Medical Research Archives

ESMED
European Society of Medicine

OPEN ACCESS

Published: July 10, 2023

Citation: L Homagk and L Hornung, 2023. Critical Examination of the Exaggerated SARS-Cov-2 Test Strategy, Medical Research Archives, [online] 11(7). https://doi.org/10.18103/mra.v11i7.1.4124

DOI
https://doi.org/10.18103/mra.v11i7.1.4124

ISSN: 2375-1924

RESEARCH ARTICLE

Critical Examination of the Exaggerated SARS-Cov-2 Test Strategy

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ABSTRACT

With SARS-CoV-2 in 2019 a coronavirus started circulating, for which the population showed no specific defense mechanisms of the immune system due to its clear distinction from the previously circulating coronavirus strains. Nevertheless, in 2021 there was a significant decrease in respiratory infections with a simultaneous significant increase in pandemic-related SARS-CoV-2 infections found. There is also a reduction in reported cases of respiratory diseases, especially in the pandemic year 2021. The aim of this retrospective cohort study is to show optimizations in the test strategy during a pandemic and thus derive the improvement of civil protection.

For Evaluation the data of the German center of Disease Control (RKI) by the GrippeWeb, the RKI's Survstat® tool and the RKI's reporting data on the new coronavirus were used. In addition, an evaluation of billing data from the EBM (Uniform Value Scale) from 2017 to 2022 for the GOP (fee schedule item) 32816 as well as an evaluation of data on sick leave and illness statistics from 2019 to 2021 and the consideration of inpatient and outpatient health costs based on the data requested in writing from the Federal Ministry of Health was performed.

The data from the Influenza Working Group shows an average of 300,000 annual reports for ARI (Acute respiratory infection) per year. In 2019 it increased to 1,985,985 reports, in 2020 (5,453,017) and in 2021 to 29,681,158. There is also a correlation between the SARS-CoV-2 test frequency and the positive results, as well as an increase in the previously 6% positive rate for SARS-CoV-2 to over 50% in 2022. At the same time decreases the medical burden due to ARI contrary to the increase of the acute respiratory diseases reported to the RKI with 2684%.

What has been neglected so far is that corona viruses (HCoV) have been responsible for around 5-10% of acute respiratory infections for decades. The comprehensive Covid-19 control measures, including the obligation to wear masks, apparently had no significant impact on reducing the spread of Covid-19, since there was also no decrease in infections with the adenovirus or RS virus in 2020 and 2021. Furthermore, an infection positive rate should not be used as a criterion for infection avoidance strategies and the recording of test results should always be validated and controlled. Only the testing of symptomatic persons should be remunerated and only these validated test results should be considered in the registration. In addition, the DIVI register for the inpatient area with recording of the main admission diagnosis and the data from the electronic transmission of sick notes to the health insurance companies for the outpatient area could be used in real time to decide on containment measures in the context of the pandemic.

Keywords: Influenza, Covid-19, SARS-CoV-2, PCR-RT

Introduction

With SARS-CoV-2, a coronavirus start a circulation, for which the population did not show any specific defense mechanisms of the immune system due to its clear distinction from the previously circulating coronavirus strains. The resulting disease - called Covid-19 - has been manifested since December 2019 as an accumulation of severe pneumonia, initially in Wuhan, China 1,2. On March 11, 2020, the World Health Organization (WHO) declared the Covid-19 outbreak a pandemic 3. The first European cases occurred in France on January 24, 2020 4,5. In Germany, the first case was registered on January 27, 2020 6.

With a total global population of almost 8 billion people 7, the Johns Hopkins University dashboard listed 666,931,333 infections and 6,723,308 resulting deaths from the start of the pandemic until January 15, 2023 8. For the same period, 37,605,135 Covid-19 cases and 163,775 Covid-19 deaths were reported to the RKI 9.

On the other hand thera are stricter hygiene measures due to the corona pandemic, such as lockdown, distance rules and the obligation to wear masks. These regulations were discussed to reduce the infection rates with SARS-CoV-2. Furthermore, these rules meant that healthy people had to be tested, if they want work, travel and participate in community life. This contradicted the previous general infection rules to test symptomless people.

