

The Measurement of Worker's Mental Health Using Logistic Model: A Case of Bogor Regency

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Abstract. During the outbreak of the Covid-19 Pandemic, many countries decided to close public places, including factories, workplaces, and schools to prevent the spread of the Novel coronavirus. Many companies were required to implement working from home (WFH) or remote working as a temporary and alternative working arrangement for their workers. Many workers find some challenges in adapting to WFH arrangements, such as limited access to the internet and electronic devices and the paperwork was not digitalized. Some workers also face physical and mental health issues while working remotely due to increased workload and long working hours for joining online meetings. However, many studies showed that WFH could make workers more productive since it provides more time to rest, reduces work-related stress and improves work-life balance. The research aims to analyze the impact of remote working arrangements on the workers' mental health by assessing the level of Depression of workers during the Covid-19 Pandemic. The level of Depression will be measured by the Center for Epidemiologic Studies Depression Scale (CESD-10) measurement. The data was collected from respondents who worked from home in Bogor regency, and then data will be examined through tabulation data and a logistic model. The result found that the remote working arrangements have no impact on depression symptoms, even though many respondents prefer to have WFH because it saves commuting and transportation cost. Therefore, the companies are suggested to provide working guidelines and procedures during WFH and support for workers to maintain productivity and achieve company goals and objectives while safeguarding the safety and health of workers.

Keywords: *Working from home, Logistic Model, Mental Health, Depression.*

INTRODUCTION

The world is currently facing the Covid-19 pandemic with various variants of concern (VOC), such as Delta, Omicron, and its subvariants, since the virus that cause COVID-19 change over time [1]. In response to this condition, some measures and strategies have been undertaken by many countries to reduce the transmission of VOC, for example, lockdown, closing public places, including factories, workplaces, and schools, and self-isolation and quarantine for infected patients. However, these measures not only affect physical health risk but are more likely on individuals' mental health of individuals [2]. This is because they influence people's activity, routines, and livelihoods and contribute to a rise in mental health symptoms, such as loneliness, anxiety, Depression, and insomnia [3]. Similarly, Khan et al. [4] argued that the main contributors to sadness, fear, Frustration, loneliness, and feeling of helplessness are self-isolation, misinformation on social media about pandemic information, and quarantine.

The other mental health impact of the pandemic is that people experienced overwork, fear, and adverse societal responses, for example, discrimination and stigmatization as infected patients[5]. Besides, Talevi et al. [6]found a psychological effect of Covid-19, in which 96.2 % of infected patients showed post-traumatic symptoms after being discharged from the hospital. This condition led to lower quality of life and working performance. Thus, the World Health Organization suggested managing mental and psychosocial well-being and physical health during the COVID-19 pandemic [7].

In addition, many companies also implement remote working arrangements as temporary and alternative working arrangements for their employees. Working from Home (WFH) is preferred to minimize the spread of coronavirus and avoid the risk of virus infection. However, several studies find different perspectives about WFH. Some of them advocate WFH because of its advantages. Dockery and Bawa [8] noted that WFH

makes employees more productive since it saves commuting time, which can be allocated to perform other activities. It also saves transportation costs for employees to travel to the office. It can benefit employers because it saves operational costs, such as power consumption. Further, WFH allows workers to give their time to work more efficiently by combining their time to work and their time with family at home.

Nevertheless, some studies suggest that WFH could negatively impact employees in many aspects, such as physical, mental, and work-family issues. This is because WFH, which allows flexible work, could lead to longer working hours. Long working hours are mostly related to poor mental health and increased anxiety and depression symptoms [9]. Besides, it could also negatively affect employees' health, for example, increased risk of hypertension, diabetes, cardiovascular disease, and sleep disturbance. Sharma and Vaish [10] found that WFH causes more physical load for workers, which causes neck, and back pain. Their study recorded that 38 % of respondents reported that their workloads were mildly increased, and 22 % reported their workloads were significantly increased during WFH. In addition, bringing work into the home and long working hours from WFH could worsen employee work-family conflict [8]. Another drawback of teleworking is a negative psychological impact on mental health workers, especially in terms of loneliness, worry, and stress [11]. Therefore, this study analyzes the impact of remote working arrangements on the workers' mental health during the Covid-19 Pandemic.

