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Mental health and information technology developers: an exploration of demographic variances

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Abstract

The mental health of Information Technology (IT) developers has become an increasingly significant concern due to the rapidly evolving and highly demanding nature of the industry. This study aims to examine the relationship between demographic factors and mental health outcomes among IT developers. A comprehensive review of existing literature was conducted, exploring variables such as age, gender, education, remote work, and sexuality. The findings highlight the multifaceted nature of mental health in IT developers, revealing complex interactions between demographic and compensation factors and mental health. A high prevalence of mental health issues was observed among IT developers, with younger developers and those with less work experience appearing to be more vulnerable. Gender disparities were also evident, with women in the field experiencing unique challenges, such as gender-based discrimination and imposter syndrome, leading to increased mental health concerns. The findings suggest that organizations should implement comprehensive mental health programs and flexible working hours and encourage in-person work. Additionally, it is recommended that companies invest in professional development opportunities and foster inclusive work environments to address gender disparities and promote mental health in the IT workforce.

Keywords: mental illness, gender, programmers, information technology developers

Introduction

According to Xie, Xu, and Al-Aly (2022), the COVID-19 pandemic has caused an increase in mental illness cases globally, including conditions like depression, anxiety disorders, schizophrenia, eating disorders, and addictive behaviors. Mental illness can affect a person's mood, thinking, and behavior, as defined by Mayo Clinic (2022a). On the other hand, mental health refers to emotional, psychological, and social well-being, affecting how people think, feel, and act, and relates to stress management, interpersonal relationships, and healthy choices, as stated by the Center for Disease Control (2022). Although the terms mental illness and mental health are often used interchangeably, they are not the same, as a person may have a diagnosed mental illness but good mental health, and vice versa.

Before the pandemic, Mental Health America (2022) reported that 19.86% of US adults had experienced mental illness. However, a survey by SingleCare (2022) revealed that 59% of US respondents had their mental health affected by COVID-19, while the World Health Organization (2022) found a 25% increase in anxiety and depression worldwide. Research has previously indicated that social disadvantage, lower income, and financial difficulties are associated with mental illness, and women are more frequently

diagnosed than men, according to Mayo Clinic (2022b), Lewis et al. (1998), and Welch and Lewis (1998). Additionally, one in six women during the pandemic were found to have post-traumatic stress symptoms (Lindau et al., 2021).

During the pandemic, many companies had to reduce their workforce due to virtual operations, affecting the IT industry. Although the technology sector was in a better position overall, IT professionals faced increased pressure and stress (Thompson, 2022). Prior research by OSMI (2016) showed that 51% of IT professionals had been diagnosed with a mental illness before the pandemic, highlighting the need to understand how mental illness affects the IT industry as new roles emerge post-pandemic. The theoretical foundation for our study was the Technostress work done by Ayyagari, R., Grover, V., & Purvis, R. (2011). They explored the affect of technology on work strain using the Person-Environment model. This paper aims to address the impact of gender, education, remote work, age, and years coding on mental health in the IT industry. The literature review will explore these areas, followed by the methodology, results, and conclusions.

Literature Review

Mental Health & Gender

Previous research indicates that women typically experience higher rates of mental illness (Chochrane, 1981; Hankin, 2001). The 2020 National Survey on Drug Use and Health found that mental illness of any kind was higher among females (25.8%) than males (15.8%) (National Institute of Mental Health, 2022).

Seedat et al. (2009) observed gender differences in mental illness across various countries but found that these differences diminish in societies where men and women have more equal roles. The COVID-19 pandemic exacerbated existing mental health issues, with women experiencing higher anxiety levels than men, and more significantly impacted women in Austria and the United Kingdom during the lockdown (Pieh, Budimir, and Probst, 2020; Pieh et al., 2021).

Prowse et al. (2021) found that the pandemic negatively affected Canadian female university students more than male students in terms of academics, stress, mental health, and isolation. Adams-Prassl et al. (2022) discovered that lockdown measures worsened mental health overall and increased the gender gap in mental health by 61%, affecting women more negatively.

Mental Health & Age

Age may be a factor in a person's mental health. Bruine de Bruin (2020) studied risk perceptions and mental health during the pandemic. Over 6,600 adults in the U.S. completed a survey assessing their perceived risks of items including running out of money and dying from COVID-19. They also completed a mental health assessment regarding anxiety and depression. Results found that older adults perceived a higher risk of dying from COVID, but less risk of running out of money. They also reported less anxiety and depression.

