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Pandemics' backlash: The effects of the 1918 influenza on health attitudes and behavior

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Pandemics' backlash: The effects of the 1918 influenza on health attitudes and behavior*

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Abstract

We study the effects of the largest adverse health shock in modern medicine—the 1918 influenza pandemic—on subsequent shifts in health-related attitudes and behavior and future-oriented policies. Our analysis builds upon self-digitized, individual-level death-register excerpts, vaccination records, and popular vote counts. We find that greater exposure to influenza leads to a decline in societal support for public health measures at the aggregate level, mainly triggered by deceased peers. However, individual-level data reveal increased vaccination rates in families who experienced influenza-related deaths. These differences did not exist before the pandemic. Our findings link to a U-shaped relationship between suffering from the pandemic and support for effective health policies. Places with predominantly indirectly-affected families drive the aggregate backlash. This challenges the idea that past health shocks improve life expectancy through societal learning.

JEL-Classification: I12, I18, H51, D72, N34.
Keywords: Health behavior, Health attitudes, 1918 influenza pandemic, Mistrust.

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1 Introduction

Over the past 150 years, life expectancy in developed countries has increased from around 40 to 80 years—an extraordinary achievement unparalleled in human history (Cutler *et al.*, 2006; Deaton, 2006, 2015). This improvement is primarily due to advancements in health technology and the implementation of public health measures that have facilitated mass immunization campaigns and curbed the spread of infectious diseases, which have mainly killed infants over millennia, including measles, diphtheria, smallpox, and polio.[1] However, UNICEF (2025) has recently reported the lowest measles vaccination rates in the 21st century among many European and Asian countries. At the same time, the U.S. is experiencing the most severe measles outbreaks in recent decades, which are likely associated with low immunization rates.[2]

Scholars have postulated that the recent decline in vaccination rates may be attributable to the COVID-19 pandemic and its negative impact on trust in public health policies (Ratner, 2025). However, the causal effect of adverse health shocks on health attitudes and behaviors—at both the societal and individual levels—remains unclear. The literature has identified two opposing mechanisms through which health adversity affects the perception of public health measures. On the one hand, pandemics can erode trust in science and institutions (Algan *et al.*, 2021; Eichengreen *et al.*, 2021, 2024), which may weaken support for and compliance with public health policies in affected communities. On the other hand, personal losses may reduce risk tolerance (Dohmen *et al.*, 2011; Meier, 2022), potentially increasing compliance with well-established public health measures, including vaccination.

In this paper, we investigate the causal relationship between health adversity and health perceptions at the societal and individual levels, thereby studying the two opposing mechanisms from the literature. We examine how the deadliest health shock in recent centuries has shaped health-related attitudes and behavior, and more broadly, future-oriented perceptions. We focus on the 1918 influenza pandemic—the first global pandemic and the first that occurred in the context of modern medicine (Huremović, 2019)—by linking direct influenza deaths to shifts in health attitudes and behavior. We assembled a unique dataset comprising individual death-register excerpts, aggregated and individual smallpox vaccination records, and popular vote counts from the Swiss canton of Grisons, covering the period before and after the influenza pandemic. This detailed data enables the

[1]Other factors are reductions in foodborne and waterborne diseases (Cutler and Miller, 2005; Costa and Kahn, 2015; Beach *et al.*, 2016; Anderson *et al.*, 2022), and general improvements in nutrition (Brosco, 1999), living standards coupled with economic growth (Fogel, 2004; Deaton, 2015) and air quality in industrialized cities (Beach and Hanlon, 2018; Hanlon, 2024; Clay *et al.*, 2024).

[2]See the reports on the measles outbreak in the US on the World Health Organization (`https://www.who.int/emergencies/disease-outbreak-news/item/2025-DON561`, last accessed April 08, 2025) or the measles tracker provided by the New York Times (`https://www.nytimes.com/interactive/2025/health/measles-outbreak-map.html`, last accessed on May 14, 2025).

investigation of the effects of health adversity in multiple dimensions, such as differences in aggregated and individual effects, the mechanisms at work, the duration of impacts, and the scope of other societal shifts, including political, schooling, or religious outcomes.

The historical setting of the 1918 influenza pandemic in the canton of Grisons provides four key advantages for studying the long-term effects of adverse health shocks compared to more recent pandemics. First, during the 1918 pandemic, scientists and the general public had limited knowledge of effective prevention measures (Zimmer, 2025). This reduces the risk that confounders drive the relationship between pandemic exposure and subsequent health perceptions. For example, testing and the probability of death during the COVID-19 pandemic are endogenous to individual and local characteristics, an issue we can largely exclude in our setting.[3] Second, the 1918 pandemic resulted in widespread and noticeable deaths among the working-age population. In contrast, recent pandemics have mainly led to fatalities among the elderly, who often pass away out of public view in retirement homes or hospitals. In Grisons, with its small-scale municipalities, the pandemic's impact was evident to community members, even for those without any direct family losses. Third, our study adopts a long-term perspective, allowing us to examine how health adversity influences health attitudes and behaviors over time. Specifically, our data on political sentiments and aggregated and individual smallpox vaccination records span the period from 1901/05 to 1933.[4] Fourth, Switzerland, and Grisons in particular, offer distinctive features that allow for precise measurement of exposure to the pandemic and its outcomes. Switzerland did not participate in World War I, which means that war-related casualties and events do not confound our measures of mortality.[5] Moreover, in Grisons, decisions made by the cantonal government on new laws, constitutional amendments, and public budgets were subject to mandatory referendums. These provide insights into public sentiments on various political topics, including health policy, during pre-survey times. In particular, Grisons' voters decided on the continuation of compulsory smallpox vaccination in 1922. This vote offers a unique measure of local public health sentiments. Finally, we leverage death-register excerpts with the official cause of death to identify locality- and family-level influenza exposure and link it to revealed shifts in vaccination rates—data that are largely inaccessible for the COVID-19 pandemic or due to data protection policies.

We begin our analysis by examining influenza mortality in Grisons and its relationship to pre-influenza public health attitudes and behaviors. The canton of Grisons was hit by the influenza pandemic in autumn 1918, at roughly the same time as other European regions.

[3] See determinants of COVID-19 cases and deaths by Albani *et al.* (2022) for the U.K., Hawkins *et al.* (2020) for the U.S. and DeNegri *et al.* (2021) for Brazil, and testing incidences by Mongin *et al.* (2022).

[4] Smallpox vaccines were the most used vaccines in the early 20^{th} century, given to infants and toddlers (initial vaccination) and to adolescents (revaccination). Influenza vaccines did not become available before the 1940s and cannot be studied in the context of the 1918 influenza pandemic.

[5] The 1918 pandemic coincided with the end of WWI, which disrupted economies and caused civilian and military deaths, complicating the identification of the pandemic's impact (Beach *et al.*, 2022a,b).

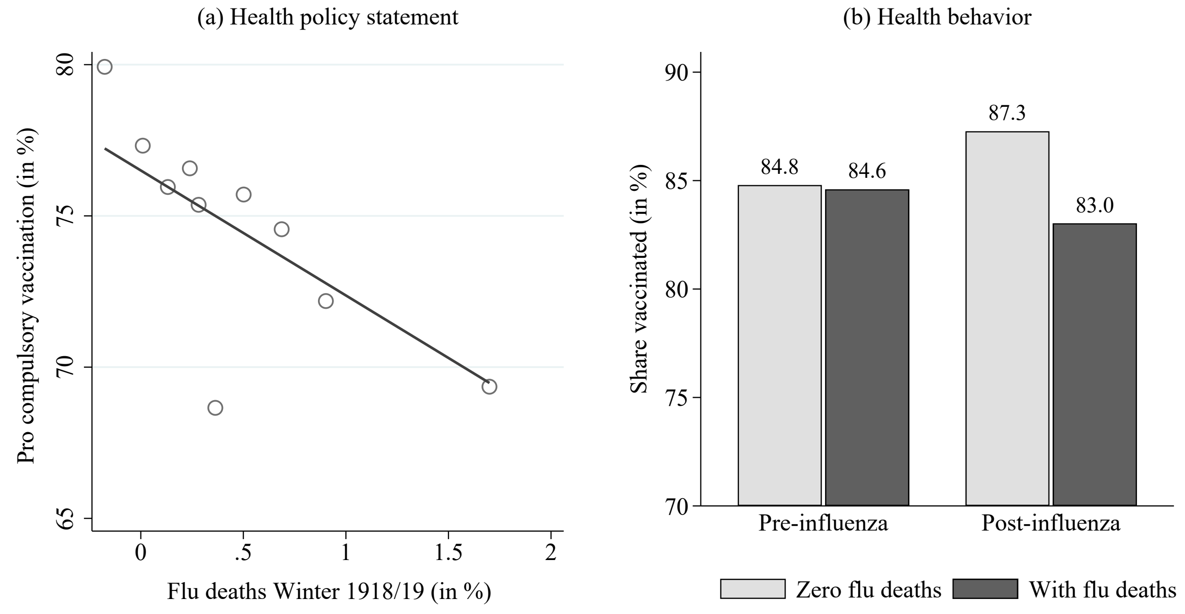
It experienced an excess mortality rate of around 50% in 1918, with monthly excess mortality rates exceeding 175% during the most severe period of the pandemic.[6] There was substantial heterogeneity in affectedness among neighboring places. For example, the most affected municipality, Calfreisen, had a total death rate of nearly 9% and an official influenza death rate of 5.3% during the winter of 1918/19. In contrast, Calfreisen's immediate neighbors were only mildly affected. We use this granular variation among neighboring municipalities for our estimations at the aggregate level. We investigate whether pre-influenza health attitudes—measured by pro-reform vote shares in health-related popular votes—and health behavior—measured as vaccination rates in smallpox vaccination campaigns—are related to influenza mortality during the pandemic. We do not find any correlation in either *levels* or in *trends* between local influenza mortality rates and pre-influenza voting or vaccination behavior at the municipality level. Likewise, families who experienced direct influenza deaths do not exhibit different vaccination rates before the pandemic than unaffected families. These findings suggest that, at both local and family levels, influenza affectedness was exogenous to pre-influenza health attitudes and behavior. We thus claim that any post-influenza shifts in health attitudes and behavior can be causally attributed to the health adversity experienced during the pandemic.

In our main analysis, we study the effects of the influenza pandemic on health-related attitudes and behaviors at both the aggregate and individual levels, employing cross-sectional, event study, and difference-in-differences estimation approaches. We first examine the effects on the societal support for public health measures at the aggregate level. Figure 1 provides suggestive evidence for public health attitudes. Graph (a) presents a binscatter plot between influenza death rates (x-axis) and the pro-vaccination vote share in the 1922 popular vote (y-axis). The graph shows that municipalities with higher influenza exposure exhibit lower support for compulsory vaccination. We test this relation in an event-study design leveraging other health-related popular votes before and after the pandemic and in a difference-in-differences (DiD) model with a triple interaction term that accounts for a general decline in pro-reform sentiments after the pandemic. Across all specifications, our results consistently show that higher influenza death rates are associated with reduced support for compulsory vaccination and public health reforms at the aggregate level.

Figure 1 indicates that influenza exposure also affected health behavior. Graph (b) displays smallpox vaccination rates in affected and non-affected municipalities before and after the influenza pandemic. Prior to the pandemic, vaccination rates were similar across these areas. However, following the pandemic, clear differences emerge, with municipalities experiencing higher influenza exposure showing a relative decline in vaccination rates. This descriptive pattern in Graph (b) is confirmed by difference-in-differences and event-study

[6] These numbers are approximately four times larger than the excess mortality of 13% in 2020, the year with the highest excess mortality during the COVID-19 pandemic in Switzerland. Source: SFS (2025).

Figure 1: Influenza mortality and support for health policy measures



Notes: The figure displays the relationship between direct 1918 influenza affectedness during the influenza pandemic and subsequent health-related attitudes and behaviors across 218 municipalities in Grisons. Graph (a) presents a bin-scatter plot with a corresponding linear fit, showing the association between influenza affectedness and the vote share in favor of compulsory vaccination in the 1922 popular vote (in %). Influenza affectedness is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population. The bin-scatter and the linear fit are conditioned on district fixed effects. Graph (b) shows the health behavior in the pre-influenza period (1913) and in the post-influenza period (1919 and 1921). Health behavior is measured as the share of babies and toddlers (aged 3 to 27 months) who received their first smallpox vaccination. Municipalities without any influenza deaths are shown in light gray bars, and those with influenza deaths are shown in dark gray bars. Vaccination behavior did not differ significantly among municipalities with and without influenza affectedness before the pandemic (p = 0.93), but a statistically significant difference emerged after the pandemic (p = 0.03).

regressions using vaccination data from 1907 to 1933. A one percentage point increase in the influenza death rate is associated with a three percentage point decline in vaccination rates. When comparing affected and non-affected municipalities, the former show a reduction in vaccination rates of over four percentage points. These results are substantial, translating into a relative increase of 33% in the number of unvaccinated children. The negative effects of revealed health behavior persist for roughly twelve years, but by the early 1930s, the differences are no longer statistically significant. The results on both health behavior and attitudes are robust across a wide range of robustness and sensitivity exercises, including alternative measures of influenza exposure, pseudo-periods analyses, sample restrictions, and subsampling strategies. We demonstrate that the results are driven by people who died directly from influenza, rather than non-influenza deaths during the same period, and by individuals who shared similar demographic and economic characteristics with those around them. Finally, we document that voters in more affected places became less supportive of future-oriented policies, such as adopting new technologies or implementing school reforms. Instead, they preferred more economic regulation and public security, and were less likely to send children to high school right after the pandemic.

We then examine the impact of individual exposure on vaccination rates by linking individual smallpox records to the influenza deaths within the same family. Employing a difference-in-differences design, we find that children who lost a family member to influenza were more likely to be vaccinated after 1918. This result holds both at the family level and within a subsample of children where we track children from their initial vaccination as infants or toddlers before 1918 to their revaccination as adolescents after the influenza pandemic. Thus, our data enable us to control for child fixed effects, thereby holding constant unobserved child-specific confounders. The child-level estimates are robust to potential attenuation biases and are not sensitive to local health-care facilities.

We reconcile these seemingly contradictory findings at the aggregate and individual levels by identifying a U-shaped relationship between municipality-level family exposure and vaccination rates. Our results show that the degree of exposure to the pandemic matters—specifically, whether people were directly affected (e.g., through family loss) or indirectly affected (e.g., by witnessing the deaths of neighbors). Support for state-led, scientifically validated health measures is lowest in municipalities with medium levels of exposure, where most residents were indirectly affected by observing the deaths of community members, but not of direct family members. Importantly, these municipalities make up the majority, which drives the aggregated backlash against state-led health measures. In contrast, places with almost no influenza deaths and those where nearly all residents witnessed an influenza death within their families tend to have relatively higher compliance with public health measures. A back-of-the-envelope estimation suggests that the pandemic backlash would have been reversed if the 1918 pandemic had been six to eight times more deadly, i.e., when almost everybody witnessed a family loss. We further document that health adversity influences support for science (evidenced by vaccination) and religiosity in opposite directions. Places with many indirectly affected families reduce vaccination rates but increase the use of religious names for newborns. This increase in religiosity can be interpreted as a coping strategy to deal with adversity (Pargament *et al.*, 1998; Dolcos *et al.*, 2021) or as a protection measure, functioning similarly to insurance.

Our paper contributes to several strands of the literature on public health compliance. Algan *et al.* (2021) find that trust—particularly in scientists but also in the government—is a key determinant of favorable attitudes toward vaccination and non-pharmaceutical interventions during the COVID-19 pandemic. Health shocks tend to erode such trust in science and in political institutions (Eichengreen *et al.*, 2021, 2024; Bičáková and Jurajda, 2025), thereby leading to a negative impact on vaccine uptake.[7] This has been shown in the context of vaccination campaigns misused by state authorities and medical professionals (Alsan and Wanamaker, 2018; Lowes and Montero, 2021; Martinez-Bravo and Stegmann, 2021), but not in the context of a pandemic.[8] Our study fills this void by offering a nuanced perspective on how immediate health adversity through a pandemic influences pro-public health attitudes and behaviors. We find that greater exposure to influenza leads to reduced support for state-driven health policies at the aggregate level—particularly in areas where deaths are primarily observed among non-family members. Drawing on the literature, we interpret this as a consequence of diminished trust in health authorities and institutions. This aligns with findings from Brück *et al.* (2020) who report that awareness of nearby COVID-19 cases lowers trust in others and in institutions—a finding that aligns with our results at the level of municipalities where local influenza cases were visible to the population. In contrast, direct individual exposure (i.e., the loss of a family member) leads to increased vaccine uptake. This is consistent with behavioral research showing that such personal losses reduce risk tolerance (Dohmen *et al.*, 2011; Kettlewell, 2019; Meier, 2022). We interpret the higher vaccination rates in directly affected families as a reflection of lower risk-taking behavior, resulting in increased engagement with local health services.[9] Our empirically documented U-shaped relationship between local influenza exposure and public health compliance highlights a novel distinction in the literature between direct exposure (loss of a family member) and indirect exposure (witnessing deaths in the community).

Second, we contribute to the literature on how adverse shocks in general—and health adversity in particular—affect people's perceptions of politics and institutions by increasing their salience. Prior research has documented a drop in electoral support for incumbents after natural disasters (Gasper and Reeves, 2011), distrust in state authorities following famine exposure (Chen and Yang, 2019), shifts in political preferences after mass shootings in the U.S. (Yousaf, 2021), and the erosion of democratic values after corruption scandals (Rivera *et al.*, 2024). In line with the salience argument, we find that greater exposure to influenza results in a decline in aggregate pro-health attitudes and behaviors, reflecting diminished trust in relevant state authorities and policies. However, we also uncover

[7]The evidence from a paper using data on countries in Africa is conflicting. Flückiger *et al.* (2019) find that individuals from regions heavily affected by the Ebola epidemic report increased trust in government authorities, attributing this to greater appreciation for state control measures and enhanced legitimacy.

[8]Further determinants of pro-public health behavior include peer effects and social pressure (Esguerra *et al.*, 2023; Alsan and Eichmeyer, 2024), monetary incentives (Campos-Mercade *et al.*, 2021; Campos-Mercade *et al.*, 2024), high levels of social capital or low economic inequality (Barrios *et al.*, 2021; Durante *et al.*, 2021; Alsan *et al.*, 2021, 2023), stringent expert communication (Bartoš *et al.*, 2022), and the collective remembrance of past health adversity (Lindskog and Olsson, 2024; Ru *et al.*, 2021; Borisova *et al.*, 2023). Conversely, certain factors undermine public health behavior, including anti-scientific rhetoric from populist leaders (Ajzenman *et al.*, 2023), vaccine skepticism among general practitioners (Steinmayr and Rossi, 2024), and higher regional exposure to COVID-19 (Blanchard-Rohner *et al.*, 2021).

[9]Shifts in attention may also explain this pattern (Maćkowiak *et al.*, 2023): the death of a family member can heighten health awareness, reducing the likelihood of missing vaccination appointments.

differential effects: higher influenza exposure does not uniformly erode trust in government. Instead, skepticism is concentrated in specific future-oriented policy areas—including health, education, and new technologies—while general support for governmental reforms remains largely unaffected. Our comprehensive data thus offers a thorough understanding of what and when health adversity influences perceptions of state and health institutions.