Studies show that Covid-19 control measures had a reducing impact on norovirus positivity rates 10,11. Norovirus is highly contagious, being transmitted via the fecal-oral route, through contaminated hands, or by consuming contaminated food or water. Therefore, the decrease in the number of norovirus positive cases observed in 2020 is explained by the closure of schools, restaurants and other facilities due to the German Covid containment measures 11. In 2021 in particular, there will be a decline in all respiratory infections with a significant increase in the number of SARS-CoV-2 infection reports caused by the pandemic, also based on an exorbitant increase in specific test procedures 12,13,14.
The goals of this work are to show optimizations in the test strategy during pandemic times, to depict a realistic depiction of the infection situation and thus to improve civil protection.

Methods

In this retrospective cohort study with a Level of Evidence of IIa (Evidence from at least one well designed controlled trial which is not randomized) the data from GrippeWeb and the RKI's Survstat® tool 14,15 were used and statistically evaluated to evaluate the flu cases. In addition, a written request was sent to all 17 Association of Statutory Health Insurance Physicians with the request for billing data to be transmitted for fee schedule item:

> **32816** (nucleic acid detection of the beta coronavirus SARS-CoV-2 using RT-PCR) from the years 2017 to 2022.

The data analysis on incapacity for work was based on the results of the Federal Ministstry of Health, which breaks down the cases and days of incapacity for work according to diagnoses for the years 2019 and 2020 15,16. For the evaluation year 2021, the data collection was based on the health reports 2021 of the German health insurances AOK (Local Health Care Fund) 17, the Barmer 18 and the Techniker Krankenkasse 19. The data requested in writing from the National Association of Statutory Health Insurance Physicians for the years 2019 to 2021 was used to evaluate the sickness statistics for the years 2019 to 2021. The consideration of inpatient and outpatient health care costs in the same period was evaluated using the data requested in writing from the Federal Ministry of Health.

The collection and statistical evaluation of the data was carried out with SPSS Statistics 26 for Windows and was purely descriptive. The statistical analysis is performed by means of Kruskal-Wallis test as a statistical test for differences in the central tendency of rank data with more than 2 groups. Paired comparisons were performed using Tukey's HSD. For the questions of frequency, the test was performed by Monte Carlo exact test. The correlation questions were performed by Cramer's V as a measure of the relationship between two discrete variables. A vote by the ethics committee is not necessary, since no data protection-relevant and personal data was evaluated. All procedures were in accordance with the ethical standards of the institutional research committee of the University of Jena, Germany.

Results

Of the 17 Association of Statutory Health Insurance Physicians, 5 departments with a total of 37,542,000 insured persons (as of 2022) responded in writing by December 30, 2022. This corresponds to coverage of 45.2% of the total population and is to be regarded as representative.

The data first shows the clear change in the spread of viral respiratory infections from 2020 onwards.

Not only did influenza A/B, which had previously been the leader at over 90%, fell to 10% in total in 2020 and tended towards zero from 2021, but also the number of Respiratory infection reports to the RKI increased from an average of 300,000 annual reports by 2019 to 1,985,985 reports in 2020, over 5,453,017 reports in 2021 and by week 49/2022 to 29,681,158 per calendar year due to the spread of the novel SARS-CoV-2.
Furthermore, in contrast to the known test results for respiratory infections in GrippeWeb 20, which have been collected for years, there is a significantly increased test frequency for the novel SAR-CoV-2. A consistently high distribution of the same over the entire observation period from 2020 to 2022 found that the Pearson correlation coefficient was 0.71, providing a correlation between testing frequency and a positive report that had not occurred in previous respiratory disease testing procedures (Fig. 1).

