

RESEARCH

# Impact of COVID-19 Pandemic on Perceived Access and Quality of Care in German People with Parkinson's Disease

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## Abstract

**Background:** the context and purpose of the study.

**Methods:** how the study was performed and statistical tests used

**Results:** the main findings.

**Conclusions:** brief summary and potential implications.

**Trial Registration:** If your article reports the results of a health care intervention on human participants, it must be registered in an appropriate registry and the registration number and date of registration should be in stated in this section. If it was not registered prospectively (before enrollment of the first participant), you should include the words 'retrospectively registered'.

**Keywords:** Parkinson's disease; COVID-19 pandemic; health care; impact; influence; Germany; iCARE-PD

## Background

The COVID-19 pandemic is an unprecedented event for people within the last few generations. The uncontrolled spread of a virus causing potential fatal side effects despite maximal intensive care therapies and the consecutive necessity to reduce everyday life has afflicted Western societies economically, culturally but obviously also within healthcare systems. In an attempt to spare societies from far worse, everyday world almost ceased with rising incidences rose and public access to almost all services was limited to the most basic needs, leaving those particularly exposed, who may not be vitally at harm but whose well-being may heavily rely on intact social functioning.

People suffering from chronic illnesses attain more frequently to non-emergency medical services and were therefore at high risk of undersupply during the pandemic. Numerous studies have unveiled the impact of the COVID-19 pandemic on chronically-ill patients [1, 2]. Yet, at the same time the need to remain at home has brought up many examples of solidarity but has also enabled societies to rapidly evolve in terms of remote medical solutions only hampered in their efficiency as not many validated tools existed before. In neurology, subjects particularly prone for undersupply were those suffering from neurodegenerative disease and particularly Parkinson's disease

. had profound impact on the accessibility of medical services. In order to learn from the pandemic in the long term, difficulties in access to healthcare must be

uncovered and addressed [?]iyengar2020learning). Although numerous studies in Germany analyze

People with Parkinson's disease (PwP) suffer from a progressive condition showing a great heterogeneity. Motor, as well as non-motor symptoms may develop so that tailored treatment options and continuous adjustments are necessary. One may therefore infer, that restrictions of healthcare services may have stricken those patients at a very high level. Surprisingly, only a limited number of studies have thus far examined the impact of the COVID-19 pandemic on PwPs in Germany [3, 4, 5]. These studies focus on personal behaviour, knowledge and access to specialized therapies. A recent study by Fründt et al. investigated the impact of the pandemic on PwPs general healthcare situation with a specific focus on long-term care [4] and contrary to one might expect posit that deficits in health care were less severe than expected [4]. Given the good performance of the German healthcare system during the COVID-19 pandemic, these results do not come as surprise [6].

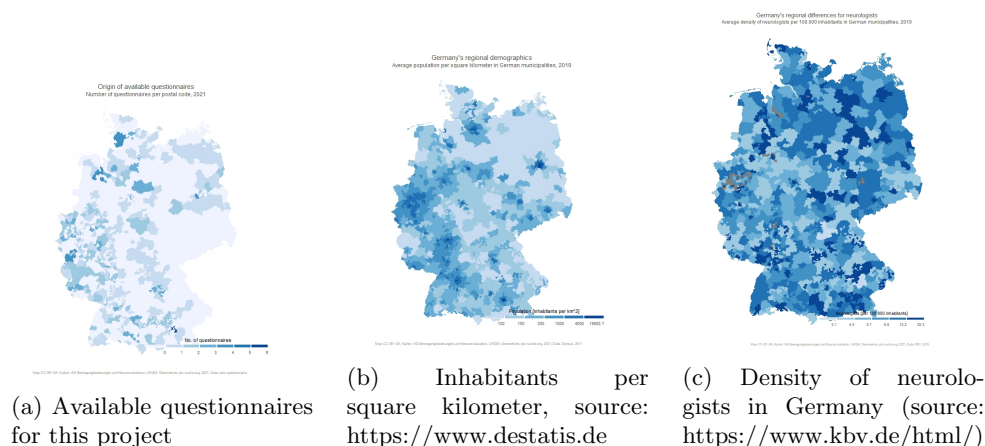
However, studies from other areas of public health research show, that the effect of public health crisis are not universal but affect some individuals more than others [7, 8]. This inequality can be explained by so-called social determinants of health (SDH). SDH are non-medical factors that influence, among other things, peoples access to healthcare. The link between SDH and individuals access to healthcare is observable with regard to the COVID-19 pandemic, which means that some population groups experienced greater impacts than others based on their SDH [9].