Third, our paper complements the literature on the consequences of pandemics on social and economic outcomes. Differences in exposure to the 1918 influenza pandemic and corresponding non-pharmaceutical interventions (NPIs) have been linked to increased investment in health infrastructure (Esteves *et al.*, 2022) and surges in innovation (Berkes *et al.*, 2023, 2024). The evidence on the impact of the 1918 influenza and its associated NPIs on educational achievements and earnings is mixed.[10] Several studies explore electoral outcomes in the aftermath of the influenza pandemic. In interwar Germany, Bauernschuster *et al.* (2025) document a long-term shift toward left-wing parties perceived as competent in health policy. Foertsch and Roesel (2023) show that robust public health infrastructure reduced the electoral backlash against incumbents. In Malthusian economies, pandemics have been partly credited with triggering the Little Divergence and the decline in fertility patterns in Western Europe, thereby promoting long-term development (Voigtländer and Voth, 2012, 2013). We contribute to this literature by examining a largely overlooked aspect: how pandemics affect health attitudes, health behavior, and other future-oriented attitudes. We find that reduced compliance with health policy persists for up to 12 years after a pandemic. Moreover, we show that health adversity affects support for science and religiosity in opposite directions and that school attainment suffers in the medium term.

The remainder of this paper is as follows. Section 2 discusses the pandemic in Grisons and provides the institutional background of the popular vote system and smallpox vaccination campaigns. Section 3 introduces our self-compiled data and discusses coding details. Sections 4 and 5 analyze the shifts in health attitudes and health behavior, respectively, at the aggregated municipality level and discuss the empirical identification of a causal effect, presenting the results and demonstrating their robustness. Section 6 focuses on the individual level, discusses identification, and presents results and robustness exercises. Section 7 links the aggregate and individual effects to a U-shaped pattern of suffering. Section 8 shows heterogeneous treatment effects, effects on other political domains, effects on educational attainment, and shifts in religiosity. Finally, Section 9 concludes.

[10] Ager *et al.* (2024) find no evidence that school closures affected educational achievement or earnings in the U.S., corroborated by Dahl *et al.* (2022) for earnings in Denmark, while Guimbeau *et al.* (2022) find negative educational effects in Brazil. For the U.S., Almond (2006) reports negative effects of in utero exposure to the 1918 pandemic, while Beach *et al.* (2022a) argue that these results may reflect the lower socioeconomic status of parents in the 1919 cohort. Galletta and Giommoni (2022) document a rise in income inequality in Italy. See Bloom *et al.* (2022) for a review of pandemics' macroeconomic effects.

2 Historical and institutional background

This section provides an overview of the influenza pandemic and explains the institutional background of the popular vote system and vaccination campaigns. We also examine the public discourse surrounding the influenza pandemic and the 1922 vaccination bill.

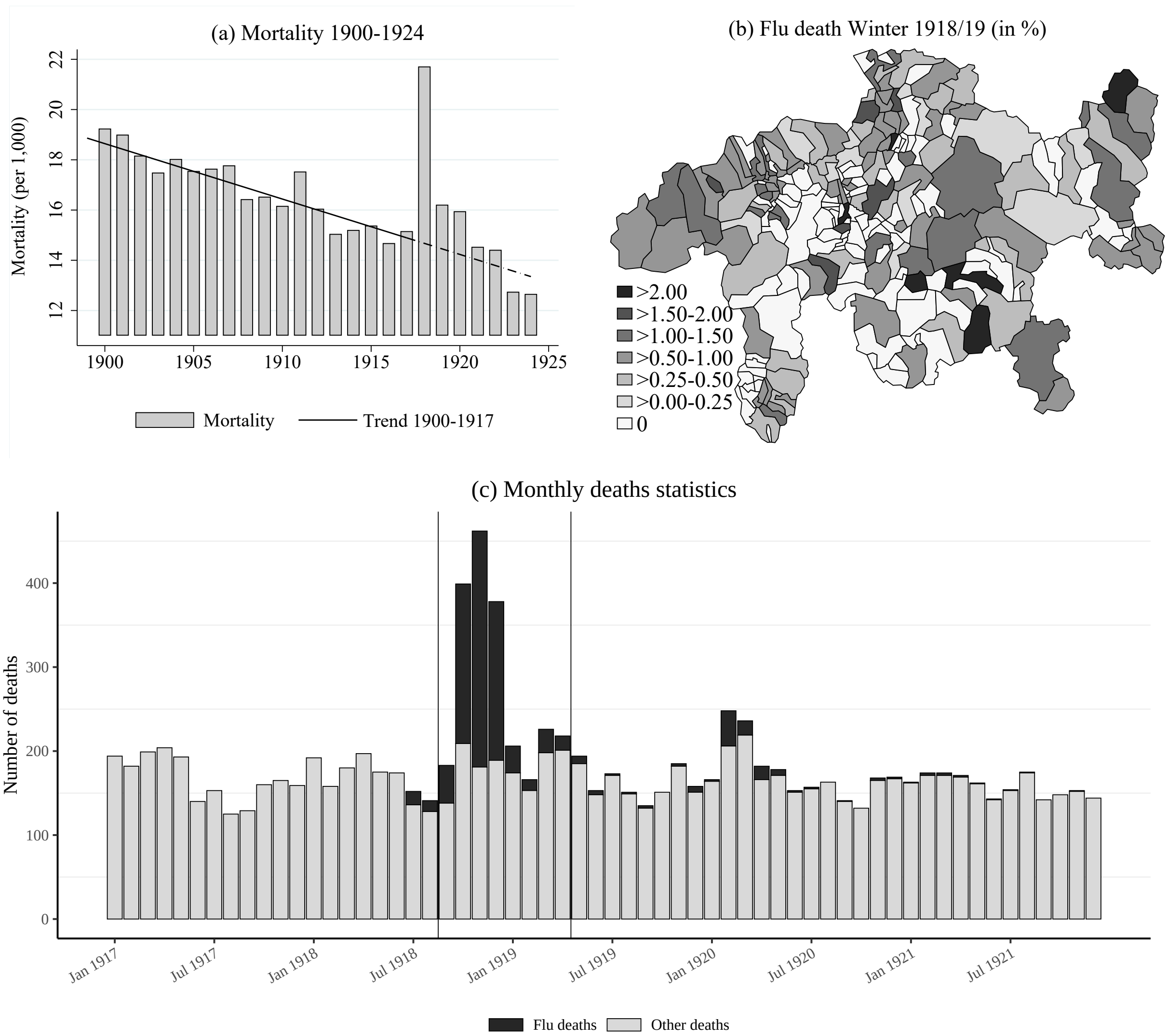
2.1 The 1918/19 influenza in Grisons

The influenza pandemic of 1918/1919 was relatively brief but is widely considered one of the deadliest pandemics in modern history (Huremović, 2019). Estimates of worldwide excess deaths range from 20 to 100 million (Johnson and Mueller, 2002; Taubenberger *et al.*, 2019). In Switzerland, the official direct influenza mortality rate was 19 per 1,000 inhabitants, resulting in an estimated total excess mortality of around 25,000 deaths (SFS, 2018). According to Barro *et al.* (2020), this corresponds to an influenza death rate in Switzerland of 0.76% of the total Swiss population—a rate comparable to neighboring Germany (0.78%), but higher than in the UK (0.46%) or the USA (0.52%).

The pandemic reached Western Switzerland in the Summer of 1918. After a temporary decline in cases, the main wave spread across the entire country, including the canton of Grisons from September 1918 onward (SFS, 2018). Figure 2 depicts several mortality-related statistics based on self-compiled data. Graph (a) reports mortality rates per 1,000 inhabitants. In 1918, the canton experienced an estimated excess mortality of around 50%, relative to the pre-influenza trend. This figure places Grisons close to the Swiss average (see Figure B.1 in Online Appendix B). Graph (c) reports the monthly mortality data by cause of death decomposed into influenza deaths (dark gray bars) and deaths from other causes (light gray bars), based on death-register excerpts. The graph highlights the intensity of the main wave, with excess mortality in November 1918 exceeding 175%.

Excess mortality primarily affected younger cohorts, particularly those aged 20 to 39 (see Figure B.4 in Online Appendix B). In our empirical analysis, we focus on the main wave of the pandemic from September 1918 until April 1919, as indicated by the two vertical lines. Graph (b) of Figure 2 presents a map of the influenza death rates, defined as officially reported influenza deaths divided by the total population in 1910 at the municipality level in Grisons. Notably, heavily affected places are often situated close to non-affected ones. For example, the municipality of Duvin (in the Glenner region), which recorded no deaths, is only about 4.5 kilometers away from the municipality of Vigens, which reported 1.4 influenza deaths per 100 inhabitants. Another extreme case is the municipality of Calfreisen, with a total death rate of nearly 9% and an official influenza death rate of 5.3% during the winter of 1918/19. By contrast, Calfreisen's direct neighbors were only mildly affected (see total and non-influenza mortality in Figure B.2).

Figure 2: Influenza mortality in Grisons



Notes: The figure illustrates the exposure of Grisons to the influenza pandemic in 1918 and 1919. Graph (a) shows the yearly mortality rate in Grisons from 1900 to 1924 (number of deaths per 1,000 inhabitants). The trend line is based on mortality rates from 1900 to 1917 (solid line) and is extrapolated through 1924 (dashed line). Graph (b) presents the direct influenza death rate at the level of 218 municipalities in Grisons. Influenza death rates are defined as direct influenza deaths (based on death-register data) during the main influenza period (September 1918 to April 1919), expressed as a percentage of the total pre-influenza population. Figure B.2 in Online Appendix B also displays the total death rate and the non-influenza death rate during this period. Graph (c) reports the monthly number of deaths from 1917 to 1921, disaggregated by cause of death (influenza death vs. non-influenza death based on death-register data). The vertical lines in Graph (c) mark the beginning (September 1918) and the end of the main influenza period (April 1919). Mortality during this period serves as our primary independent variable throughout the paper.

During the pandemic, state authorities implemented non-pharmaceutical public-health interventions (NPIs) to contain the spread of the A/H1N1 influenza virus. Among others, the government of Grisons prohibited public gatherings and events, including strikes, cinema screenings, the Holy Mass, and dancing events. It also closed schools and recommended the wearing of face masks. We examine the public discourse about the measures through a word cloud analysis of the two leading newspapers in Grisons, as shown in Graph (a) of Figure 3. The newspapers accurately reported pandemic facts—including the number of new cases and deaths, and announced new NPIs—while urging the population to comply with government measures. Although negative sentiments towards the government were largely absent in newspapers, records from the State Archive of Grisons reveal instances of opposition, including efforts by the Catholic Church to continue holding Holy Mass.[11]

2.2 Institutional background

The canton of Grisons is the largest Swiss canton in terms of area. It is a mountainous and thinly populated region with a highly heterogeneous population in terms of language and culture. Swiss cantons have enjoyed significant autonomy, being responsible for education and health policy, public finance, and civil law, among other matters. Grisons' cantonal government was historically weak due to extensive communal autonomy and a strong tradition of popular votes. Almost all decisions by the cantonal government—including new laws, constitutional amendments, and public budgets—were subject to mandatory referendums. In 1880, Grisons introduced a legislative initiative, initially requiring 5,000 signatures from male voters.[12] This expanded system of political rights led to 78 mandatory referendums and five popular initiatives in our sample period from 1901 to 1933. Table A.1 in Online Appendix A lists all these popular votes by political domain and shows the vote outcome and the government's vote recommendation. We use these popular votes to measure the political sentiments of people and how they have changed over time, particularly in relation to the influenza pandemic. We leverage the fact that the cantonal government consistently pursued reform-oriented laws and amendments, while the population tended to favor the status quo. This allows us to trace pro-reform sentiments in political campaigns by analyzing pro-government vote shares. There are three exceptions——popular initiatives that the government opposed—because these proposals were considered too radical or inconsistent with established knowledge or common sense.

2.3 Compulsory vaccination and the popular vote of 1922

In 1798, English physician Edward Jenner developed a smallpox vaccine—the first vaccine ever created. In Grisons, the first children were vaccinated in 1801, and by 1807, the canton had already begun fully covering vaccination expenses. To increase vaccination rates, Grisons introduced compulsory smallpox vaccination in 1867—similarly to many other Swiss cantons at the time. The canton kept mandatory vaccination until 1973 (IKG-SAG,

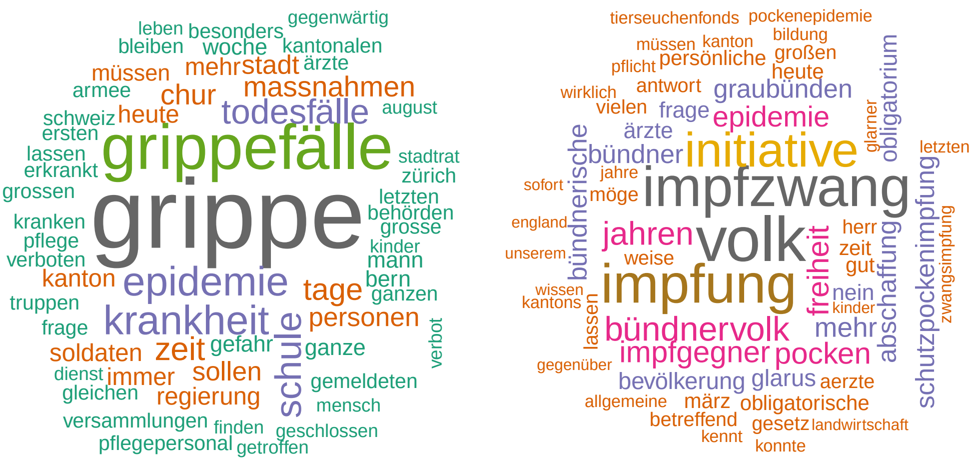
[11]Police reports document violations of these measures and the penalties imposed, i.e., fines of up to 5,000 Swiss Francs. Police reports can be retrieved by the State Archives of Grisons (SAG).

[12]See *Historisches Lexikon der Schweiz* for the institutional setup (`https://hls-dhs-dss.ch/de/articles/007391/2023-08-29/#HPolitischeGeschichteab1797`), last accessed on April 08, 2025.

2024).[13] The cantonal health ministry organized biannual vaccination campaigns during the spring, i.e., before the school holidays, which were offered free of charge. District doctors were responsible for supervising the campaigns and providing reports on vaccination success and reasons for absenteeism, as well as tracking children who received vaccinations elsewhere. Municipal authorities were responsible for providing a list of children to be vaccinated. Children were expected to receive their first vaccination as babies or toddlers (between four months and 27 months) and a revaccination as adolescents (at around 13 years old, typically before leaving school). State authorities were authorized to impose a fine of up to 5-10 Swiss francs on parents who failed to comply with the vaccination law. However, penalties were rarely enforced.[14]

Figure 3: Word cloud analysis of local newspapers

(a) Influenza pandemic (b) Popular vote on vaccination



Notes: The figure presents a word cloud analysis of local newspaper coverage on the influenza pandemic (Graph (a)) and the 1922 popular vote on compulsory vaccination (Graph (b)). The newspaper articles are drawn from the two main local newspapers of Grisons: *Der Freie Rätier* and *Neue Bündner Zeitung*. The word clouds in Graph (a) are based on all articles that contain the words "Grippe (flu/influenza)", "Pandemie (pandemic)", or related synonyms from July 1918 to December 1918. The word cloud in Graph (b) is based on all articles that report on the popular vote on compulsory vaccination prior to the polling day on March 05, 1922. The centrality and the font size of the words relate to their relative frequency in the text corpus.

In the early 1920s, a group of individuals critical of vaccination launched a popular initiative to abolish compulsory smallpox vaccination in Grisons. The main argument of the initiators was that vaccination should not be mandatory, but a free choice of individuals.

[13] In Switzerland, a federal law requiring compulsory smallpox vaccination was rejected in a popular vote in 1882. Thereafter, many Swiss cantons stopped compulsory vaccination. By 1922, only seven cantons (out of 25) in Switzerland had a compulsory vaccination law, among them Grisons.

[14] This information stems from a message of the cantonal parliament to the municipalities (German: *Der Grosse Rat des Kanton Graubündens an die Gemeinden desselben, 30. November 1921*) and from the decree on smallpox vaccination (German: *Verordnung über die Pockenschutzimpfung* from 1949) that outlined the procedures and responsibilities of the involved state authorities. This decree largely remained unchanged over the years and can be accessed in the State Archive of Grisons (SAG).

They claimed that vaccination costs covered by the state lead to disproportionally high vaccination rates. The government and the parliament strongly advocated for maintaining the mandate—59 of 66 MPs voted for a continuation of compulsory vaccination. They argued that vaccination is only effective if enough individuals are vaccinated, that the costs of the campaigns are low, and that cantons with no compulsory vaccination recently had suffered heavily from local smallpox outbreaks. In the end, about 66% of voters in Grison rejected the initiative, thereby supporting the continuation of compulsory vaccination. Graph (b) in Figure 3 illustrates the debate as reflected in local newspapers. The sentiments expressed in the press align with the general support for vaccination. Newspapers appealed to civic duty, highlighted the worldwide success of smallpox vaccinations, and reported on smallpox cases in regions with low immunization rates.

3 Data and descriptives

We describe the self-compiled data used in our analysis. Our primary data sources include collected and digitized handwritten transcripts of death-register excerpts, voting records, and local vaccination reports, which we merged with official census data and additional covariates. We provide further details on data sources, coding, and access modalities in Online Appendix A. In the first part of our analysis, we focus on a consolidated number of 218 municipalities in Grisons.[15] In the second part of the analysis, we rely on self-compiled family- and child-level data in the region of Glenner, a subregion of Grisons with similar features and health-related behaviors to those of the entire canton.

3.1 Death-register excerpts

In contrast to most studies on the 1918 influenza pandemic, our analysis does not rely on statistical estimates of excess mortality. Instead, we use primary sources to determine the exact numbers and causes of death at a highly granular level. Specifically, we accessed local death-register excerpts from all 218 municipalities in Grisons for the years 1917 (the last full pre-influenza year) to 1921 (the year before the popular vote on compulsory vaccination). These death-register excerpts are handwritten official documents issued by each municipality's civil registration office. Figure A.1 in the Online Appendix A provides an example. We digitized all relevant information for our analysis. These are (i) the cause of death according to a doctor (e.g., influenza), (ii) the deceased's names (to be merged with vaccination reports for the individual-level analysis), (iii) dates of death and birth, (iv) place of residence and origin, (v) gender, (vi) occupation, and (vii) marital status.

[15]During our study period from 1901 to 1933, the number of municipalities declined slightly from 224 to 218 due to mergers. We follow these mergers and aggregate all data to the 1918 new municipalities.

On average, approximately 150 people died each month in Grisons between 1917 and 1921, as shown in Graph (c) of Figure 2. This number nearly tripled during the peak months of the influenza pandemic (October to December 1918), primarily driven by officially reported influenza deaths. Panel A in Table B.2 in Online Appendix B presents descriptive statistics of influenza deaths during the winter of 1918/19. We find that official influenza deaths are almost evenly distributed between women and men, that individuals aged 20 to 40 account for the highest proportion of deaths, and that approximately 58% of Grisons' municipalities reported at least one influenza death. Figure B.4 further illustrates the number of deaths by age group and year from 1917 to 1921, confirming that younger cohorts were most affected by excess mortality.[16] Online Appendix A.1 provides more details on the death-register excerpts, coding, and access modality.

