

Wennberg
International Collaborative
2023 Fall Meeting
Sant'Anna School of Advanced Studies
in Pisa, Italy | Sept 13-15

Research Session 2 - Warranted and unwarranted variation in the COVID-19 pandemic

How the rate of elective surgeries has changed due to the Covid-19's impact: a district level analysis in three regional health systems in Italy

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Background

The Italian National Health System had to manage the surge in patients requiring **acute hospital services** and intensive treatments because of the **COVID-19 pandemic**.

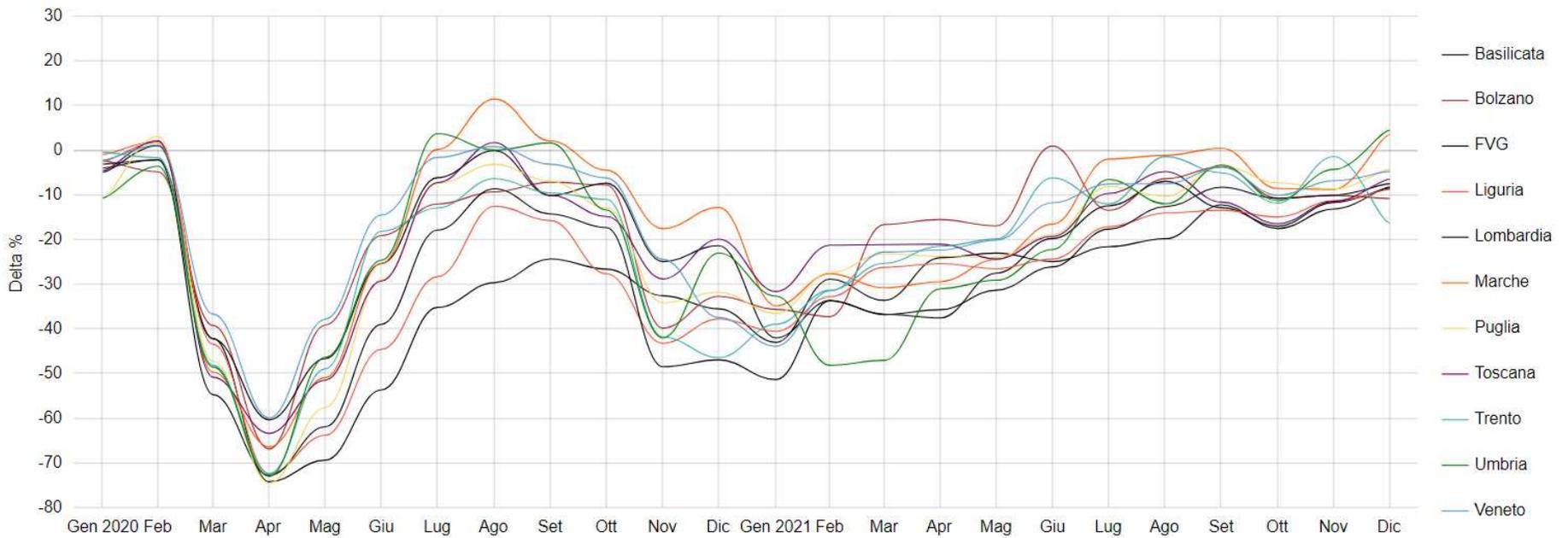
At hospital level, rapid adjustments have been made and fewer **admissions to non-essential medical** care including most of the elective surgery have been registered during the pandemic (Ministero della Salute, 2020).

Elective surgeries were cancelled or postponed during the peak of the pandemic with differences across regions, also in the recovery of surgical rates.



% changes in elective hospital surgeries Jan 2020 – Dec 2021

S.M2 Volumi ricoveri programmati
 Variazione 2020-2021 su base mensile rispetto al 2019



Il grafico riporta la variazione percentuale dei volumi delle prestazioni erogate da ciascuna Regione nel 2020 e nel 2021 rispetto al 2019 per mese.

Source: <https://performance.santannapisa.it/pes/network/resilienza.php?codice=S.M2>



Aim & setting

How has the coronavirus disease 2019 (COVID-19) pandemic affected elective hospital surgical care?

What (and if) prioritization policies for elective intervention have been introduced during the different pandemic periods?

Describe geographical variation of selected surgical procedures across and within three regions in Italy.

Procedures are tonsillectomy, cholecystectomy, vein stripping, hip replacement, knee replacement and arthroscopy.

Regions included are Tuscany, Friuli Venezia Giulia, PA Bolzano.

Data were analyzed at health district (HD) level.



Method

For the chosen elective surgeries, a standard hospitalization rate (direct method based on age and sex) has been estimated using hospital discharge records.

We categorized COVID-19 exposure as time periods:

2018–19 as the pre-Covid period

2020–21 as the Covid period

2022 as the post-Covid period

The box plot and the Coefficient of Variation (CV) have been employed to analyze the variation at district level considering 50 HDs in the three Italian regions.

Pearson correlation ($p = 0.05$) between the hospitalization rate in the pre-Covid period and the percentage variation of volumes (2022 vs 2018/19) have been calculated to understand any potential impact of COVID-19 on the possible unwarranted variation inside the three regions.



