

Generation COVID-19 Long Haulers

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ABSTRACT: The COVID-19 pandemic, which started at the end of 2019, has been spreading around the world for over a year by now and no clear end is foreseeable yet. While vaccination and medication opportunities to cure the disease have improved impressively and steadily, the most recent coverage of the crisis features yet another set of devastating news as around 10 to over 30% of previously COVID-infected are estimated to become suffering from long haul symptoms. While our first understanding of post-COVID infection long haul symptoms, impetus and cure is still missing, this article provides a speculative account of the socio-economic impact of the newly emerging Generation COVID-19 Long Haulers. Demographically, COVID Long Haulers will be prevalently arising in a 0.3-1.659 billion Long Haulers strong cohort comprised of around 30-40 years old women at infection facing waves of recurrent symptoms of fatigue, headaches and breathing problems as well as a set of debilitating memory fog and emotional distress. While the causes and long-term lasting effects are unclear and to be investigated in the future, first preliminary results on a potential cure via vaccination and self-help movement has arisen in the age of social media. Facebook Long Hauler groups have leveraged as quick and trusted remedy to understand and provide support during a time when hospitals around the world are still facing a more pressing situation of overloaded emergency care. Future research demands for preventive medical care guided by real-time measurement of health status but also the socio-economics of rest and recovery need to be explored.

KEYWORDS: COVID-19, Crisis, Debilitation, Emotional impairment, Fatigue, Headaches, Memory fog, Generation COVID-19 Long Haulers, Healthcare, Medication, Preventive care, Respiratory symptoms, Self-measurement, Vaccination

Introduction

The novel Coronavirus COVID-19 started at the end of 2019, when it was first diagnosed in China. To this day, there are around 150 million reported infections with COVID-19 and over 3 million deaths reported around the world (Worldometer 2021). A new angle of the healthcare crisis became apparent early on in cases reporting continuous impairment after an infection. Most recently, an information wave broke on growing numbers of previously infected, who report either constant impairment or recurrent waves of symptoms after their infection – even after having been tested negative for COVID-19.

This so-called Long COVID affects 10-30% of people who have symptomatic infection with Sars-CoV-2 as a symptomatic disease lasting longer than 12 weeks (Harrison, 2021). The range of Long COVID symptoms is wide and diffuse but early on a social media Facebook Long Hauler group consisting of 1567 long-term strugglers after a COVID infection identified almost 100 long-haul effects that include fatigue (100%), muscle or body aches (66.8%), shortness of breath or difficulty breathing (65.1%), difficulty concentrating or focusing (59%), inability to exercises or be active (58.5%), headache (57.6%), difficulty sleeping (49.9%), anxiety (47.6%), memory problems (45.6%) and dizziness (41.9%) among the top long haul symptoms (Britt 2020). Follow up studies revealed a cluster of symptoms ranging from chest pain and cough; dyspnea and cough; anxiety and tachycardia; abdominal pain and nausea; and low back pain or joint pain (Antrim 2021). The list of symptoms is still updating and includes by now cognitive dysfunction, numbness or tingling, loss of taste, smell and other senses such as hearing and vision, muscle pain, tinnitus, heart rate and blood pressure issues, gastrointestinal

complaints, insomnia, depression and anxiety but also dermatological anomalies (Ault 2021; Doheny 2021). Most recently, studies emerge that report multi-organ functioning debilitation after COVID-19 (Harrison 2021).

With research estimating about 10 up to more than 30% of COVID-19 patients become Long Haulers, the newly emerging Generation COVID-19 Long Haulers has the potential to change our world lastingly. This article speculatively discusses the impact of a wave of COVID-19 Long Haulers emerging in society in terms of socio-economics. First, the etiology of COVID-19 Long Haulers will be featured to appear in three major groups: those with strong infection cases and long-term organ impairment, those with initially mild cases that develop waves of obscure symptoms that either resemble inflammatory diseases and/or neurological impairments that bleed into psychological traumatized states. Second, the demographics of COVID-19 will be outlined based on current data prevalence for COVID Long Haulers to fall disproportionately heavy on 30-40 years young female at the time of their initial infection. Third, the socio-economic impetus of a Long Haul wave in the decades to come will be discussed on the general healthcare, workforce and the overall societal socio-economic system. Finally potential remedies will be proposed in the surprising vaccination relief and real-time self-monitoring of the personal healthcare status, ecowellness nutrition lifestyle changes and economic appreciation of deurbanization, rest and calm.

