leaders from a similar gender background.

From Theory to Practice. By discussing the link between mental health and various aspects of aspirations, we see that HCI4D research can practically benefit from considering participants' mental health at multiple stages of a study: for better understanding individuals' context, for discovering factors that affect the design and impacts of a study, and for measuring auxiliary outcomes of a study.

First, just as we often collect information about participants such as demographics and socioeconomic factors, it can be important to inquire about people's mental health to understand the composition of participants in a study. This may also help us to contextualize further forms of data collection, such as interviews, surveys, or focus groups, within limit. For example, we might better understand participants' engagement with topics that have been found to be linked to mental health, with conceptualizations of the future being one example [30, 33, 70, 70, 81] that we have just discussed.

Second, having knowledge of participants' mental health can help detect a potential factor that may be modifying, or even *confounding* [80], the effect of an HCI4D intervention. For instance, for health or education interventions, as we discussed in Section 3, participants' mental health plays an important role in how they engage with an intervention. Measuring mental health allows us to associate outcomes with mental health, and discover if there are significant effects that should be factored into the design of an intervention that accounts for different mental health states. Without such measurements, we may miss out on these differences, confounding our understanding of the effect of an intervention.

Finally, measuring dimensions of mental health state can also contribute to measuring the various impacts of an intervention. Often, an impact on the desired developmental goal (or behavioral indicator) may be hard to achieve, but an intervention may have contributed auxiliary beneficial outcomes

on people's well-being and lowered mental distress. For instance, consider a recent study on a digital app intervention for helping low-income drivers pay their loans on time and avoid costly fees [82]. Due to structural factors that affect a driver's financial situation, a technology intervention may not be able to increase payment rates substantially. However, the intervention may be able to provide timely information and future loan projections, making it worthwhile to understand drivers' stress levels related to ambiguity around finances.

In terms of methodology, one approach may be to add questions around understanding mental health to existing surveys or interviews as a part of a study. For example, they can be added to "pre" and "post" surveys or to regular interval longitudinal interviews [72, 137]. While these ideas are preliminary and speculative, we believe that considering mental health state offers new ways for the design and evaluation of HCI4D studies that consider their interplay with mental health.

5 DISCUSSION: RISKS AND BEST PRACTICES

Through an analysis of past work in mental health, we highlighted the importance of considering mental health in HCI4D studies, both when working to directly address mental health issues, and when doing any kind of research with participants that may have significant mental health issues. However, as a result of the globally stigmatized nature of having a mental illness, considering mental health must be done in a delicate and nuanced way. In this section, we discuss some of the risks and related opportunities for impact when considering mental health in HCI4D research. We close with a list of important considerations and best practices for practitioners and researchers to keep in mind when doing HCI4D research.

Risks and Ethics

Research on mental health in the Global South inevitably involves working with people in low-resource communities and often who are stigmatized and vulnerable due to their mental illness. Therefore, as we discussed in Section 3, the potential for unintended harm is high. Due to the stigma associated with mental illness, the method in which mental health is measured and framed within a study can have significant impact on the well-being of participants. For example, disclosing to participants that they have significant symptoms of a mental health disorder in a study that is not related to mental health could cause participants to feel further stigma, particularly among sensitive populations [23]. It is critical that research designs preserve anonymity and privacy of the participants to the extent possible. Additionally, when designing interventions, the construction of mental

distress as a technological problem to be solved could potentially cause other political or socioeconomic factors to be ignored [77], similar to past concerns raised with the pathologization of mental distress [76]. Finally, when a mental health intervention is useful, there is a risk of abruptly ending it when the research study ends, with adverse effects on participants.

For these reasons, it is especially important to collaborate with mental health professionals to guide design of an intervention or a study, so as to minimize harm to participants and utilize best practices from clinical psychology. Moreover, given the sensitive nature of such studies, we recommend working with stakeholders when designing studies that address or consider mental health, including people with mental health disorders in the community as well as public health researchers and mental health professionals.

In balancing risks and benefits, one potential strategy is to proactively address the role of mental health in HCI4D studies so that studies incorporate exercises that are intended to benefit participants' mental health, following Siddarth et al.'s [116] call for studies to incorporate "in-action" impact into their research methodology. It has been observed in several works that behavioral exercises from behavioral activation and cognitive-behavioral therapy are effective at increasing adherence to medication [108], helping increase overall focus [105], and can help to bring about a remission in mental distress [25]. These measures can be used with individuals who present with a high amount of mental distress within an intervention, to understand whether mental distress is the reason for a lack of success in the intervention among a population with high distress. Additionally, even if lack of success is not due to mental distress, using behavioral exercises to address mental distress would be providing access to one form of relief to a detected distress, a form of in-action impact adjacent to the research questions of the study.

Important Considerations and Best Practices

Given the complexity of how mental health is experienced along with the global prevalence of mental health disorders, a nuanced approach that considers and addresses individual, systemic, and environmental factors of distress is necessary for any kind of meaningful impact. The level of complexity needed in considering mental health presents a large challenge to both mental health and HCI4D researchers, but presents an equally large opportunity for collaboration on high-impact work.