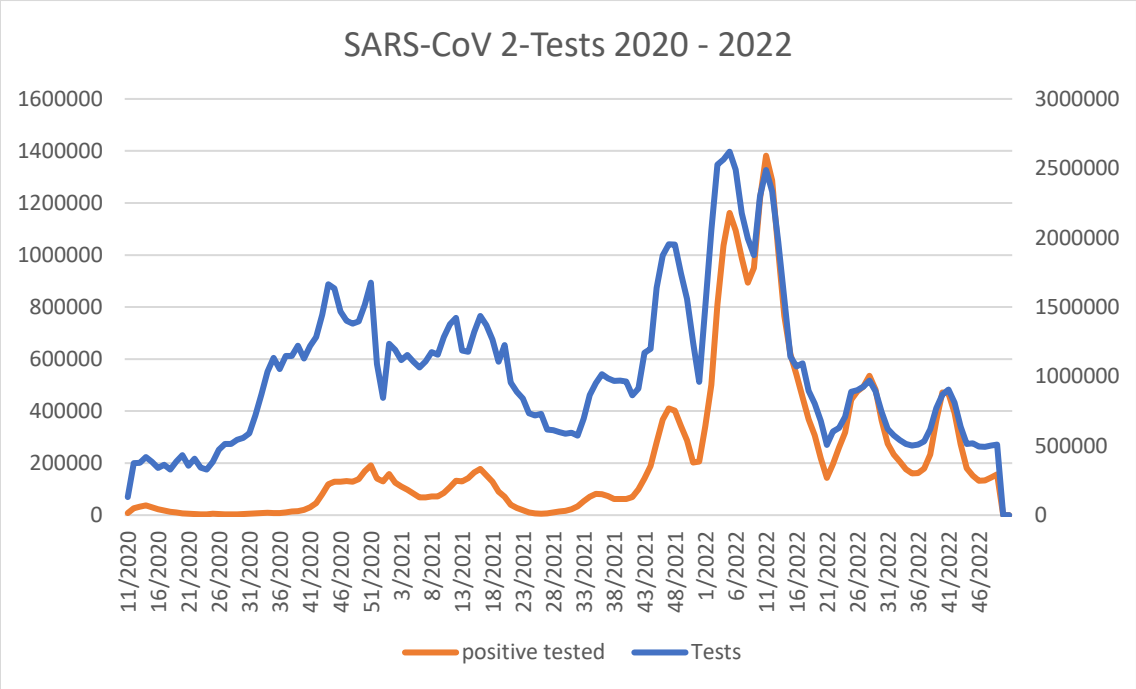

Fig. 1: Test frequency and positive report for SARS-CoV-2 in the period from week 11/20 to 49/22

If you look at the billing frequency for 32816 as solely laboratory-based nucleic acid detection of the beta-coronavirus SARS-CoV-2 using RT-PCR, there is a very strong correlation to the billing of 32006 and 32841 as laboratory-based evidence an influenza (Fig. 2).

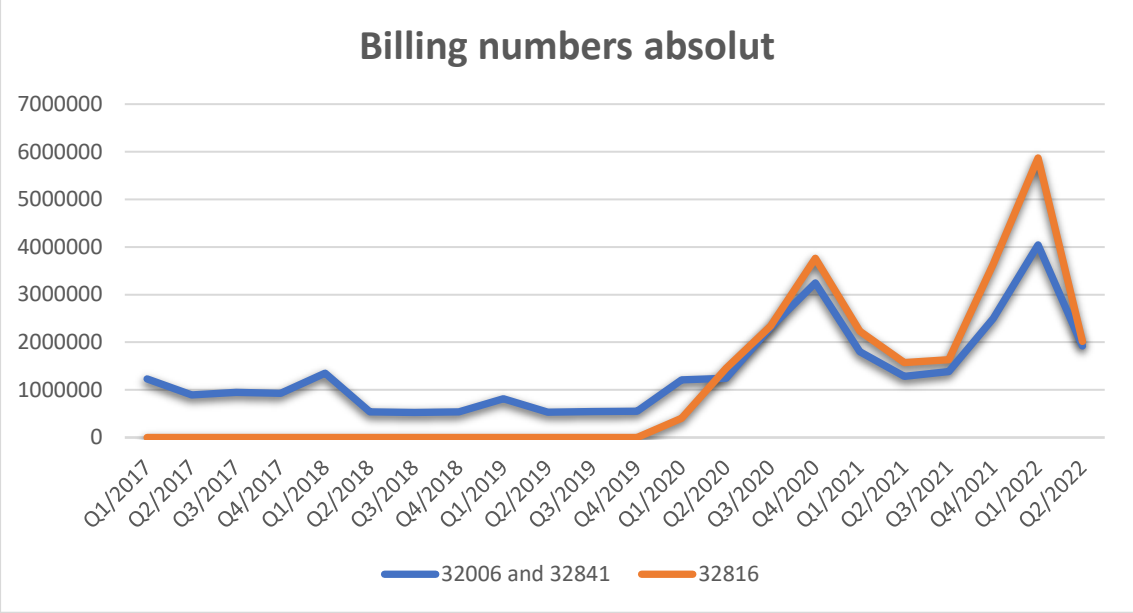

Fig. 2: Representation of the test frequency GOP 32006, 32841, 32816 from Q1-2017 to Q2-2022, Pearson: 0.97

While there is an average positive rate of 4.26% for influenza A and B over the calendar year, which increases in the flu waves and falls to 0% in the summer quarters, but is still independent of the test frequency, this is evident in the case of novel SARS-CoV -2 another picture. Not only do test frequency and test result correlate, there are also differences in the positive detection at the RKI depending on the Survstat evaluation module or the RKI's own data table 21. In addition, the reporting rate according to the RKI method exceeds the number of PCR samples billed many times over, especially from the fourth quarter of 2021 (Table 1). Also noticeable in the quarters mentioned above is the massive increase in the positive rate for SARS-CoV-2, which was previously 6%, to over 50%.