There are several conceptualizations and definitions of what SDH are but in a broadest sense, they comprise contextual, structural and individual factors [10]. The word *contextual* is of utmost importance here: what may be considered as relevant SDH is not universal. For the context of Parkinson's disease, Zaman et al. proposed a model which summarizes structural and individual factors that may influence PwPs access to healthcare [11]. Structural SDH in this model may be reflected by barriers, that PwPs meet on a system-level when trying to access healthcare, such as a lack of care coordination, limited communication between healthcare providers, disparities in health services or the unavailability of specialist services [11]. Individual SDH may be reflected by personal barriers in this model, which influence the PwPs ability to seek help, engage with care providers, reach important care services or pay for them [11].

To the best of our knowledge, it has not been investigated how SDH may explain the impact of the COVID-19 pandemic on PwPs access to healthcare. Therefore, we here explicitly examine the impact of relevant SDH on PwPs access to healthcare during the COVID-19 pandemic in Germany. The basis of our analysis is the German dataset of an anonymous survey that was carried out as part of the icare-PD project.

## Methods

The study was approved by the local Ethics committee and carried out in accordance with the Declaration of Helsinki. All patients gave informed written consent prior to participating.



## Participants

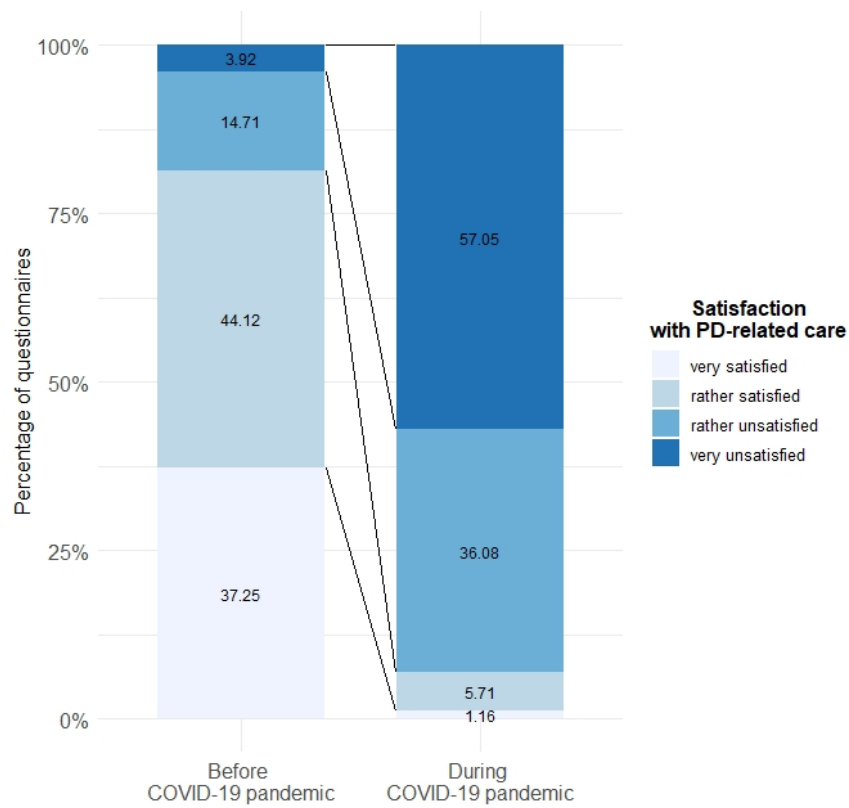
## Results

In total, 552 questionnaires were filled out with ? different postal codes. Further demographics are listed in Table 1. With respect to the distribution of the questionnaires, participants were located at all regions in Germany (cf. Figure 1a)

Table 1: Demographics of subjects filling out questionnaire:

	Overall (n = 552)
Age (mean (SD))	66.76 (9.25)
Gender = female (%)	148 (41.6)
Disease duration (%)	
<2 years	62 (13.1)
2–5 years	154 (32.6)
5–10 years	157 (33.2)
10–15 years	69 (14.6)
>15 years	31 ( 6.6)
Disease stage (%)	
Hoehn & Yahr I	189 (40.3)
Hoehn & Yahr II	156 (33.3)
Hoehn & Yahr III	77 (16.4)
Hoehn & Yahr IV	41 ( 8.7)
Hoehn & Yahr V	6 ( 1.3)
Education level according to ISCED (%)	
primary education	20 ( 5.0)
secondary education	234 (58.4)
post secondary education	69 (17.2)
highest education level possible	78 (19.5)
PDQ-8 scores (mean (SD))	41.30 (14.23)
Van-Walraven-Elixhauser Comorbidity Index (mean (SD))	6.55 (1.95)

One of our primordial analyses, was to analyze how the satisfaction with PD-related care had evolved during the pandemic. For that purpose we asked the participants,? A sign-test thereby indicated significantly lower values during the pandemic (Mdn = 1) compared to before (Mdn= 3,  $p = 10^{-73}$ ). More than 90% of the participants thereby indicated to be "rather unsatisfied" or "very unsatisfied" with their PD-related care during the pandemic (cf Figure 2