Mean hospitalization rate change considering the 3 regions

	Mean change preCOVID and COVID	Mean change COVID and postCOVID	Mean change preCOVID and postCOVID
TONSILLECTOMY	-52%	24%	-40%
CHOLECYSTECTOMY	-28%	22%	-12%
VAIN STRIPPING	-55%	-1%	-56%
KNEE REPLACEMENT	-13%	19%	4%
HIP REPLACEMENT	-12%	18%	4%
ARTHROSCOPY	-24%	11%	-16%

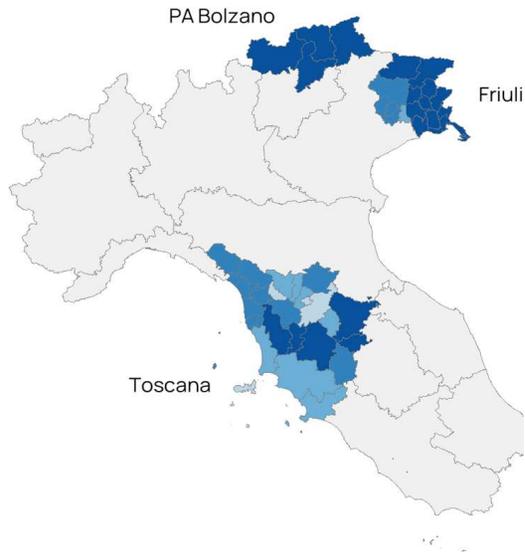


Tonsillectomy

Std hospital rate every 100,000 resident

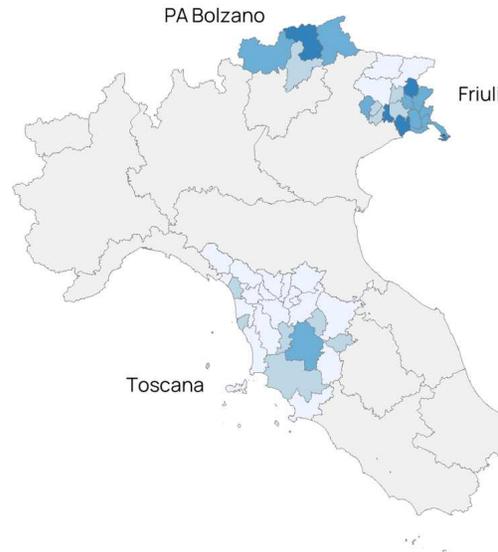
Pre-COVID

HD data - Mean value 2018-2019



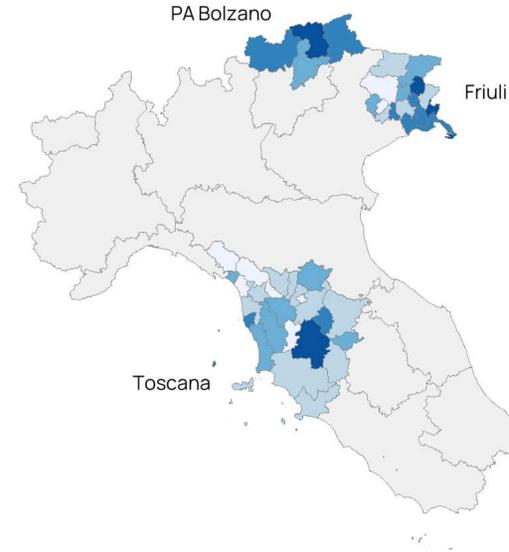
COVID

HD data - Mean value 2020-2021



Post-COVID

HD data - 2022 value