3.2 Vaccination campaigns (locality and individual level)

We use vaccination rates and documented reasons for vaccination absenteeism from local smallpox vaccination campaigns (for both initial vaccination and revaccination) in Grisons from 1907 to 1933 as a measure of health behavior. Most of the data were accessed through the State Archives of Graubünden (SAG), though we also visited all municipality archives in the region of Glenner to fill in missing years for our individual-level dataset. The SAG does not retain vaccination reports before 1907 and after 1933, and records are missing for 1909, 1911, 1915, and 1917. We digitized and coded the following vaccination records:

District/regional summaries: Most vaccination data for our panel from 1907 to 1933 at the municipality level come from regional/district summaries. Figure A.2 shows an example for the region of Heinzenberg for 1919 (initial vaccination). These summaries are lists compiled by the local health authority and contain information on all municipalities in the region, including the total number of children to be vaccinated, the number of children who were vaccinated during the campaign, and summaries of unvaccinated children according to the reason for vaccination failure or absenteeism. Reasons for failure are often supplemented with an additional comment (German: *Bemerkungen*), including cases such as children being too young, attending the vaccination campaign but deemed too sick or too weak for vaccination, ineligibility due to a disability (e.g., Down syndrome), having relocated or having died. The reports also indicate whether children were vaccinated elsewhere. Reasons for absenteeism include excused absence, unexcused absence, and the label "*renitent*", which means that public health authorities classified the family as strict vaccination resisters.[17] We coded all vaccination campaigns consistently by subtracting those who were too young, relocated, deceased, and disabled from the total number of

[16] Figure B.2 shows the regional variation of total deaths and non-influenza deaths during the main influenza period, and Figure B.3 shows the histograms of influenza deaths and total death frequencies.

[17] Since the label *renitent* is also used in the initial vaccination for children at the age below 2.5 years, the term refers to the parents/families. We label such families as "vaccination-skeptical families".

children to be vaccinated. We also adjusted the data to account for cases where vaccinations were administered later or elsewhere.

Municipality records with individual names: We accessed vaccination records at the municipality level to fill data gaps in district/regional summaries and to create an individual-level dataset by linking the surnames of children and families to those of individuals who died from influenza in the region of Glenner. The SAG also stores municipality-level vaccination records. Moreover, we visited all 38 municipality archives in Glenner to fill gaps and to find data for the vaccination campaigns in 1905, 1909, 1911, 1915 and 1917 for the individual-level data. Figure A.3 in Online Appendix A.2 shows a vaccination record of an initial vaccination campaign in 1929 in Fellers/Falera, signed and stamped by the local authorities. We use the information on the number of children on the list (children to be vaccinated) and code the vaccination success, reasons for vaccination failures, and absenteeism (similar to the district/regional summaries). We also collect the surnames and first names of the children, as well as the surnames and first names of the father, and the first name and maiden name of the mother, to link these family names to local deaths for the individual analysis. With all this information, we match families and link children in their initial vaccination to their revaccination behavior 12 years later.

Our vaccination data at the level of 218 municipalities covers around 83% of all possible municipality-campaign-vaccination type combinations.[18] In Table B.1 in Online Appendix B, we show that data availability is unrelated to influenza deaths. Panel C in Table B.2 and Figure B.5 present descriptive statistics on vaccination rates and absenteeism at the municipality level and over time. On average, around 87.5% of all children to be vaccinated received their vaccination. This rate remained relatively stable from 1907 to 1933 and was slightly higher in the revaccination campaigns compared to the initial vaccination. Most unvaccinated children were officially excused, while only around 2.5% of all children to be vaccinated are labeled as "unexcused" or belonging to a "vaccination-skeptical family". However, the group of "unexcused" cases increased slightly after the influenza pandemic (see Figure B.5 for a graphical overview). Table B.3 presents descriptive statistics for our individual-level data in Glenner. In total, we observe nearly 11,000 child-vaccination cases, including 1,039 children whom we observe both before the pandemic for their initial vaccination and after for their revaccination. Overall vaccination rates in Glenner are similar but somewhat smaller than in Grisons as a whole (around 80% in Glenner compared to 87% in Grisons). Based on our definition of families that accounts for degrees of kinship, i.e., sister-/brother-in-law, around 44% of children stem from a

[18]There are 218 municipalities over 10 vaccination campaigns between 1907 and 1933, divided into initial vaccination and revaccination. Thus, a fully balanced panel would consist of 4,360 observations ($218 \times 10 \times 2$), of which we have data on 3,614, which is 82.9% ($3,614/4,360$). Missing data are either due to absent records in the archives or from—mostly very small—municipalities without any children to be vaccinated in a given year and in a given vaccination type.

family having direct exposure to death from influenza. We provide more details on data, coding/cleaning, and access modalities for the vaccination data in Online Appendices A.2.1 (district/regional summaries) and A.2.2 (municipality records).

3.3 Popular votes

We utilize the universe of 83 cantonal popular votes in Grisons from 1901 to 1933 to measure local political and pro-government sentiments and their shifts in the early 20^{th} century. We retrieved handwritten records of most voting results from the SAG. These records include the number of eligible voters (restricted to men) and the number of "Yes" and "No" votes cast. For four of the popular votes, however, records were missing. To fill these gaps, we accessed newspapers from the days following the respective votes, available at the Cantonal Library in Chur.[19] We then categorized all popular votes by political domain. In total, we define ten political domains, ranging from "health policy" and "economic policy" to "hunting and fishing laws", among others. Table A.1 in Online Appendix A lists all these popular votes by domain, indicates the type of the bill (referendum or initiative), describes the content, and reports the government's voting recommendation—i.e., whether voters were advised to support or reject the proposal. We use deviations from the government's recommendation as a proxy for anti-government sentiments, which also reflects broader anti-reform sentiments. Panel B of Table B.2 presents descriptive statistics on voting behavior, measured by vote share aligned with the government, as well as voter turnout. On average, the pro-government vote share is approximately 55% and voter turnout is around 58%. Figure B.6 illustrates a slightly increasing trend in turnout over time, while pro-government vote shares remain relatively stable but exhibit high volatility.

3.4 Further variables

We collected a battery of additional data. First, we retrieved decennial census data at the municipality level from the Swiss Federal Statistical Office, covering various socio-demographic characteristics. Second, we assessed hard copies of special issues of the Swiss census, including the historical age structure of municipalities in 1880, the commuting population in 1910, and economic sector shares in 1920. Third, we extracted mortality data for all Swiss cantons from 1901 to 1925 from the annual editions of the Statistical Yearbook of Switzerland (German: *Statistisches Jahrbuch der Schweiz*). Fourth, we obtained Grisons-specific data from the SAG and from the cantonal homepage, including information on operating doctors and hospitals during the influenza pandemic, the number and names of churches, and the number and origin of students in higher education institutions (high school). Finally, geographic data, train access information, and shapefiles of the territorial

[19]Newspapers only list the total number of Yes and No votes per municipality, but not the number of eligible voters. We interpolated them from the popular votes before and after.

boundaries in the 1920s were sourced from the Swiss Federal Statistical Office. Online Appendix A.4 discusses the source and access modalities. Panels F and G in Table B.2 report descriptive statistics of these municipality covariates for 1910 and 1920, respectively. The average municipality in Grisons is relatively small, with a population of around 540—approximately 430 if we exclude the two largest cities, Chur and Davos. The majority of people speak Romansch (45%), followed by German (38%) and Italian (16%). The sex ratio and religious denomination (Catholics, Protestants) are nearly balanced. Economically, the canton remained rather agricultural, with 72% of the population working in agriculture in 1920, and fewer than 3% commuting between municipalities.

4 Aggregate impact on health attitudes

This section links influenza affectedness to shifts in health-related attitudes at the municipality level. We focus on the popular vote on compulsory vaccination in March 1922. We discuss the empirical identification, the results, and the robustness and extend the analysis by incorporating health-related popular votes before and after the pandemic using event-studies and triple-interaction models.

4.1 Empirical model and identification

We begin by exploiting the granular variation of direct influenza affectedness with a cross-sectional specification. Specifically, we investigate whether pro-compulsory vaccination vote shares differ among neighboring municipalities with varying levels of influenza affectedness. Our empirical model takes the following form:

$$Y_i = \alpha + \beta(Share\,Flu\,Death_i) + \lambda_d + X'_{i,1910}\gamma + \epsilon_i \tag{1}$$

where Y_i describes the vote share (in %) in favor of pro-compulsory vaccination in municipality i. Our independent variable of interest is denoted by $Share\,Flu\,Death_i$. It is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919 as a share of the total pre-influenza population based on the census in 1910 (in %). We also estimate Equation (1) with a bunch of alternative definitions of influenza affectedness to show the robustness. The parameter β is our parameter of interest that measures how influenza affectedness impacts support for compulsory vaccination. λ_d is a set of district dummies to control for district fixed effects, enabling us to estimate the effects within neighboring municipalities.[20] $X_{i,1910}$ is a vector of municipality control variables that mainly stem from the Swiss census in 1910.[21] Control variables include locality characteristics (population size, train access, sea level,

[20]Our sample is divided into 34 districts. This implies that we estimate the impact of influenza affectedness on health attitudes within clusters of around six to seven municipalities (218/34 = 6.41).

[21]Data on sector shares of residents stem from 1920 since these data are not available before WWI.

doctors and hospitals in 1918), demographic characteristics (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), housing conditions and the pre-influenza trend of socio-demographic variables (change in population, language, religion, foreigners and living conditions). The parameter α is a constant and ϵ_i is the error term. We estimate Equation (1) using ordinary least squares (OLS) and apply spatially clustered standard errors with a spatial cutoff of 15 kilometers (Conley, 1999, 2010). We report standard errors with different spatial cutoffs and alternative clustering approaches in the robustness exercises.

The most crucial assumption for any causal interpretation of whether influenza affectedness impacts vaccination attitudes is that influenza affectedness is uncorrelated in both stocks and trends with pre-influenza health attitudes and health behavior. Our detailed data allow us to empirically test this assumption. First, for stocks, we show unconditional correlations and the respective p-values between influenza affectedness at the municipality and individual levels and measures of pre-1918 health attitudes and health behavior in Columns (3) and (4) of Table 1. For health attitudes, we take all popular votes related to health policy from 1901 to June 1918. We do not find any correlation between influenza affectedness during the pandemic and pre-influenza voting behavior and turnout in health-related popular votes (Panel A). For health behavior, we document that influenza affectedness is not related to pre-influenza vaccination behavior by linking local smallpox vaccination rates of young children and adolescents (in total, initial vaccination, and revaccination) and the respective reasons for vaccination absence (excused absence, unexcused absence, from vaccination-skeptical family) in Panel B in Table 1. These findings corroborate the impression of Graph (b) in Figure 1. Panel C in Table 1 further shows that directly affected families in the region of Glenner did not have different vaccination rates before 1918. Second, for trends, we find strong support for the parallel trend assumption in health attitudes and behavior with influenza affectedness.[22] In summary, influenza affectedness seems to be exogenous to pre-influenza health attitudes and behavior.

Third, we include district fixed effects in our regressions to account for regional heterogeneity. Often, districts are valleys with their own cultural and regional characteristics. District fixed effects compare the effects within groups of six to seven municipalities on average.

Fourth, we test whether the influenza spread randomly, given local characteristics, in three different ways. First, Table B.4 in Online Appendix B displays unconditional correlations and p-values of measures of influenza affectedness with time-invariant and pre-influenza time-varying municipality characteristics and their pre-influenza trends. Second, Table B.5 shows regression-based balance tests in which we regress measures of influenza affectedness

[22] We show event-study regressions on shifts in health attitudes in Figure 4 (Section 4.2) using pre-influenza popular votes on health bills together with the vaccination bill of 1922 in a panel setup, and we show event-study regressions on shifts in vaccination rates in Figure 5 (Section 5.2).

Table 1: Balance table of pre-influenza health attitudes and behavior

	Summary Statistics		Balance Table with Share Flu Deaths	
	Mean (in %)	Std. Dev.	Unconditional Correlation	p-value
	(1)	(2)	(3)	(4)
Panel A: Pre-influenza health statements in popular votes, 1901—1918				
All health-related popular votes [a]				
Yes share (Pro-government)	52.542	36.542	0.007	0.824
Turnout	51.632	23.969	-0.031	0.312
Popular votes w.r.t. health care supply [b]				
Yes share (Pro-government)	59.864	32.323	-0.033	0.488
Turnout	60.641	23.063	-0.048	0.318
Popular votes w.r.t. health prevention policies [c]				
Yes share (Pro-government)	69.217	34.487	-0.022	0.747
Turnout	39.900	22.604	-0.059	0.384
Panel B: Pre-influenza vaccination behavior, 1907—1913				
Vaccination rates				
Share vaccinated children (all)	86.064	15.702	-0.023	0.512
Share vaccinated initial vaccination	86.739	13.991	-0.016	0.757
Share vaccinated re-vaccination	85.381	17.249	-0.029	0.564
Reasons of vaccination absence				
Share excused children	12.733	15.028	0.003	0.924
Share not excused children	1.146	5.821	0.051	0.149
Share awkward families	0.058	0.542	0.030	0.393
Panel C: Family- and child-level pre-influenza vaccination behavior, 1905-1917				
Family-level affectedness				
Vaccination behavior pooled (0/1)	0.769	0.372	-0.002	0.993
Child-level affectedness				
Vaccination behavior pooled (0/1)	0.850	0.357	-0.006	0.809

Notes: The table presents summary statistics and balance tests for proxies for pre-influenza health attitudes and behavior. Columns (1) and (2) report the mean and standard deviation of each variable, respectively. Columns (3) and (4) present the unconditional correlations between influenza affectedness and pre-treatment health attitudes and behavior, along with their corresponding p-values at the level of 218 municipalities. Influenza affectedness in Columns (3) and (4) is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population. Unconditional correlations and p-values are calculated using Stata's *pwcorr* command. Panel A includes all popular votes between 1901 and March 1918 related to health policy; these are: (a) all five health-related popular votes before the influenza pandemic; (b) votes addressing the expansion of health-care supply (e.g., the nursing bill and the bill on the construction and operation of a psychiatric clinic); and (c) votes on health prevention policies (e.g., anti-tuberculosis measures). Table A.1 in Online Appendix A lists all health-related popular votes before and after the influenza pandemic. Panel B includes data from local smallpox vaccination campaigns in 1907 and 1913. It reports vaccination rates (vaccinated children as a share of all listed children assigned to be vaccinated) and rates of vaccination absence by reason (children absent for specific reasons as a share of those assigned for vaccination). Panel C draws on family- and child-level data from the Glenner region, showing children's vaccination rates in relation to affected families before the influenza pandemic. Family-level vaccination rates link pre-influenza vaccination behavior of all children to direct influenza deaths within that family. Child-level rates link the pre-influenza vaccination behavior of children observed in both the pre-influenza period (initial vaccination) and the post-influenza period (revaccination).

on local characteristics and their trends. Lastly, Table B.6 shows conditional correlations and potential shifts of covariates with influenza affectedness from the pre- to the post-influenza period. These tables report correlations and coefficients with our main measure of influenza affectedness (*Share Flu Deaths*) and overall mortality. Municipalities more exposed to the influenza pandemic are observationally almost similar in terms of local characteristics. However, exceptions are train connection, population size, location of hospitals, and the share of Catholics—measures that support the spread of viruses due to more potential contacts with other people. Column (3) in Table B.6 shows that these variables do not change with influenza affectedness over time. Nevertheless, we address these threats for a causal interpretation in various robustness tests in which we exclude certain municipalities (i.e., with hospitals) or perform regressions within subsamples (with and without train connection, by population size and Catholic shares). We also control for all these potential confounders in the empirical model. Indeed, we include all control variables listed in Tables B.4 and B.5 in our estimations.

Finally, our specific setting makes a causal interpretation more likely. First, the municipalities in our sample are relatively small, with around 500 inhabitants on average. This implies that people know each other and are aware of nearby deaths. This granular setting thus contrasts with studies on the Great Influenza so far that look at US, German, or Italian counties as the unit of analysis in which the knowledge of influenza affectedness might be confounded by population size. Second, Switzerland did not take part in WWI in WWI. Thus, our estimates are not confounded with WWI casualties.

4.2 Results

Table 2 reports the main results from estimating the cross-sectional model in Equation (1). Column (1) shows the impact of influenza affectedness on the vote share in favor of pro-compulsory vaccination without any district fixed effects and control variables. A one percentage point increase in direct influenza deaths reduces the vote share in favor of compulsory vaccination by around 5.5 percentage points. The one percentage point increase is equivalent to moving from a non-affected municipality to a municipality at the 85^{th} percentile. Columns (2) and (3) stepwise include district fixed effects and the full set of control variables. The results are highly statistically significant and show a strong negative impact of influenza affectedness on support for vaccination. Column (4) controls for non-influenza deaths during the same period. Our coefficient of interest is only marginally affected by this additional control. Non-influenza deaths also reduce the support for compulsory vaccination, but the effect is not statistically significant at any conventional level. This finding is in line with false-negative reports on the cause of death—some deaths due to influenza might not be officially reported as such.

Table 2: Impact of influenza deaths on vaccination policy support

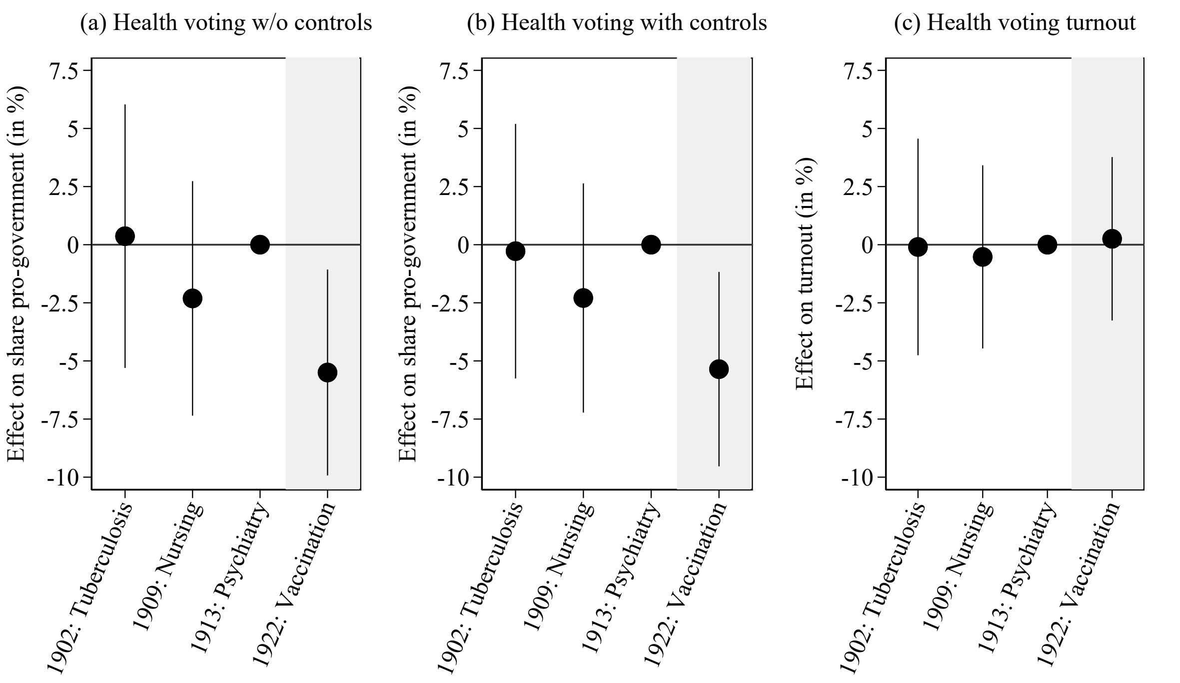
	Dependent variable: Votes for pro-compulsory vaccination (in %)					
	(1)	(2)	(3)	(4)	(5)	(6)
Share Flu Deaths	-5.468***	-4.133***	-2.913***	-2.720***		-3.988**
	(1.643)	(0.940)	(0.711)	(0.629)		(1.785)
Share non-Flu Deaths				-1.501		
				(0.982)		
Flu Death (Yes = 1)					-4.387***	
					(1.545)	
Mean of Dep. Var.	74.617	74.617	74.617	74.617	74.617	70.487
Std. Beta Coef.	-3.448	-2.606	-1.837	-1.715	-2.170	-2.515
Obs.	218	218	218	218	218	125
Sample	All	All	All	All	All	Flu death ⩾1
District FE	No	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	Yes	Yes	Yes
R2 centered	0.951	0.968	0.976	0.977	0.976	0.977

Notes: The table presents the impact of direct influenza deaths on support for vaccination policy at the municipal level. The dependent variable is the vote share in favor of pro-compulsory vaccination in the popular vote 1922 (in %). The independent variable is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population. Column (1) reports the baseline specification without controls and fixed effects. Columns (2) and (3) sequentially add district fixed effects and the full set of controls to the baseline specification. Column (4) includes a control for non-influenza deaths from September 1918 to April 1919, also expressed as a percentage of the total pre-influenza population. Column (5) uses a categorical treatment variable equal to one if there was at least one influenza death in a municipality during the pandemic period, and zero otherwise. Column (6) restricts the sample to municipalities that experienced at least one direct influenza death. Control variables include all those reported in the balance tests in Table B.4 and B.5 in Online Appendix B. These include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), housing conditions, and pre-influenza trends in socio-demographic variables (changes in population, language, religion, foreigners and living conditions). Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Next, we use a binary treatment variable equal to one for municipalities with at least one influenza death from September 1918 to April 1919, and zero otherwise. Column (5) reports the results documenting that municipalities with direct influenza deaths exhibit a decline in their support for compulsory vaccination by around 4.4 percentage points compared to unaffected ones. In other words, around one out of six voters who voted against compulsory vaccination only did so because their location was affected by the pandemic.[23] Finally, Column (6) reports strong negative effects with higher affectedness within affected municipalities only.