Table 1: Test report, positive cases and billing frequency GOP 32816 from Q1-20 to Q2-22

Quarter	Tests RKI	Positive tested RKI	Tested Survstat	32816
Q1/2020	573318	35110	29511	402933
Q2/2020	4462575	188114	156294	1454618
Q3/2020	8385933	71049	65252	2336258
Q4/2020	22666303	1622062	1532894	3763195
Q1/2021	14389348	1179375	1002541	2230956
Q2/2021	13508772	1152502	937167	1575936
Q3/2021	8562590	404328	367317	1634631
Q4/2021	20953608	3253479	3137110	3639275
Q1/2022	26915866	11662235	13338982	5870300
Q2/2022	11663795	5207642	6741707	2017132

The Barmer health insurance company reported 58.8% fewer diseases of the respiratory system for its 3,793,289 insured persons in 2021 with a simultaneous increase of only 19.0% cases of illness with "code numbers for special purposes", which is the code numbers of SARS-CoV-2 -diseases U07 and U99, which were not yet recorded by the Federal Ministry of Health in 2021 18. This clear net decline in cases of sick leave, especially in 2021, is also reflected in the evaluation of the health reports of the AOK with 14,087,213 insured persons in 2021 and the Techniker Krankenkasse with 8,260,286 insured persons in 2021 for the diagnoses of respiratory diseases 17,19 (Fig.3).

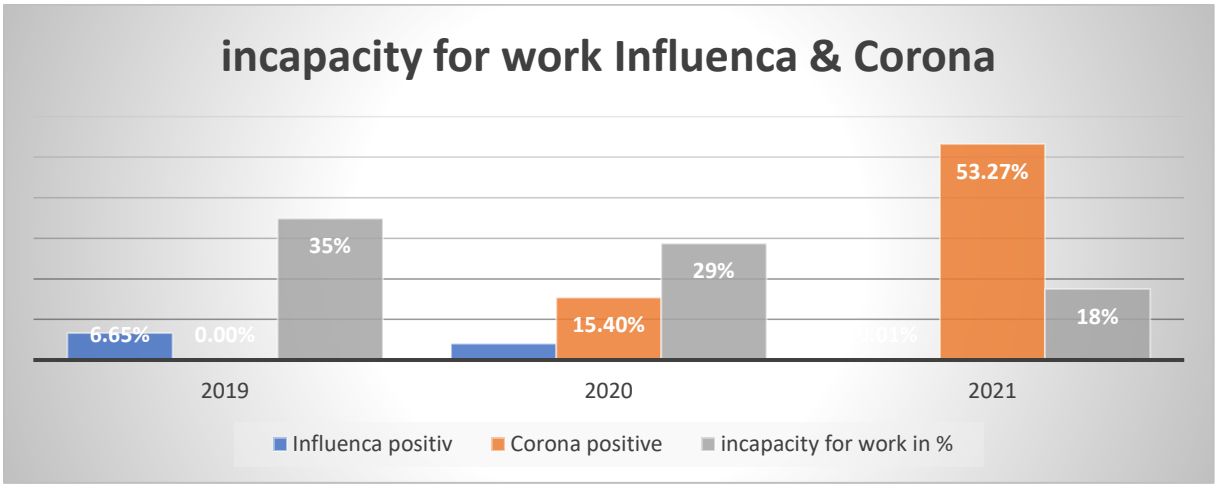

Fig. 3: Positive rate SARS-CoV-2 and influenza in comparison with diagnoses: J00, J01, J02, J03, J06, J09, J20, J32, J40, J98, B34, B99, U07, U99 in 2019 – 2021

This significant decrease in the burden of illness among the German population is due in particular to the significant decline in "classic" respiratory diseases with an increase in the frequency of SARS-CoV-2 disease from 0% to 2.8% of all disease frequencies in 2020 and to 5.5 % in 2021. According to the results of the statistics of the Federal Ministry of Health for the years 2019 and 2020 for the ICD-Codes: J00, J01, J02, J03, J06, J09, J20, J32, J40, J98, B34 , B99, the total number of sick leave days in 2019 was 73,281,305 and 75,106,232 in 2020. However, a massive increase in sick leave would have been expected from 2020 and especially 2021, since the frequency of respiratory infections reported to the RKI was around 2684 % increase (Fig. 4).