LITERATURE REVIEW

The remote working arrangement has become more popular since the Covid-19 pandemic since many companies and organizations implement this alternative working method to mitigate the spread of the virus. Other terms of the remote working arrangement are work from home (WFH), telecommuting, and teleworking. Those terms

reflect that remote working arrangement utilizes telecommunication and information and communication technology (ICT) to work from home [8]. Many organizations also determine how many minimum working hours are from home to keep employees' productivity, although some employees need to work overtime to finish their jobs.

Many recent papers discuss and review the link between remote working arrangements and mental health since the covid-19 outbreaks. Some study finds that working from home has deteriorated both physical and mental well-being. The decline in physical and mental health was caused by some factors, for example, less physical exercise, uncontrolled food intake, less communication with coworkers, children at home, distractions while working at home, extended working hours, and screen exposure for joining an online meeting, blurred work-life balance, and unsupported workstation set up and workstation at home [12]. In addition, working from home also negatively impacts mental well-being [13]. However, this study suggests that a balance arrangement between working from home and the office can be beneficial for workers. Based on the research's findings, there is no difference in the mental well-being of workers who work from home and the employer's office. Therefore, structuring the way of working could contribute to the worker's job performance and mental well-being.

Furthermore, Oakman et al. [14] reviewed the impact of working from home from three literature, ProQuest (Central, Coronavirus Research Database, Social Science Premium Collection, Science Database), PsycINFO, and Web of Science databases. They found mixed results that showed in the majority of studies, namely increased stress level, improved well-being dan different levels of exhaustion. Those studies' varying and mixed results were determined by the responses and support from organizational workers, such as IT and other electronic devices support and mental health counseling. In other words, organizational support and job-related factors are the main factors that affect the

employees' satisfaction when they work at home [15]. Shows that organizational support could increase and mitigate the negative health impact of working from home.

Besides, Mann and Holdsworth [11] argued that the drawbacks of teleworking are social isolation, lack of technical support from companies such as personal computers, and blurring boundaries between work affairs and home life which can lead to work-family conflict. Working from home also led to work-family conflict curvilinearly [16]. Even though remote working arrangement allows workers to combine their work with their family role, it also undermines the boundaries between working tasks and family life. Thus, it leads to emotional exhaustion and stress for workers. Chandola et al. [17] also noted that work-to-family conflict and family-to-work conflict could lead to poor mental health, especially for single fathers or single mothers in three different countries, namely Helsinki, London, and Japan. Therefore, there should be a balance between work and family roles to maintain mental health for both men and women. Further, remote working arrangement, seen as a new way of working, could decrease the worker's health, despite there being null effects on fatigue or stress [18]. The other mental health problems that were often shown are fear, fear, and anxiety about potentially infected viruses from meeting people who have traveled from highly infected places or any person who has shown any symptoms of infection, such as cough, sneezing, and fever [19].

On the contrary, the study that Vias conducted and Butakhieo [20] showed that more than 80% of respondents preferred to work from home for several reasons, namely more time to rest, reduced work-related stress, and improvement in work-life balance. Further, the workers who support work from home view the benefit of WFH due to flexible working time, compressed working hours, and mentally relaxed feelings during WFH. Similar to that, Perelman et al. [21] found that even though working from home has worsened mental health symptoms. However, there was no significant effect of health

consequences except for anxiety. Even the worsening effect did not differ between observed workers and non-workers. Thus the effect is mainly caused by the pandemic and not specific to working from home. They also argued that working from home was not the leading cause of mental health deterioration of European adults during the Covid-19 pandemic. The other advantage of teleworking is that employees experience more positive well-being and less job-related negative well-being from working from home rather than from the office [22].

In addition, some have raised concerns about remote working arrangements due to workers' productivity during the COVID-19 pandemic. The study by World Economic Forum [23] found that during work from home (WFH), the productivity of employees has increased from 61 in 2020 to 78 in 2021 (scale 100). Employee productivity improvement is caused by learning effects and supporting office equipment at home. Similarly, Bloom et al. [24] found that working from home could lead to a 13 % increase in the performance index at Ctrip, a NASDAQ-listed Chinese travel agency. The employees also showed an improvement in satisfaction index and attrition rate decreases. As a result, the company continues to provide an optional choice between working from home and working from the office.

