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ORIGINAL RESEARCH

# Reduced Requests for Medical Rehabilitation Because of the SARS-CoV-2 Pandemic: A Difference-in-Differences Analysis



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## Abstract

**Objective:** To examine the extent to which medical rehabilitation requests decreased because of the pandemic in Germany.

**Design:** Data were retrieved from the German Pension Insurance, which is the main provider for rehabilitation of working-age people in Germany. Our data represented all medical rehabilitation requests in 2019 and 2020. These requests have to be approved to use a rehabilitation program. We used a difference-in-differences model to determine the reduction in rehabilitation requests attributable to the pandemic.

**Setting:** General community.

**Participants:** We included 1,621,840 rehabilitation requests from working-age people across Germany in 2019 and 1,391,642 rehabilitation requests in 2020 (N=3,013,482).

**Intervention:** Medical rehabilitation in inpatient or outpatient facilities.

**Main Outcome Measures:** Number of medical rehabilitation requests.

**Results:** The number of medical rehabilitation requests decreased by 14.5% because of the pandemic (incidence rate ratio, 0.855; 95% confidence interval, 0.851-0.859). The decline in requests was more pronounced among women and in Western Germany than among men and in Eastern Germany. The reduction in requests affected non-postacute rehabilitations more clearly than postacute rehabilitation services. After the pandemic declaration by the German Bundestag in March 2020, the reduction in requests was initially strongly associated with the regional incidence of infection. This association weakened in the following months.

**Conclusions:** The reduction in requests will have a significant effect on the number of completed rehabilitation services. For many people with chronic diseases, failure to provide medical rehabilitation increases the risk of disease progression.

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People with disabilities and chronic diseases require ease access to health care and rehabilitative services to avoid disease progression and permanent participation restrictions.<sup>1</sup> When the World Health Organization declared the coronavirus outbreak as a pandemic on March 11, 2020, health care providers immediately responded to the acute and anticipated treatment needs of people with coronavirus disease 2019 (COVID-19). The concomitant provision of human, spatial, and financial resources for the diagnosis of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections and

the treatment of COVID-19 led to limitations in the treatment of other health problems in many countries.<sup>2-6</sup> People with disabilities and chronic diseases are particularly challenged if these limitations go beyond primary and acute care to also affect rehabilitation care.<sup>7,8</sup>

In Germany, rehabilitation for the working-age population is mainly provided by the German Pension Insurance (GPI), a compulsory pension insurance scheme. Utilization of a rehabilitation program requires a claim by the person in need and therefore depends on whether people apply for these services or not. This is particularly the case for non-postacute rehabilitations, that is, rehabilitation that is used because of chronic illness (eg, chronic back pain, depression) without immediately preceding hospital treatment. Postacute rehabilitations, that is, rehabilitation services beginning

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\* Bethge and Fauser contributed equally to this work.

within 14 days of hospital treatment (eg, because of myocardial infarction, spinal fusion, or cancer) also require a formal claim by the insured individual, but this is largely managed by the hospital. Although the closures of many rehabilitation centers in April 2020 had an immediate and direct effect on the use of medical rehabilitations, a reduction in requests only has a delayed effect on the number of rehabilitations performed. To date, there is a lack of a systematic description of the extent to which requests for medical rehabilitation declined after the German Bundestag declared an epidemic situation of national concern on March 27, 2020.

We therefore compared the number of requests for medical rehabilitation completed in Germany during the pandemic with the number of rehabilitation requests in the previous year. In addition to measuring the nationwide reduction in requests for rehabilitation attributable to the pandemic, we determined sex and regional differences as well as differences by type of rehabilitation request. Moreover, we examined the extent to which regional differences in the reduction in requests were because of regional differences in the incidence of SARS-CoV-2 infection.

## Methods

### Study design

We used monthly cross-sectional data of medical rehabilitation claims in 2019 and 2020 for our difference-in-differences analysis. Manuscript preparation followed the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology Reporting (STROBE) statement.<sup>9</sup> Because only aggregated and individually not assignable data were used, a review of our study by an ethics committee was not required.