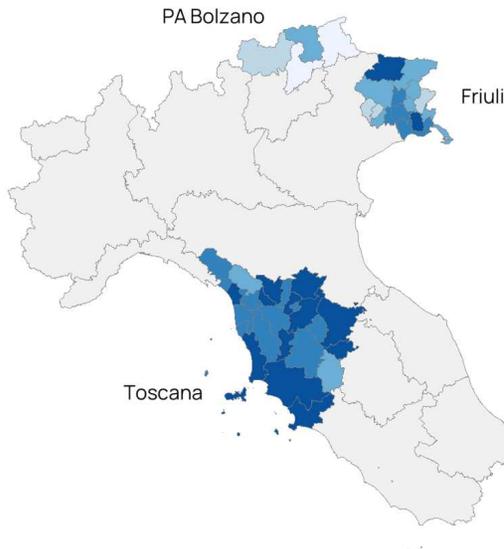


Cholecystectomy

Std hospital rate every 100,000 resident

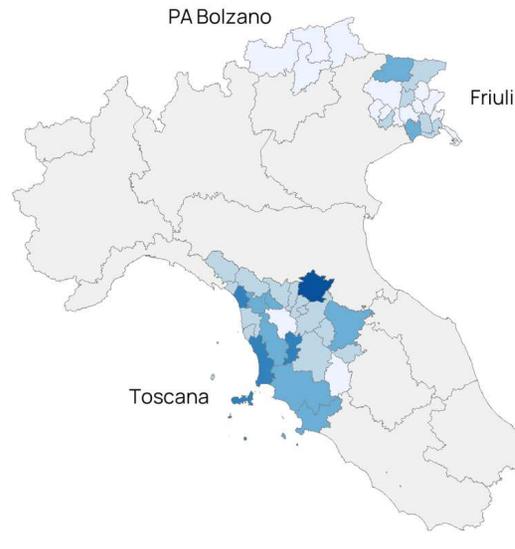
Pre-COVID

HD data - Mean value 2018-2019



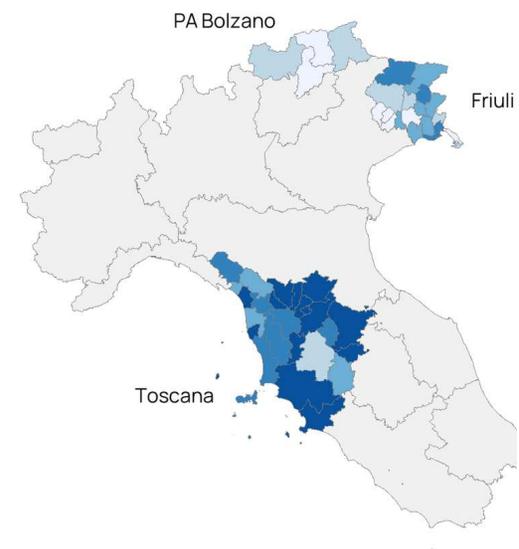
COVID

HD data - Mean value 2020-2021

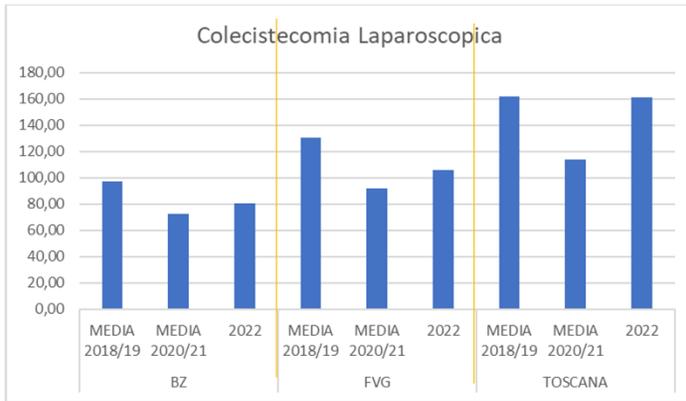


Post-COVID

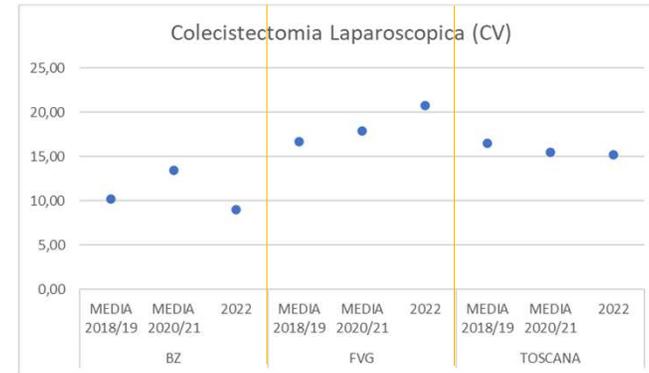
HD data - 2022 value



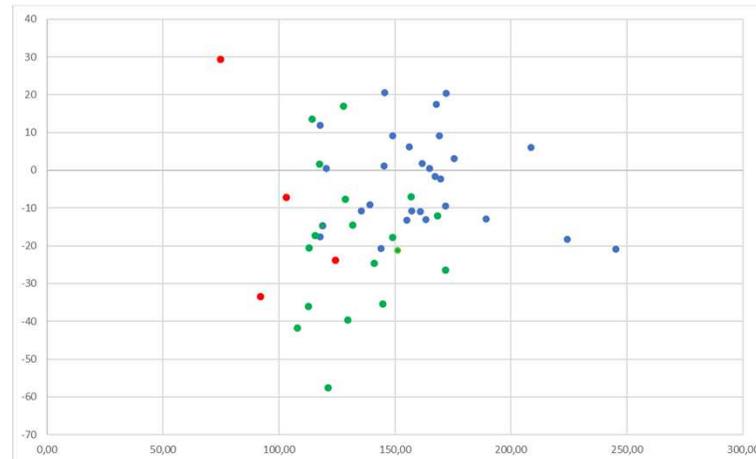
Mean surgical rate across 3 regions in the different time periods



CV across 3 regions in the different time periods



Pearson correlation between pre COVID user-rates and their change considering pre and post COVID