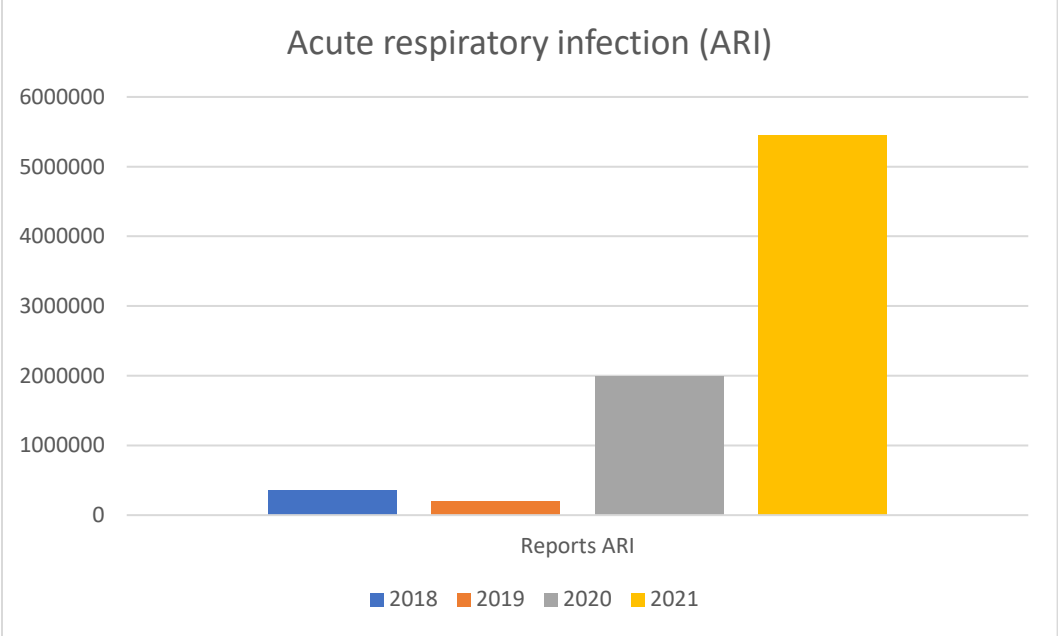

Fig. 4: Positive reports to the RKI of respiratory infections 2019 – 2021

Likewise, from the 1st quarter of 2020 with the introduction of the ICD codes for the novel SARS-CoV-2:

U07.1 COVID-19, virus detected
U07.2 COVID-19, virus not detected

show a significant increase in encryption due to the pandemic situation. However, there is a discrepancy with the data from the RKI, which is illustrated in Table 2. The test frequencies and positive tests according to the RKI have already been shown in Table 1, resulting in an annual average positive rate of 5.4% for 2020 and 10.4% for 2021. If you

now compare the number of positive cases, specified by the RKI, with the diagnostic key U07.1 (COVID-19, virus detected), the result for the year 2020 is a predominance of 1,029,806 encrypted SARS-CoV-2 cases that are not were registered by the RKI. If one also considers the ICD code U07.2 (COVID-19, virus not detected), i.e. the purely clinical diagnosis, the number of unregistered SARS-CoV-2 cases will quadruple in 2020 and double in 2021.

Table 2: Test report, positive cases and diagnosis coding SARS-CoV-2 2020 and 2021

Year	U07.1	U07.2	Tests	Positive tests	Positive tests RKI	Positive tests ICD U07.1	Positive tests ICD U07.1 und U07.2
2020	2.946.141	5.576.007	36.088.129	1.916.335	5,3%	8%	24%
2021	4.890.793	6.886.794	57.414.318	5.989.684	10,4%	9%	21%

By far the most frequently encrypted ICD-Code for respiratory diseases, the J06 (acute infections at several or unspecified localizations of the upper respiratory tract) shows no significant changes in the years 2016 to 2021 (Fig. 5).