Na, Yang, Mezo and Liu (2022) examined the modifying effects of age, resilience and coping between the perceived adversity and mental distress. They used data drawn from the Understanding America Study's longitudinal online survey of 7145 participants. Results showed that the youngest age group reported the highest mental distress and the lowest resilience and low relaxation.

McGinty, Presskreischer, Han and Barry (2020) conducted a survey to study psychological distress and loneliness among US adults. They collected data in April 2020 and compared their results with national data from 2018. Results found that the group with the highest serious psychological distress in April 2020 was young adults aged 18 to 29 years old (24%). This was only 3.7% in the corresponding 2018 data. Adults aged 55 years and older had the lowest reported serious psychological distress (7.3%).

Mental Health & Education

Past research has established a relationship between education and mental health, with two primary explanations: social causation and social selection. Social causation posits that education affects mental health causally, enhancing skills, providing structural advantages, and promoting better coping mechanisms (Kessler et al. 1995; Lantz et al. 2005; Mirowsky and Ross 2003; Ritsher et al. 2001; Schieman and Plickert, 2008). In contrast, social selection suggests that preexisting mental health conditions hinder an individual's ability to achieve higher education levels.

Those with mental health problems are more likely to face school difficulties, including increased absenteeism, suspension and expulsion rates, lower grades and test scores, and higher dropout rates (Bernstein and Shaw, 1997; Diperna and Elliott, 2002; Gutman, Sameroff and Cole, 2003; Reid et al., 2004). Research implies that functional impairments, stigma, and social exclusion accompanying mental illness are often the cause (McLeod, Uemura, and Rohrman 2012; Needham, Crosnoe, and Muller 2004).

On the other hand, a study conducted in the UK by Lewis and colleagues (1998) uncovered a relationship between social class and gender, without any direct connection to educational attainment.

IT Profession

Workplace stress and increased job demands can influence a person's mental health. In a study conducted by Salanova, Llorens, and Cifre (2013) focused on the impact of workplace stress specifically on IT professionals. The researchers found that high job demands and low job resources can lead to increased burnout and mental health issues among IT workers.

A study by Shukla and Srivastava (2016) highlighted the importance of work-life balance among IT professionals. They found that poor work-life balance can result in increased anxiety, depression, and other mental health issues in this population.

Tarafdar, Tu, and Ragu-Nathan (2007) examined the impact of technostress on the mental well-being of IT workers. Techno stress is defined as stress or psychosomatic illness caused by working with computer technology on a daily basis. Their findings indicated that technostress can negatively affect mental health by increasing anxiety, depression, and burnout among IT professionals.

Arnetz (1997) performed an oft-cited study on the increased stress placed on IT workers and recommended directed interventional strategies to address mental health issues among this population. A recent study by Takahashi et al. (2023) found high levels of mental health issues among IT workers in Japan and concluded that work hours must be properly managed.

Mental Health & Remote Work

Working remotely may impact a person's mental health. Miron, Petcu, David-Sobolevski, & Cojocariu (2021) studied the impact of remote work on employee's well-being. They based their research on the

theory of social production function which uses seven areas of evaluation: professional development and competencies, autonomy, work satisfaction, commitment, emotional dimension, work-life balance, and organizational climate. The authors hypothesized that there would be a difference between how employees who worked remotely and those who worked in person perceived their well-being. They also hypothesized that there would be a positive relationship between the seven areas of evaluation and well-being.

In addition, they hypothesized that there would be a difference between genders regarding the appreciation of the remote employees' well-being. All three hypotheses were validated or in part. Hypotheses 2 showed that autonomy, commitment, and emotional dimension have a negative rather than a positive relationship with well-being. Emotional dimension is the mental health area of evaluation, indicating that there is a negative relationship between remote employees and mental health.

Pelissier, Paredes, Moulin, Bitot, Fakra and Fontana (2021) studied the amount of anxiety and depressive symptoms that were found in hospital staff who were forced to telework during the pandemic. They looked at various factors which were associated with these symptoms. Of the eligible hospital staff, 340 participated in the study. Results highlighted the association between anxiety symptoms and the "increase in mental workload, the difficulties in teleworking related to family-work balance, noise and internet connection during the lockdown" (Pelissier, et al., 2021, p. 8).