BZ		
FVG		
TOS		
		p
Pearson	0.10	0.5052

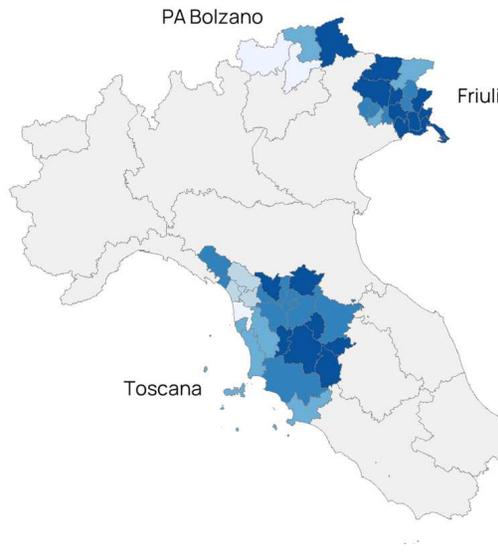


Vein stripping

Std hospital rate every 100,000 resident

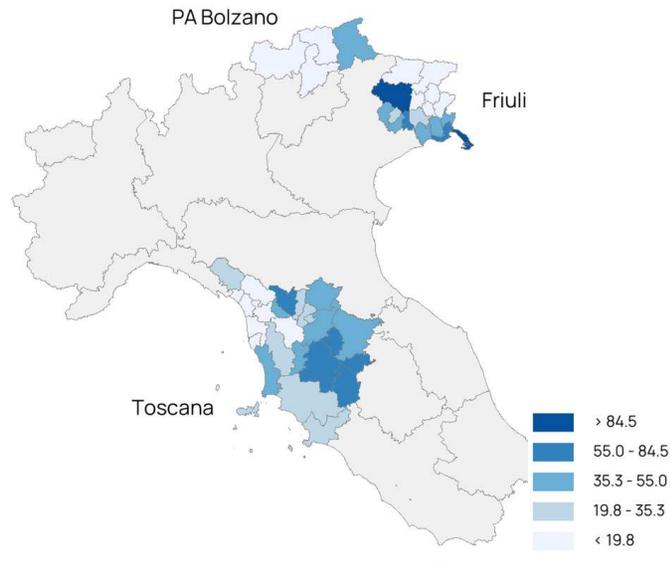
Pre-COVID

HD data – Mean value 2018-2019



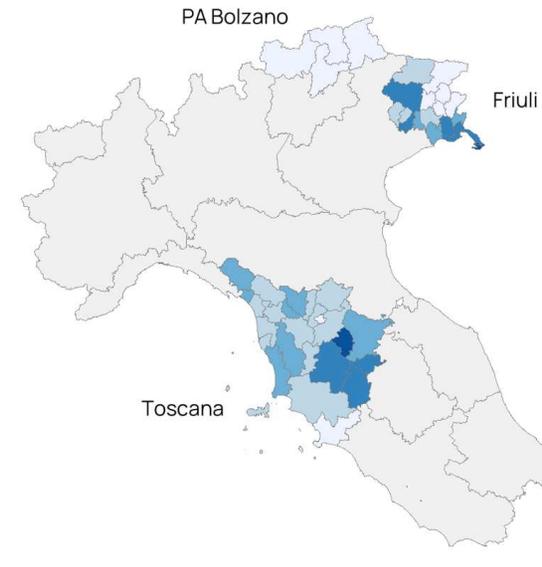
COVID

HD data – Mean value 2020-2021

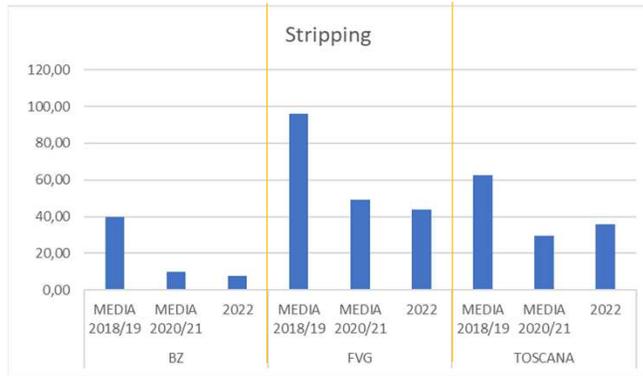


Post-COVID

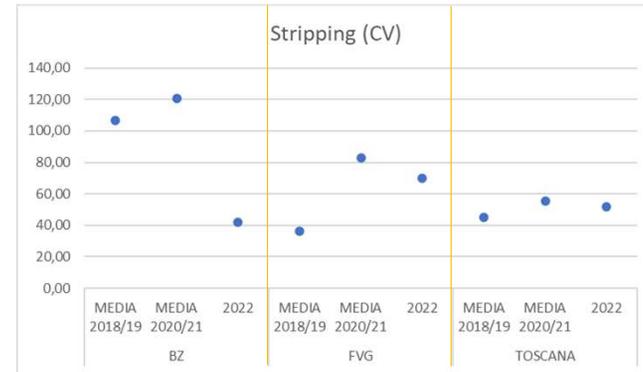
HD data – 2022 value



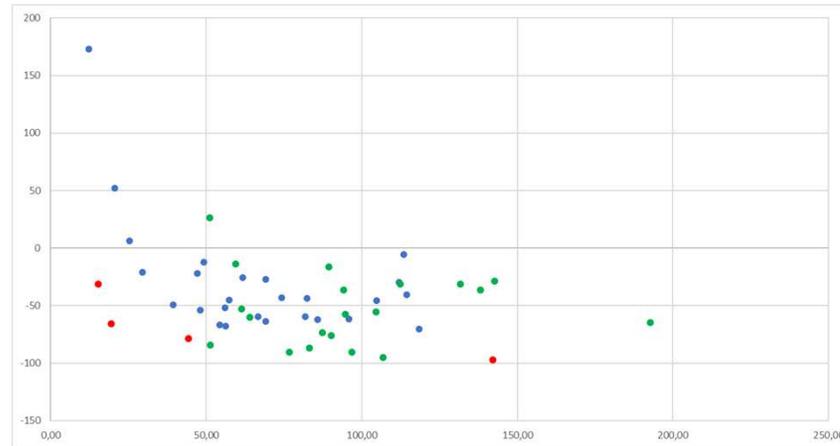
Mean surgical rate across 3 regions in the different time periods



CV across 3 regions in the different time periods



Pearson correlation between pre COVID user-rates and their change considering pre and post COVID