Besides, Njip et al. [18] viewed working from home as beneficial for workers because it saves commuting time to travel from home to the office. It also means more hours at home and fewer office hours. Thus it results in access to work location control. WFH also provides some advantages for employees; for example, it saves transportation costs, reduces stress due to traffic jams and commuting from home to the office, and gives more flexible time to work [25]. The other benefits of teleworking are better working-life balance and increased productivity [11]. Besides, Vander Elst et al. [16] argued that remote working arrangement does not necessarily change the way people

work; this is because it depends on how the working arrangement is set up and how organizations can support and provide for the workers' needs in order to work at home, such as IT equipment, internet access, and office supplies. Thus, workers can keep working at home productively and effectively at the office if the company can provide IT support.

METHOD, DATA, AND ANALYSIS

This study uses primary data sources. This primary data was obtained through a google form questionnaire (question list) which was distributed to 44 employees/ employees working in the Bogor Area. Filling out this questionnaire asks respondents to fill out a questionnaire about how respondents feel about the statements in the questionnaire distributed in the study. The questionnaire distributed was a questionnaire adapted from a journal guide by Moon et al. (2017). To measure a person's level of depression, this study used the CES-D Scale (Center for Epidemiological Studies Depression Scale) measuring instrument. CES-D contains 20 statement items which will be personally assessed by the respondent on a scale of 0 to 3 according to the respondent's condition.

This study calculates the impact of WFH on depressive symptoms in employees. Samples of individuals who experience symptoms of depression and who do not experience symptoms of depression. The relationship between risk factors on the binary outcome of the impact of WFH was investigated using the Logit Regression model and the margin values for each group. The model can be written as follows:

$$P_i(Y_i = 1 | X_i) = \phi(\beta_0 + \beta_1 X_1)$$

Where $Y=1$ is the probability of individuals experiencing symptoms of depression; X is an independent variable consisting of various kinds as already mentioned in the summary statistics, and ϕZ is the Logit model function.

The best way to interpret the coefficients of the Probit model is to calculate the change in the probability value or the so-called marginal effect. This marginal effect calculates the change in the probability value if there is a change in the independent variable. The trick is (1) to calculate the probability prediction value on the value of a particular independent variable as the initial value; (2) calculate the value of the probability prediction on the value of the other independent variables as a new value, and (3) calculate the probability difference between the two.

Dependent Variable

Depression is a mood disorder which characterized by a dysphoric effect (loss of excitement or arousal) that often occurs in society. This dependent variable represents individuals who experience symptoms of depression. The appropriate instrument to detect Depression in employees who perform WFH is to use the CES-D Scale because, according to Shafer (2006), the factors contained in the CES-D Scale are as follows:

- Depression (harmful) effects are negative feelings, emotions, or moods, such as feelings of sadness, Depression, loneliness, and crying.
- Somatic symptoms, namely psychological symptoms related to the condition/state of the body, such as feeling disturbed, decreased/increased appetite, requiring more significant effort in doing something, difficulty sleeping or not sleeping well, and difficulty starting something.

- Positive influence is a positive feeling, emotion, or mood, such as feeling happy, happy, having hope, and feeling good about yourself.
- Interpersonal relations, namely negative feelings felt by individuals related to the behavior of others, such as being unfriendly and feeling unwelcome.

Independent Variable

In this study, the independent variables were measured by using the variables of age, gender, the average income for a month, length of stay at home during WFH, length of work while WFH, the desire between WFH, Mixed WFH WFO, and WFO only. The age variable was measured by age range 17-25 years, age 26-35 years, 36-45 years, > 46 years. The monthly average income is measured in the range of < IDR 3 million, IDR 3 million – IDR 5 million. IDR 5 million – IDR 10 million, > IDR 10 million.

In order to perform a descriptive analysis of respondents' answers regarding research variables, the authors need to know the class to categorize respondents' answers by looking at the total score or total score of respondents' answers on the CES-D Scale. According to Weissman et al., in Moon et al. (2017), the categories are:

- a. No depression (total score 0-9),
- b. Mild depression (total score 10-15),
- c. Moderate depression (total score 16-24),
- d. Major depression (total score of 25 and above).