Demographics

COVID-19 is a worldwide pandemic, which started 2019 in China. COVID-19 is caused by a coronavirus called SARS-CoV-2 that causes in older adults and those with severe underlying medical conditions, like heart or lung disease or diabetes, serious complications and illness.

As of the end of April 2021, there are around 150 million reported infections with COVID-19 and over 3 million deaths reported around the world (Worldometer 2021). Actual infection rates may be higher, ranging from 5% to 20% (ScienceDaily 2021).

Of the COVID-infected, there are three different major scenarios described based on the immune system response: (1) Symptomatic COVID-19 trajectory with variable severity leading to disease and likely hospitalization due to respiratory symptoms, cytokine storms and multi-organ function impairment; (2) Mild symptomatic COVID-19 trajectory leading to signs and symptoms of evasion of immune surveillance as well as (3) Asymptomatic COVID-19 spreaders, who may or may not turn symptomatic (Baig 2020).

Who falls into what group of immune responses to COVID-19 is yet unclear but certain trajectory propensities seem to depend on gender, age, pre-existing conditions and viral load received at exposure to the virus alongside a range of genetic predispositions and environmental pre-COVID episodes (Baig 2020). For instance, of the currently roughly 20 million COVID-19 infected, 99.4% appear to have only mild conditions and only 0.6% is considered as serious and/or critically ill (Worldometer 2021). Of the closed cases so far, in 2% the disease led to death, 98% are considered to have recovered (Worldometer 2021). As for the probability of dying if infected by the virus, this death rate is calculated by the total number of deaths divided by the total number of infected cases. The death rate represents the risk of dying of a person in a given age group if infected with COVID-19. The death rate is rising with age as the COVID-19 fatality rate by age outlines in 0-9 year old having no fatalities, 10-19 years old 0.2% fatalities, 20-29 years old 0.2%, 30-39 years old 0.2%, 40-49 years old 0.4%, 50-59 years old 1.3%, 60-69 years old 3.6%, 70-79 years old 8% and 80+ have 14.8% death rate of all cases (Worldometer 2021). As of April 2021, the New York City Health COVID-19 Death Summary reports share of deaths from COVID-19 to raise with age with the 0-17 year old age bracket only holding 0.04% of death cases, the 18-44 years old 4.5%, 45-64 years old 23.1%, 65-74 years old 24.6% and the 75+ years old comprising of 47.7% of COVID-19 deaths (NYC Health 2021; Worldometer 2021). Underlying conditions and pre-existing health impairments such as,

for instance, diabetes, lung disease, cancer, immunodeficiency, heart diseases, hypertension, asthma, kidney disease, and GI/liver diseases appear to play a major role in determining the outcome likelihoods of a COVID-19 infections (Worldometer 2021).

Of the deceased, 61.8% appear to be male and 38.2% female (NYC Health, 2021; Worldometer, 2021). The COVID-19 fatality as the death rate calculated by the total number of deaths divided by the total number of cases outlines the probability of dying if infected by the virus in percent. This COVID-19 fatality rate varies by sex of all cases 2.8% fatality rate for male and 1.7% of female (Worldometer 2021). As for the COVID-19 fatality rate by comorbidity, pre-existing conditions make a difference by 10.5% death rate for all cases for cardiovascular diseases, 7.3% for diabetes, 6.3% chronic respiratory diseases, 6% hypertension and 5.6% cancer.

A recent study of 6500 COVID Long Haulers estimates that 10-30% of all infected have the potential to become Long Haulers, who experience lasting effects of a previous COVID infection. The average COVID Long Hauler appears to be in their late 30s and early 40s with female making up an estimated 70-75% of all Long Haulers (Rubin 2020).

Remedy

Of the COVID-19 survivors, most recently a wave of information has broken on long haul symptomatics, meaning many of the survivors start suffering from chronic COVID syndrome weeks or months after an initial infection. As COVID-19 is a fairly novel disease and long-term effects are detected and monitored over a period of at least 8 weeks to 6 months, our understanding of long COVID syndrome is still developing in its infancy.

What preliminary data appears to suggest so far is that COVID Long Haulers appear to be infected that never fully recover back to their pre-COVID-19 levels even weeks or months after having experienced first symptoms. Some Long Haulers continuously experience debilitating symptoms that either are prevalent constantly or come back in waves or relapse with ongoing, old and/or new symptoms. This so-called post-COVID-19 syndrome or post-acute sequelae of SARS-CoV-2 infection (PASC) currently appears to be similar to other post-viral infections such as Lyme disease, for instance, that can cause similar long-lasting mild symptoms after a viral infection.