	BZ	FVG	TOS
Pearson	-0.37		
p			0.0088

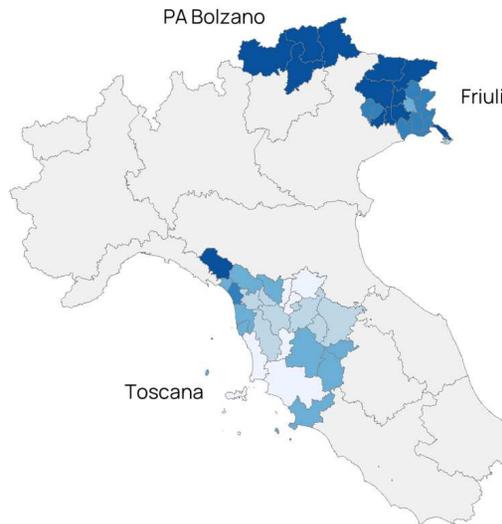


Hip replacement

Std hospital rate every 100,000 resident

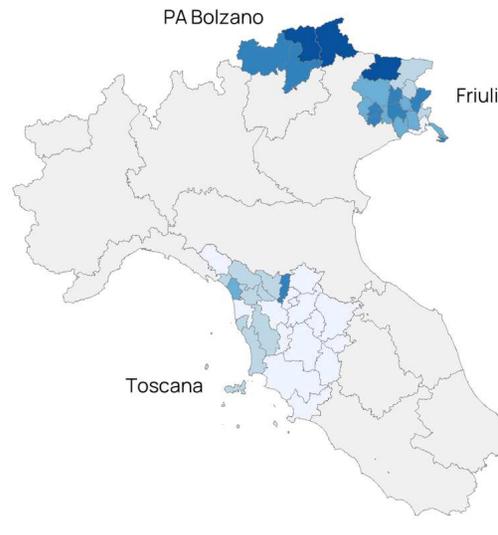
Pre-COVID

HD data – Mean value 2018-2019



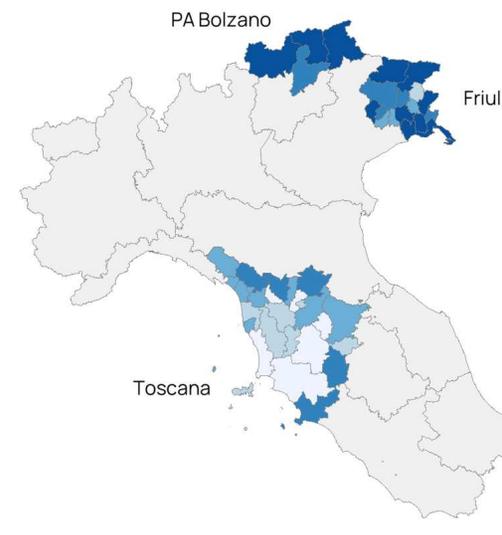
COVID

HD data – Mean value 2020-2021



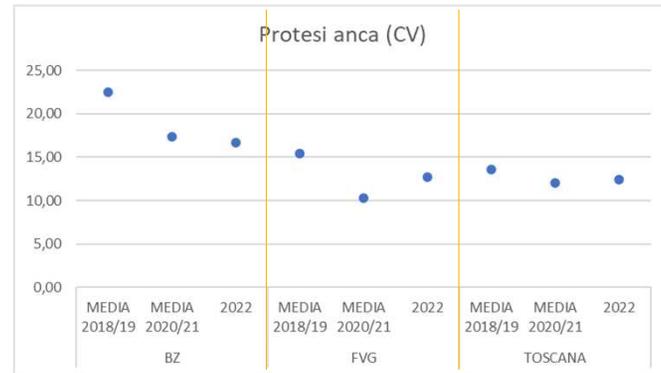
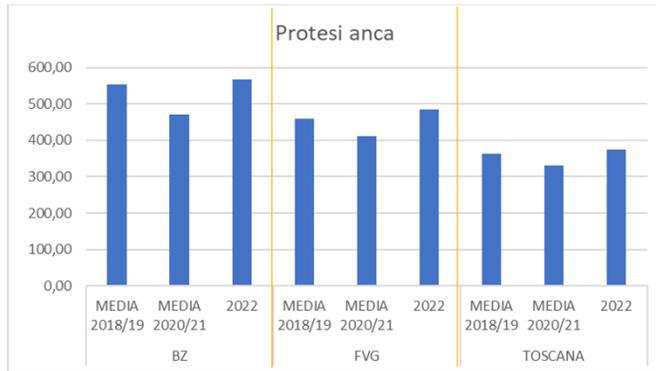
Post-COVID