### Setting

A request for rehabilitation funded by the GPI has to be supported by a physician's report. After approval by the GPI, rehabilitation is delivered in inpatient and outpatient facilities for usually 3–4 weeks with a treatment dose of about 60 hours.<sup>10</sup> The program is provided by a multiprofessional team and contains mainly exercise, social counseling, patient education, and psychological groups. Musculoskeletal disorders (42%), mental disorders (16%), and cancer (15%) are the most frequent diagnosis of approved rehabilitation measures. Copayments by the patients are only required to a very limited extent. The employers, health insurance, or GPI pay a wage replacement during the use of rehabilitation.

### Participants

In Germany, people pay pension insurance contributions when they start their first job. They can apply for rehabilitation provided by the GPI if they have paid pension insurance contributions for at least 5 years. It is also sufficient to have paid these contributions for at least 6 months in the past 2 years.

#### List of abbreviations:

<b>CI</b>	<b>confidence interval</b>
<b>COVID-19</b>	<b>coronavirus disease 2019</b>
<b>GPI</b>	<b>German Pension Insurance</b>
<b>IRR</b>	<b>incidence rate ratio</b>
<b>SARS-CoV-2</b>	<b>severe acute respiratory syndrome coronavirus 2</b>

## Variables and data sources

Data on requested rehabilitations were provided by the German Pension Insurance aggregated by sex, state, type of request (non-postacute or postacute rehabilitation), month. These data fully represented medical rehabilitations requested in 2019 and 2020. We studied requests instead of current use to capture prospective effects of the pandemic. Although most requests are approved (around 70%), some claims are rejected by the GPI because the limitations of the person requesting a rehabilitation do not require multimodal treatment, unimodal treatments have not been used sufficiently before, rehabilitation is not promising, or legal requirements are not met. The reported incidence of SARS-CoV-2 infection was obtained from the Robert Koch Institute. Regional population data were obtained from the Statistical Information System of the Federal Statistical Office. All data used are provided as supplemental appendix S1 (available online only at <http://www.archives-pmr.org/>).

## Statistical analyses

Requests were first descriptively presented by sex, state, type of rehabilitation request, and timing. We then used a difference-in-differences model to estimate the reduction in rehabilitation requests attributable to the pandemic. The difference-in-differences approach uses repeated cross-sectional data collected before and after an event (eg, law reform, pandemic outbreak).<sup>11</sup> The difference-in-differences estimator corresponds to the difference in 2 before-after differences observed in an exposed and nonexposed group. Frequently, comparable regions are chosen as the exposed and nonexposed groups. In our analyses, the exposed condition was represented by the months from January to December of the pandemic year 2020, whereas January to December 2019 were our nonexposed condition. The first quarter of each year, that is, January to March, was categorized as the preobservation period. April to December was categorized as the postobservation period. The distinction between the pre- and postobservation periods considered that the German Bundestag declared the national concern of the SARS-CoV-2 epidemic on March 27 2020, and we expected a reduction in medical rehabilitations requests to occur after this declaration. We used the following Poisson regression model to calculate the difference-in-differences estimator<sup>12</sup>:  $\log(Y) = \beta_0 + \beta_1 P + \beta_2 D + \beta_3 Z + \beta_4 W + \beta_5 R + \beta_6 T + \log(S)$ . The variable Y represented the number of rehabilitation requests stratified by month, sex, state, and type of request for both years (1536 observations). P was a dummy variable that had a value of 0 for the prepandemic year 2019 and a value of 1 for the pandemic year 2020. D was a dummy variable coded with a value of 1 for the postobservation period (April to December) in both years and 0 otherwise. Z was also a dummy variable and represented the interaction of year and observation period. The variable was coded with a value of 1 for the follow-up period (April to December) in the pandemic year 2020 and 0 otherwise. Other dummy variables were used to represent sex, region, and type of request. The dummy variable W categorized men with a value of 0 and women with a value of 1, whereas the dummy variable R represented eastern federal states, including Berlin, with a value of 0 and western federal states with a value of 1. The dummy variable T categorized postacute rehabilitations with the value 0 and non-postacute rehabilitations with the value 1. Population sizes stratified by sex, federal state and year were included as logarithmic terms in the model. The coefficient  $\beta_0$  represented the number of rehabilitations in the prepandemic