Long COVID affects 10-30% of people who have symptomatic infection with Sars-CoV-2 and is defined as symptomatic disease lasting longer than 12 weeks (Harrison 2021). While a solid nomenclature of COVID-19 Long Haulers is yet to be determined, it appears that three long-hauling clusters may emerge of which, the symptomatic COVID-19 infected with heightened cases of COVID and likely severe symptoms such as cytokine storms and hospitalization, complications and multi-organ diseases will likely have more organ impairment that leads to long-term labile conditions (Baig 2020). The symptomatic COVID-19 infections with mild symptoms may fall into two categories of either persistent viral load in the body that creates waves of mild signs and symptoms of a disease with persistent abnormal serological findings similar to Lyme disease or post-Ebola infection (Baig 2020). The third cluster of COVID-19 Long Haulers will be those with immune cell deficiencies after an evasion of immune surveillance and potential inflammation similar to rheumatoid arthritis (Baig 2020).

In finding a cure for these three clusters of Long Haulers, potentially the type of Long Haulers will determine the remedy. While in cluster 1 of organ damage the type of damage and type of organ will set the range of possibilities for convalescence, in cluster 2 so far anti-COVID vaccinations have shown promising results (Goodman 2021) and in cluster 3 potentially the overall status and balance of the immune system will become the focus of attention for finding back to a state of balance. In all three groups and in the path forward with a chronic and long-term COVID Long Hauling generation, healthcare will pay more attention to whole-rounded medical care with focus on prevention, self-monitoring and long-term balance.

Estimations

As of April 2021, COVID-19 has infected over 150 million people around the world. Already in October 2021, the World Health Organization estimated that around 10 percent of the world population have been infected by COVID-19 (NBCNews, The Associated Press, October 5, 2020). Cumulative cases are estimated to be 5-20 times greater than confirmed ones (Noh & Danuser 2021). Substantial undocumented infections, the speed and unpredictable cluster outbreaks but also asymptomatic infections that turn into Long Haulers with conditions popping up long after the initial infection obscure the true size of the potential debilitation caused by the novel Coronavirus (Noh & Danuser 2021). Estimations are expecting in total of up to 40-70% of the world's population to get infected with COVID-19 (Coleman, 2020). If considering worst case that 70% of the world's population to get infected with COVID-19 and 10-over 30% end up as Long Haulers, the world could end with 0.3-1.659 billion Long Haulers. If considering additional fall-outs of COVID vaccination failures and breakthrough infections, the number may even be higher. What will the world change to if considering the vast amount of Long Haulers forming a Generation COVID-19 Long Haulers?

Generation COVID Long Haulers

Future changes in light of an emerging COVID Long Haulers generation, may comprise of healthcare, economic and social transitions. Regarding healthcare changes, a cadre of chronically debilitated and sick will lead to a drive to alleviate chronic diseases. Already as early as the end of 2020, the United States Congress already approved 1.15 billion USD in funding over four years for the National Institute of Health to support research into the prolonged health consequences of SARS-CoV-2 infections (National Institute of Health 2021). Of the investigated symptoms, chronic fatigue, headaches, shortness of breath and memory fog range among the top mentions that will draw attention to find cures for. Immune system related research and attention to the immune response based on activation levels but also inflammatory disfunctioning will likely gain on research attention, when considering the long-term effects of COVID Long Haulers report.

An interesting connection is the similarity of post-COVID long haul symptoms and vaccination side effects, which deserves future attention. Since COVID Long Haulers tend to have common features of anorexia nervosa symptoms – such as a low weight to begin with, electrolytes imbalances, coldness, shivers, headache, dizziness, memory fog and nausea – future research may help draw inferences between the reported extraordinarily strong immune system of anorectic individuals but similar conditions of COVID Long Hauler symptoms that lead to a decline in overall health status and fragility. A further exploration of the connection between anorexia nervosa and COVID Long Haul symptoms is recommended.

The medical industry itself will likely experience a disproportionately high rate of Long Haulers, of which especially nurses, a predominately female and young profession, are at heightened likelihood to be overrepresented. While safety and precaution standards will likely improve for the overall profession, also insurance coverage and class action for medical professional, who suffer from long haul symptoms are likely to follow.

As for medical devices, the world is likely to experience a chronic disease remedy revolution that will feature an extensive drug intake. Already now we are experience an all-time-high consumption of pharmaceuticals and vaccination effort. A prolonged COVID-19 crisis will accentuate this trend and with the heightened pharmaceutical consumption the water quality may decline when thinking about the disposal of drugs after consumption (United Nations Office of Drug and Crime, Press Release, June 25, 2020).

