Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Public Health 192 (2021) 12–14

Contents lists available at ScienceDirect

Public Health

journal homepage: www.elsevier.com/locate/puhe

Short Communication

The relationship between fever rate and telework implementation as a social distancing measure against the COVID-19 pandemic in Japan

T. Kawashima [a, b, 1], S. Nomura [b, c, 1], Y. Tanoue [b, d, 1], D. Yoneoka [b, c, e, 1], A. Eguchi [f, 1], S. Shi [g, h, 1], H. Miyata [b, *]

[a] Department of Mathematical and Computing Science, Tokyo Institute of Technology, Tokyo, Japan
[b] Department of Health Policy and Management, School of Medicine, Keio University, Tokyo, Japan
[c] Department of Global Health Policy, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan
[d] Institute for Business and Finance, Waseda University, Tokyo, Japan
[e] Graduate School of Public Health, St. Luke's International University, Tokyo, Japan
[f] Center for Preventive Medical Sciences, Chiba University, Chiba, Japan
[g] Department of Systems Pharmacology, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan
[h] Laboratory for Synthetic Biology, RIKEN Center for Biosystems Dynamics Research, Osaka, Japan

ARTICLE INFO

Article history:
Received 28 April 2020
Received in revised form
8 May 2020
Accepted 11 May 2020
Available online 22 May 2020

Keywords:
Japan
Social network service
COVID-19
Social distancing measure
Teleworking

ABSTRACT

Objectives: On March 28, the Japanese government decided on the "Basic Policies for Novel Coronavirus Disease Control" and called on the public to thoroughly implement social distancing measures (i.e., behavioral restrictions to limit the frequency and intensity of human contact), especially telework.
Methods: We used population-level questionnaire data from a social networking service (SNS), with 275,560 respondents from March 5 to April 6, to evaluate the relationship between telework implementation and the presence of a fever (body temperature higher than 37.5 °C) within 1 month as a surrogate indicator of COVID-19 infection, by occupation type and age-group.
Results: Among company employees, statistical significance was identified in the 15- to 29-year and 30- to 59-year age-groups, showing higher fever rates in the non-teleworker group (for the 15- to 29-year age-group, non-teleworkers: 7.64%; teleworkers: 6.45%; $P = 0.02$; for the 30- to 59-year age-group, non-teleworkers: 3.46%; teleworkers: 3.14%; $P = 0.02$).
Conclusions: Telework remains a controversial topic in Japan as the government called for emergency measures. Although caution is warranted in interpreting our findings because our data are limited to the voluntary SNS users, they will be essential to push forward with more measures to promote social distancing measures in the midst of Japan's current tense political climate.

Introduction

The World Health Organization (WHO) officially declared the outbreak of infectious coronavirus disease 2019 (COVID-19) as a pandemic on March 11, 2020, calling for preventive action against the spread of COVID-19.[1] Preventive measures are categorized into those requiring individual-level efforts, such as handwashing, and those requiring social efforts, such as telecommuting, also known as telework.[2,3] Telework refers to a flexible way of working that is not limited by location or time, using information and communication technology. On March 28, the Japanese government decided on the "Basic Policies for Novel Coronavirus Disease Control" and called on the public to implement social distancing measures (i.e., behavioral restrictions to limit the frequency and intensity of interpersonal contact), with an emphasis on telework.[4] In this study, population-level questionnaire results were used to evaluate the relationship between telework implementation and the presence of a fever, defined as a body temperature higher than 37.5 °C within one month, as an surrogate indicator of COVID-19, by occupation type and age-group.

* *Corresponding author.* Department of Health Policy and Management School of Medicine, Keio University, 35 Shinanomachi, Shinjuku-ku, Tokyo, 160-8582, Japan. Tel.: +81 35363 3774; fax: +81 33225 4828.
E-mail addresses: h-m@keio.jp, hiroaki.miyata@gmail.com (H. Miyata).
[1] Shared co-first authorship.