Mendonca, Coelho, Ferrajao, and Abreu (2022) studied telework and mental health during the pandemic. They hypothesized that a high mobile maintenance expectation is associated with high entrapment. Also, both of those factors are associated with increased depression, anxiety and stress. In addition, they hypothesized that "teleworkers might present higher mobile maintenance expectation and entrapment, through the mediation of imagined surveillance and communication overload, which would increase levels of depression, anxiety and stress" (Mendonca, et al., 2022, p. 4). They had 500 participants take part in an online survey. Results showed that telework was associated with imagined surveillance, which then led to the increase of depression, anxiety and stress. They also found that mental health issues were higher in women.

Methodology

To investigate the impact of mental illness on software developers, data from 2021 and 2022 Stack Overflow survey was utilized. The Stack Overflow Developer Survey is recognized as the most extensive and comprehensive examination of individuals who code globally. Each year, the survey encompasses a broad array of topics, including developers' preferred technologies and job preferences. As stated on their website:

"For almost a decade, Stack Overflow's annual Developer Survey held the honor of being the largest survey of people who code around the world. This year (2020), rather than aiming to be the biggest, we set out to make our survey more representative of the diversity of programmers worldwide. That said, the survey is still big. This year's survey was taken by nearly 65,000 people." (Stack Overflow, 2020)

Numerous peer-reviewed journals, such as Barua, Thomas, and Hassan (2014), Asaduzzaman, Mashiyat, Roy, and Schneider (2013), and Treude and Robillard (2016), have relied on Stack Overflow as a data source. The dataset includes a plethora of demographic, descriptive, and opinion questions about the current state of programming. IBM SPSS 27 was employed to analyze the results. It should be noted that the mental health responses were self-reported and could include self-diagnosed cases.

The survey served as the basis for our analysis. Although 88,420 responses were obtained from 2019 and 73,268 were collected from 2022, the survey contained data on hobbyists and non-professional users. Hobbyists were excluded from our analysis. Furthermore, this international survey was narrowed down to focus solely on US developers to eliminate variations in salary. Lastly, anomalies in compensation featuring unrealistically high and low compensation values were excluded; those with yearly salaries below \$15,000 and exceeding \$1,000,000 were omitted. In summary, the initial data was filtered to include only surveys from individuals residing in the United States, who identified as professional developers, and whose converted compensation was between \$15,000 and \$1,000,000. Any responses with missing data or "prefer not to say" were removed from the dataset, resulting in a final dataset 7,779 responses from 2021 and 6,865 from 2022.

A range of statistical analyses were conducted using SPSS 29 to determine the influence of mental health on information technology compensation. The working hypothesis centered around the potential impact of mental health on employment opportunities, which could be reflected in compensation levels. Additionally, the study aimed to compare the effect of mental health issues on compensation relative to other demographic factors.

Results

Mental Health

First focusing on the aspect of mental health differences pre-covid vs 2019 and then on the effect mental health has impacted compensation, the survey asked the following question to ascertain the respondents' mental health:

Which of the following describe you, if any? Please check all that apply.

- I have a concentration and/or memory disorder (e.g., ADHD)
- I have a mood or emotional disorder (e.g., depression, bipolar disorder)
- I have an anxiety disorder
- I have autism / an autism spectrum disorder (e.g., Asperger's)
- None of the above
- In your own words

The results of this survey question are shown in Figure 1. As respondents can check more than one disorder there are many different combinations. Figure 1 on the other hand, shows the percentage of those surveyed who indicated having a specific disorder separated out by year.

Given that respondents can check more than one disorder, the sum of the columns is larger than 100%. Even within a one-year time frame, there was over an 11 percent decrease in the number of respondents indicating that they had some type of mental illness, (45.5% vs 34.4%). This may be due to the reduction in the effects of the COVID pandemic.