Another trend of the post-COVID world that will likely stay around will be the self-monitoring and self-measurement of body functions with artificial intelligence and self-testing

kits having arisen dramatically in record speed in light of the COVID pandemic. With the fear of patients to visit doctors and attend a hospital for care during the pandemic, new online consultation revolutions have started that are likely to be continued after COVID and be exacerbated by Long Haulers who will likely face fast-paced symptom changes and a novel set of easily-changing health status conditions.

Another trend springing out of COVID-19 in the age of social media is the democratization of information about health and well-being found online. Facebook Long Hauler groups have leveraged as quick and trusted remedy to understand and provide support during a time when hospitals around the world are still facing a more pressing situation of overloaded emergency care.

As for economic changes, COVID Long Haulers appear to have a preference for unwinding speed and mental overloads. While standard neoclassical economic theory is based on the belief that efficiency maximization based on productivity gains and activation level increases is the ultimate preference of all individuals, COVID Long Haulers may develop – for the first time in economic history – a large-scale demand for attention to disability, rest and relaxation and thereby drive a trend of the economics of slowness. Legal professionals will address attention to the growing cohort of disabled and debilitated workforce. Drawing from behavioral insights, the laws of human productivity after rest but also different time discounting over life calculating time use strategically will be required in the future to better and more accurately describe workforce trends (Puaschunder 2021, forthcoming).

With Long Haulers facing trends of changing health conditions, novel workforce uncertainty will become a topic of discussion for corporate governance and business contingency planning. The newly-imposed obligation of corporations to look after a healthy work environment will likely remain beyond COVID and pass on some rights to corporations to monitor and track the health status of the workforce (Gelter & Puaschunder, forthcoming). Corporations will have to become attuned to the health situation of employees and will likely divide capital into artificial intelligence and more unpredictable human workforce with appreciation for rest and relaxation. New activation studies will be needed guided by behavioral specialists that find the right balance between work and rest. These studies will likely be inspired by activation research such as the Yerkes-Dodson law that predicted an individual activation level of the overall immune system status determining individual potentials and overstimulation leading to potential work deficiencies and quality of life impairments (Yerkes & Dodson 1908).

In the personal sphere, there is currently a deurbanization trend going on or what Brunnermeier calls the Doughnut effect that the urban population enjoys time off from large metropolitan areas and moves to the suburbs or even country side. Current home owner booms in remote areas like Arizona, Texas or Florida speak for people's preference to escape cities. Corporations are still offering to opt for home offices and many of the corporate headquarters have moved to less crowded, more affordable locations. Cities are still seen as disadvantaged to control large crowds and ventilation in skyscrapers. The ongoing ecowellness trends has not only changed our perception of closeness and contact with others, it has also revolutionized interior design in offices with glass and plastic protection. Outdoors city and landscape has been shaped by deurbanization as well. New community development in harmony with nature are forming in so-called agri- or agrohoods, neighbourhoods that are directly attuned to the surrounding and celebrate the natural and cultural heritage. In interior design for the private living space, cleanliness has become key. Attention to healthy nutrition is on the rise for Long Haulers, who appear to have a craving for minimalistic stimulation at home that often also features a Biophilia design, which resembles nature and sustainable fabrics.

As for societal trends, COVID Long Haulers being primarily female in their 30s and 40s will impact the activities of mothers and female professions. Long Haulers appear to be previously healthy and active people with exposure to others if considering that they got COVID as a highly transmittable disease. Potential professions with prevalences appear to be healthcare, sports and

people with high exposure to infected in hospital settings, or many people in gastronomy or large groups in the arts, culture and entertainment sector. These professionals will likely experience a shortage in the following decades and male counterparts, who have a lower likelihood to experiencing long haul symptoms may take over to fill the emerging gap. Lastly, with almost 50% of COVID Long Haulers reporting a disinterest in procreation, child bearing of this segment may be impaired or less likely with even wider impact on society as previously thought.