[23]The vote share against compulsory vaccination is 25.4% (100 minus the yes-share as shown with the mean of the dependent variable). This implies that the no-vote share is around 17% (4.4/25.4) higher in directly affected places compared to the mean.

Figure 4: Event-study regressions on health voting



Notes: The figure presents coefficients from event-study regressions on popular votes that strongly reference health policies. These include votes on health-care supply and public health prevention measures (see Table 1 for their unconditional correlations with influenza affectedness). The graphs display the impact of influenza affectedness on pro-government vote shares (Graphs (a) and (b)) and on turnout at the municipal level (Graph (c)). Influenza affectedness is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percent of the total pre-influenza population. Vote share and turnout differences are normalized to zero for the last popular vote on health policy before the influenza pandemic in the winter of 1918/19—specifically, the 1913 vote on the construction and operation of a psychiatric clinic. The gray-shaded areas indicate the post-pandemic period with the popular vote on compulsory vaccination in 1922 (the first post-influenza popular health policy vote). All event-study regressions include municipality fixed effects, year fixed effects, and district fixed effects interacted with year fixed effects. The regressions in Graph (b) and Graph (c) include also time-varying control variables (the logarithms of population and population per household, shares of females, shares of religious denominations, share of foreigners, and shares of spoken languages). Vertical lines represent the 90% confidence intervals (spatially- and temporally- clustered standard errors).

Our setting of regular popular votes on similar political issues allows us to run event-study regressions to explore whether unobservable factors might drive influenza affectedness and voting. For this purpose, we use pre-influenza popular votes on health policies and append them to the vaccination vote in 1922. We run a difference-in-differences specification and interact influenza affectedness with fixed effects of the respective popular vote, standardized for the last pre-influenza popular vote. Figure 4 depicts the coefficient plots of this event-study setup.[24] All graphs show a parallel pre-treatment trend in voting behavior and turnout. However, both Graphs (a) and (b) show that higher influenza

[24]We label the dependent variable on the y-axis as *"Effect on pro-government share"* to ensure that political statements are comparable over time. The government consistently supported pro-reform-oriented referendums and was often opposed to radical initiatives, like the anti-vaccination bill.

affectedness reduces support for the compulsory vaccination bill in 1922, while turnout remains unaffected (Graph (c)). Adjusting the effects for potential pre-treatment differences in health-policy-related voting increases the treatment effect from around 3-4 percentage points (Columns (2) and (3) in Table 2) to up to more than 5 percentage points in Figure 4.

We further extend our setup with all popular votes since 1901 to test whether post-influenza health voting differs from voting behavior in popular votes unrelated to health, controlled for pre-influenza trends. We use the vote shares in favor of the government's voting recommendation, which consistently advocates reform. To do so, we run a difference-in-differences model in which we test for shifts in general anti-government voting with higher affectedness, $Share\,Flu\,Death_i \times Post\,Flu_t$, and include a triple-interaction term, $Health\,Votes_t \times Share\,Flu\,Death_i \times Post\,Flu_t$. This triple-interaction term tests whether more-affected municipalities voted differently in health-related popular votes than in non-health-related popular votes after the influenza pandemic. Table B.7 in Online Appendix B shows the results. Columns (1) and (2) restrict the post-influenza sample to popular votes until the vaccination bill in March 1922, and Columns (3) and (4) include all popular votes until 1930. The results show that more influenza-affected places dislike state-induced health reforms after 1918, but are not generally against reforms in other political domains. This finding rules out the time-trends as a driver of our results and a general decline of state support with affectedness. In Section 8.2, we will further investigate potential heterogeneous effects by political domains. We conclude that influenza decreased support for health-prevention policies in general and pro-vaccination attitudes in particular.

4.3 Robustness and sensitivity

Our results on vaccination voting hold across a series of robustness and sensitivity exercises. We discuss them below and show all related tables in Online Appendix B.

First, our findings do not depend on the definition of influenza affectedness. Table B.8 shows estimates with alternative specifications of our independent variable, including the natural logarithm and hyperbolic sine of influenza deaths, shares of influenza deaths in fall 1918 and total influenza deaths from its first occurrence in the summer of 1918 until 1922, and shares of total deaths during the winter of 1918/19 and for fall 1918 independent of the cause of death. Second, we test for the potential effects of mortality in other periods from 1918 to 1921 and report these (pseudo-)effects in Table B.9. Hereby, only mortality during the main pandemic period is associated with higher anti-vaccination sentiments. Third, we test whether infant mortality matters for vaccination statements. Table B.10 confirms that infant mortality does not trigger health-voting behavior. Fourth, we run several regressions in which we exclude outliers or look at subsamples to account for those pre-treatment confounders, which are correlated with influenza affectedness (see Section 4.1). Table B.11 excludes the region of Vorderrhein to make the sample the same as in Section 5, excludes places with very high influenza rates, places with hospitals ($n = 8$) and municipalities with a general practitioner in 1918/1919 ($n = 42$). Table B.12 further looks at subsamples concerning train connection, population size, and share of Catholics. All these sample restrictions and subsampling strategies lead to quantitatively and qualitatively similar effects as in our baseline model. Fifth, we show in Table B.13 the impact of influenza affectedness on health attitudes concerning total eligible voters, and not only with respect to those who voted. Sixth, one potential but unlikely concern is that those who died from influenza might have been the individuals most likely to support compulsory vaccination. We address this concern in Table B.14 by adding direct influenza deaths as potential pro-vaccination voters to rule out selective sorting into treatment. Not surprisingly, the effects become smaller but stay sizeable and statistically significant. Finally, Columns (1) and (2) of Table B.15 shows estimates with different cutoffs of spatially clustered standard errors and alternative clustering of standard errors. All these exercises confirm our main results.

5 Aggregate impact on health behavior

This section focuses on the shift in vaccination rates from 1907 to 1933 for influenza affectedness at the municipality level. We implement difference-in-differences and event-study setups and discuss the identification, the results, and robustness exercises.

5.1 Empirical model and identification

We rely on a difference-in-differences model to exploit the variation of direct influenza affectedness on a shift in vaccination behavior after the influenza pandemic. We look at vaccination rates in local smallpox vaccination campaigns with the following model:

$$Y_{it} = \alpha_i + \beta(Share\,Flu\,Death_i \times Post\,1918_t) + \delta_t + (\lambda_d \times \delta_t) + X'_{it}\gamma + (X'_{i,1910} \times \delta_t)\theta + \epsilon_{it} \quad (2)$$
$$\text{with } i = 1, ..., 218; \;\; t = 1907, ..., 1933$$

where Y_{it} describes the children's vaccination rate, which is defined as the number of vaccinated children as a share of the number of all children who are supposed to be vaccinated in municipality i in the vaccination campaign in year t (in %). The interaction term ($Share\,Flu\,Death_i \times Post\,1918_t$) relates to our difference-in-differences coefficient of interest, β, which reports the shift in vaccination behavior with influenza affectedness. Hereby, $Share\,Flu\,Death_i$ are direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919 as a share of the total pre-influenza population based on the census in 1910 (in %). The time-specific dummy variable $Post\,1918_t$ equals one for vaccination campaigns after 1918 (after the influenza pandemic), and zero before 1918. We include municipality fixed effects, α_i, to control for time-invariant local characteristics and include vaccination campaign year-fixed effects, δ_t, to capture trends and temporal idiosyncrasies. We further control for district fixed effects interacted with year fixed effects, $(\lambda_d \times \delta_t)$. On the one hand, this interaction ensures that we compare neighboring municipalities with each other. On the other hand, this interaction term also addresses data concerns regarding the quality and interpretation of the regional vaccination reports.[25] The matrix X_{it} controls for time-varying local control variables, such as the log of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. $X'_{i,1910} \times \delta_t$ is a matrix of pre-influenza control variables, mainly for 1910, interacted with year fixed effects. These control variables include locality characteristics (population size, train connection, sea level, and presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), and housing conditions and are also reported in the balance discussion in Table B.4 and B.5. We estimate difference-in-differences models using ordinary least squares (OLS) and exclude the region of Vorderrhein from the main sample due to missing vaccination data from 1919 to 1929. We employ spatially and temporally clustered standard errors (Colella *et al.*, 2023). We set the spatial and temporal cutoffs to 15 kilometers and 2 years, respectively. This ensures that clusters include locations within the same valley and two subsequent vaccination campaigns. We also report standard errors with different cutoffs and clustering methods.

We have already discussed crucial identification assumptions for a causal interpretation of our results in Section 4.1. First, we have demonstrated that health attitudes and health behavior did not differ among more or less affected municipalities before the influenza pandemic (see Table 1). We also refer to the event-study setup on health voting (Figure 4) and the event-study on vaccination rates below (Figure 5) to show parallel pre-treatment trends in health-related statements and behavior. Our DiD model in Equation (2) also accounts for heterogeneity and covariates correlated with influenza affectedness as shown in different balance tests in Tables B.4, B.5 and B.6 in Online Appendix B. These are mainly train connections, hospitals, population size, and the share of Catholics. We control for time-invariant confounders and interact pre-influenza characteristics with year fixed effects to address concerns about imbalances. We also run the same battery of sample restrictions and subsampling as in Section 4.3 to rule out that these confounders drive our results. Moreover, our DiD model controls for district fixed effects interacted with year/vaccination campaign fixed effects. This rather saturated specification will use granular regional variation in influenza exposure and accounts for measurement issues as

[25] Our vaccination data primarily come from district and regional summaries, which are handwritten by the respective local health officers. Officers used different terms mainly for unvaccinated children, and part of our data was recoded based on municipality transcripts. $\lambda_d \times \delta_t$ capture this regional and year-specific variation in our data (see Online Appendix A for a detailed discussion).

discussed above. Finally, our small units of analysis and results that are not confounded by WWI exposure also increase the reliability of our findings. To sum up, all these figures make us confident that we can detect a shift in health measures caused by the pandemic.

5.2 Results

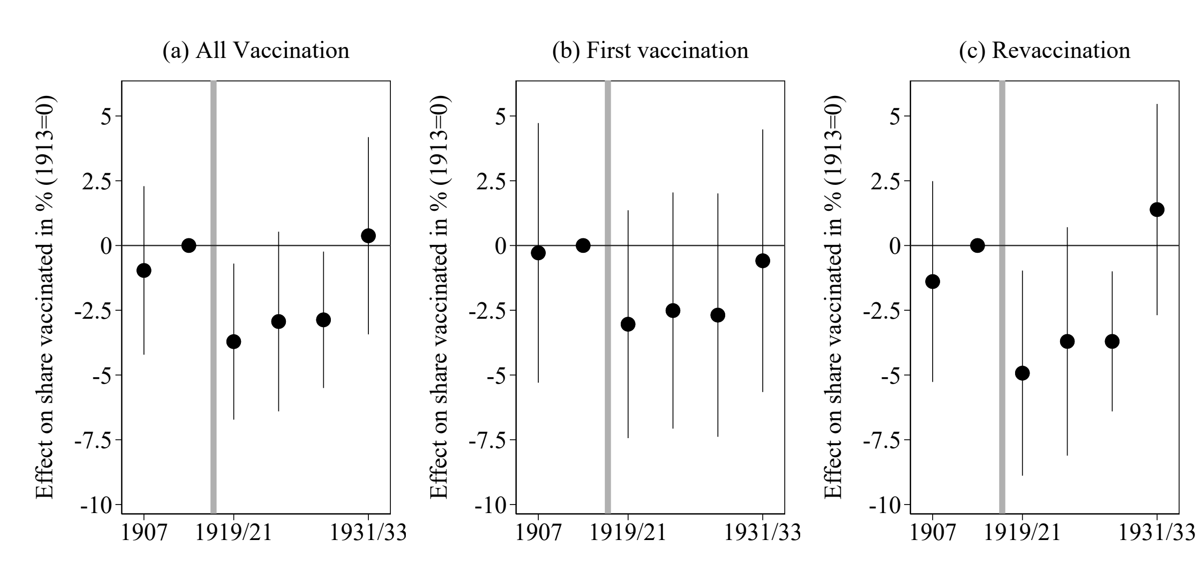
We first graphically inspect the effects of influenza affectedness on the shift in vaccination behavior based on an event-study setup in Figure 5. For that, we adjust Equation (2) by interacting influenza affectedness, $Share\,Flu\,Death_i$, with year dummies of two subsequent vaccination campaigns, standardized for the last pre-influenza vaccination campaign in 1913. Graph (a) in Figure 5 shows the pooled effects for the initial vaccination of young children and the revaccination campaigns of adolescents, and Graphs (b) and (c) show these vaccination types separately. In all graphs, we observe no differences in influenza exposure and pre-influenza vaccination rates (parallel pre-treatment trend). After the influenza pandemic, however, vaccination rates decrease with influenza affectedness. The effects are larger and more precisely estimated in the pooled figure and in the revaccination campaigns, but are also sizeable in the initial vaccination campaigns. The effect persists for six subsequent vaccination campaigns, totaling twelve years. By the early 1930s, i.e., the coefficients that pool the campaigns of 1931 and 1933, the effect vanishes.

We now turn to the regression results in Table 3, which reports different specifications of Equation (2) with pooled data for the initial vaccination and revaccination campaigns. Columns (1) and (2) report the effect of influenza affectedness on vaccination rates using all campaigns until 1933; and Columns (3) to (6) restrict the sample to campaigns until 1929, for which we find persistent negative effects. Columns (1) to (3) confirm the event-study impression in Figure 5 and report a decline in vaccination rates with influenza affectedness that persists throughout the 1920s. Pooled effects and most effects in Column (2) before 1930 are statistically significant at the 5% level.[26] Next, we control for non-influenza deaths during the influenza period in Column (4). Non-influenza deaths are associated with a moderate and statistically insignificant decline in vaccination rate. However, our coefficient of interest is not affected by this additional control. This finding, as discussed in Section 4, aligns with false-negative reports on the cause of death.

We now turn to the binary specification of Equation (2), in which $Share\,Flu\,Death_i$ equals one for municipalities with at least one reported influenza death, and zero otherwise. In doing so, we also address the concerns of Callaway *et al.* (2021, 2024), who caution against continuous treatment effects in DiD setups, mainly due to heterogeneity of the treatment effect. We find that continuous and binary treatments yield similar results—the binary specification has a somewhat larger and more precise coefficient as reported in Column (5).

[26] The only exception is the coefficient for the campaigns in 1923 and 1925, where the point estimate is similar to the one for the campaigns in 1927 and 1929 with a p-value of 0.13.

Figure 5: Event-study on vaccination behavior, 1907-1933



Notes: The figure presents event-study regressions estimating the impact of influenza affectedness on children's vaccination rates. Influenza affectedness is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population. The children's vaccination rate is defined as the number of vaccinated children as a percentage of the number of all children who are supposed to be vaccinated. Grap (a) reports the pooled effects of the initial vaccination of young children and the revaccination campaigns for adolescents. Graphs (b) and (c) display the effect of the initial vaccination and the revaccination campaigns separately. Post-influenza coefficients are pooled over two subsequent vaccination campaigns. The gray vertical lines represent the period of the influenza pandemic during the winter 1918/19. All estimates include municipality fixed effects, year fixed effects, district fixed effects interacted with year fixed effects, as well as time-varying controls and pre-treatment controls interacted with year fixed effect (analog to the regressions in Table 3). Vertical lines represent the 90% confidence intervals (spatially and temporally clustered standard errors).

Municipalities with influenza deaths exhibit a decline in vaccination rates after the pandemic of more than 4 percentage points compared to unaffected municipalities. This is a sizable effect, given that, on average, less than 13% of all children were not vaccinated. Influenza-affected places thus show over a 30% increase in vaccination absenteeism compared to the mean (4%/12.3% = 32.5%). Column (6) shows that within influenza-affected municipalities, higher affectedness also reduces vaccination rates.

We also look at the reasons for vaccination absenteeism in Table B.16 in Online Appendix B. There, we regress influenza affectedness interacted with year dummies for two subsequent vaccination campaigns on the shares of unvaccinated children by reasons of absenteeism (share of excused, unexcused, and from vaccination-skeptical families). Our findings provide some evidence that mainly the share of unexcused children surged right after 1918 (also compared to the mean), while the effects on unvaccinated children from vaccination-skeptical families is ambiguous.[27] To sum up, our DiD estimates show that the influenza pandemic affected health behavior negatively during the first decade after the pandemic.

[27] Despite the demanding nature of the approach in Table B.16 with three subcategories of absenteeism, we also lose more than 20% of our observations because the reasons of absenteeism are not always reported.