https://doi.org/10.1016/j.puhe.2020.05.018

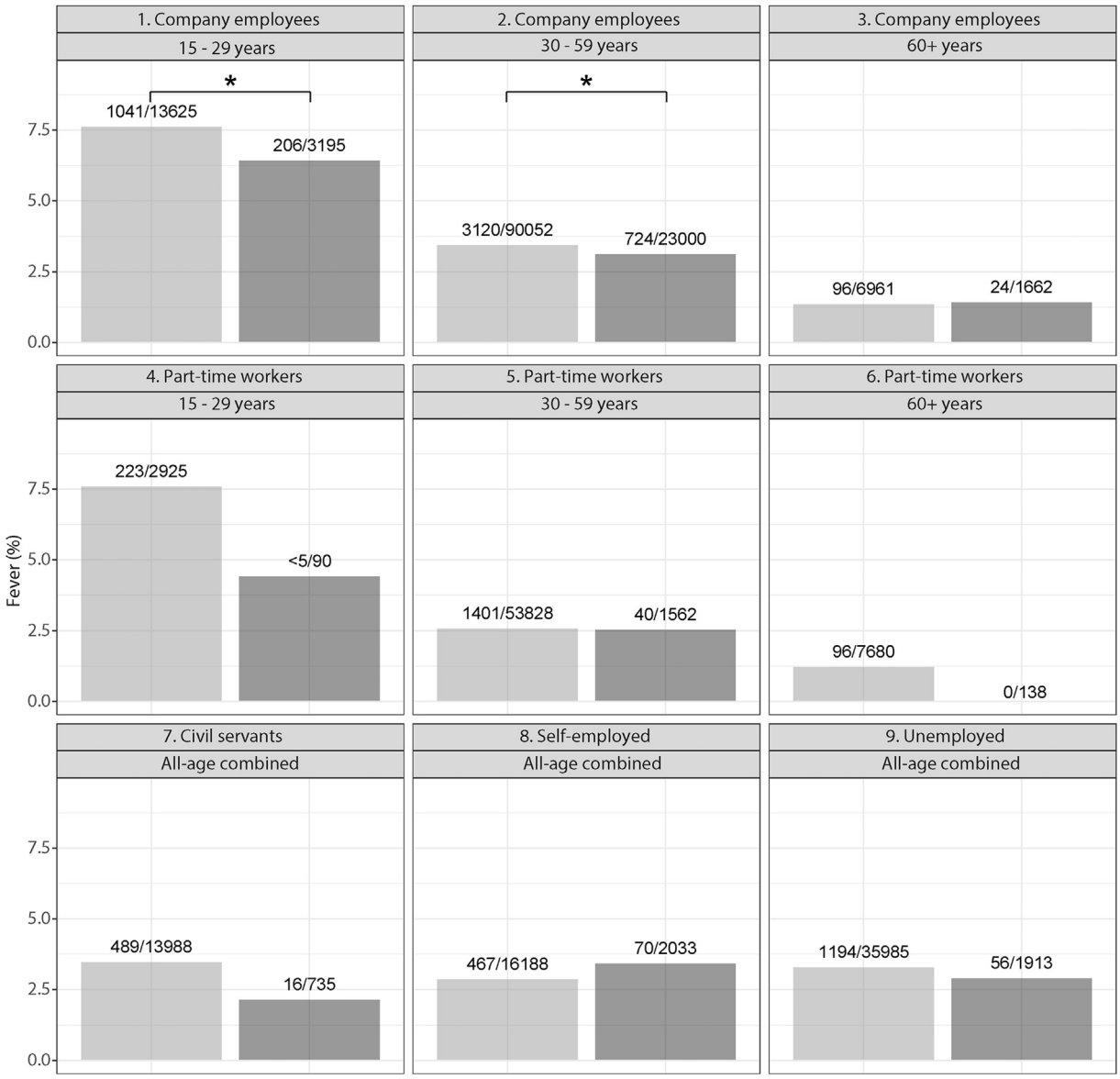

Fig. 1. Fever rate and telework implementation by occupation and age-group. Light grey: non-teleworker; dark grey: teleworker. The numbers above the bar graphs represent, from left, the number of those having fevers higher than 37.5 °C and the number of all respondents. *$P < 0.05$. The ratio of fever rate among non-teleworkers to teleworkers (95% confidence intervals) is as follows: (1) 1.18 (1.02–1.38), (2) 1.10 (1.01–1.19), (3), 0.96 (0.61–1.56), (4) NA, (5) 1.02 (0.74–1.43), (6) NA, (7) 1.61 (0.98–2.83), (8) 0.84 (0.65–1.09), and (9) 1.13 (0.87–1.51).

Methods

On March 5, 2020, Kanagawa Prefecture, the second most populous prefecture in Japan with about nine million people, launched an individualized support program for residents using the LINE chatbot (the largest social communication application in Japan with about 83 million active users, accounting for 65% of Japan's population) as a way to monitor the spread of COVID-19 and associated societal factors. Through LINE, the prefecture shared a questionnaire that asks users about their current and past month's physical condition and what type of actions they are taking to prevent infections. It also asks about gender, age, and occupation. After filling in the questionnaire, users were provided with personalized information on how to prevent infection. We obtained and analyzed data on the initial responses of individuals in Kanagawa Prefecture.