year 2019, coefficient  $\beta_1$  represented period-independent differences between the prepandemic year 2019 and pandemic year 2020, and coefficient  $\beta_2$  represented year-independent differences between the pre- and postobservation period (January to March vs April to December). The coefficient  $\beta_3$  denoted the difference-in-differences estimator of interest and stands for the additional reduction in rehabilitation requests in the postobservation period in the pandemic year 2020. The coefficients  $\beta_4$ ,  $\beta_5$ , and  $\beta_6$  represented differences between men and women, East and West Germany, and postacute rehabilitations and non-postacute rehabilitations, respectively. The exponentiated coefficient  $\beta_3$  is the incidence rate ratio (IRR) and compares the number of requests in the follow-up period of the pandemic year 2020 with the number of requests in the corresponding period of the previous year. An IRR <1 represents a reduced number of requests attributable to the pandemic. The value of  $1 - \text{IRR}$  describes the average proportion by which the number of rehabilitation claims decreased during the follow-up period in the pandemic year 2020. In addition to the difference-in-differences estimator for the total population, we also determined difference-in-differences estimators by sex, region, and type of request. We additionally performed a sensitivity analysis for which we assumed a preobservation period from January to February and a postobservation period from March to December.

Supplementary to this, we correlated the regional cumulative incidences of reported SARS-CoV-2 infections with the regionally observed reduction in rehabilitation claims for April to December separately and graphed the correlations in scatterplots to test the relevance of regional infection incidence to the reduction in requests.

The 2-sided probability of error was 5%. All analyses were performed using Stata/SE version 16.0.<sup>a\*\*</sup>

## Results

### Sample

From January to December 2020, a total of 1,394,608 medical rehabilitation services were requested, whereas there were 1,625,158 rehabilitation claims from January to December 2019. We excluded 3318 applications in 2019 and 2966 applications in

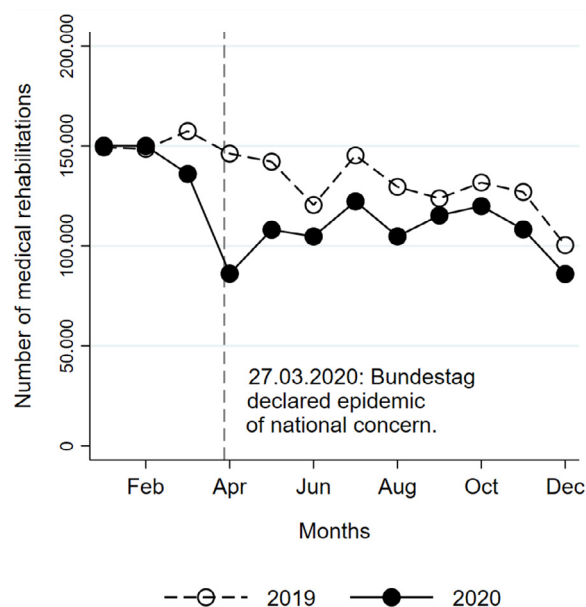
2020 because of undetermined sex, residency abroad, or incomplete residency information. Of the remaining 1,621,840 rehabilitation claims in 2019, a total of 838,785 (51.7%) were made by women. Of the remaining 1,391,642 rehabilitation claims in 2020, a total of 712,231 (51.2%) were made by women. The number of rehabilitations requested in Western Germany was 1,293,209 (79.7%) in 2019 and 1,098,493 (78.9%) in 2020, whereas 440,632 (27.2%) rehabilitations in 2019 and 394,275 (28.3%) rehabilitations in 2020 were requested as postacute rehabilitation services (supplemental table S1, available online only at <http://www.archives-pmr.org/>).

### Reduction in rehabilitation requests

The nationwide reduction in medical rehabilitation requests was greatest in April of the pandemic year 2020, with a 41.1% reduction compared with the previous year (table 1 and fig 1). The reduction in requests in April was higher for women (44.4%) than for men (37.3%). By region, the reduction in requests in April was much more prevalent in the western federal states (43.3%) than in the eastern federal states (32.3%) (supplemental figs S2 and S3, available online only at <http://www.archives-pmr.org/>). The lowest reduction in requests in April was observed in Brandenburg (23.9%), and the highest request reduction was in Saarland (58.3%) (supplemental fig S4, available online only at <http://www.archives-pmr.org/>). A reduction in postacute rehabilitation requests (39.2%) and non-postacute rehabilitation requests (41.7%) was observed to a comparable extent in April (supplemental fig S5, available online only at <http://www.archives-pmr.org/>). After the significant reduction in rehabilitation claims in April, the number of requests initially increased again before remaining relatively stable from June onward, ranging from 8513-24,789 claims below the level of the previous year. Deviations were lowest in September and October. In November and December, the deviations from the level of the previous year increased again. The number of postacute rehabilitations reached the level of the previous year in June and September, at least temporarily. The number of non-postacute rehabilitation requests