Table 3: Impact of influenza deaths on children's vaccination rates, 1907-1933

	Dependent variable: Children vaccination rate (in %)					
	(1)	(2)	(3)	(4)	(5)	(6)
Sh. Flu Deaths × Post 1918	-2.183**		-2.817**	-2.733**		-3.112**
	(1.100)		(1.149)	(1.149)		(1.462)
Sh. Flu Deaths × $\text{Year}_{1919-21}$		-3.360**				
		(1.435)				
Sh. Flu Deaths × $\text{Year}_{1923-25}$		-2.546				
		(1.689)				
Sh. Flu Deaths × $\text{Year}_{1927-29}$		-2.517**				
		(1.153)				
Sh. Flu Deaths × $\text{Year}_{1931-33}$		0.770				
		(1.919)				
Sh. non-Flu D. × Post 1918				-0.854		
				(0.567)		
Flu Death (Yes) × Post 1918					-4.064***	
					(1.222)	
Mean of Dep. Var.	87.418	87.418	87.711	87.711	87.711	86.378
Std. Beta Coef.	-1.300	-2.002	-1.678	-1.628	-2.013	-1.853
Obs.	3,559	3,559	2,911	2,911	2,911	1,655
Sample Period	1907-33	1907-33	1907-29	1907-29	1907-29	1907-29
Sample	All	All	All	All	All	Flu D. ⩾1
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE × District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE × Pre-flu controls	Yes	Yes	Yes	Yes	Yes	Yes
R2 centered	0.381	0.382	0.390	0.390	0.390	0.488

Notes: The table displays the impact of direct influenza deaths on shifts in health behavior at the municipal level. The dependent variable is the children's vaccination rate, defined as the number of vaccinated children as a percentage of all children supposed to be vaccinated. The vaccination data include both the initial vaccination of young children and the revaccination campaigns of adolescents. Columns (1) and (2) include campaigns from 1907 to 1933. Columns (3) to (6) restrict the post-influenza period to campaigns before 1930 (as the effect diminishes thereafter, as shown in Figure 5). *Share Flu Deaths* is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919 as a share of the total pre-influenza population (in %). *Share non-Flu Deaths* is defined as non-influenza deaths during the same period as a percentage of the total pre-influenza population. *Flu Death (Yes)* is a binary variable equal to one if at least one person in a municipality died directly of influenza during the influenza period, and zero otherwise. *Post 1918* is a dummy variable equal to one for all vaccination campaigns after 1918 (after the pandemic), and zero otherwise. $Year_{YY}$ are year-specific dummy variables equal to one for vaccination campaigns conducted in year YY. All specifications include municipality fixed effects, year fixed effects, and district fixed effects interacted with year fixed effects. Time-varying control variables include the logarithms of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. Pre-influenza control variables, which are interacted with year fixed effects, include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in-, and out-commuters), and housing conditions. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

5.3 Robustness and sensitivity

We show that our results on health behavior hold throughout a series of robustness and sensitivity exercises that parallel Section 4.3 on voting. We briefly discuss these results below and show all related tables in Online Appendix B.

First, Table B.17 uses alternative definitions of influenza affectedness (natural logarithm and hyperbolic sine of influenza deaths, shares of influenza deaths in fall 1918 and total influenza deaths, and shares of total deaths during the winter of 1918/19 and for the fall of 1918). These measures yield similar negative effects on vaccination rates, except for total deaths in the fall of 1918, which is not statistically significant at any conventional level. Second, Table B.18 uses total mortality for all years from 1917 to 1921 separately and pooled and finds only a significant negative association for the main years of the pandemic (1918 and 1919), but not for pseudo-pandemic years. Third, Table B.19 relates infant mortality to vaccination. We find a positive and statistically significant association between infant mortality, particularly among younger children, and vaccination rates. This implies that infant mortality *increases* trust in vaccination or increases awareness, while the influenza pandemic reduces it. Fourth, we exclude outliers and perform subsampling to address the threats to identification as discussed in Section 5.1. Table B.20 includes the region of Vorderrhein where no vaccination data is available from 1919 to 1929, to make the sample comparable to Section 4. We then exclude places with very high influenza rates, places with hospitals ($n = 8$) and places with a general practitioner in 1918/1919 ($n = 42$). The results remain unaffected. Table B.21 further examines subsamples concerning train connection, population size, and share of Catholics. Subsampling leads to quantitatively and qualitatively similar effects as in our baseline model—with some loss of precision due to the reduced sample size—suggesting that our results are unlikely to be driven by confounders correlated with influenza affectedness. Finally, Table B.15 shows estimates with different spatial and temporal cutoffs of standard errors and alternative clustering of standard errors. All robustness and sensitivity exercises confirm our main findings.

6 Individual impact on health behavior

In this section, we examine individual vaccination records from the region of Glenner. We link family- and children-specific vaccination rates from 1905 to 1933 to family-specific influenza deaths in a difference-in-differences setup controlling for family and child fixed effects. We discuss the empirical identification, results, and robustness exercises.

We focus on the region of Glenner for two main reasons. First, the aggregated shifts in health attitudes and health behavior with influenza affectedness closely mirror the patterns observed in the canton as a whole. Graph (a) in Figure B.7 of Online Appendix B shows the location of Glenner within Grisons, while Graph (b) presents a binscatter plot of influenza deaths and pro-vaccination support at the municipality level, revealing similar effects to those in Graph (a) of Figure 1 for the entire canton. A comparable pattern is observed in the shift in vaccination behavior, as documented in Table B.22. Second, Glenner is an ideal region for individual-level analysis, as it consists primarily of small, single-locality municipalities. This structure allows for more accurate family formation—crucial for identifying direct exposure—and ensures that influenza deaths occurred in the immediate neighborhoods, making it possible to capture indirect exposure effects.

6.1 Empirical model and identification

In the first part of the individual-level analysis, we compare shifts in family-specific vaccination rates based on whether a direct family member with residence in the same municipality died of influenza. We look at vaccination rates in local smallpox vaccination campaigns with the following difference-in-differences model:

$$Y_{ijt} = \beta(Family\,Flu\,Death_i \times Post\,1918_t) + \alpha_i + \lambda_j + \delta_t + X'_{it}\gamma + (X'_{i,1910} \times \delta_t)\theta + \epsilon_{it} \quad (3)$$

$$\text{with } i = 1, ..., 38; \;\; j = 1, ..., 3279; \;\; t = 0, 1$$

where Y_{ijt} describes the share of children vaccinated in a family j in a municipality i in period t. It is defined as the number of vaccinated children in a family divided by the total number of children in the same family who are supposed to be vaccinated in t. We form families based on the surnames listed in the individual vaccination reports (see Online Appendix A.2.2 for coding details). Overall, our data comprise 3,279 distinct municipality-families in the 38 municipalities of Glenner. The periods are defined as the pre-treatment period (1905-1917) and the post-treatment period (1919-1933). The variable $Family\,Flu\,Death_i$ is a binary indicator equal to one if at least one person with the same surname as the surname of the child, the father's surname or the mother's maiden name in a specific municipality died directly of influenza and during the main influenza period, and zero otherwise. The time-specific dummy variable $Post\,1918_t$ equals one for vaccination campaigns after 1918 and zero before 1918. In all specifications, we control for period fixed effects, δ_t, municipality fixed effects, α_i, and family fixed effects, λ_j. The matrix X_{it} includes a set of time-varying local control variables, and $X'_{i,1910} \times \delta_t$ represents a matrix of pre-influenza municipality control variables interacted with year fixed effects, as defined in Equation (2). ϵ_{it} denotes the error term. We estimate DiD models using ordinary least squares. Standard errors are spatially clustered in the baseline specification and clustered at the municipality or family level to show the robustness.

In the second part of the individual-level analysis, we examine changes in child-specific vaccination rates based on direct family affectedness. We include only those children in our dataset who received their initial vaccination before 1918 (as infants or toddlers) and their revaccination after 1918. We estimate the following difference-in-differences model:

$$Y_{icjt} = \beta(Family\,Flu\,Death_i \times Post\,1918_t) + \alpha_i + \zeta_c + \lambda_j + \delta_t + X'_{it}\gamma + (X'_{i,1910} \times \delta_t)\theta + \epsilon_{it} \quad (4)$$
$$\text{with } i = 1, ..., 38; \;\; c = 1, ..., 1039; \;\; j = 1, ..., 642; \;\; t = 0, 1$$

where Y_{icjt} is a binary indicator that captures whether a child c from municipality i of family j was vaccinated at time t. Equation (4) is nearly identical to Equation (3) above, with the sole exception that we also control for child fixed effects, ζ_c. This enables us to examine the effects of the influenza pandemic at the child level, specifically whether children from families with a direct influenza death *increased* or *decreased* their vaccination rates in the revaccination campaigns compared to their initial vaccination before the pandemic. This effect is captured by our coefficient of interest, β. The DiD model is estimated using ordinary least squares with standard errors clustered at the child level. In both parts of the individual-level analysis, we focus on the last campaign entry of the respective campaign and apply the same restrictions as in our main analysis in Section 5: We follow children if they relocate or were vaccinated elsewhere and we drop children who were too young, disabled, or deceased at the time of the vaccination campaign.

The key identification assumptions are similar to the aggregate analysis in Section 5. First, we do not find any difference in the pre-treatment *level* of vaccination rates between families with and without influenza deaths (see Panel C in Table 1). This applies to both the family level and the child level. Second, we test for the parallel pre-treatment trend between directly-affected and non-affected families and children. To do so, we divide the pre- and post-influenza periods into further sub-periods and run event-studies in which we interact the family- and child-specific vaccination rates with sub-period fixed effects. Figure B.8 in Online Appendix B presents these event studies at the family and child level. We observe a parallel trend for the fully balanced child-level sample, whereas the family sample exhibits some pre-treatment differences in the trend before the influenza outbreak. Thus, the family-level results should be interpreted with a bit more caution.

6.2 Results

Columns (1) and (2) of Table 4 report the results from estimating Equation (3). We focus on the interaction between the indicator for at least one influenza death within the family, $Family\,Flu\,Death_i$, and the post-1918 indicator, $Post\,1918_t$. The coefficients indicate that experiencing a family member's death due to influenza increases family vaccination rates by 1.8 percentage points (Column 1), and up to 5.3 percentage points when including the full set of municipality controls and pre-treatment covariates interacted with year fixed effects (Column 2). This corresponds to a relative effect of approximately 6.9% (5.3/76.9),

Table 4: Individual level results with direct influenza deaths within families

	Dependent variable: Child vaccinated (0/1)			
	Family level		Child level	
	(1)	(2)	(3)	(4)
Family Flu Death (Yes) × Post 1918	0.018**	0.053***	0.046***	0.057***
	(0.007)	(0.010)	(0.010)	(0.011)
Mean of Dep. Var.	0.800	0.800	0.814	0.814
Obs.	4,116	4,116	2,078	2,078
No. of children	10,966	10,966	1,039	1,039
No. of distinct families	3,279	3,279	642	642
Municipality FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Time-variant controls	No	Yes	No	Yes
Time FE × Pre-flu controls	No	Yes	No	Yes
Family FE	Yes	Yes	Yes	Yes
Child FE	-	-	Yes	Yes
R2 centered	0.874	0.885	0.563	0.592

Notes: The table displays the impact of direct influenza deaths on shifts in health behavior, using individual-level vaccination records for the Glenner region between 1905 and 1933. The dependent variable is a binary indicator of whether a child was vaccinated. *Flu Death (Yes)* is a binary variable equal to one if at least one person with the same surname as the child, the mother, or the father in a specific municipality died directly of influenza during the influenza period, and zero otherwise. *Post 1918* is a dummy variable equal to one for all vaccination campaigns after 1918 (after the pandemic), and zero before. The pre-treatment period spans 1905 to 1917, and the post-treatment period spans 1919 to 1933. The family-level sample in columns (1) and (2) includes children who were assigned to be vaccinated during the entire sample period. The balanced child-level sample in columns (3) and (4) includes children who were assigned to get the initial vaccination in the pre-treatment period and a revaccination in the post-treatment period. In all samples, we apply the same restrictions as in our main analysis: we exclude children vaccinated in or coming from a different locality, children deferred to the following year, children who were too young, and those who had died. The sample is restricted to panel observations with at least one entry in one of the vaccination campaigns before 1918 and at least one entry in a revaccination campaign after 1918. Time-fixed effects are pre-treatment and post-treatment fixed effects. Statistical inferences are based on spatially and temporally clustered standard errors as in our main analysis. Significance levels: *** 0.01, ** 0.05, * 0.10.

based on the treatment group's pre-influenza mean vaccination rate of 76.9%. This finding appears even more substantial when compared to the share of non-vaccinated children prior to the pandemic of 23.1%. In this comparison, the relative effect is nearly 23% (5.3/23.1), suggesting that nearly one in four children who would not have been vaccinated received the vaccination as a result of a family member's death.

The effects at the child level, estimated using Equation (4), are presented in Columns (3) and (4) of Table 4. The results are similar in magnitude to those reported at the family level in Column (2). Our most preferred specification is shown in Column (4), where we hold constant time, locality, family, and child effects, as well as heterogeneity at the municipality level. We find that family-specific influenza exposure increases vaccination rates by 5.7 percentage points, corresponding to a 6.9% increase relative to the overall pre-treatment vaccination mean of approximately 82.7%. This translates into a relative reduction of non-vaccinated children by about 32.9% (5.7/17.3) as a result of direct family exposure.[28] These findings stand in contrast to the aggregate-level results at the municipality level discussed in Section 5, where we document negative effects. We reconcile these differing findings in Section 7.

6.3 Robustness and sensitivity

We show that our individual-level health behavior results are robust across several robustness and sensitivity checks. First, we assess the robustness of our treatment variable coding. In our main analysis, children are classified as treated if a person who died of influenza shared the same surname, father's surname, or mother's maiden name. We acknowledge that incorrect attribution of influenza deaths would likely lead to attenuation bias, potentially weakening our estimates. To address this concern, we exclude all children from families with the most common surnames within a given municipality in Table B.23 in Online Appendix B. The results for the family level remain almost identical to our main results in Table 4, while the estimates for the child level increase in magnitude—consistent with our expectations. Second, in Table B.24, we test for sensitivity to the presence of local health infrastructure. We exclude children from the municipality with a hospital (Columns (1) to (4)) and those from municipalities with a practicing general practitioner during 1918/1919 (Columns (5) to (8)). These estimates are slightly smaller, suggesting that access to local health services may have increased awareness of health measures among directly affected families. Third, our results are robust to different cutoffs of spatially clustered standard errors. Specifically, they hold when using different cutoffs for spatial clustering and when clustering standard errors at the municipality, family, and child levels (Columns (5) and (6) of Table B.15). Fourth, we apply randomization inference as an alternative approach to statistical inference. We randomly assign the treatment status to families and children, and compare the resulting placebo estimates to our actual treatment effects. As shown in Figure B.9, we reject the null hypothesis with p-values of 0.034 for the family-level estimates and 0.048 for the child-level estimates in one-sided tests.

7 Mechanism: The U-shaped pattern of suffering

We have shown that higher influenza affectedness at the municipality level decreases support for public health policy measures (Section 4) and reduces compliance with health prevention policies (Section 5). At the same time, however, children from directly affected families increase their vaccination response (Section 6). These are, at first glance, striking

[28] Individual level estimates do not revert to the pre-indluenza trends by the early 1930s as the aggregate data suggest, and effects seem to diverge after 1922, i.e., after the popular vote on smallpox vaccination, which might have increased awareness of public health measures within directly affected families.

and seemingly contradictory. We now synthesize these results to understand the mechanism of these contrasting effects.

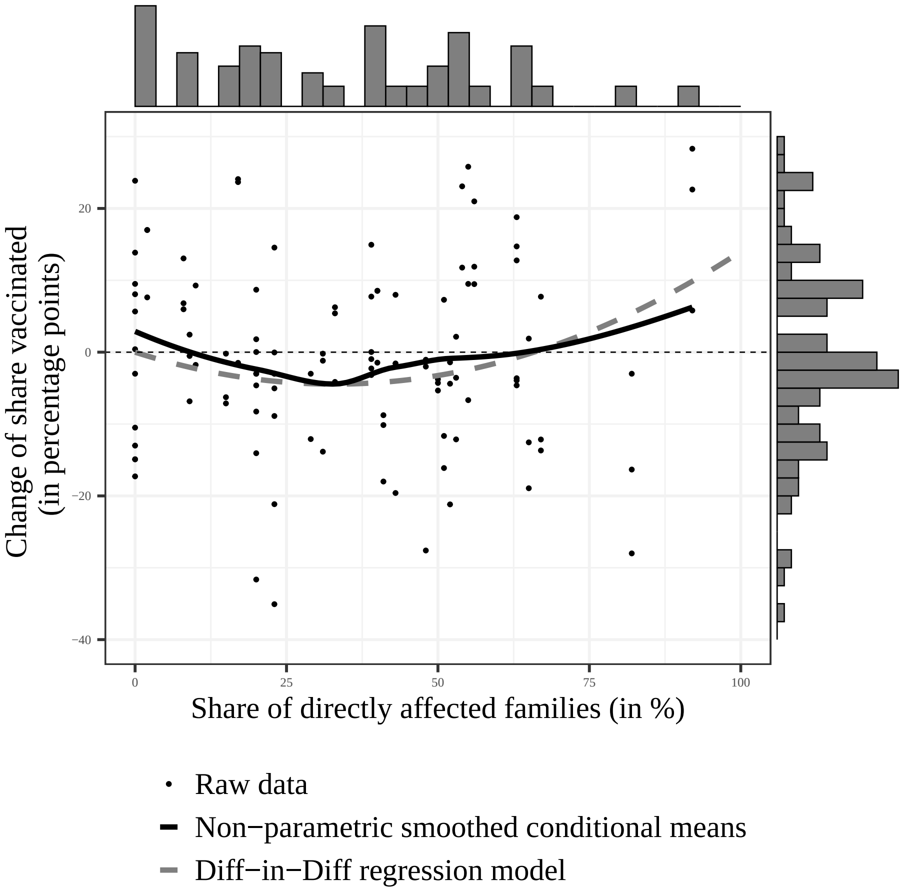
We aim to investigate whether the reaction to the influenza shock varies depending on the proportion of directly and indirectly affected families within a municipality. For this purpose, we combine our individual-level data on influenza exposure with aggregated shifts in vaccination behavior at the municipality level. We aim to demonstrate that almost non-affected places and heavily-affected ones do not alter their vaccination behavior, while in places where many people are only indirectly affected, i.e., by observing mainly non-family members die, vaccination rates tend to drop relatively. Such a finding aligns with the contrary effects observed at the municipality and individual levels. We thus create the following measure of directly affected families within the municipality:

$$SDAF_i = Share\ directly\ affected\ families_i = \sum_{j \in J_i} \frac{1}{|J_i|} Flu\ Death_{i,j} \tag{5}$$

We consider all families $j \in J_i$ living in municipality i and calculate the average affectedness across families using the death-register excerpts and individual vaccination reports in Glenner. $FluDeath_{i,j}$ sums up all families per municipality with at least one person who died during the influenza pandemic. As in Section 6, a directly affected family j has the same child, father's, or maiden surname as a dead person in municipality i. We then divide the sum of directly affected families by the total number of families in the respective municipality to calculate the $Share\ directly\ affected\ families_i$, in short $SDAF_i$. This measure captures municipality-level exposure to influenza by looking at aggregate family-wise affectedness. For example, if a municipality consists of 20 families and three have the same surname as a dead person, $SDAF_i$ would be 15% (3/20). This means that 15% of the families in this municipality are directly affected by the influenza, while 85% of the families only observe others dying and are thus indirectly affected.

We link this family-wise affectedness to shifts in vaccination rates after 1918. Figure 6 displays this relationship between $SDAF_i$ (x-axis) and the change in the share of vaccinated children at the municipality level (y-axis). The variable $SDAF_i$ ranges from 0% in municipalities without any influenza deaths (no direct and no indirect affected families) up to almost 90% (almost all families are directly affected). However, only a few municipalities have a $SDAF_i$ above 65%. We divide our sample period with vaccination rates into two pre-treatment periods (1905-1911 and 1913-1917) and three post-treatment periods (1919-1924,1925-1930, and 1931-1933). Each black dot in Figure 6 represents the period-wise change in the share of vaccinated children per municipality compared to the pre-influenza periods, i.e., the period share minus the pre-treatment mean minus the overall vaccination decrease in the post-treatment period (3 percentage points). The black solid line is a

Figure 6: U-shaped pattern of suffering



Notes: The figure displays the relationship between the share of families affected by at least one person who died in the family (in %) and the change of the share of vaccinated children at the municipality level after, compared to before, the influenza pandemic. The sample period is divided into two pre-treatment periods (1905-1911 and 1913-1917) and three post-treatment periods (1919-1924,1925-1930, and 1931-1933). The black dots represent changes in the share of vaccinated children among those assigned for vaccination at the period × municipality level. This is calculated as the period share minus the pre-treatment mean, adjusted for the overall vaccination decline in the post-treatment period (3 percentage points). The solid black line is a non-parametric LOESS smoother based on the raw data, while the dashed gray line represents a fitted curve from a quadratic difference-in-differences model, as reported in Table B.25 in Online Appendix A. The histogram at the top shows the distribution of the share of directly affected families (in %), while the histogram to the right shows the distribution of changes in vaccination share.

non-parametric loess smoother based on the raw data of changes in vaccination rates. The gray dashed line is based on a quadratic difference-in-differences model with covariates as reported in Table B.25 in Online Appendix B. The histogram at the top shows the distribution of the share of directly affected families (in %), and the histogram to the right shows the distribution of the change of share vaccinated in the post-influenza period compared to the pre-influenza vaccination rates (in percentage points).