We considered respondents aged older than 15 years during a period from March 5 to April 6. In addition, to correct for confounding effects, the analysis was limited to those who reported implementing basic public health precautions such as handwashing, gargling, mask wearing, and crowd avoidance. The data were separated into five occupations: company employees, part-time workers, civil servants, self-employed, and others. Students and the unemployed were excluded from the analysis. For occupations with a sufficient sample size, the ages were divided into age-groups of 15–29 years, 30–59 years, and 60+ years. Significant difference tests were performed using the chi-squared test or Fisher's exact test (when frequencies were lower than five in a two-by-two table).

Results

We used the data of 275,560 respondents during the study period. Fig. 1 shows the percentage of people who reported a fever within one month, among teleworkers and non-teleworkers, respectively, separated by occupation and age-group. Among company employees, a statistical significance was identified in the

15- to 29-year and 30- to 59-year age-groups (for the 15- to 29-year age-group, non-teleworkers: 7.64%; teleworkers: 6.45%; $P = 0.02$; for the 30- to 59-year age-group, non-teleworkers: 3.46%; teleworkers: 3.14%; $P = 0.02$), showing higher fever rates in the non-teleworker group. No statistically significant difference was identified for other occupation types.

Discussion

This study shows that teleworking has significant association with fever as a surrogate symptom of COVID-19 among company employees aged 15–59 years. For other occupations and age-groups, although there were differences in percentages, the small sample size may have prevented statistical significance. Note that our data are limited to the voluntary users of LINE app in one prefecture, and confounding factors were not adjusted. In addition, fever is one surrogate, not absolute, indicator of the status of infection with COVID-19.

The WHO and governments in several countries also recommend telework as a means of preventing the spread of COVID-19 in the workplace, which allows people to continue working while protecting themselves from infection.[3,5] However, the implementation of telework is generally out of a person's control and requires some form of social support.[6] To promote telework, paradigm shifts in organizational management and communication methods and workflow processes are required. Given the rapid spread of COVID-19, we expect that the results will be used as one of the scientific evidence to support the social adoption of telework in Japan.

Author statements

Acknowledgments

The authors would like to thank Kanagawa Prefecture for providing them with data.

Ethical approval

Ethical approval was granted by the Ethics Committee of Keio University School of Medicine, under authorization number 20190338.

Funding

This study was funded by the Ministry of Health, Labour and Welfare of Japan (H29-Gantaisaku-ippan-009). The funding organization had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; or decision to submit the manuscript for publication.

Competing interests

H.M. reports a grant from the Ministry of Health, Labour and Welfare of Japan and consultation fees from Kanagawa Prefecture, outside the submitted work. All other authors have nothing to disclose.

Author contributions

T.K., S.N., Y.T., D.Y., A.E., and S.S. contributed to the concept and design of the study. All authors contributed to acquisition, analysis, or interpretation of data. T.K., S.N., D.Y., and A.E. contributed to drafting of the manuscript. All authors contributed to critical revision of the manuscript for important intellectual content. D.Y. and A.E. contributed to statistical analysis. S.N. and H.M. contributed to administrative, technical, or material support. H.M. contributed to supervision. All authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

References

1. World Health Organization. *WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020*. 2020. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—11-march-2020. [Accessed 7 May 2020].
2. World Health Organization. *Coronavirus disease (COVID-19) advice for the public*. 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public. [Accessed 7 May 2020].
3. World Health Organization. *Getting your workplace ready for COVID-19: how COVID-19 spreads, 19 March 2020*. 2020. https://apps.who.int/iris/handle/10665/331584. [Accessed 7 May 2020].
4. Ministry of Health, Labour and Welfare. *Basic Policies for Novel coronavirus disease control by the government of Japan*. 2020. https://www.mhlw.go.jp/content/10900000/000617686.pdf. [Accessed 7 May 2020].
5. Belzunegui-Eraso A, Erro-Garcés A. Teleworking in the context of the covid-19 crisis. *Sustainability* 2020;**12**(9):3662. https://doi.org/10.3390/su12093662.
6. Ministry of Health, Labour and Welfare. *LINE Corporation will conduct the second nationwide survey to ask people about their health status*. Japanese. 2020. https://www.mhlw.go.jp/stf/newpage_10695.html. [Accessed 7 May 2020].