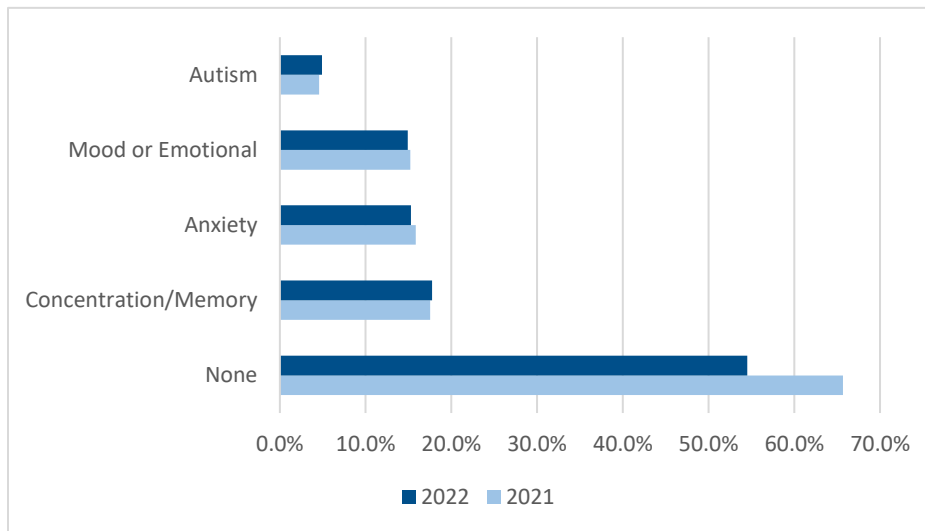


Figure 1: Percentage of Respondents with Mental Disorders

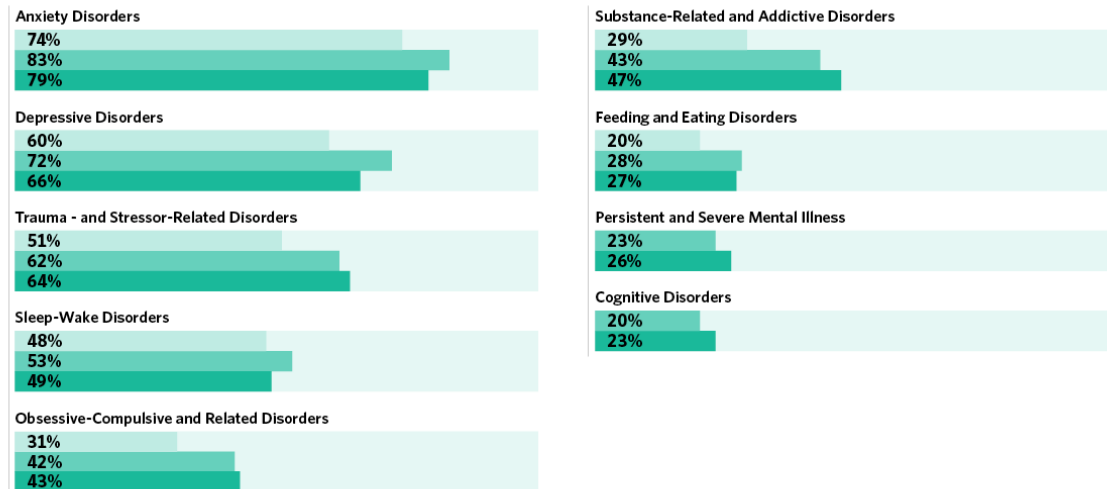
This is a bit in contrast to the general practitioners’ survey by the American Psychological Association (Figure 2) who saw mixed results in 2022 versus 2021. Anxiety Disorders and Depressive Disorders and Sleep-Wake Disorders were down but some other categories showed mixed results.

CHANGES IN TREATMENT AREAS, 2020-2022

% REPORTING INCREASE SINCE THE BEGINNING OF THE PANDEMIC



2020 2021 2022



COVID-19 PRACTITIONER SURVEY © 2022 American Psychological Association

Figure 2: American Psychological Association’s Changes in Treatment Areas

To explore the extent of mental health, our study reviewed the 2022 demographic variables of those who expressed one or more mental health issues. Our intent was to determine the characteristics of information technology workers that are most affected by these issues. By understanding these characteristics, we can

better target programs and policies that can reduce the negative impact of mental issues on job performance, overall job satisfaction, and monetary compensation.

Gender & Sexuality

The respondents to the survey were predominately male as is shown in Figure 3. The Mental Health Issues (MHI) and gender shows that men self-reported much less mental health issues than women, with the largest reporting MHI being other gender (Table 1). Women reported a 53% (55.2% versus 36%) higher MHI rate than men and Other was 94% higher. A chi-square analysis confirmed the significance of these differences at $p < .001$. Non-heterosexuality reports a higher level of MHI than heterosexual in all the categories (Figure 4).