Figure 6 points to a U-shaped pattern of suffering for effective use of vaccination. Municipalities with very low and high levels of directly affected families exhibit increased vaccination rates. In contrast, most municipalities are in the middle of the $SDAF_i$-distribution and show a decline in vaccination rates. This pattern is consistent with our contrary findings at the municipality and family levels of influenza affectedness: Vaccination rates remain high with almost no influenza affectedness, but start to decrease with affectedness, and overall skepticism prevails. This finding aligns with studies documenting a decline in trust in science and political institutions after periods of health adversity (Eichengreen *et al.*, 2021, 2024). Once nearly all families in a municipality are directly affected, overall vaccination rates go up. The non-parametric loess smoother implies that the positive effects prevail once around 50-60% of families within a municipality have a dead person in their family. The parametric model suggests that vaccination rates become positive if approximately 65% of families are directly affected. Personal losses seem to reduce risk tolerance as suggested by Dohmen *et al.* (2011), Kettlewell (2019), or more recently by Meier (2022). This shift in risk tolerance seems to increase compliance with well-proven public health measures. The reduction in vaccination rates is most prevalent in medium-exposed societies, which are the majority of places. These findings explain our overall negative effects in linear models on voting and vaccination.

We test the insights from above with our municipality-level data for all 218 municipalities in Grisons to see whether the aggregated voting and vaccination data also suggest a U-shaped pattern. So far, we have only used linear regression models in Sections 4 and 5, which might hide a potential quadratic effect. Figure B.10 in Online Appendix B links influenza affectedness to the pro-compulsory vaccination vote shares (Graph (a)) and to the raw shift in vaccination rates from the pre-influenza to the post-influenza period (Graph (b)). We also find statistical support for quadratic effects in aggregated data at the cantonal level. This shows a diminishing pattern in mistrust with more and more people directly dying from influenza. The quadratic functions imply that the negative effects would prevail up to an overall influenza death rate of around 4% (vaccination) up to 6% (voting). However, these numbers are somewhat hypothetical given that we rarely observe municipalities with an influenza mortality of more than 2%. However, the implied quadratic patterns suggest that if the influenza had been around eight to ten times more severe, the health responses of the entire society would have been entirely positive.[29]

8 Heterogeneous effects and additional outcomes

In this section, we present heterogeneous treatment effects (Section 8.1) and provide a broader understanding of the shifts in society, which includes increased skepticism for progress-oriented political reforms (Section 8.2), effects on educational attainment (Section 8.3), and potential shifts in religiosity (Section 8.4).

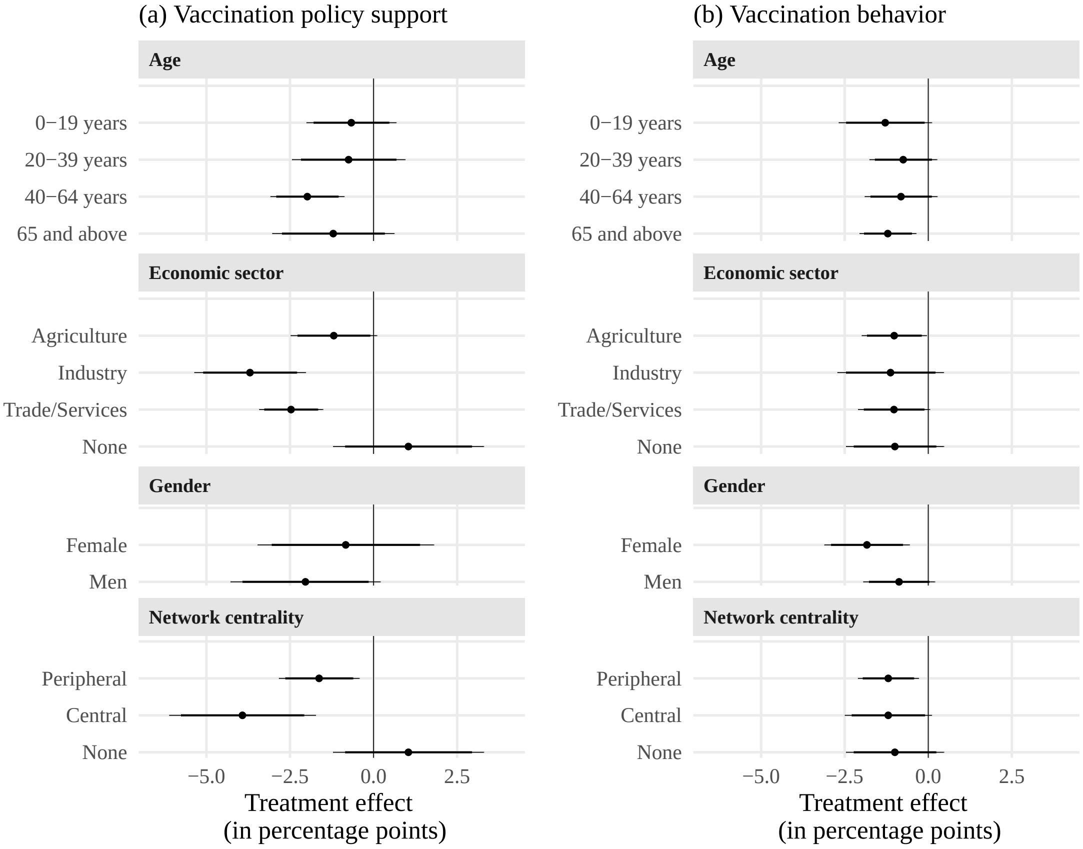
[29] In Grisons, around 0.4% (main period) to 0.6% (all years) of the total population are officially influenza deaths according to the death-register excerpts (see the summary statistics in Table B.2 in Online Appendix B). In this range, skepticism about health policy is still increasing overall.

8.1 Heterogeneous treatment effects

We investigate heterogeneous treatment effects at the municipality level to see whether some influenza deaths are more salient within the municipality. For example, the perception of the severity of the pandemic for indirectly affected persons might differ if a well-connected entrepreneur with employees or a grouchy old man died of influenza. We thus test which socio-demographic and economic characteristics of direct influenza deaths matter more for the shifts in health attitudes and health behavior. We use our detailed death-register excerpts and divide influenza deaths along the following characteristics: Deaths by age groups, sex, economic sectors, and a measure of network centrality. This measure of network centrality refers to the role of a deceased individual within the municipality, i.e., whether they had more ties to other people in the municipality, given their occupation, position, age, or gender. For example, the local priest, the mayor, the cheese maker, or the entrepreneur with employees might be more important for other members of the municipality than a farmer, an old person, or a housewife. The network-centrality measure reflects these ties of dead individuals and thus their relative salience.

We test the heterogeneity in treatment with repeated estimates in accordance with Equation (1) for health attitudes and Equation (2) for health behavior. To do so, we adjust the variable $Share\,Flu\,Death_i$ slightly so that it states the share of direct influenza deaths during the main influenza period by category (age cohort, gender, economic sectors, network centrality) as a share of the total pre-influenza population. For example, we use the number of women (men) who directly died of the influenza, divided by the 1910 population, to investigate heterogeneous treatment effects by gender. We z-standardize the respective dead shares to make the coefficients comparable. Graph (a) in Figure 7 shows the heterogeneous treatment effects for pro-compulsory vaccination voting, and Graph (b) shows the shifts in vaccination rates. In general, the heterogeneous effects are more pronounced in voting than in health behavior. We find that mainly influenza deaths of the age group between 40 and 64 matter most for anti-vaccination voting, and influenza deaths of people employed in the industrial or service sector (but much less for people in agriculture or people without any occupation, including children/adolescents or retirees). These characteristics also relate to the network centrality and show that influenza deaths with higher network centrality affect voting more. We also find a sizable larger effect for dead men compared to women. Note that only men had the right to vote back then—their peers thus matter in particular, i.e., adult men who worked with other men in more advanced economic sectors. These findings on voting suggest that some parts of society matter more to explain health-related skepticism at the municipality level.

Figure 7: Heterogeneous treatment effects by influenza deaths' characteristics



Notes: The figure displays coefficient plots estimating the impact of different demographic and economic characteristics of direct influenza deaths on health-related attitudes and behaviors at the level of 218 municipalities. Influenza deaths are disaggregated by age at death, economic sector, gender, and a centrality measure within the municipality network. The number of the respective death characteristics is divided by the total pre-influenza population and standardized (Z-scores). Graph (a) shows the effects on the vote share in favor of compulsory vaccination in the 1922 popular vote. Each coefficient is derived from a separate cross-sectional regression that includes district fixed effects and a set of pre-influenza control variables (as in Column (3) of Table 2). Graph (b) presents the effects on children's vaccination rates from 1907 to 1929. Each coefficient is estimated from a separate difference-in-differences model that includes municipality fixed effects, year fixed effects, district fixed effects interacted with year fixed effects, time-varying controls, and pre-influenza controls interacted with year fixed effects (as in Column (3) of Table 3). Horizontal lines represent the 90% (bold) and 95% (thin) confidence intervals. Standard errors are spatially clustered in Graph (a) and spatially and temporally clustered in Graph (b).

The heterogeneous effects on shifts in vaccination rates are more ambiguous (Graph (b)). The largest heterogeneous treatment effect relates to gender, for which we find that dead women matter more. This is somewhat the opposite finding compared to the voting outcome, but confirms our peer-group argumentation from above. Women care more about other (dead) women, and since they are more likely to be responsible for their children—in particular for infants and toddlers to bring them to their initial vaccination—the effects on vaccination rates are mostly driven by women. We test this argument in more detail in Table B.26 in Online Appendix B, in which we show shifts in vaccination rates over time by affected gender and vaccination type (initial vaccination and revaccination). We find that the decline in the overall vaccination rates by women-affectedness is mainly driven by a strong effect in the initial vaccination. For the revaccination of young adults, however, the effect is slightly dominated by men's influenza deaths, for which the father is pivotal in the vaccination decision of adolescents. The findings in Table B.26 also rule out an alternative interpretation. One can argue that babies of mothers who died of influenza were not vaccinated, i.e., due to an overwhelmed widower. If this is the main driver of the decline in vaccination rates, we could only expect a gender effect in the very first year after the pandemic, i.e., in 1919, since there aren't any babies anymore in 1921 or thereafter of mothers who died in the influenza winter of 1918/19. The negative treatment effects of dead women persist throughout the 1920s, indicating that the peers of mothers matter (other women) and not dead mothers of young babies directly. We conclude that shifts in health attitudes and health behavior at the aggregate level is highly driven by dead peers.

8.2 Political domains

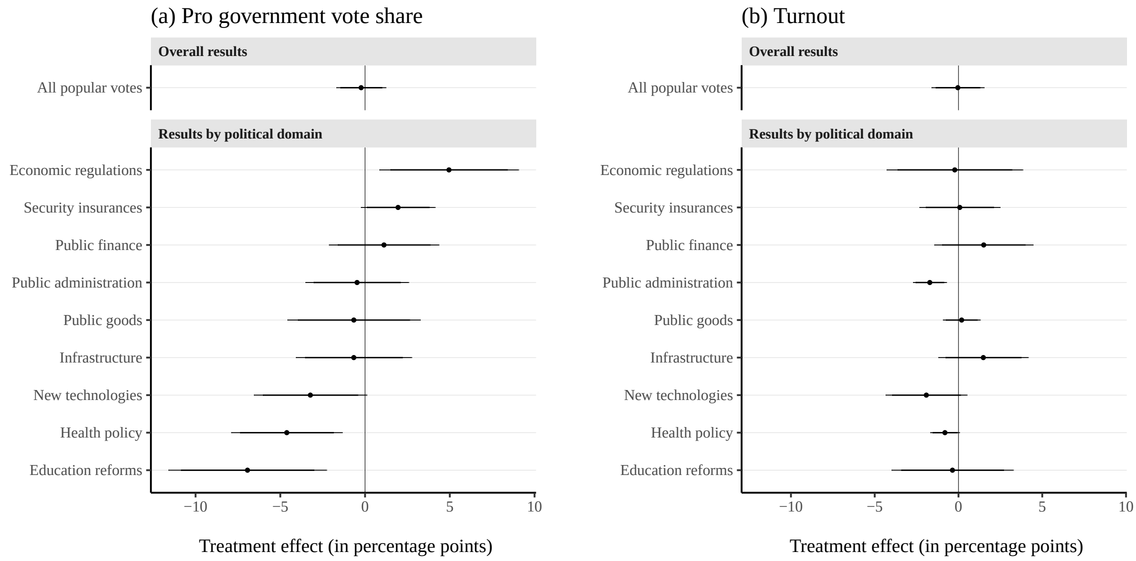
So far, we have only investigated the effects of influenza affectedness on voting behavior in the popular vote on compulsory vaccination in 1922 and specific health-related popular votes before the influenza in general (see Figure 4). However, societies might also respond in other dimensions to adverse shocks (Berkes *et al.*, 2023). We test in which political domains more influenza-affected municipalities increase their skepticism towards political reforms and the government. We rely on the universe of 74 popular votes in Grisons from 1901 to 1930 (36 before the influenza outbreak and 38 thereafter) to test in which policy dimensions influenza affectedness matters most.[30] We estimate difference-in-differences models for each political domain separately to see whether skepticism, measured as turnout and anti-government reform sentiments, is affected by influenza affectedness after 1918, controlled for the differences before.[31]

Figure 8 shows the coefficient plots with all popular votes (upper panel) and the repeated difference-in-differences estimates by political domain (bottom panel). Graph (a) shows the shifts in pro-governmental reform voting with influenza affectedness. Overall, influenza affectedness does not affect voting patterns if we pool all popular votes from 1901 to 1930. However, the pooled estimates conceal large differences by political domains. Voters in highly influenza-affected municipalities support stricter economic regulations (i.e, licensing, store opening hours, holidays, etc.) after 1918. They are also more in favor of expanding the public safety net, primarily through reforms related to the introduction and extension

[30]Most popular votes are referendums in which the government aims to implement reforms. Pro-governmental voting thus also shows the local willingness for reforms. The popular initiatives also aim for reforms, but they are often extreme and thus the government is most likely against them. See the list of all popular votes from 1901 to 1933 in Table A.1 in Online Appendix A.

[31]The two-way fixed effect model is: $Y_{PDit} = \alpha_i + \beta(Share\,Flu\,Death_i \times Post\,1918_t) + \delta_t + (\lambda_d \times \delta_t) + X'_{it}\gamma + \epsilon_{it}$ in which Y_{PDit} is the pro-governmental reform vote share (or turnout) in popular votes on the political domain PD in municipality i in year t. The remaining terms are equal as in Equation (2).

Figure 8: Shift in pro-governmental reform sentiments by political domain



Notes: The figure displays coefficient plots on shifts in pro-government reform sentiments (Graph (a)) and voter turnout (Graph (b)) across 218 municipalities, disaggregated by political domain. Each coefficient is derived from a separate difference-in-differences (DiD) estimation that links direct influenza deaths to pro-governmental voting and turnout after the start of the pandemic, controlling for pre-pandemic differences. Negative coefficients indicate that higher influenza affectedness was associated with a shift toward more anti-government sentiment after 1918, while positive coefficients reflect a shift toward greater pro-government sentiment. The DiD estimates are based on all 74 popular votes from 1901 to 1930, categorized by political domain (see Table A.1 in Online Appendix A for a complete list). The top panel shows the overall DiD effects for pro-government voting and turnout using all 74 popular votes. The bottom panel shows DiD results by political domain, ordered by descending levels of pro-government vote effects. All regressions include municipality fixed effects, year fixed effects, district fixed effects interacted with the post-influenza period, and a set of time-invariant control variables (the logarithms of population and population per household, shares of females, share of religious denominations, share of foreigners, and shares of spoken languages). Horizontal lines represent the 90% (bold) and 95% (thin) confidence intervals. Standard errors are spatially and temporally clustered.

of building and livestock-disease insurance. In contrast, voters in more influenza-affected places become very critical against reforms to promote new technologies, health-care measures, and education reforms.[32] Popular votes on infrastructure, administration bills, regulation of public property or public finance are not shifted by the influenza.

We repeat the estimates with turnout in Graph (b). Turnout is often used as a proxy for social capital and generally measures whether people care about a certain topic. We do not find an overall decline in turnout (upper panel) and only turnout in the popular votes on administration and health bills are negative and statistically different from zero. The shifts in turnout are, however, rather small and cannot explain the shifts in pro-governmental reform sentiments as reported in Graph (a). We interpret these figures on shifts in political domains as a general decline in the support for future-oriented policies in

[32]Popular votes on new technologies ask to end the Grisons' automobile ban and thus to allow one of the most influential technologies of the 20^{th} century also in Grisons. Health-care reforms include health-care supply, prevention measures, and admission rules of doctors. Education reforms deal with the extension of the duration of compulsory schooling, or with the introduction of new school subjects to promote girls.

more influenza-affected places (technologies and education), a general increase of mistrust towards governmental health reforms, and the willingness to accept stricter regulations for economic activity and a higher degree of risk-sharing attitudes.

8.3 Educational attainment

In the previous section, we have documented that voters in places with higher influenza affectedness decrease their support for education reforms after 1918. We now test whether this shift in education reform attitudes is mirrored in educational attainment. We collect data on the place of origin of students who enter the gymnasiums in Grisons (Kantonschule Chur, Evangelische Mittelschule Schiers, and Klosterschule Disentis) from 1907 to 1930. Overall, the number of high school students in a highly agricultural-based society is small. Only 2,360 students entered high schools during these years, which is around 0.5 students per municipality per year, or around one student per 1,000 inhabitants per year.

We link these high school entrances to local influenza affectedness in a pooled event-study setup. We pool four subsequent years of school data to achieve more stable numbers, given the low number of students per year. Figure B.11 in Online Appendix B reports the results. The event study in Graph (a) analyzes whether places with higher influenza affectedness send any students to high schools compared to the pre-influenza entrances.[33] We document a parallel pre-influenza trend in high school entrances among more and less influenza-affected municipalities. After the influenza pandemic, we find that places with higher local influenza mortality rates are less likely to have any new students who enter high school in the four years following the pandemic. An increase of the influenza mortality rate by 1 percentage point reduces the probability that any student will enter high school by around 6 percentage points. Graph (b) reports the z-standardized event-study plot. There, the figures are similar and show that a one standard deviation increase of influenza mortality reduces the likelihood of any new high school student by around 12 percent of a standard deviation. We conclude that the pandemic has a negative impact on high school entrances in the short term, with potential long-term effects for affected students. This finding aligns with the reported shifts in opposition to education reforms, as outlined in Section 8.2. At the same time, we do not find any shifts in popular votes on public finance (see Figure 8), which proxies sentiments in spending and tax policies. We thus exclude economic hardship as a driver of lower high school rates.