In the service of making collaboration more accessible for HCI4D practitioners and researchers, as well as towards creating more awareness of the important role that mental health might play in HCI4D research, we conclude this work

with a list of important factors to consider and best practices for incorporating mental health in research.

- (1) As social, biological, and environmental factors influence the onset of mental distress, it is important to consider both structural factors and individual factors that may contribute to symptoms when designing an intervention to address mental distress [99]. This might include a pharmacological intervention, a psychosocial intervention, or some combination of the two [24]. *Section 2, Moving From Physical to Mental Health in HCI4D*
- (2) A diagnostic interview is the most commonly used way to formally diagnose someone with a mental illness [35], but self-report scales are one of the most common ways to understand what symptoms of mental distress are present [28], and how interventions can take those symptoms into consideration. It is important to use a self-reported scale that is validated in the cultural context of the population being studied. The SRQ-20, designed by the WHO, has been validated in a variety of cultural contexts [141]. Additionally, the PHQ-SADS, GAD-7, and PHQ-9 are all scales that can be used to measure mental distress, and have been validated in a variety of cultural contexts [63, 63, 126]. *Section 4.1, Measuring Mental Health*
- (3) Symptom presentation can vary based on the cultural background and socioeconomic status of the individual experiencing distress [60, 87, 91]. Though the symptoms of mental illness tend to be fairly constant worldwide, it is commonly the case in low-income communities that the symptoms of mental distress that are first presented are somatic [90, 98], such as stomachaches, headaches, and sexual dysfunction [29]. This may be linked to the level of stigma within a community [16, 104]. *Section 3.1, Culture-Based Interactions*
- (4) Based on community norms, mental distress can often be seen as an affliction that affects an entire family rather than an individual [19, 99], with family members being quite active in the help-seeking and caregiving process [139]. It is necessary to consider the family as a potential focus of intervention rather than solely the individual experiencing distress [49, 124]. *Section 3.1, Culture-Based Interactions*
- (5) When designing digital interventions for mental distress, it is important to consider whether your intervention needs to be accessible to people from lower socioeconomic statuses and lower levels of literacy to be successful, as the treatment gap is the highest among people from that demographic [99]. Projects from ICTD such as IVR systems have been shown to have high

rates of success outside of mental health [17, 43, 53].
Section 3.2, Resource-Based Interactions

- (6) Stigma against mental distress and illness is a huge disincentivizing factor with regards to whether people choose to seek help. With higher access and more private modes of engagement, digital technology might be one method of increasing access in the context of stigmatized environments [18, 36]. *Section 3.2, Resource-Based Interactions*
- (7) Considering the high risk of harm (particularly when interventions are not sustained efforts), it is important to collaborate with mental health professionals and domain experts when creating interventions for mental distress. *Section 3.3, Designing for Mental Health Interactions*
- (8) As a result of how common mental distress and mental illnesses are [129], particularly in low-resource contexts [96], it is highly likely that some participants in HCI4D studies will meet the criteria for a common mental disorder, which can have an impact on other parts of an intervention [31, 148]. One in-action method of addressing this is through integrating behavioral exercises into interventions. *Section 3.4, Mental Health as a Constant Consideration and Section 5.1, Risks and Opportunities*

6 CONCLUSION AND FUTURE QUESTIONS

In this paper, through analyzing work done in mental health, we discussed the importance of considering mental health when doing HCI4D research. It is clear that mental health has a substantial impact on how participants engage with the studies we design and administer, with these impacts being seen across sociocultural and economic lines. However, while it is clear that we should include a greater consideration of mental health to HCI4D, there are still open questions to be addressed about *what* that greater consideration should look like. As an experience intensely shaped by identity, low mental health is a fundamentally intersectional issue, and the different identities that people hold have a sizeable impact on mental health. Similarly, the identities that people hold also have an impact on how they use technology. Thus, one question to be addressed further is thus the extent to which different identity-based factors have an impact on how people who have a mental illness use technology. Additionally, considering the stigma and sensitivity associated with mental health, there are ethical questions when examining mental health issues, such as the level of training necessary for researchers or research assistants without a professional background in mental health who want to incorporate mental health into their research methods. Considering that the causes of mental illness are numerous and come from biological, social, and environmental factors, it is still an open

question of what specific actions could be taken if a large amount of participants in a study unrelated to mental health are presenting symptoms of mental illness. Explorations of these questions in the future could make the link between HCI4D and mental health much deeper, and give researchers and practitioners the opportunity to make progress in an under-covered and important area.

7 ACKNOWLEDGMENTS

We thank Srujana Kamath, Faisal Lalani, Bonnie Nardi, and Ding Wang for their amazing feedback. We would also like to thank Bhrigupati Singh and Project LETS for their work to teach and spread awareness about the structural and sociocultural aspects of mental health, particularly among marginalized communities.

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