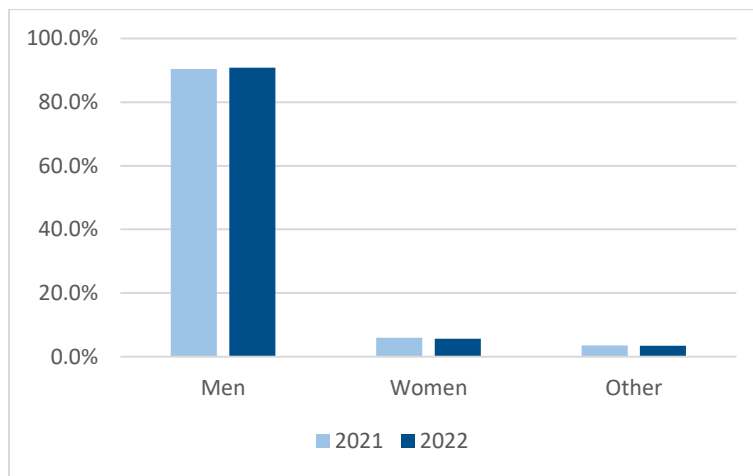


Figure 3: Gender

Table 1: 2022 Gender and Mental Health Issues

	MHI	No MHI	Total
Male	3,993	2,242	6,235
Female	175	216	391
Other	72	167	239

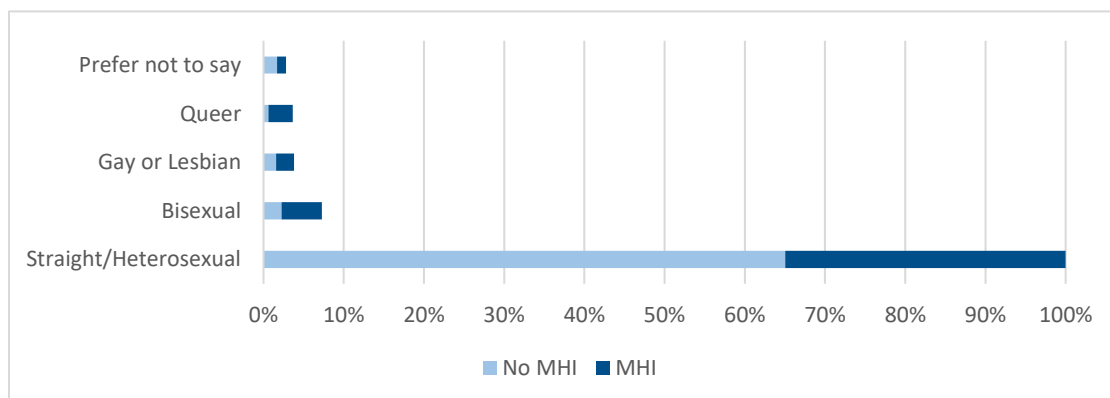


Figure 4: MHI and Sexuality

Age

The ages of the respondents were primarily within the 25 – 44 years of age range. (Figure 5). We examined the rate of self-reported MHI in our dataset and found that for the most part, younger individuals expressed a higher rate of MHI (Table 2). Whether this is due to more openness about MHI among younger individuals versus actual differences would require further study, but the results suggest that age may need to be considered when developing programs to reduce MHI among IT developers. Differences were significant at $p < .001$.

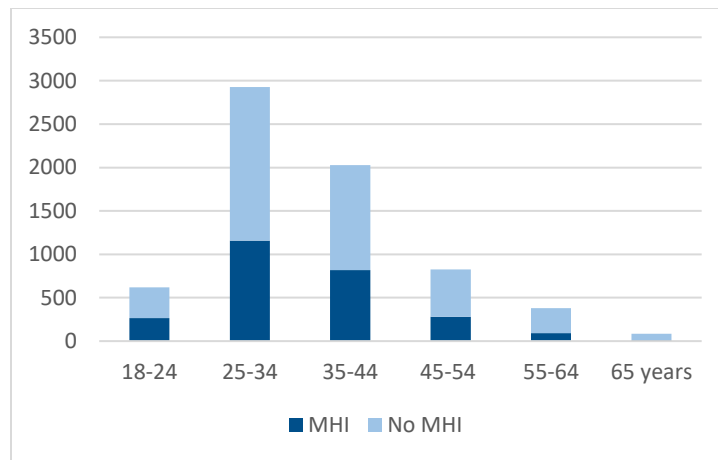


Figure 5: Age and Mental Health Issues

Table 2. 2022 Age and Mental Health Issues

Age Range	MHI	No MHI	Total
18-24	265 (42.7%)	356 (57.3%)	621
25-34	1,158 (39.6%)	1,768 (60.4%)	2,926
35-44	818 (40.4%)	1,209 (59.6%)	2,027
45-54	281 (34.0%)	545 (66.0%)	826
55-64	91 (23.9%)	290 (76.1%)	381
65 years	12 (14.3%)	72 (85.7%)	84