8.4 Science versus religiosity

Our findings show that health adversity resonates in health-related perceptions. In short, local exposure to influenza reduces the support for well-established policies and technologies,

[33] The start of the school year in 1918 was before the outbreak of the influenza. We thus take 1918 as the last pre-treatment year. Our results are not sensitive to the inclusion or exclusion of 1918.

including vaccination. Studies show that adversity—due to natural disasters or health shocks—increases religiosity in affected communities (Bentzen, 2019, 2021; Berkes *et al.*, 2023). We thus test whether the influenza pandemic affects religiosity and whether shifts in religiosity are opposed to shifts in support for science, as measured by vaccination rates.

We use our detailed municipal vaccination records from 1905 to 1933 and extract the first names of all newborns in the region of Glenner. First names are often used in studies on culture and religion (Abramitzky *et al.*, 2020; Fouka, 2019a,b). In Glenner, almost 100% of all first names of newborns have a distinct Christian origin. To measure potential shifts in religiosity in such a setting, we employ a novel approach: examining local naming patterns associated with the local patron saint. 83 out of 93 churches or chapels in the 38 municipalities of the region of Glenner are dedicated to a saint or a biblical person. For example, four churches in our sample are dedicated to St. Martin of Tours. We then test whether more newborns were given the name Martin at baptism after the year 1918, controlling for the naming patterns within the municipality before the pandemic.[34]

We link our measure of the share of directly affected families in Equation (5) to shifts in municipality-wise naming patterns of newborns in favor of the name of the local saint. In our sample, around 11% of newborns were baptized in accordance with the name of the local church. We estimate quadratic models that parallel the specification of the U-shaped patterns of suffering in Section 7. Column (1) in Table B.27 in Online Appendix B shows that shifts in naming pattern after 1918 follow an inverted U-shaped pattern: Almost non-affected places and highly-affected places baptize their newborns less in favor of the local saint, while middle-affected places, i.e., places with many *indirectly* affected families, increase their religiosity given pre-1918 figures. The finding on shifts in religiosity is thus opposed to the findings on shifts in vaccination (see Figure 6): An increase in local influenza affectedness reduces initially vaccination rates and increases religiosity. Once almost all families in a place are directly affected by the pandemic, vaccination rates increase, and naming patterns in favor of the local saints decrease. This finding is stronger and more precisely estimated if we drop mainly Protestant-dominated localities in Glenner in Column (2) in Table B.27.[35] We conclude that health adversity affects support for science (vaccination) and expressions of religiosity in different ways. Our findings therefore stand in contrast to Berkes *et al.* (2023) in the U.S. context.[36] However, an increase in religiosity can be interpreted as a coping strategy to deal with adversity (Pargament *et al.*,

[34]We allow for different spelling- and gender-types of first names (Martin/Martina), and different languages (i.e., Martin/Martinus).

[35]In many small places, churches are "parity" churches, i.e., Catholics and Protestants share the same church. These parity churches are often dedicated to a saint, while pure Protestant churches are not.

[36]Berkes *et al.* (2023) also look at the exposure during the Great Influenza in 1918/19 on shifts in religiosity (naming patterns) and science (patenting). However, their measure of exposure is based on county mortality, whereas ours is based on individual records across different municipalities.

1998; Dolcos *et al.*, 2021) or as a complement for the sake of protection, as voters indicate higher support for more public insurance with influenza affectedness (see Section 8.2).

9 Conclusion

Our study explores the effects of a severe health crisis—the influenza pandemic of 1918/19—on shifts in societal support for health measures and health technologies. We focus on the Swiss region of Grison, which offers unique measures of residents' health attitudes due to its direct democratic political system, detailed cause-of-death records, and vaccination data from before and after the influenza pandemic. Additionally, Switzerland did not participate in World War I and thus influenza deaths are not confounded by war casualties.

We find that suffering during the influenza pandemic is unrelated to pre-influenza health attitudes and health behavior, both at the aggregate and individual levels. At the municipality level, more severely affected localities reduced both their stated and revealed support for health measures after the pandemic and exhibited increased skepticism toward future-oriented policies. At the individual level, families directly affected by the pandemic were more likely to send their children to vaccination campaigns. These findings suggest a U-shaped relationship between suffering from the pandemic and support for effective health policies. State-induced and scientifically validated health measures receive less support in municipalities with medium exposure to the influenza pandemic—representing the majority of cases. In contrast, both minimally affected and heavily affected localities did not exhibit increased skepticism. In the former case, the low death rate may have enhanced trust in state authorities, as the state appeared capable of protecting its citizens during the crisis. In the latter case, where nearly all families were directly affected, individuals may have become more risk-averse due to their suffering and thus become more attentive to complying with public health rules.

Our study provides important insights into how pandemics can shape societies in the years that follow, particularly by reducing overall support for state-induced health measures. It may offer a blueprint for understanding the current health challenges that have emerged in the aftermath of the COVID-19 pandemic. Recently, classic childhood diseases like measles have been on the rise globally. UNICEF (2025) reports the highest number of measles cases in over 25 years across Europe and other parts of the world. At the same time, children's vaccination rates have declined significantly. In 2023, countries including Albania (83%), Czech Republic (87%), Romania (78%), and the Netherlands (89%) reported vaccination rates that are 10 to 20 percentage points lower than in the decade before COVID-19. Our findings suggest that, following a health crisis, many people in society become more skeptical—or even mistrustful—of state-led health policy measures. Thus, a decline in vaccinations after COVID-19 may have been because most people only encountered the virus by observing the suffering of others. Such indirect exposure heightens awareness of state health authorities while simultaneously eroding trust in them.

Policymakers should be aware of the long-term negative consequences that pandemics can have on public support for health policies and technologies. Our findings suggest that public perception of health policies remains positive at either very low or very high levels of health adversity. The former case is associated with rigorous prevention policies to reduce mortality and demonstrate the state's ability to act and protect its citizens. However, the broader costs of such measures—including lockdowns, school closures leading to educational gaps, and mental health issues due to isolation—must also be taken into account. The latter case, involving widespread loss until nearly every family is directly affected, may lead to heightened caution and increased compliance with health measures. Managing future health shocks will therefore remain a significant challenge for state authorities.

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Online Appendix

Pandemics' backlash: The effects of the 1918 influenza on health attitudes and behavior

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Appendix A: Data sources, coding and access modality

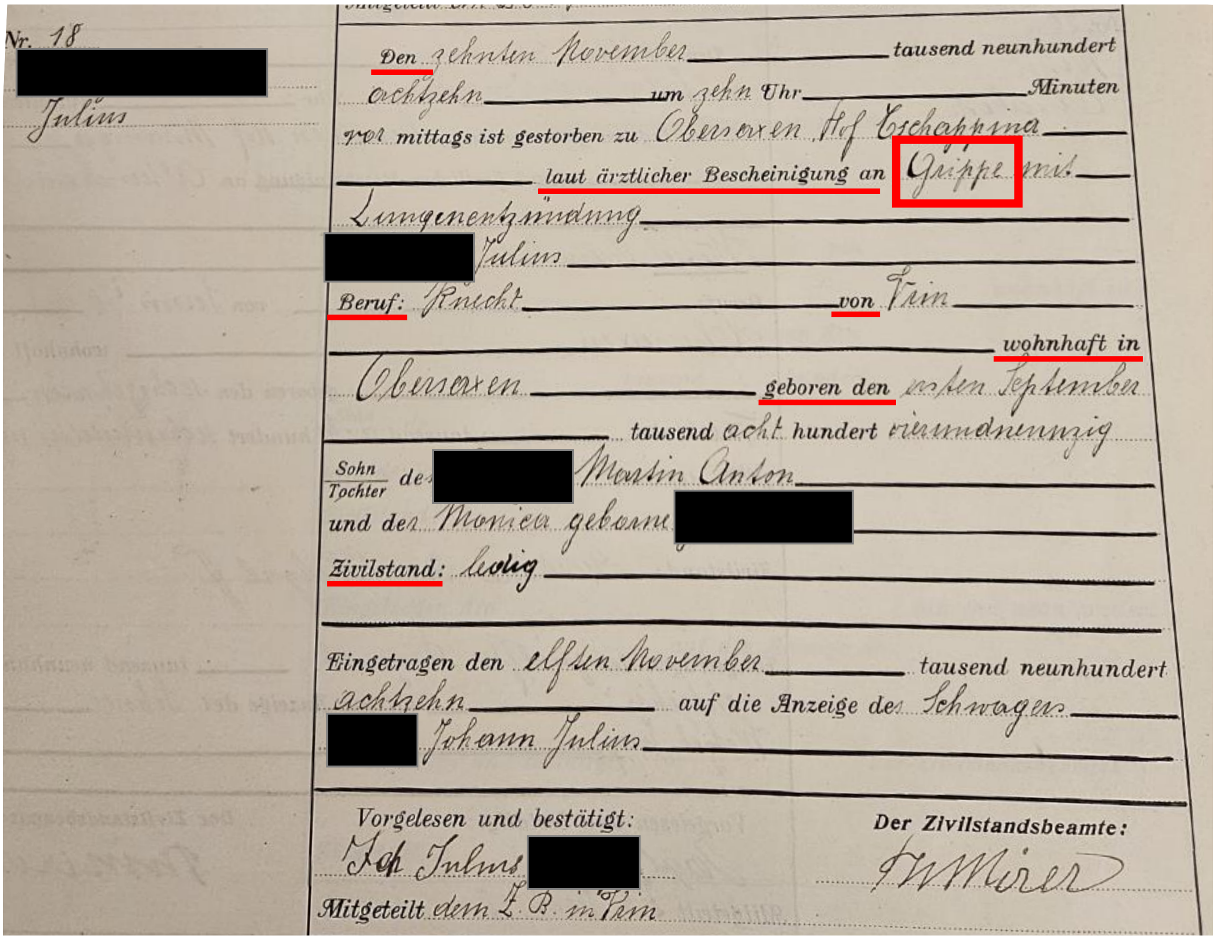
Appendix A lists the main data sources, shows examples of original documents, highlights coding issues and provides detailed access modality for replication.

A.1 Death-register excerpts

We accessed local death-register excerpts from all 218 municipalities in Grisons for 1917 (the last full pre-influenza year) to 1921 (the year before the popular vote on compulsory vaccination). Figure A.1 shows an example of such a document, from which we extract information on the cause of death, the first name and surname of the deceased, date of death and birth, place of residence and origin (i.e., citizenship in accordance with the Swiss law), gender, occupation, and marital status. We coded a person as a "direct influenza death" whenever the influenza was mentioned as the cause of death—either as the sole cause of death or in combination with other diagnoses. Death registers maintained by the municipality's civil registry office include so-called A- and B-Registers. For our analysis, we only use the A-Registers, which cover the universe of death excerpts from people who were residents of the municipality at the time of death. B-Registers, by contrast, contain entries for individuals who did not live in the municipality but held local citizenship. In Switzerland, citizenship is granted at the municipality level and then passed down across generations.

Access modality: All municipality death-register excerpts are stored by the SAG (`https://www.gr.ch/EN/institutions/administration/ekud/afk/sag/`) as civil registry duplicates. These civil registry duplicates are not freely accessible for 1918 and later years, as they are stored together with more recent documents that are still subject to access restrictions. To access the data for 1918 onward, a user must submit a request to the Office for Migration and Civil Law of the Canton of Grisons (*Amt für Migrations- und Zivilrecht des Kanton Graubündens*, see: `https://www.gr.ch/DE/institutionen/verwaltung/djsg/afm/Seiten/start.aspx`). Our contact person in 2022 was Mr. Jon Peider Arquint. Once permission to inspect the death-register excerpts is granted, users must inform the SAG about it. Subsequently, users need to register online with the SAG and pre-order the respective documents in advance via the library order portal at: `https://staatsarchiv-findsystem.gr.ch/home/#/` [Search for: CB VI 001/02 - Zivilstandsregisterdoppel NAME-OF-MUNICIPALITY (1899 - 1917) for death-register excerpts for 1917, and for: CB VI 001/03 - Zivilstandsregisterdoppel NAME-OF-MUNICIPALITY (1918 - 1950) for excerpts for 1918 to 1921. Hereby, NAME-OF-MUNICIPALITY refers to all 218 municipalities that must be ordered separately]. The requested documents will then be delivered to the reading room of the SAG.

Figure A.1: Example of official death-register excerpt from November 1918


Nr. 18
[redacted]
Julius

Den zehnten November tausend neunhundert achtzehn um zehn Uhr Minuten vor mittags ist gestorben zu Obersaxen Hof Tschappina laut ärztlicher Bescheinigung an Grippe mit Lungenentzündung
[redacted] Julius
Beruf: Knecht von Trin wohnhaft in Obersaxen geboren den ersten September tausend acht hundert neunundneunzig
Sohn / Tochter des [redacted] Martin Anton
und der Monica geborne [redacted]
Zivilstand: ledig

Eingetragen den elften November tausend neunhundert achtzehn auf die Anzeige des Schwagers
[redacted] Johann Julius

Vorgelesen und bestätigt:
Joh Julius [redacted]
Mitgeteilt dem Z. B. in Trin

Der Zivilstandsbeamte:

Notes: The figure shows an official death-register excerpt from local authorities. We have blacked out all surnames to maintain anonymity (including the surname of the deceased, the surnames of the deceased's parents, and the reporting person). We digitized first names (to infer the sex) and the surnames of the deceased (to merge them with the infant vaccination data). The excerpt contains detailed information about the person and their death (underlined/highlighted in red). This includes the date, time, and place of death, the medical statement by a doctor of the cause of death (which is influenza (German: *Grippe*) highlighted by the red box), the occupation of the deceased, place of origin, place of residence, date of birth, and marital status. *Source:* SAG (access subject to request).

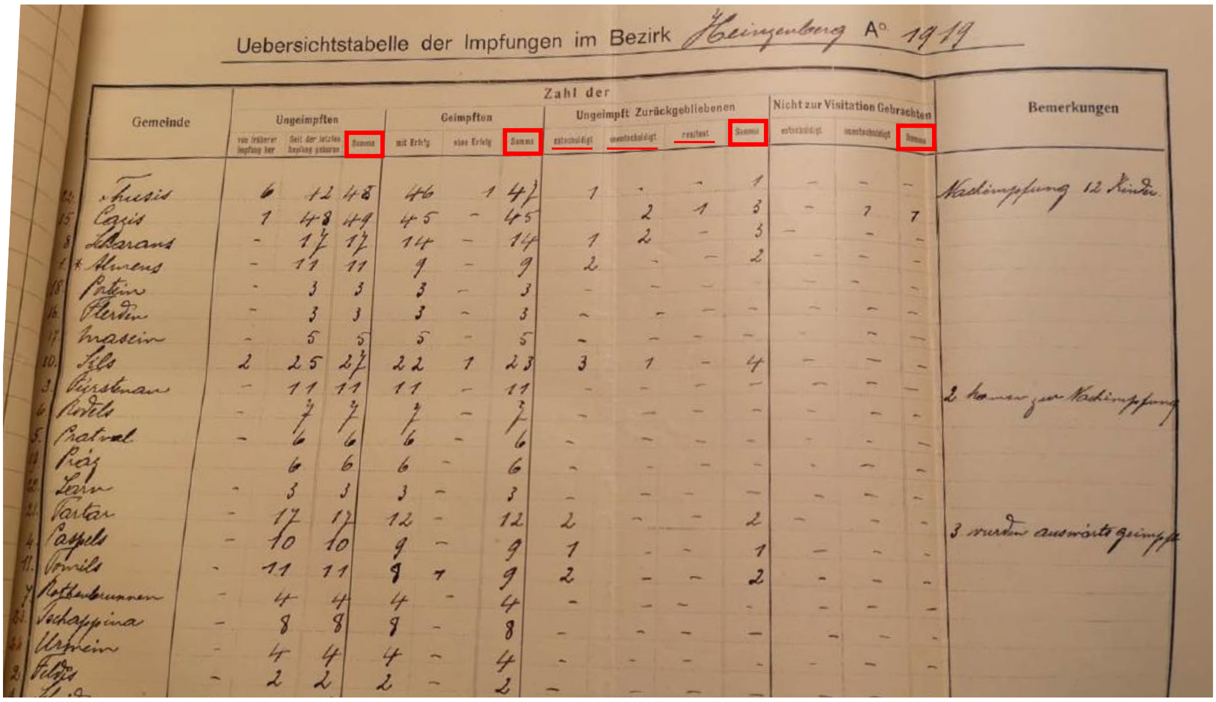
A.2 Vaccination campaigns

Our vaccination data stem from two different types of data sources. District/regional summaries are introduced in Section A.2.1, and municipality records with information on names of the child and their parents are introduced in Section A.2.2.

A.2.1 District/regional summaries

District/regional summaries contain vaccination data from each municipality in a given district or region in Grisons by the type of the vaccination campaign (initial vaccination and revaccination). Figure A.2 provides an example for the region of Heinzenberg for 1919 for the initial vaccination. These summaries list the following columns: total number of children to be vaccinated, number of children vaccinated in the campaign, and a breakdown of unvaccinated children by the reason for vaccination failure or absenteeism. Reasons for failure or absenteeism are often supplemented with an additional comment (German: *Bemerkung*). We applied a uniform coding procedure across all vaccination campaigns to account for differences between regions and years. Specifically, we subtracted children who had relocated, died, were disabled, or were exempted by the health authority (due to age or illness) from the total number of children to be vaccinated. We also adjust our data based on whether a vaccination was carried out later or elsewhere. Figure A.2 also shows that there are two categories to record information on unvaccinated children (German: *Ungeimpft Zurückgebliebenen* and *Nicht zur Visitation Gebrachten*). However, many health authorities used only one of these two categories and did not differentiate between children who attended the campaign but were not vaccinated and those who did not attend at all. (Note that in both categories, children can be excused or not excused). We therefore aggregated all unvaccinated children and summed the reasons for absenteeism, distinguishing between excused, not excused, and *renitent*). Finally, we ensured that the sum of successfully vaccinated children and unvaccinated children matched the total number of children to be vaccinated. Based on these figures, we computed the corresponding shares used in our analysis.

Figure A.2: Example of a vaccination report—district summaries



Notes: The figure shows official district summaries of the district of Heinzenberg's local vaccination campaigns (initial vaccination) for 1919. The district tables contain the following columns: name of the municipality, the number of children who are supposed to be vaccinated, the number of (successfully) vaccinated children, the number of unvaccinated children by cause of absence (excused, not excused, and from vaccination-skeptical families (German: *renitent*)). The district tables also contain comments that we used to clean the data. Reading example of the municipality of Cazis (2^{nd} entry from the top): 49 children are supposed to be vaccinated, 45 children are successfully vaccinated, and 4 children are not vaccinated of whom one child was assigned to belong to a vaccination-skeptical family. *Source:* SAG.

Access modality: District/regional summaries of vaccination campaigns can be freely accessed from the SAG (`https://www.gr.ch/EN/institutions/administration/ekud/afk/sag/`. Users have to register online by the SAG and pre-order the respective documents in advance over the library order portal under: `https://staatsarchiv-findsystem.gr.ch/home/#/` [Search for: V 16 f - Impfberichte der Bezirksphysikate]. The documents are then delivered to the reading room of the SAG.