References

- Antrim, Aislinn. 2021. "Study: Many Long-Haul COVID-19 Patients Were Asymptomatic During Initial Infection." *Pharmacy Times*, March 12, 2021. Retrieved at <https://www.pharmacytimes.com/view/study-many-long-haul-covid-19-patients-were-asymptomatic-during-initial-infection>.
- Ault, Alicia. 2021. "Are there COVID-19-related 'long-haul' skin issues?" *Dermatology News*, January 28, 2021. Retrieved at <https://www.mdedge.com/dermatology/article/235153/coronavirus-updates/are-there-covid-19-related-long-haul-skin-issues>.
- Baig, Abdul Mannan. 2020. Chronic COVID syndrome: Need for an appropriate medical terminology for long-COVID and COVID long-haulers. *Journal of Medical Virology*, 93, 5, 2555-2556.
- Britt, Robert Roy. 2020. *Long-lasting COVID Symptoms: Early research helps quantify coronavirus long-hauler' experiences*. Elemental, August 14, 2020. Retrieved at <https://elemental.medium.com/new-survey-identifies-98-long-lasting-covid-symptoms-87935b258a3e>.
- Coleman, Justine. 2020. "Virus expert: As much as 70 percent of world's population could get coronavirus." *The Hill*, March 2, 2020. Retrieved at <https://thehill.com/policy/healthcare/public-global-health/485602-virus-expert-as-much-as-70-percent-of-worlds>.
- Doheny, Kathleen. 2021. *Neurological Symptoms frequent in COVID Long-Haulers*. Webmd Health News, March 23, 2021. Retrieved at <https://www.webmd.com/lung/news/20210323/neurologic-symptoms-frequent-covid-long-haul-patients>.
- Gelter, Martin & Julia Margarete Puaschunder. Forthcoming. COVID-19 and comparative corporate governance. *Journal of Corporation Law*.
- Goodman, Brenda. 2021. "Some with long-haul COVID see relief after vaccination." *Webmd Health News*, March 17, 2021. Retrieved at <https://www.webmd.com/vaccines/covid-19-vaccine/news/20210317/some-with-long-haul-covid-see-relief-after-vaccination>.
- Harrison, Arielle. 2021. *70% of COVID long haulers have impaired organs up to 4 months after infection, study finds*. KUTV, April 27, 2021. Retrieved at <https://kutv.com/news/local/70-of-long-haulers-have-impaired-organs-up-to-4-months-after-covid-19-infection>.
- National Institutes of Health (NIH). 2021. NIH launches new initiative to study "Long COVID." February 23, 2021. Retrieved at <https://www.nih.gov/about-nih/who-we-are/nih-director/statements/nih-launches-new-initiative-study-long-covid>.
- NBCNews, The Associated Press. 2020. Covid-19 may have infected 10 percent of world's population, WHO says. October 5, 2020. Retrieved at <https://www.nbcnews.com/news/world/covid-19-may-have-infected-10-percent-world-s-population-n1242118>.
- New York City Health. 2021. *Coronavirus Disease 2019 (COVID-19) Daily Data Summary*, April 28, 2021. Retrieved at <https://www1.nyc.gov/assets/doh/downloads/pdf/imm/covid-19-daily-data-summary-deaths-04152020-1.pdf>
- Noh, Jungsik & Gaudenz Danuser. 2021. "Estimation of the fraction of COVID-19 infected people in the U.S. states and countries worldwide." *PLoS ONE*, 16, 2, 2021: e0246772.
- Puaschunder, Julia Margarete. 2021. *Behavioral Economics and Finance: Nudging and Winking to make Better Choices*. Springer Nature.
- Puaschunder, Julia Margarete. forthcoming. *Verhaltensökonomie und Verhaltensfinanzökonomie: Ein Vergleich europäischer und nordamerikanischer Modelle*. Springer Gabler.
- Rubin, Rita. 2020. "As their numbers grow, COVID-19 'Long Haulers' stump experts." *Journal of the American Medical Association* 324 (14): 1381-1383.
- ScienceDaily. 2021. "Severe undercounting of COVID-19 cases in U.S., other countries estimated via model." February 8, 2021. Retrieved at <https://www.sciencedaily.com/releases/2021/02/210208142434.htm>.
- United Nations Office of Drug and Crime, Press Release, *UNODC World Drug Report 2020: Global drug use rising; while COVID-19 has far reaching impact on global drug markets*. June 25, 2020. Retrieved at <https://www.unodc.org/unodc/press/releases/2020/June/media-advisory---global-launch-of-the-2020-world-drug-report.html>.
- Worldometer COVID live update, April 28, 2021. Retrieved at <https://www.worldometers.info/coronavirus/>.
- Yerkes, Robert M. & John Dillingham Dodson. 1908. "The relation of strength of stimulus to rapidity of habit-formation." *Journal of Comparative Neurology and Psychology* 18(5): 459-482.