**Table 1** Number of rehabilitation requests by month and change from 2019 to 2020

Month	No. of Requests		Change	
	2019	2020	Absolute	Relative (%)
January	149,297	150,094	797	0.5
February	148,541	150,028	1487	1.0
March	157,458	135,993	-21,465	-13.6
April	146,177	86,170	-60,007	-41.1
May	142,152	108,085	-34,067	-24.0
June	120,452	104,728	-15,724	-13.1
July	145,290	122,302	-22,988	-15.8
August	129,554	104,765	-24,789	-19.1
September	123,795	115,282	-8513	-6.9
October	131,722	119,922	-11,800	-9.0
November	126,986	108,268	-18,718	-14.7
December	100,416	86,005	-14,411	-14.4
Total	1,621,840	1,391,642	-230,198	-14.2



**Fig 1** Number of rehabilitation requests in 2019 and 2020 by month.

remained considerably below the previous year's level over the total follow-up period (supplemental figs S6 and S7, available online only at <http://www.archives-pmr.org/>).

### Difference-in-differences estimators

Table 2 shows the difference-in-differences estimators for the reduction in requested medical rehabilitations attributable to the pandemic. Requested medical rehabilitations decreased by 14.5% (IRR, 0.855; 95% confidence interval [CI], 0.851- 0.859). The reduction was about 2 percentage points higher for women (IRR, 0.846; 95% CI, 0.841-0.852) than for men (IRR, 0.864; 95% CI, 0.858-0.870). The reduction in requests in Western Germany was 15.1% (IRR, 0.849; 95% CI, 0.844-0.853), and only 12% in Eastern Germany (IRR, 0.880; 95% CI, 0.871-0.890). The reduction in requests was much greater for non-postacute rehabilitations at 16.4% (IRR, 0.836; 95% CI, 0.832-0.841) than for postacute rehabilitations at 9.7% (IRR, 0.903; 95% CI, 0.894-0.912). The difference-in-differences model estimated in our sensitivity analysis determined a reduction in medical rehabilitation requests attributable to the pandemic of 18.2% for the total population (IRR, 0.818; 95% CI, 0.814-0.823).

### Regional SARS-CoV-2 incidence and regional reduction in requests

The association between the regional cumulative incidence of reported SARS-CoV-2 infections and the regional observed reduction in medical rehabilitation requests is shown in fig 2. Regional infection incidence was significantly associated with request reduction in April ( $r=0.65$ ;  $P=.006$ ), May ( $r = 0.69$ ;  $P=.003$ ), and June ( $r=0.53$ ;  $P=.034$ ). This association weakened in the following months.

### Discussion

The difference-in-differences analysis that we conducted shows that the number of requests for medical rehabilitation decreased

by 14.5% because of the pandemic. The reduction in requests was more pronounced among women and in the western states than among men and in the eastern states. The reduction affected non-postacute rehabilitations more clearly than postacute rehabilitations. After the German Bundestag declared the national concern of the epidemic, the reduction in requests was initially very strongly associated with the regional incidence of SARS-CoV-2 infections. This association weakened noticeably in subsequent months.

In Germany, a significant decrease in outpatient visits to specialists was described during the first peak of the pandemic.<sup>13</sup> There are comparable findings from other countries. Among other things, some studies suggest that there has been a significant decrease in the number of urgently needed hospital treatments for people without COVID-19. In the United States, a reduction in hospital treatments for acute myocardial infarction of approximately 50% has been reported.<sup>3</sup> An Italian study found significantly fewer clinic treatments because of acute coronary syndrome.<sup>2</sup> Comparable results have been reported for important preventive and screening measures, such as childhood vaccines.<sup>6,14</sup>