HD data – 2022 value

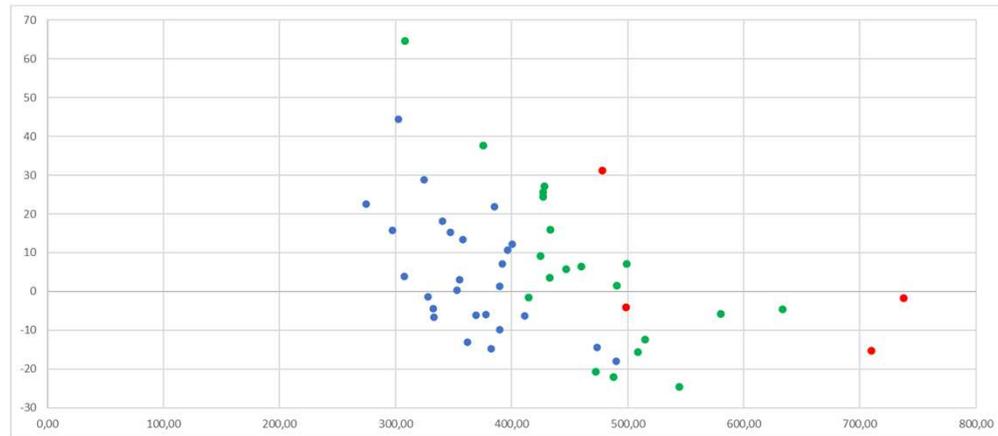


Mean surgical rate across 3 regions in the different time periods

CV across 3 regions in the different time periods



Pearson correlation between pre COVID user-rates and their change considering pre and post COVID