To determine individual differences between age groups we performed CROSSTABS Pairwise Z-Tests. The results show that there were significant differences in the older age groups. The 45-54 age group had significantly less reported MHI than the 18-24, 25-34, and 35-44 age groups. The 55-64 age group was also significantly less than the 45-54. Lastly the 65 and older group was significantly less than the 55-64 age group.

Education

The majority of the respondents held at least a bachelor’s degree (Figure 6) In reviewing education levels and MHI, it was found that generally those who only had primary school, secondary school and Associate college degrees had higher levels of MHI than those who had a bachelor’s degree and above (Table 3). Post hoc analysis confirms these differences.

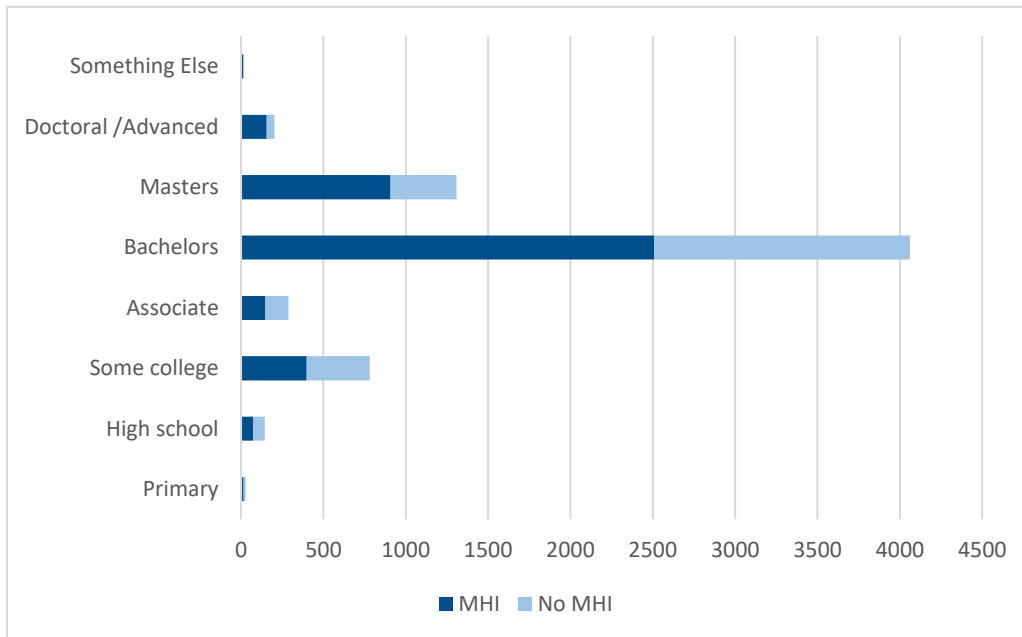


Figure 6: Education and Mental Health

Table 3. Education and Mental Health

Education	MHI	No MHI	Total
Primary	15	12	27
High school	73	71	144
Some college	399	383	782
Associate	147	141	288
Bachelors	2,509	1,553	4,062
Masters	908	400	1,308
Doctoral /Advanced	156	46	202
Something Else	13	5	18

Years as a Professional Coder and Years Coding

Two scalar variables were next examined, Years as a professional coder and Years Coding overall (Figures 7 and 8). We used regression analysis to determine the correlation of these variables with the reporting of MHI. Both variables were significant at $p < .05$ but they showed contradictory results.

The more years coding, the more likely MHI were reported. However, the more years coding professionally, the lower likelihood of MHI. Perhaps starting too young in coding has a negative impact on MHI, whereas starting as a professional does not. Also, this variable could be influenced by age or other variables and requires further study.