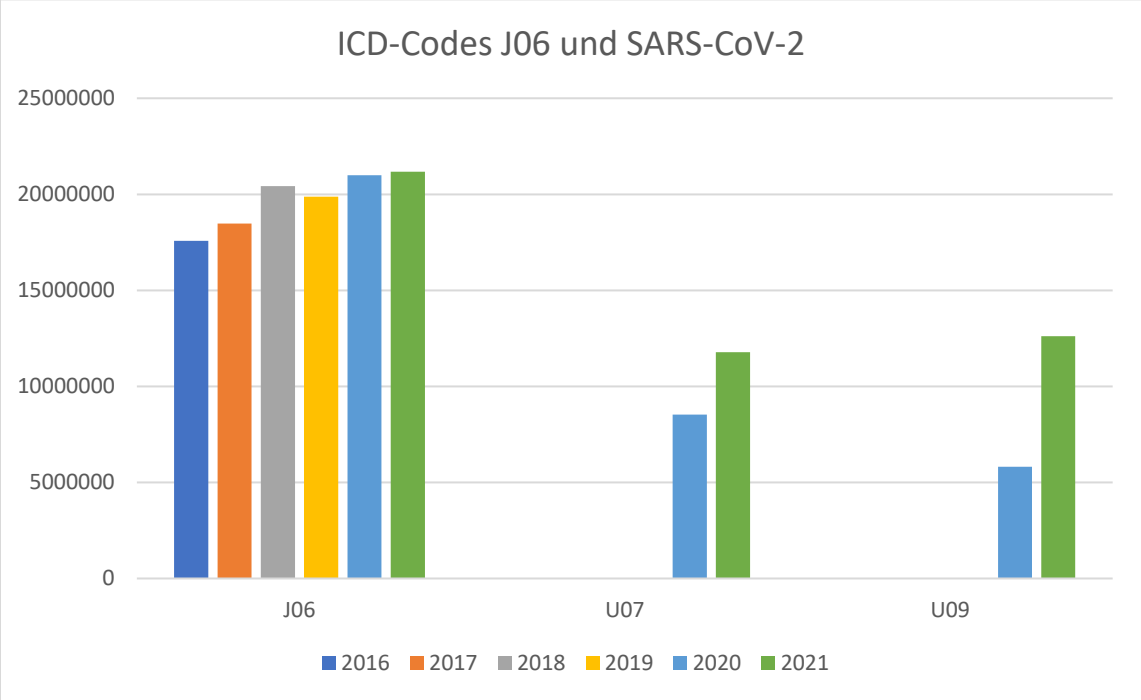

Fig. 5: KBV statistics for diagnosis coding J06, U07, U09 2016-2021

In summary, in 2021 there will be a significant reduction in respiratory infections with a significant increase in pandemic-related SARS-CoV-2 infections, also based on an exorbitant increase in specific test procedures. Corresponding to the reduction in the ARI, there is a reduction in the reported cases of respiratory diseases, especially in the pandemic year 2021, so that the question of cost developments in the inpatient and outpatient areas arises.

Overall, the costs for outpatient treatment rose marginally from €41,082,000 to €44,778,000. In comparison, there was a significant decline in operations by attending physicians by 12% in 2019 compared to 2020 and even 17% compared to 2021. At the same time, psychotherapeutic services increased by 13% (Fig. 6).