BZ		
FVG		
TOS		
		p
Pearson	-0.44	0.0012

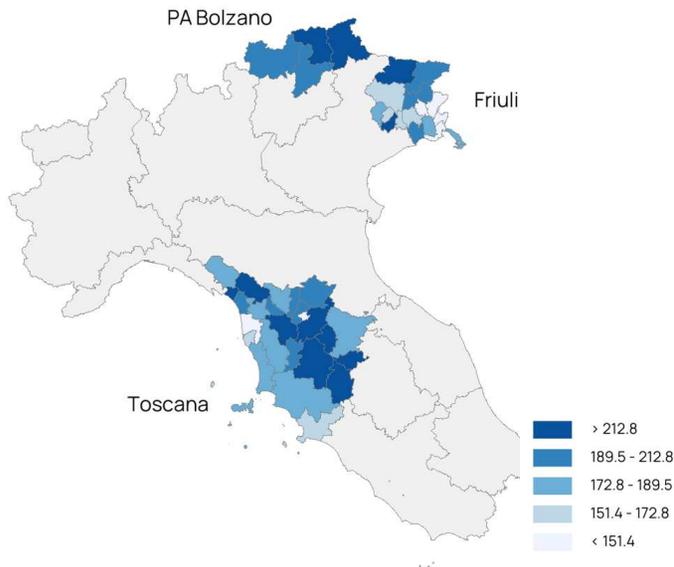


Knee replacement

Std hospital rate every 100,000 resident

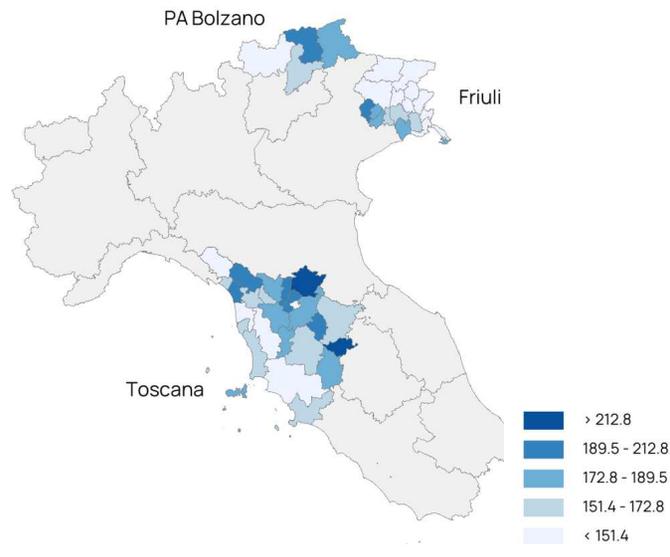
Pre-COVID

HD data - Mean value 2018-2019



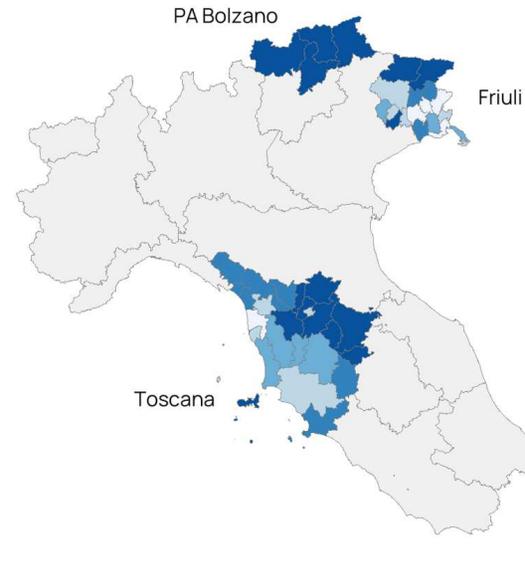
COVID

HD data - Mean value 2020-2021

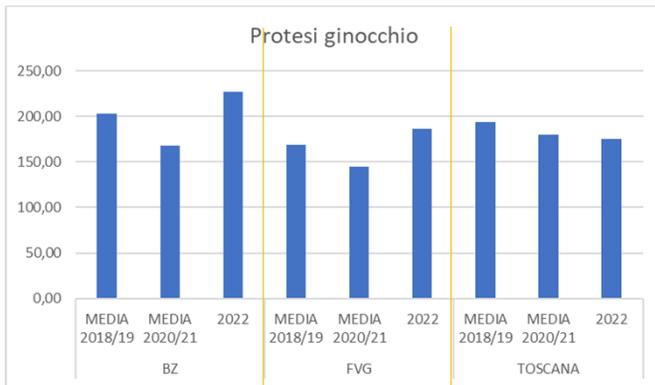


Post-COVID

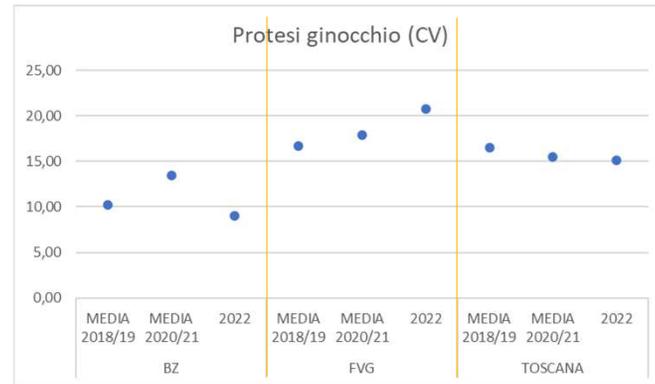
HD data - 2022 value



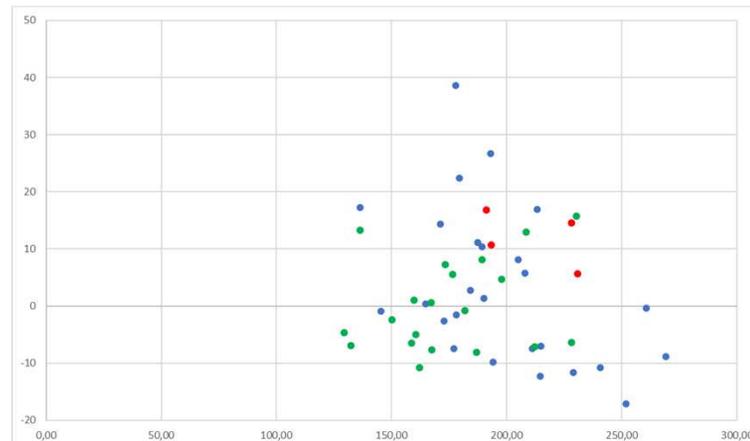
Mean surgical rate across 3 regions in the different time periods



CV across 3 regions in the different time periods



Pearson correlation between pre COVID user-rates and their change considering pre and post COVID