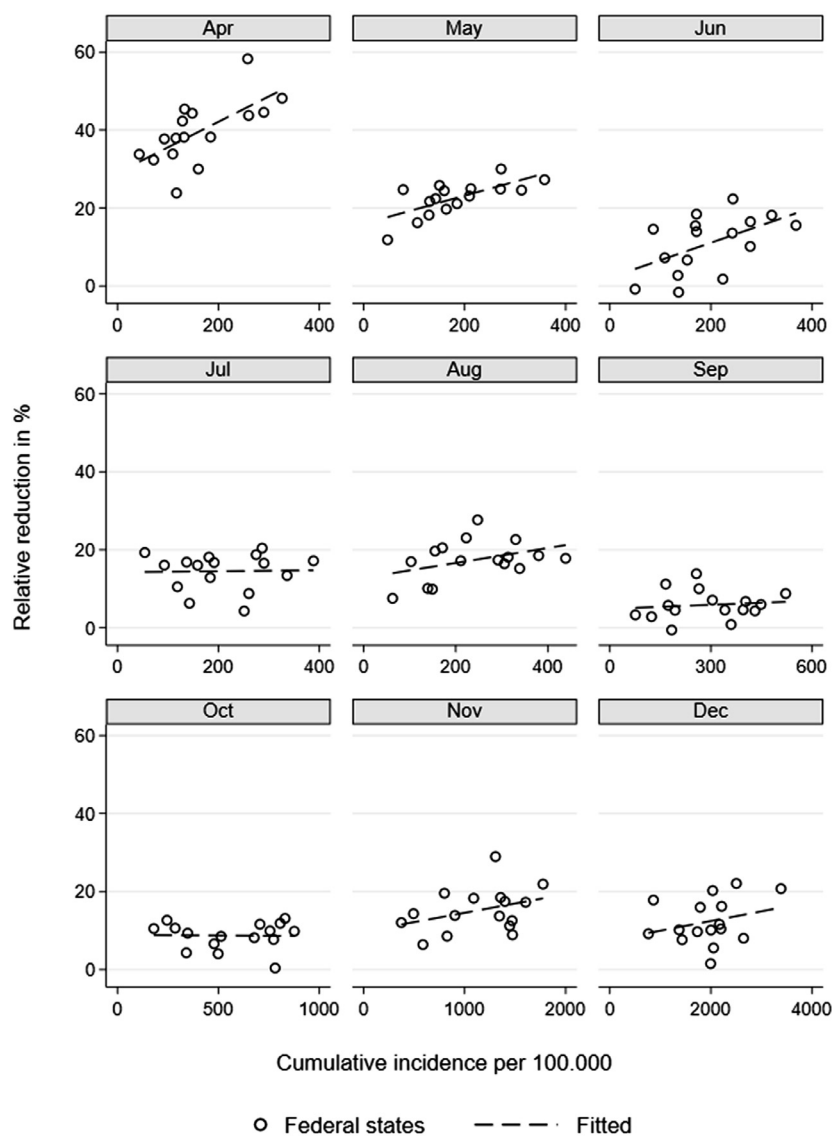
The reasons for the reduced numbers of requests for medical rehabilitation are likely to be multiple and interrelated. Fear of infection and the gradually introduced restrictions in Germany to prevent the spread of SARS-CoV-2 infections may have led to the postponement of important steps required for such a request, including physician visits. In early April 2020, 13.7% of the German population reported that necessary medical visits were not possible. In July, this proportion had decreased to 5.8%.<sup>13</sup> The postponement of elective operations had likewise a direct effect on the reduction in requests for medical rehabilitation.<sup>15</sup> In addition, many people may have been unsure of whether and how rehabilitations were possible in principle and could be performed safely. The sharp drop in applications, especially in March/April, was very likely in part because of the actual substantial reduction in rehabilitation capacity in Germany during this period. Although postacute rehabilitation in particular could be used without interruption, the GPI had recommended that rehabilitation facilities should not accept any new non-postacute patients until the beginning of May. Moreover, people may have also had uncertainties about whether high-quality rehabilitation treatments could be delivered in the face of staffing and space constraints. The suspension of quality requirements by the pension agencies to relieve the rehabilitation centers may have reduced the outcome expectations of persons in need of rehabilitation.