In this study, in order to determine whether someone is depressed or not depressed, it is necessary to utilize the CESD value disaggregation. A CESD value above 16 indicates a person is experiencing symptoms of Depression. On the contrary, below a value of 15

does not show symptoms of depression (Lewinsohn et al., 1997). In other word, someone is not experiencing the symptoms of depression.

RESULT AND DISCUSSION

The demographic distribution in this study is summarized in Table 1. The sample size for this study were 44 people, which consist of 56.8% male and 43.2% female. From the table 1, it is shown that 25% respondents are between the ages 17 and 25, while 65.9% are between the ages of 26 and 35, and 9.1% are between the ages of 36 and 45.

Table 1: summary statistics of each dependent and independent variable.

Variable	Obs	Mean	Standard dev.	Min	Max
Age	44	1.840909	0.568277	1	3
Gender	44	0.568182	0.501056	0	1
Income	44	3.136364	0.667899	1	4
Home	44	2.659091	0.568277	1	3
worktime	44	2.159091	0.713432	1	3
family	44	1.522727	1.067242	0	3
wfhorw	44	2.113636	0.722267	0	3
fo	44	0.977273	0.150756	0	1
protocol	44	0.977273	0.150756	0	1

Further, the table 2 shows the categories of respondents' depression symptoms when doing WFH. The table shows that 38 percent of respondents have no symptoms of Depression, and 31 percent of respondents have symptoms of major depression. The symptoms of major depression make a second contribution when a person does WFH.

Table 2 Categories Depression Symptoms

Depressive		
symptoms	Freq.	Percent
Major	14	31.82
Mild	6	13.64
Moderate	7	15.91
No Symptoms	17	38.64

Table 3 shows the results of OLS and logit regression. In the table, the results of the OLS show that the results of tightening health protocols can provide an increase in symptoms of Depression. Meanwhile, using the logit model, there is not a single independent variable that impacts depressive symptoms.

The tightening of health protocols forces people to keep their distance, wear masks, and wash their hands. However, keeping a distance can make it difficult for a person who usually interact with others, especially their loved ones. This condition can make people also feel bored and less closed to other people. The use of masks also makes people have less understanding of expression, so it is difficult to reveal their identities. Quarantine is one of the steps taken to prevent the spread of the coronavirus outbreak. This action is reported to have adverse psychological effects, including the occurrence of symptoms of Depression, confusion, and anger.

One factor that was considered as a stressor during quarantine are the duration of quarantine. This is because the duration of quarantine which was longer than ten days is associated with increased mental disorders, particularly depressive symptoms, avoidance behavior, and anger. Meanwhile, the fear of experiencing infection and transmitting it to others. This fear is especially true for pregnant women and those with young children. Frustration and boredom occur when a person loses his daily routine, and there is a reduction in physical and social contact with others, including feeling isolated from the world around him. Not having enough reserves of basic needs, such as food, drink, clothing, or accommodation, including medicine to personal protective equipment Lack of official information from the government regarding guidelines for steps that need to be taken, the division of risk levels, and the purpose of quarantine. This lack of information is one predictor of the onset of depressive symptoms.

The patient's mental health will be influenced by the severity of symptoms, complications, sequelae, effects of therapy, as well as the ability to access health services. Difficulty carrying out daily functions due to symptoms of the disease or the sequelae experienced can cause a person's mental health disorders. Some patients can experience feelings of helplessness and even feelings of grief due to the loss of their closest people, including fellow patients in care. Psychological stress can persist after the quarantine period is over; influencing factors include the presence of symptoms related to viral infection during the quarantine period, unmet needs, social activities, history of mental disorders, and financial loss.

Table 3 Regression Result

	(1)	(2)
	OLS	LOGIN

main		
Age	-4.799 (-1.19)	-0.764 (-1.06)
Gende	0.606 (0.12)	-0.771 (-1.06)
r		
Incom	-5.115 (-1.35)	-0.356 (-0.58)
e		
Home	-1.924 (-0.50)	0.353 (0.46)
workti	6.570 (1.95)	0.0806 (0.14)
me		
family	-2.257 (-1.12)	-0.504 (-1.34)
time		
wfhor	-3.620 (-1.14)	-0.285 (-0.55)
wfo		
protoc	10.86* (2.52)	
ol		

_cons	34.98	3.096
	(1.69)	(0.99)
<i>N</i>	44	44

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

After treatment or a pandemic, some patients or medical personnel experience a certain stigma, such as rejection by their local community or society. This can lead to self-blame, and become as barriers for returning to home or workplace, and barriers to seeking help. Meanwhile, uncontrolled social media will cause excessive reporting conditions, spread fear, and even increase the risk of mental disorders in those who receive or send messages. In addition, social media can also increase the stigma against patients and health workers undergoing quarantine.