Data from *n* = 399 participants

Figure 2: Available questionnaires for this project

## Discussion

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## Conclusion

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In this section we examine the growth rate of the mean of  $Z_0$ ,  $Z_1$  and  $Z_2$ . In addition, we examine a common modeling assumption and note the importance of considering the tails of the extinction time  $T_x$  in studies of escape dynamics. We will first consider the expected resistant population at  $vT_x$  for some  $v > 0$ , (and temporarily assume  $\alpha = 0$ )

$$E[Z_1(vT_x)] = \int_0^{v \wedge 1} Z_0(uT_x) \exp(\lambda_1) du.$$

If we assume that sensitive cells follow a deterministic decay  $Z_0(t) = xe^{\lambda_0 t}$  and approximate their extinction time as  $T_x \approx -\frac{1}{\lambda_0} \log x$ , then we can heuristically estimate the expected value as

$$\begin{aligned} E[Z_1(vT_x)] \\ = \frac{\mu}{r} \log x \int_0^{v \wedge 1} x^{1-u} x^{(\lambda_1/r)(v-u)} du. \end{aligned} \quad (1)$$

Thus we observe that this expected value is finite for all  $v > 0$  (also see [?, ?, ?, ?, ?, ?]).

## Appendix

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### Acknowledgements

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### Funding

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### Abbreviations

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### Availability of data and materials

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### Ethics approval and consent to participate

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### Competing interests

The authors declare that they have no competing interests.

**Consent for publication**

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**Authors' contributions**

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**Authors' information**

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**References**

1. Olivieri M, Halimeh S, Wermes C, Hassenpflug W, Holstein K, von Mackensen S. Auswirkungen der COVID-19 Pandemie auf die medizinische Versorgung von Patienten mit angeborenen Blutungsneigungen. *Das Gesundheitswesen*. 2021;83(04):282-90.

2. Cegla TH, Magner A. Einfluss der Coronapandemie auf Schmerzpatienten: Welche Auswirkungen der Pandemie auf ihre Versorgung nehmen Patienten mit chronischen Schmerzen wahr? *Schmerz* (Berlin, Germany):1.

3. Zipprich HM, Teschner U, Witte OW, Schöenberg A, Prell T. Knowledge, attitudes, practices, and burdens during the COVID-19 pandemic in people with Parkinson's disease in Germany. *Journal of clinical medicine*. 2020;9(6):1643.

4. Fründt O, Hanff AM, Mai T, Kirchner C, Bouzanne des Mazery E, Amouzandeh A, et al. Impact of COVID-19 Pandemic on (Health) Care Situation of People with Parkinson's Disease in Germany (Care4PD). *Brain sciences*. 2022;12(1):62.

5. Richter D, Scherbaum R, Bartig D, Gold R, Krogias C, Tönges L. Analysis of nationwide multimodal complex treatment and drug pump therapy in Parkinson's disease in times of COVID-19 pandemic in Germany. *Parkinsonism & related disorders*. 2021;85:109-13.

6. on Health Systems EO, Policies, M B, A S, K A, A M, et al. Germany: health system review. *Health Systems in Transition*; Vol. 22 (6). World Health Organization. Regional Office for Europe; 2020.

7. Huijts T, Stornes P, Eikemo TA, Bamba C, Consortium H. Prevalence of physical and mental non-communicable diseases in Europe: findings from the European Social Survey (2014) special module on the social determinants of health. *The European Journal of Public Health*. 2017;27(suppl.1):8-13.

8. Lowcock EC, Rosella LC, Foisy J, McGeer A, Crowcroft N. The social determinants of health and pandemic H1N1 2009 influenza severity. *American journal of public health*. 2012;102(8):e51-8.

9. Organization WH. COVID-19 and the social determinants of health and health equity: evidence brief. World Health Organization; 2021.

10. Organization WH, et al. A conceptual framework for action on the social determinants of health. 2010.

11. Zaman MS, Ghahari S, McColl MA. Barriers to Accessing Healthcare Services for People with Parkinson's Disease: A Scoping Review. *Journal of Parkinson's Disease*. 2021;(Preprint):1-17.

**Figures**

Figure 3: Sample figure title

Figure 4: Sample figure title

**Tables**

Table 2: Sample table title. This is where the description of the table should go

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A2	...	..	.
A3	..	.	.

**Additional Files**

Additional file 1 — Sample additional file title  
Additional file descriptions text (including details of how to view the file, if it is in a non-standard format or the file extension). This might refer to a multi-page table or a figure.

Additional file 2 — Sample additional file title  
Additional file descriptions text.