The rebound in the number of rehabilitations requested after the significant reduction in April followed the mobility trend of the German population that can be described with telecommunications data.<sup>16</sup> This is likely because of the gradual lifting of contact restrictions in May and June and changes in perceptions of the pandemic, such as the reduced subjectively perceived probability of infection and reduced pandemic fear and anxiety.<sup>17</sup> The regional differences that could be attributed to different incidences of infection in our analyses—at least from April to June—suggest that the immediate proximity to the hazard had a behavioral effect. This may explain in part the difference between Western and Eastern Germany because the eastern states were characterized by a very low infection incidence during the first epidemic wave.

The differences observed between women and men are consistent with the higher pandemic fear and anxiety and more pronounced protective behaviors of women described in the COVID-19 Snapshot Monitoring.<sup>17</sup> Similar findings have been described

**Table 2** Difference-in-differences estimators for the reduction in medical rehabilitation requests attributable to the pandemic

Variable	IRR	95% CI	P Value
<b>Primary analysis</b>			
Total	0.855	0.851-0.859	<.001
Women	0.846	0.841-0.852	<.001
Men	0.864	0.858-0.870	<.001
East Germany	0.880	0.871-0.890	<.001
West Germany	0.849	0.844-0.853	<.001
Non-postacute rehabilitation	0.836	0.832-0.841	<.001
Postacute rehabilitation	0.903	0.894-0.912	<.001
<b>Sensitivity analysis</b>			
Total	0.818	0.814-0.823	<.001
Women	0.801	0.795-0.808	<.001
Men	0.836	0.829-0.843	<.001
East Germany	0.833	0.823-0.844	<.001
West Germany	0.814	0.809-0.819	<.001
Non-postacute rehabilitation	0.798	0.793-0.803	<.001
Postacute rehabilitation	0.873	0.863-0.883	<.001



**Fig 2** SARS-CoV-2 incidence and reduction in requests across German federal states.

by Galasso et al<sup>18</sup> in an 8-country study of nearly 22,000 participants. Women were more likely to perceive the pandemic as a very serious health hazard, more likely to agree to restrictive measures, and more likely to comply with mitigation measures than men. The authors also showed that these differences could hardly be explained by sociodemographic factors but, to some extent, by factors such as risk aversion and confidence in science.

### Study limitations

The results of the current analysis must be interpreted considering the following limitations. First, we have only been able to consider data on requests so far and not on the utilization of rehabilitation services. Therefore, the direct effect of the pandemic on the number of completed rehabilitations could not be shown. Second, our analyses only describe the extent of the reduction in requests. They do not enable us to explain why people decided to refrain from requesting for medical rehabilitation. This knowledge is important to inform people in need of rehabilitation precisely

about the possibilities of rehabilitation services under the current conditions. Third, the period we included in the analyses is limited to the first wave of the pandemic, the summer with very low infection rates, and the first part of the second wave. The extent to which the described reduction in requests will continue can only be clarified with future data.

### Conclusions

The number of requests for medical rehabilitation decreased noticeably because of the pandemic. A failure to provide medical rehabilitation will be associated with progression of chronic diseases and further limitations on participation by people with chronic diseases and those in need of rehabilitation. Therefore, we recommend a repeated cross-sectional monitoring of participation, work ability, health, and risk perception of people with chronic diseases to clarify how these people can be supported in applying for rehabilitation.

## Supplier

a. Stata/SE version 16.0; Stata Corp LP.