CONCLUSION

The covid-19 pandemic has made some changes in the working arrangement method. Many companies decided to have WFH as the alternative working arrangement, and some of them preferred a hybrid method, a combination between working from home and working from the office to maintain the company's output and provide services to their customers. However, this new working arrangement has its advantages and drawbacks for workers. Based on some studies, many employees also faced some challenges in working from home due to limited support from the companies, such as IT support and office supplies. Some recent studies showed that WFH could negatively impact employees in

many aspects, such as physical, mental, and work-family issues because it could lead to longer working hours. Many employees also need to join multiple and extended online meetings, which causes eye fatigue and overworked.

On the contrary, some studies suggested several advantages of WFH: employees become more productive because it saves commuting time and transportation costs to travel to the office. Besides, WFH allows employees to give their time to work more efficiently by combining their time to work and their time with family at home. Based on the regression, our findings showed that restrictions on health protocol affect workers' mental health and cause increasing in depression levels. However, WFH does not affect workers' mental health issues and depression symptoms. Even many respondents prefer to have WFH as a new method of working because of its benefits. Namely, it provides an efficient way to work since it saves time from traffic jams, saves commuting costs, and allows flexibility in work. Besides, respondents felt that they have stable both physical and mental health during WFH since they do not have to spend their time commuting to their office.

To conclude, some recommendations to consider for government and organizations to support workers in order to make WFH more feasible are providing guidelines to different sectors for both employers and employees, determining minimal requirements for technology for virtual meetings, and supporting equipment to maintain workers' productivity at home, and promoting family-friendly employment practices [20]. Organizations could also provide a working option for workers to choose from and a combination of hybrid working methods so that workers can choose their best working method.

IMPLICATION/LIMITATION AND SUGGESTIONS

We understand that our research has some limitations due to the limited number of respondents who participated, which may affect the result and conclusion of this study. The result may not represent the total population of workers who live in Bogor regency. Thus we recommend having more respondents to have more valid results and conclusions.

REFERENCES

1. Tracking SARS-CoV-2 variants.
2. Hamouche S. COVID-19 and employees' mental health: stressors, moderators and agenda for organizational actions. *Emerald Open Research*. 2020 Apr 20;2:15.
3. Kumar A, Nayar KR. COVID-19 and its mental health consequences. *Journal of Mental Health*. Taylor and Francis Ltd.; 2020. p. 1–2.
4. Khan KS, Mamun MA, Griffiths MD, Ullah I. The Mental Health Impact of the COVID-19 Pandemic Across Different Cohorts. Vol. 20, *International Journal of Mental Health and Addiction*. Springer; 2022. p. 380–6.
5. Shigemura J, Kurosawa M. Mental Health Impact of the COVID-19 Pandemic in Japan. *Psychological Trauma: Theory, Research, Practice, and Policy*. 2020;
6. Talevi D, Socci V, Carai M, Carnaghi G, Valeri S, Trebbi E, et al. Mental health outcomes of the CoViD-19 pandemic Gli esiti di salute mentale della pandemia di CoViD-19. Vol. 55, *Riv Psichiatr*. 2020.
7. mental-health-considerations.
8. Moon JR, Huh J, Song J, Kang IS, Park SW, Chang SA, ... & Jun TG (2017). The center for epidemiologic studies depression scale is a good screening instrument for depression and anxiety disorder in adults with congenital heart disease. *Health and quality of life outcomes*, 15(1), 1–7. [PubMed: 28069015]
9. Dockery M, Bawa S. Working from Home in the COVID-19 Lockdown. 2020.