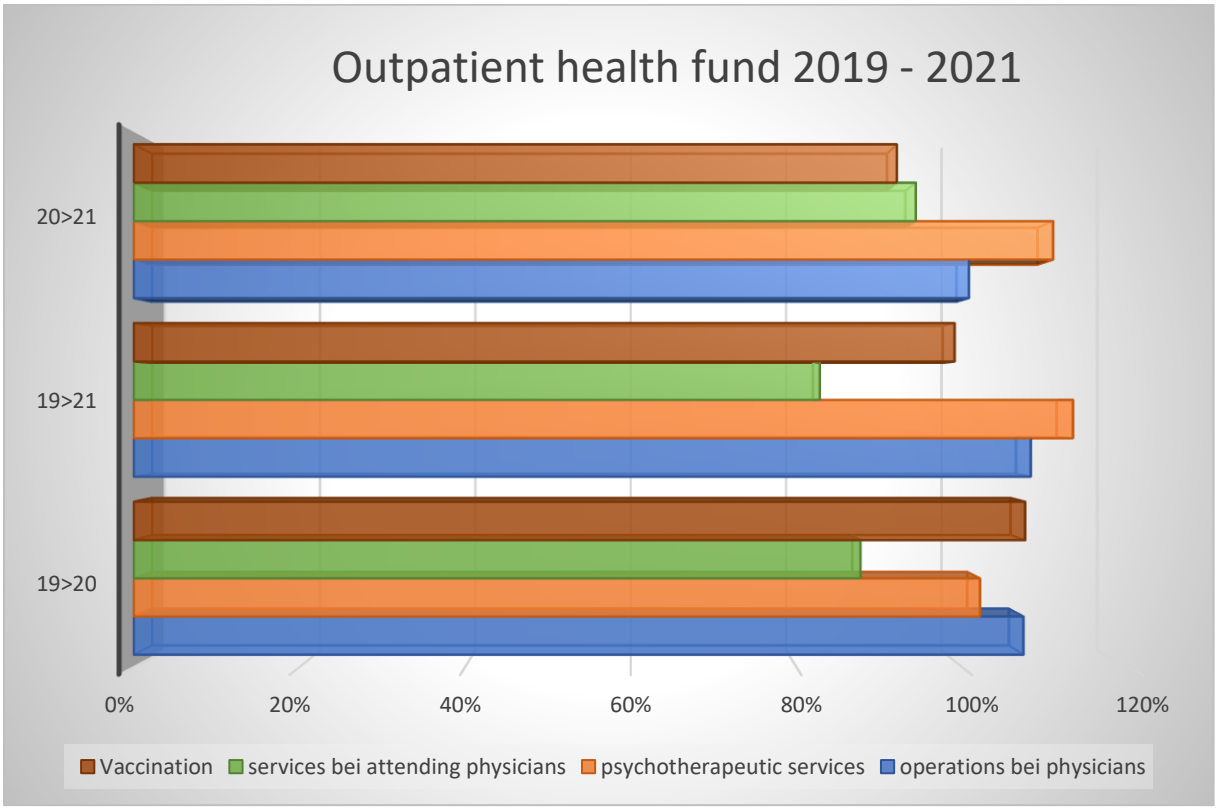

Fig. 6: Use of funds for health insurance contributions and outpatient health fund 2019-2021

Corresponding to the outpatient sector, the costs in the inpatient sector have not increased significantly during the pandemic either. In 2019, expenditure in the hospital sector amounted to €80,345,000, rising from €81,547,000 in 2020 to €85,869,000 in 2021. The ward-equivalent psychiatric treatments can be seen increasing by 350%, which corresponds to a volume increase of 20 million euros. Inpatient psychiatric treatments also increased significantly, while general hospital treatments decreased by 19% from 2019 to 2020 (from €68,130,000 to €55,161,000) and did not increase significantly in 2021.

Discussion

A decline in all infectious diseases in 2021 is described for Switzerland 22. This also explains the decline in chickenpox, herpes zoster, rubella and measles 23 and the decline in foodborne infections and sexually transmitted diseases 24. Noroviruses are primarily transmitted through direct contact and droplet infection, which could explain the reduction in hygiene measures and contact restrictions to prevent the spread of Covid-19 10,11. However, the main viral pathogens of respiratory infections differ only marginally in their properties and size. The coronavirus is described as a membrane-enveloped RNA virus with a spherical to pleomorphic shape and a diameter of 60 to 140 nanometers (nm) 25. Similarly, the influenza viruses are globular or spherically ellipsoid (round to ovoid), occasionally also filamentous, enveloped virus particles with a diameter of 80 to 120 nm 26. These similar epidemiological profiles and the same physico-chemical properties are essential for the probability of transmission 27. Thus, the comprehensive Covid-19 control measures should have had a significant impact on reducing the spread of Covid-19, which has been largely refuted by studies and meta-analyses 28-31. This assumption is supported by the fact that our analyzes did not show a significant decrease in infections with the adenovirus or RS virus in 2020 and 2021. Jefferson et al. confirm this with their meta-analysis on the efficiency of a mask requirement in endemic and pandemic respiratory infections, which does not exist 32.

The fact that corona viruses (HCoV) have been responsible for around 5-10% of acute respiratory infections (ARI) for decades is somewhat underexposed in public perception 33. This probably led to an underestimation of the clinical and epidemiological impact of the endemic coronaviruses NL63, HKU1, OC43 and 229E. Biere et al. examined the endemic distribution of these four CoV types in 2019 and 2020 and showed that HKU1 was predominant and was present in 8% of