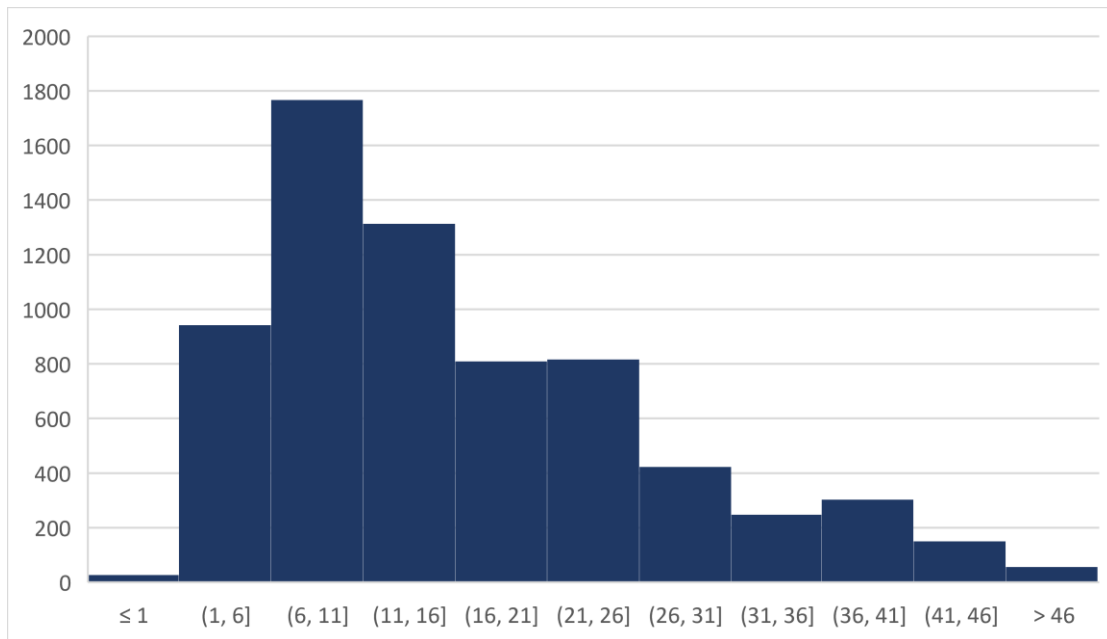


Figure 7: Years Coding

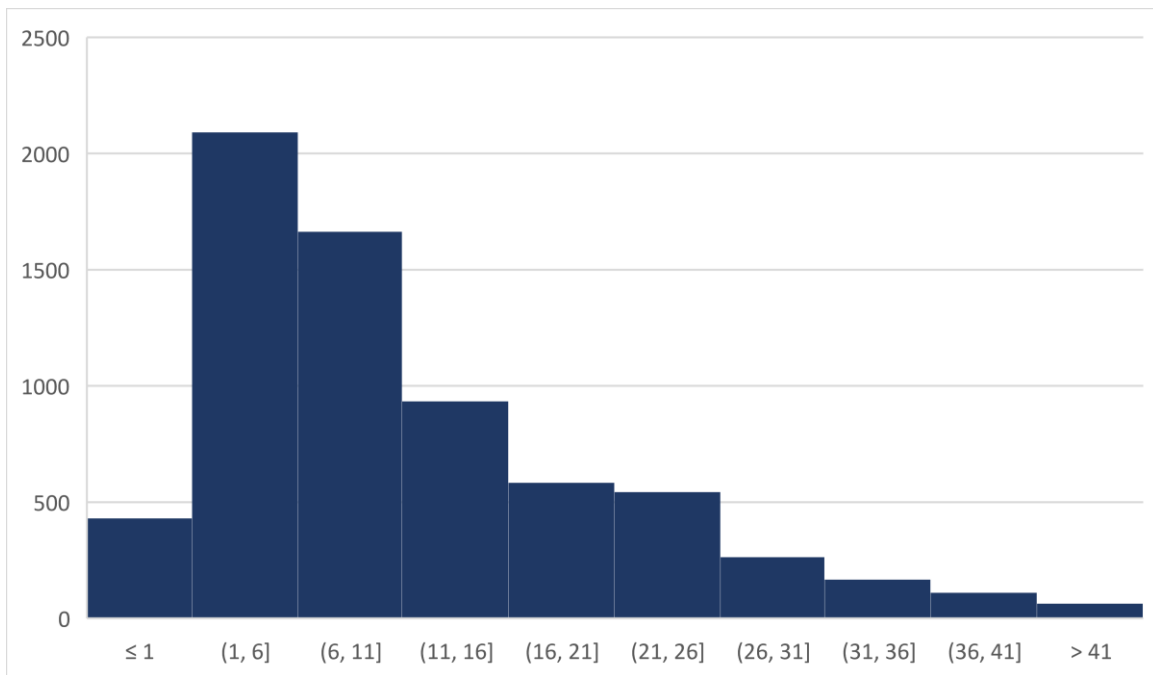


Figure 8: Years as a Professional Coder

Remote Work

Finally, we reviewed the impact of remote work on MHI (Figure 9). We found significant differences between in-person and remote work. In person work reported the lowest level of MHI, followed by hybrid, and fully remote. We suggest that higher levels of remote work promote higher levels of MHI.