BZ		
FVG		
TOS		
		p
Pearson	-0.14	0.3397

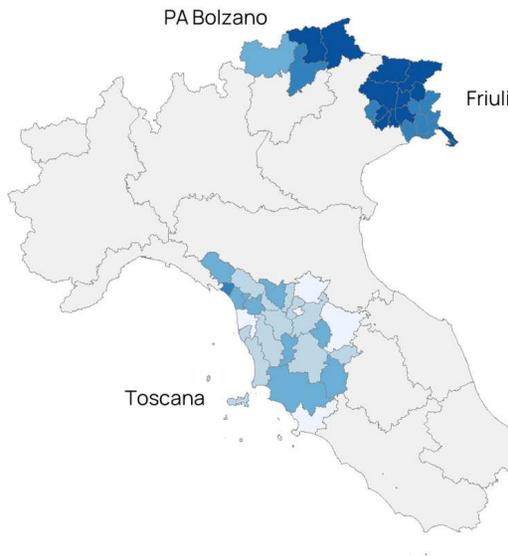


Knee arthroscopy

Std hospital rate every 100,000 resident

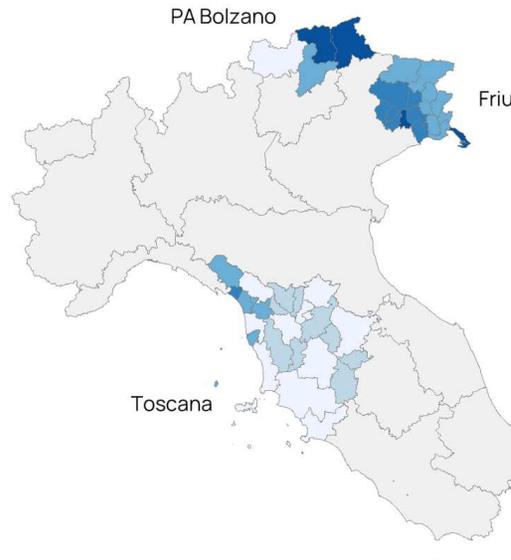
Pre-COVID

HD data - Mean value 2018-2019



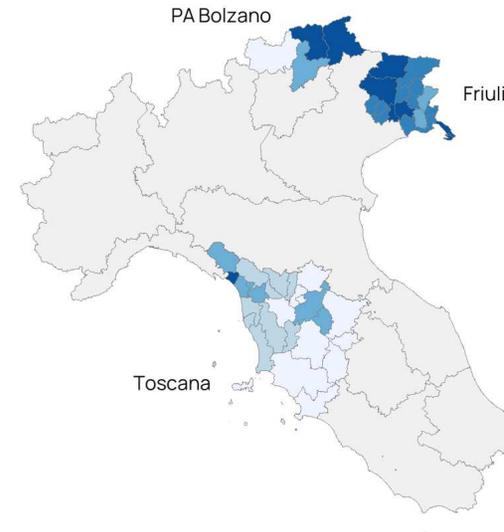
COVID

HD data - Mean value 2020-2021

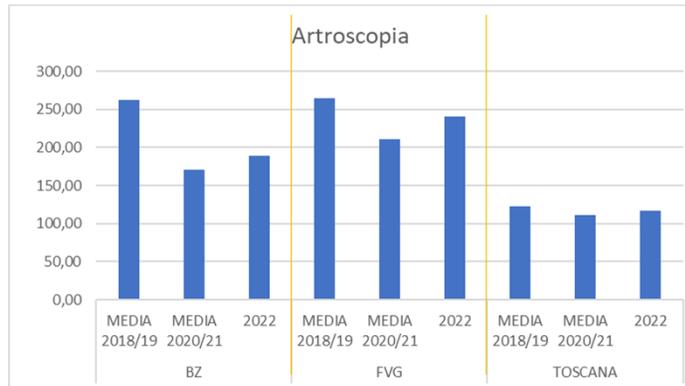


Post-COVID

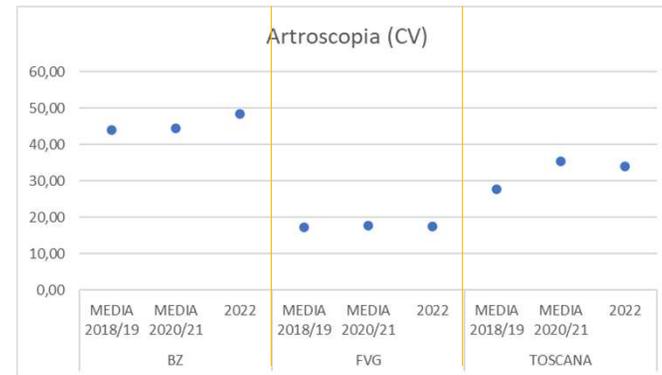
HD data - 2022 value



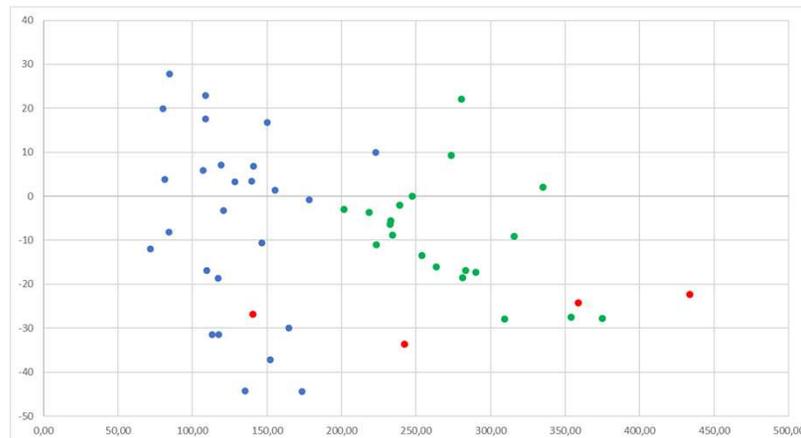
Mean surgical rate across 3 regions in the different time periods



CV across 3 regions in the different time periods



Pearson correlation between pre COVID user-rates and their change considering pre and post COVID



BZ		
FVG		
TOS		
		p
Pearson	-0.27	0.0599



Summary of results

Hospitalization data show a **decrease during the COVID time (2020/21)** and an **increase in 2022, with some values reaching a higher rate than the years prior to COVID**, such as hip replacements in all three regions and knee replacement in Bolzano and Friuli Venezia Giulia **or returned to the pre-COVID level** such as cholecystectomy in Tuscany.

Tuscany displays consistent values related to the CV throughout all procedures and over all periods, while **Bolzano and Friuli Venezia Giulia** results are more variable.

Tonsillectomy (-0.31 , $p = 0.0296$), hip replacement (-0.44 , $p = 0.0012$), and vein stripping (-0.37 , $p = 0.0088$) each showed significant **correlation values** thus suggesting larger reduction in volumes.



Conclusion

The analysis revealed that the impact of COVID-19 has determined a **decrease in hospitalization rates for elective treatments during the pandemic years** (on average - 31%) **and recovery in the following year** (on average 15%), albeit at varying degrees amongst procedures and the three observed regions.

Larger reductions were registered **among potentially inappropriate elective surgeries** i.e. hip replacement, vein stripping and tonsillectomy.

The **differences could be attributed to different factors**, including bed and operating room availability, financial resources, clinical approaches, prioritization strategies, and healthcare settings.

While the statistics indicate that there is some kind of **linear reduction at district level** for **vein stripping, hip replacement, and tonsillectomy**, there appears to be random variation for cholecystectomy and knee replacement.



Main references

- Bonetti, M., & Melani, C. (2023). Effects of Covid-19 on the elective surgery: an approach based on the case of the Italian Province of Bolzano. *Research in Health Services & Regions*, 2(1), 6.
- Ministero della Salute. Linee di indirizzo assistenziali del paziente critico affetto da COVID-19. Circolare prot. GAB 2619 del 29 febbraio 2020. Roma: Ministero della Salute; 2020. <https://www.trovanorme.salute.gov.it/norme/renderNormsanPdf?anno=2020&codLeg=73530&parte=1%20&serie=null>
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- Vola, F., Benedetto, V., Vainieri, M., & Nuti, S. (2022). The Italian interregional performance evaluation system. *Research in Health Services & Regions*, 1(1), 10.



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Thank you!