10. Afonso P, Fonseca M, Pires JF. Impact of working hours on sleep and mental health. *Occupational Medicine*. 2017 Jul 1;67(5):377–82.
11. Sharma N, Vaish H. Impact of COVID–19 on mental health and physical load on women professionals: an online cross-sectional survey. *Health Care for Women International*. 2020;41(11–12):1255–72.
12. Mann S, Holdsworth L. The psychological impact of teleworking: Stress, emotions, and health. *New Technology, Work and Employment*. 2003 Nov;18(3):196–211.
13. Xiao Y, Becerik-Gerber B, Lucas G, Roll SC. Working from Home during COVID-19 pandemic impacts Physical and Mental Well-Being of Office Workstation Users. *Journal of Occupational and Environmental Medicine*. 2021 Mar 1;63(3):181–90.
14. Giovanis E, Ozdamar O. Implications of COVID-19: The Effect of Working From Home on Financial and Mental Well-Being in the UK. *International Journal of Health Policy and Management*. 2021 Apr 21;
15. Oakman J, Kinsman N, Stuckey R, Graham M, Weale V. A rapid review of mental and physical health effects of working at home: how do we optimize health? *BMC Public Health*. 2020 Dec 1;20(1).
16. Baker E, Avery GC, Crawford J. Satisfaction and Perceived Productivity when Professionals Work From Home.
17. vander Elst T, Verhoogen R, Sercu M, van den Broeck A, Baillien E, Godderis L. Not Extent of Telecommuting, but Job Characteristics as Proximal Predictors of Work-Related Well-Being. *Journal of Occupational and Environmental Medicine*. 2017 Oct 1;59(10):e180–6.
18. Chandola T, Martikainen P, Bartley M, Lahelma E, Marmot M, Michikazu S, et al. Does conflict between home and work explain the effect of multiple roles on mental health? A comparative study of Finland, Japan, and the UK. *International Journal of Epidemiology*. 2004 Aug;33(4):884–93.
19. Nijp HH, Beckers DGJ, van de Voorde K, Geurts SAE, Kompier MAJ. Effects of new ways of working on work hours and work location, health, and job-related outcomes. *Chronobiology International*. 2016 Jul 2;33(6):604–18.

20. Chaturvedi SK. Covid-19, Coronavirus and Mental Health Rehabilitation at Times of Crisis. Vol. 7, *Journal of Psychosocial Rehabilitation and Mental Health*. Springer; 2020.
21. Vyas L, Butakhieo N. The impact of working from home during COVID-19 on work and life domains: an exploratory study on Hong Kong. *Policy Design and Practice*. 2021;4(1):59–76.
22. Perelman J, Serranheira F, Pita Barros P, Laires P. Does working at home compromise mental health? A study on mature European adults in COVID times. *Journal of Occupational Health*. 2021 Jan 1;63(1).
23. Vega RP, Anderson AJ, Kaplan SA. A Within-Person Examination of the Effects of Telework. *Journal of Business and Psychology*. 2015 Jun 1;30(2):313–23.
24. Does working from home make you more or less productive__ World Economic Forum.
25. Bloom N, Liang J, Roberts J, Ying ZJ. Does working from home work? Evidence from a Chinese experiment. *Quarterly Journal of Economics*. 2015 Feb 1;130(1):165–218.
26. Purwanto A, Fahlevi M, Akbari M, Mufid A, Agistiawati E, Cahyono Y, et al. Impact of Work From Home (WFH) on Indonesian Teachers Performance During the Covid-19 Pandemic : An Exploratory Study Quality Management Strategies View project DAMPAK PEFC, FCS DAN ISO 38200 TERHADAP PENINGKATAN DAYA SAING INDUSTRI KAYU IMPACT OF PEFC, FCS AND ISO 38200 SCHEME ON THE COMPETITIVENESS OF THE WOOD INDUSTRIES View project Impact of Work From Home (WFH) on Indonesian Teachers Performance During the Covid-19 Pandemic : An Exploratory Study. *International Journal of Advanced Science and Technology* [Internet]. 2020;29(5):6235–44. Available from: <https://www.researchgate.net/publication/341413246>
27. Lewinsohn, P.M., Seeley, J.R., Roberts, R.E., & Allen, N.B. (1997). Center for Epidemiological Studies-Depression Scale (CES-D) as a screening instrument for Depression among community-residing older adults. *Psychology and Aging*, 12, 277- 287.