## Keywords

Chronic disease; Pandemics; Rehabilitation; SARS-CoV-2

## Corresponding author

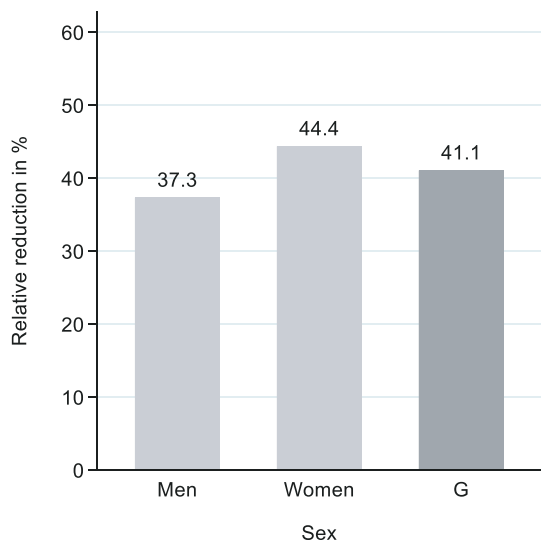
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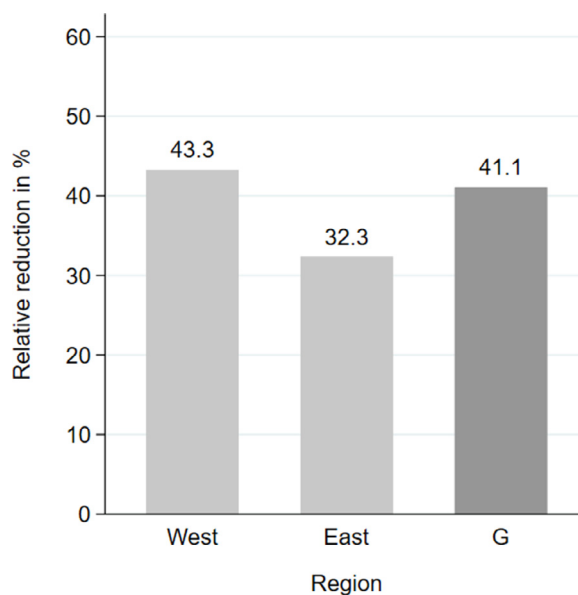
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**Supplemental Table S1** Number of rehabilitation requests by subgroups

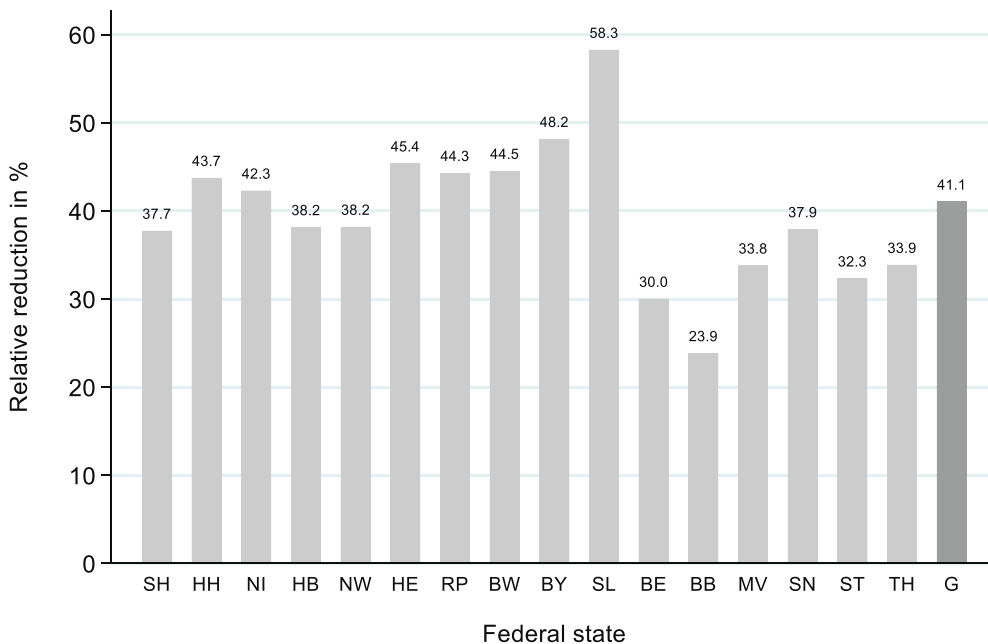
	2019	2020
<b>Sex</b>		
Women	838,785 (51.7%)	712,231 (51.2%)
Men	783,055 (48.3%)	679,411 (48.8%)
<b>Region</b>		
East Germany	328,631 (20.3%)	293,149 (21.1%)
West Germany	1,293,209 (79.7%)	1,098,493 (78.9%)
<b>Type of rehabilitation</b>		
Postacute rehabilitation	440,632 (27.2%)	394,275 (28.3%)
Non-postacute rehabilitation	1,181,208 (72.8%)	997,367 (71.7%)