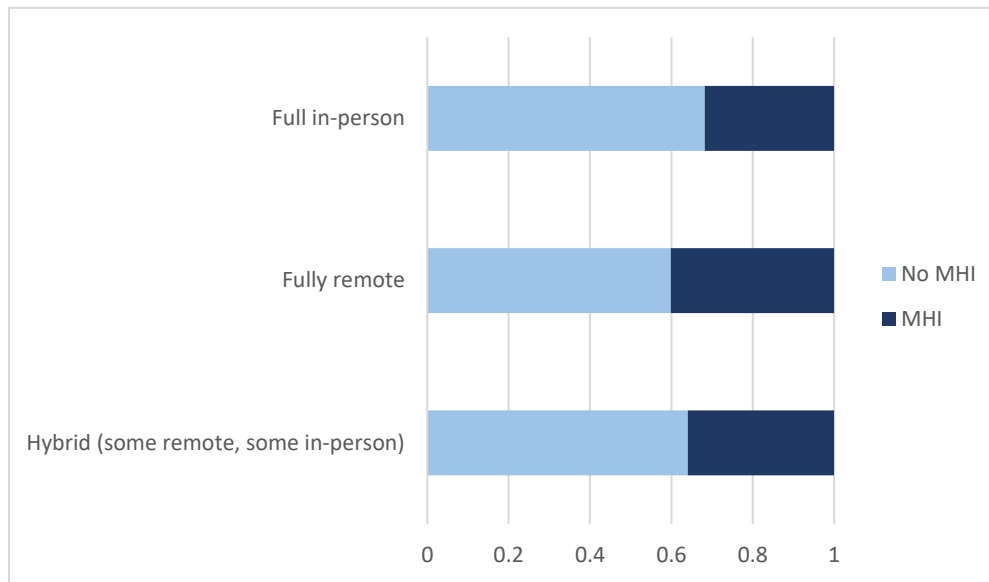


Figure 9: Mental Health and Remote Work

Discussion and Conclusion

The study aimed to explore the demographic variables of information technology workers with mental health issues to identify the most affected individuals and develop targeted programs and policies. Key findings include:

1. **Gender:** Men reported significantly fewer mental health issues than women, with the highest reporting rate among the "Other" gender category. Women reported a 53% higher rate than men, while "Other" gender reported a 94% higher rate.
2. **Age:** Younger individuals generally reported higher rates of mental health issues. Age should be considered when developing programs to reduce mental health issues among IT developers.
3. **Education:** Those with primary school, secondary school, and associate college degrees reported higher levels of mental health issues than those with a bachelor's degree or higher.
4. **Professional experience:** More years of coding correlated with a higher likelihood of mental health issues, while more years of professional coding experience correlated with a lower likelihood. The impact of starting to code at a young age on mental health issues requires further investigation.
5. **Sexual orientation:** Non-heterosexual individuals reported higher levels of mental health issues across all categories.

In addition, we found negative impact of remote work and years coding professionally showed lower levels of MHI whereas more total years coding negatively impacted MHI.

Limitations of the study include the potential reliability of self-reported mental health identification as well as the results only being applicable to US developers due to our data scrubbing. Results are not necessarily generalizable across the world.

In conclusion, the study identified several demographic variables significantly linked to mental health issues among IT workers, providing key data to inform targeted interventions. Our findings reveal a higher prevalence of mental health issues in women and those identifying as "Other" gender, younger individuals, those with lower levels of formal education, non-heterosexual individuals, and individuals who started coding at an early age.

Additionally, while more years of professional coding experience seem to mitigate mental health issues, the overall duration of coding years had a negative impact. Remote work also surfaced as a potential factor exacerbating mental health issues. This detailed demographic exploration provides a robust foundation for designing effective programs and policies to address mental health concerns in the IT sector, prioritizing vulnerable groups, and ultimately improving job performance and satisfaction. Further investigations are needed to clarify certain relationships, such as the impact of early coding experience on mental health.

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