all samples of this virus. The less pronounced NL63 population was also found with 4% of the positive results. Corona viruses are mainly detectable from late autumn to spring with a sharp increase in autumn and a peak from December to April. Only sporadic evidence was shown as the season progressed, but nevertheless the data indicate frequent circulation of coronaviruses 34.
Furthermore, our results show a high correlation between the number of corona tests and the positive reports. A possible explanation is the highly sensitive RT-PCR test 35,36 in some studies with a sensitivity of 99% and a specificity of 99.5%, developed by the Charité 37. Therefore, when testing asymptomatic people, more false-positive results can be detected, which is one reason for the increase in corona cases, especially in 2020, and explains the development of the test-positive rate to over 50% 38. The fact that this would have to lead to a large number of medical treatments and also to an enormous number of sick leave was refuted on the basis of the available data. In the context of the corona pandemic, the phenomenon that a high positive rate also correlates with more cases of illness in contrast to the previous flu waves seems to have been eliminated 39. Since the coronaviruses, in particular with the establishment of the omicron variant, also show a reduced morbidity compared to influenza viruses 40, 41, the positive rate cannot be used as a criterion for infection avoidance strategies and, on the other hand, the recording of test results should be validated.

This test strategy, even for asymptomatic people, was taken up by the Ifo Institute in 2020 and rated negatively 42. Nevertheless, this increase in the positive rate is particularly evident in 2022, which can certainly be associated with the spread of the omicron variant of SARS-CoV-2. But if these corona tests had only been used in symptomatic patients, this should have resulted in an increase in ICD coding, which we are seeing, but on the other hand the sickness burden and sick leave would have to increase to the same extent. Our data show exactly the opposite trend. In 2021 in particular, all health insurance data examined indicate a significant decrease in respiratory diseases - despite SARS-CoV-2. This mismatch is based on the testing of healthy people, who are then classified as corona cases and which, in their exorbitant number, then led to politicians sticking to infection prevention strategies. For this reason, only the testing of symptomatic persons should be remunerated and only these test results should flow into a registration. During the pandemic, testing healthy people became a political control instrument to regulate containment measures, which should be reconsidered. Farkas et al. confirm this argument through their work on blanket testing of air travelers in spring 2022 at Heathrow and Bristol airports 43 In its meeting on May 18, 2022, the evaluation committee carried out another reassessment of the laboratory performance according to billing number 32816 and reduced the remuneration in the 3rd quarter from €35 to €27.30, but when the new service was introduced at the end of January 2020, the RT -PCR test was still valued at 59 euros 44. The evaluation of GOP 32841 (laboratory testing for influenza A and B) for example was 16.50 euros in 2021 in the area of Westfalen-Lippe 45. This created monetary incentives on the part of health policy to carry out a test for SARS-COV-2, although there was no medical indication, namely a symptomatic respiratory infection.

When looking at the inpatient and outpatient healthcare costs for the years 2019 to 2021, it is noticeable that the costs for psychiatric treatment have risen in both areas, but have fallen in the outpatient sector in particular, which was responsible for the treatment of 95% of all corona cases 46. In addition, almost exclusively the inpatient sector has received billions in aid for the treatment of corona-positive patients, the creation and later keeping free of intensive care beds and for additional hygiene costs. If one now also includes the procurement costs for hygiene products and the approximately 6 billion test costs, which in turn only affected the cost block of the outpatient sector, there will be a significant cost reduction for outpatient medical treatments in 2020 and 2021 for the outpatient sector The results are consistent with the statements already made on the significantly reduced sickness burden in the pandemic years in general and respiratory diseases in particular.
For these reasons, it is also advisable to use the proven DIVI register for the inpatient area as a control instrument for any containment measures. However, only the main admission diagnoses to the intensive care units should apply as a criterion. For the outpatient area, it is advisable to access the data from the electronic notification of incapacity for work that has been available to the health insurance companies in almost real time since January 1st, 2023. With both measures, the bias-prone testing moves into the background.

Conclusion

Allmost over the world there are stricter hygiene measures due to the corona pandemic, such as lockdown, distance rules and the obligation to wear masks. These regulations were discussed to reduce the infection rates with SARS-CoV-2. On the other

hand, these rules meant that healthy people had to be tested, if they want work, travel and participate in community life. This contradicted the previous general infection rules to test symptomless people.

In summary, the authors propose the following recommendations for future exceptional pandemic situations and for recording respiratory infections:

- Clinical testing in symptomatic individuals only
- No compensation incentives for new testing procedures
- Include corona viruses in the statistical recording (AG influenza).
- To establish a uniform test recording that is also used in the event of a pandemic
- Control of the containment measures in the future via:
    - DIVI register for the inpatient area with recording of the main admission diagnosis
    - Data from the electronic transmission of incapacity to work to the health insurance companies for the outpatient area in real time

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