**Supplemental Figure S2** Reduction in requests by sex in April 2020. Abbreviation: G, Germany.

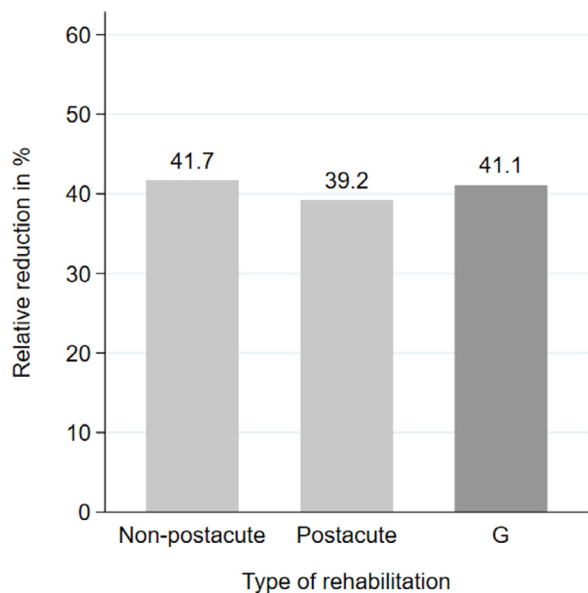


**Supplemental Figure S3** Reduction in requests by region in April 2020. Abbreviation: G, Germany.

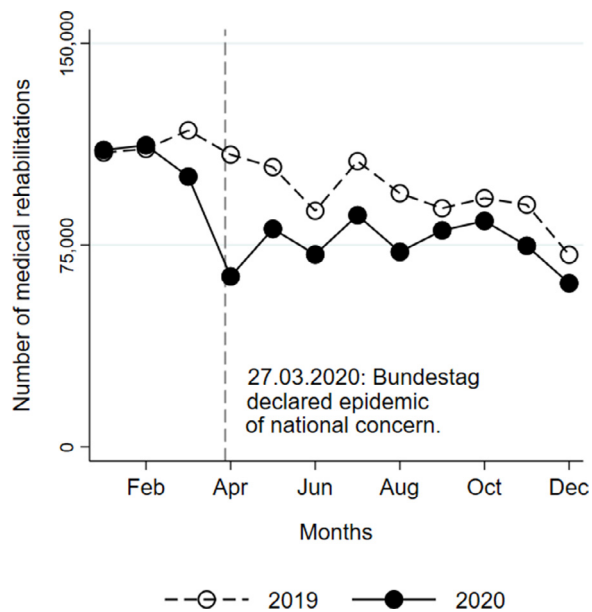


**Supplemental Figure S4** Reduction in requests by federal state in April 2020. Abbreviations: SH, Schleswig-Holstein; HH, Hamburg; NI, Lower Saxony; HB, Bremen; NW, North Rhine-Westphalia; HE, Hesse; RP, Rhineland-Palatinate; BW, Baden-Württemberg; BY, Bavaria; SL, Saarland; BE, Berlin; BB, Brandenburg; MV, Mecklenburg-Western Pomerania; SN, Saxony; ST, Saxony-Anhalt; TH, Thuringia; G, Germany.

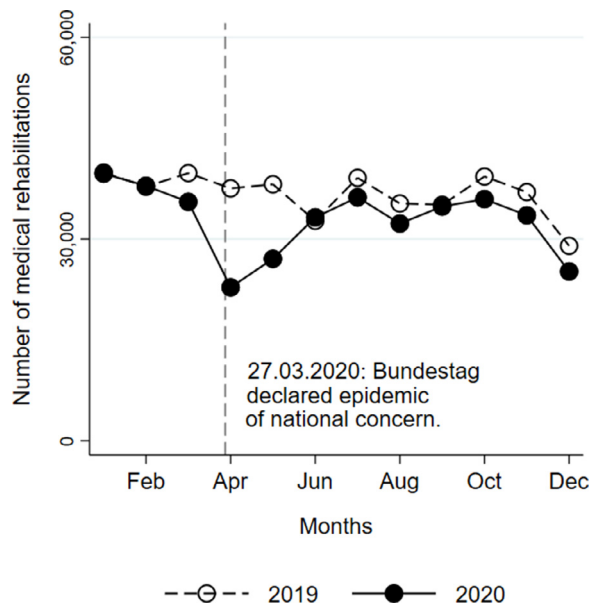




**Supplemental Figure S5** Reduction in requests by type of rehabilitation in April 2020. Abbreviation: G, Germany.



**Supplemental Figure S7** Non-postacute rehabilitation requests.



**Supplemental Figure S6** Postacute rehabilitation requests.