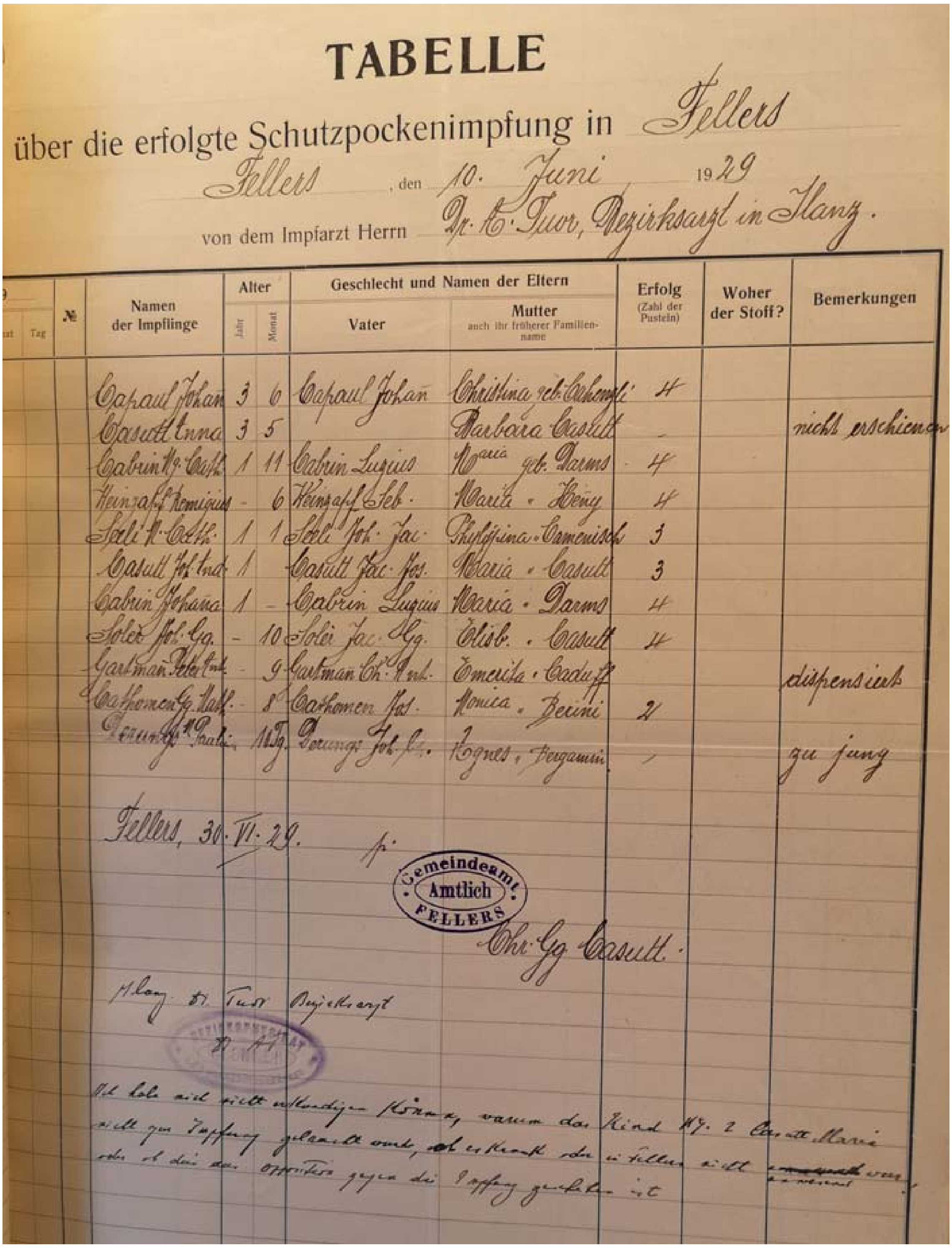
A.2.2 Municipality records (with family names)

Municipality records of the vaccination campaigns consist of separate lists by campaign year, municipality, and vaccination type (initial vaccination and revaccination). Figure A.3 shows an example of such a list from an initial vaccination campaign in 1929 in Fellers/Falera, signed and stamped by the local authorities. We use the information on the number of children on the list (representing the raw number of children to be vaccinated) and code the vaccination success, reasons for vaccination failures, and absenteeism. From the raw number, we subtract children who are on the list but are not expected to be vaccinated from the raw number. These include—following the coding approach used for district/regional summaries in Section A.2.1—children who had relocated, died, or were disabled as well as those exempted by the health authority due to age or sickness.

We collected municipality records for two main purposes. First, we aimed to fill gaps in the data for the vaccination campaign data for 1907, 1913, and 1919 to 1933, which are primarily based on district summaries available from the SAG. Second, we accessed the municipality archives of all 39 municipalities (based on the territorial status of the 1920s) in the region of Glenner to construct an individual-level dataset. In these archives, we searched for missing records for the years unavailable in the SAG. These include the vaccination campaign years of 1905 (children with their initial vaccination in 1905 will be revaccinated in 1919—the first campaign year *after* the influenza pandemic), 1909, 1911, 1915 and 1917.

For the 38 municipalities of Glenner, we digitized all information on children, including surnames, first names, parents' names, and age. All names were cleaned to correct typos and standardize spelling variations—for example, handling differences like "ph" vs. "f" in Stephan vs. Stefan, or the historical shift from "y" to "i" in surnames such as Yten to Iten. We also accounted for common short forms of names (e.g., Toni for Anton, Sepp for Joseph), and adjusted for first name variants across languages (e.g., "Menga" in Romansh for "Monika/Monica" in German). Using this data, we constructed a panel that links children and their parents to direct influenza death with the same surnames. For the family-level panel, we manually form families by looking at sequential orderings of fathers' surnames, fathers' first names, mothers' maiden surnames, and mothers' first names, and then assign children to these families. The assignment of children to families was given to

Figure A.3: Example of an individual (child) level vaccination report at the municipality



TABELLE

über die erfolgte Schutzpockenimpfung in Fellers

Fellers, den 10. Juni 1929

von dem Impfarzt Herrn Dr. A. Tuor, Bezirksarzt in Ilanz.

№	Namen der Impflinge	Alter Jahr	Alter Monat	Geschlecht und Namen der Eltern: Vater	Mutter auch ihr früherer Familienname	Erfolg (Zahl der Pusteln)	Woher der Stoff?	Bemerkungen
	Capaul Johan	3	6	Capaul Johan	Christina geb. Cahenzli	4		
	Casutt Anna	3	5		Barbara Casutt	–		nicht erschienen
	Cabrin Cath.	1	11	Cabrin Luzius	Maria geb. Darms	4		
	Heinzapf Remigius	–	6	Heinzapf Seb.	Maria " Beny	4		
	Soler M. Cath.	1	1	Soler Joh. Jac.	Philippina " Camenisch	3		
	Casutt Jos. Andr.	1		Casutt Jac. Jos.	Maria " Casutt	3		
	Cabrin Johana	1	–	Cabrin Luzius	Maria " Darms	4		
	Soler Jos. Gg.	–	10	Soler Jac. Gg.	Elisb. " Casutt	4		
	Gartman Peter Ant.	–	9	Gartman Chr. Ant.	Emerita " Caduff			dispensiert
	Cathomen Gg. Mat.	–	8	Cathomen Jos.	Monica " Berini	2		
	Derungs M. Paula		14 Tg.	Derungs Joh. [illegible]	Agnes " Bergamin	–		zu jung

Fellers, 30. VI. 29.

Gemeindeamt Amtlich FELLERS

Chr. Gg. Casutt.

Ilanz Dr. Tuor Bezirksarzt

[illegible]

Notes: The figure shows an official local vaccination report (initial vaccination) for the municipality of Fellers/Falera in the district of Glenner. The list includes the first name and surname of the child who should be vaccinated, the age of the child (in years and months), the first name and surname of the father, and the first name and the maiden name of the mother (if available). Using the child's age and the recorded date of the vaccination campaign, we estimate each child's approximate birth date. This, combined with the name and parental information, allows us to identify the same child across different years and across both vaccination and revaccination campaigns. The vaccination report records whether the vaccination was successful (German: *Erfolg*) and includes comments (German: *Bemerkungen*) explaining the reasons for unsuccessful vaccinations or absences. We used these comments for data cleaning and coding. For instance, children who are labeled as "too young" (German: *zu jung*) were excluded from the pool of children assigned to be vaccinated. *Source:* SAG and various municipality archives in Glenner.

two research assistants who worked independently. We then consolidated the result files ourselves.

We create the individual-level panel linking children who were assigned to receive their initial vaccination before the influenza pandemic to children who were supposed to be revaccinated after the pandemic. We matched children based on their naming information and estimated date of birth, which was inferred using the date of the vaccination campaign and the child's recorded age in years and months. For each entry in the pre-pandemic period, we searched entries with similar birthdates and similar names in the post-treatment period and performed several rounds of manual checks. The same task was given to two research assistants who worked independently. We then consolidated the result files ourselves.

Access modality: Municipality vaccination campaign records for 1907 and 1913, and from 1919 to 1933 can be freely accessed through the SAG at `https://www.gr.ch/EN/institutions/administration/ekud/afk/sag/`. Users must register online with the SAG and pre-order the respective documents in advance over the library order portal at `https://staatsarchiv-findsystem.gr.ch/home/#/` [Search for: V 16 e - Impfwesen der Gemeinden, Kreise und Bezirke; The municipality records are bound in books by year]. The documents are then delivered to the reading room of the SAG.

To access the municipality archives of Glenner to obtain the remaining municipality vaccination records from 1905 to 1933, users must contact each individual municipality archives separately. As of 2024, the former 38 municipalities of Glenner have been merged to ten municipalities as of 2024. The relevant municipality archives of the former entities can be accessed through the following municipalities: Breil/Brigels (of which only Andiast and Waltensburg belonged to Glenner in the 1920s), Falera, Ilanz/Glion, Laax, Lumnezia, Obersaxen Mundaun, Safiental, Sagogn, Schluein, Vals. For access, visit the official website of each municipality and contact the local office to obtain the archivist's details and arrange a visit.

A.3 Popular votes

We compiled all popular votes at the cantonal level in Grisons from 1901 to 1933. 79 out of 83 cantonal popular votes were retrieved from handwritten voting records provided by the SAG. These records include the number of eligible voters and the number of "Yes" and "No" votes. For the remaining four popular votes, we accessed the newspaper "*Neue Bündner Zeitung*", one of the main local German-language newspapers in Grisons at that time. The following four popular votes (date and German title) were retrieved from the newspaper:

- 21.12.1919: Gesetz über das Lehrlingswesen

– 19.08.1923: Gesetz über das Jagdpatent

– 25.07.1926: Teilrevision des Eisenbahngesetzes

– 07.04.1929: Gesetz betreffend Ausübung von Handel und Gewerbe

All popular votes are sorted by political domain and date and are reported in Table A.1 below. The table lists the date, German title, type of popular vote (referendum or initiative), the government's vote recommendation, and the content of each bill. The tables are divided into ten different panels, each corresponding to a specific political domain. We assigned each popular vote a domain based on its content. The government's recommendation is sourced from official voting books, in which the government presents the pros and cons for each bill and issues a recommendation to the public (either "Yes" or "No"). This recommendation stems from both the cantonal executive (*Kleiner Rat*) and the cantonal parliament (*Grosser Rat*)—the executive and the parliament never contradict each other. In general, the recommendation is always "Yes" for referendums, these are government- and parliament-initiated bills. For initiatives, the recommendation varies depending on the proposal.

Access modality: 79 out of 83 voting records can be freely accessed through the SAG (`https://www.gr.ch/EN/institutions/administration/ekud/afk/sag/`). Users have to register online with the SAG and pre-order the respective documents in advance via the library's order portal: `https://staatsarchiv-findsystem.gr.ch/home/#/` [Search for: VI 2 b - Kantonale Abstimmungen]. The documents will be delivered to the SAG reading room upon request. Access to the newspapers converting the remaining 4 popular votes is provided by the Cantonal Library of Grisons in Chur via microfilms (`https://www.gr.ch/DE/institutionen/verwaltung/ekud/afk/kbg/Seiten/welcome.aspx`). Historical issues of the newspaper "*Neue Bündner Zeitung*" are freely accessible in the library's reading room.

Table A.1: Overview of all popular votes in Grisons, 1901-1933

Date	Topic of popular vote (original title in German)	Initia-tive	Claim of Gov.	Content of popular vote in English (own translation and description)
Panel A: Health policy (provision and prevention)				
03.11.1901	Abänderung des Art. 19 der Sanitätsordnung	0	Pro	Authorization of doctors w/o Swiss diploma (adaptation to a federal law to promote foreign doctors to work in CH)
16.11.1902	Gesetz betr. Massnahmen gegen die Tuberkulose	0	Pro	Voting on a law to combat tuberculosis (mandatory reporting and measures to prevent infections)
13.10.1907	Partielle Revision der Sanitätsordnung	0	Pro	Regulation of licensing rules for veterinarians
31.10.1909	Staatliche Förderung der Krankenpflege	0	Pro	Promotion of state health care via construction and operation of hospitals (subsidies for health infrastructure)
06.04.1913	Errichtung einer kant. Versorgungsanstalt in Realta	0	Pro	Construction and operation of a cantonal psychiatric building Realta
05.03.1922	Volksinitiative betreffend Impfzwang	1	Against	Aims to abolish compulsory vaccination of children (to stop free-of-charge smallpox vaccination)
30.04.1922	Initiative betr. Gestattung der Kräuterheilmethode	1	Against	Herbal healing methods should be treated the same as conventional medicine
08.04.1923	Gesetz betreffend die Krankenversicherung	0	Pro	New health insurance law with more subsidies from the federal governm. incl. a cap for contributions and benefits
Panel B: Policies on new technologies (automobile ban)				
13.10.1907	Automobilverordnung	0	Pro	Allowing for easing the automobile ban; exceptions can be granted by the government
05.03.1911	Gesetz betreffend Automobilverbot	1	Against	Aims to abolish the automobile ban (popular initiative)
05.03.1911	Gegenvorschlag zum Gesetz betreffend Automobilverbot	0	Pro	Counterproposal by the government to the initiative that aims to abolish the automobile ban.
21.03.1920	Gesetz betreffend Motorfahrzeuge	0	Pro	Admission rules for automobiles to abolish the automobile ban
13.03.1921	Gesetz betreffend Motorfahrzeuge	0	Pro	Aims to abolish the automobile ban
30.04.1922	Zulassung des Verkehrs mit Motorfahrzeugen für Ärzte, usw.	1	Pro	Aims to abolish the automobile ban for certain professions (doctors, fire brigade, etc.)
24.06.1923	Gesetz betr. probeweise Öffnung einiger Strassen fürs Auto	0	Pro	Trial opening of some roads to automobiles
09.06.1924	Öffnung von Strassen fürs Auto während der Zentenarfeier	0	Pro	Opening roads to automobiles during a local festival
18.01.1925	Gesetz über den Verkehr mit Motorfahrzeugen	0	Pro	Law on motor vehicle traffic (Abolition of the automobile ban)
21.06.1925	Gesetz betreffend teilweise Zulassung des Automobils	1	Pro	Law concerning partial registration of automobiles (Abolition of the automobile ban)
Panel C: Education reforms				
11.09.1904	Schulpflicht und Schuldauer	0	Pro	Law on compulsory schooling (at the age of 7) and the duration of schooling (8 years)
21.12.1919	Gesetz über das Lehrlingswesen	0	Pro	Change in the employment relationship of the apprentices and improvement of the working conditions
04.03.1923	Gesetz betreffend Handarbeit für Mädchen	0	Pro	Increase of handicraft lessons for girls and making them mandatory in all communities
10.09.1933	Gesetz betreffend Schulpflicht und Schuldauer	0	Pro	Adaptation to the new curriculum and Switzerland-wide harmonization of school hours and duration
Panel D: Infrastructure policies				
28.02.1904	Bau des Archiv- und Bibliothekgebäudes	0	Pro	Approval of a loan for the construction of a new archive and library building
01.03.1908	Subventionierung der Splügenbahn mit 4 Mill. Franken	0	Pro	Cantonal participation in the construction of a railway line through the Splügen (planning stage)
24.10.1908	Revision des Art. 6 des Wuhrgesetzes	0	Pro	Cantonal support in river corrections and torrent control measures (cost-sharing)
24.04.1910	Chemisches Laboratorium und Musterschulgebäude	0	Pro	New construction of the cant. laboratory for the examination of food and everyday objects (incl. training rooms)
09.11.1919	Finanz. Beteiligung des Kantons an der AG GR Kraftwerke	0	Pro	Financial participation of GR in a hydropower cooperative for power plants (to produce electricity for the RhB)
16.06.1922	Beteiligung des Kantons an der AG Bündner Kraftwerke	0	Pro	The canton should contribute CHF 5 million to the electricity power plants (for economic development)
25.07.1926	Teilrevision des Eisenbahngesetzes	0	Pro	Partial revision of the Railway Act by adapting railway fund rules to improve the railway infrastructure
20.02.1927	Strassengesetz	0	Pro	Changing the road law to adjust cost calculations for the operation of roads and similar public tasks
10.09.1933	Kantonales Meliorationsgesetz	0	Pro	Cantonal land improvement law by adjusting the financing due to the increase in federal subsidies
Panel E: Public security insurances (fire, water, livestock)				
13.10.1907	Gebäudeversicherungsgesetz	0	Pro	Introduction of compulsory state fire insurance for all buildings in the canton
28.04.1912	Revision des Viehversicherungsgesetzes	0	Pro	General revision of the livestock insurance law (regulates local join forces, defines object insured, and payoffs)
08.11.1914	Gesetz betreffend Viehseuchenfonds	0	Pro	Creation of a mandatory cantonal cattle disease fund and state support in the event of cattle disease
11.04.1920	Gesetz betr. Brandversicherung im Kanton Graubünden	0	Pro	Extension of the Fire Protection Act of 1908 (inclusion of household goods)
11.04.1920	Kantonales Fürsorgegesetz	0	Pro	Establishing a welfare center for alcoholics, people with a dissolute lifestyle, and vagrants
03.10.1920	Brandversicherungsgesetz	0	Pro	Revision of the Fire Insurance Act of 1920 (lower premium rates and measures against fraud)
27.02.1921	Bildung eines Viehseuchenfonds	0	Pro	Revision of the livestock disease fund due to a new federal law and balancing the financial deficit
05.03.1922	Gesetz betreffend Bildung eines Tierseuchenfonds	0	Pro	Revision of the livestock disease bill (regain power from the federal gov. and better conditions for goat owners)
18.01.1925	Gesetz zur Vergütung von Schäden bei Naturereignissen	0	Pro	Law on compensation for damages caused by natural disasters (better coverage and creation of a cantonal fund)
06.12.1931	Gesetz betreffend die Kleinviehversicherung	0	Pro	Law on small livestock insurance to include small livestock to receive more subsidies from the federal government
06.03.1932	Gesetz betreffend die Versicherung der Gebäude	0	Pro	Insurance of buildings against natural hazards (extension of the insurance coverage due to floods in 1927)
03.04.1932	Gesetz über den kantonalen Tierseuchenfonds	0	Pro	Law on the cantonal animal disease fund (increase of contribution per animal to balance deficits)

Continued on the next page

Table A.1 — *(continued from the previous page)*

Date	Topic of popular vote (original title in German)	Initiative	Claim of Gov.	Content of popular vote in English (own translation and description)
Panel F: Administration policies (concordats, laws)				
16.11.1902	Gesetz betr. Verantwortlichkeit der Behörden/Beamten	0	Pro	Law concerning the responsibility of authorities and officials (regulation activities and prosecution)
28.02.1904	Konkordat betreffend Prozessvertröstung	0	Pro	Concordat on postponement of court proceedings (to protect people from other cantons)
03.11.1907	Zivilprozessordnung	0	Pro	Complete revision of the Code of Civil Procedure (regulates the course of proceedings in civil disputes)
25.04.1909	Gesetz über bedingten Straferlass	0	Pro	Law on conditional amnesty mainly for juvenile delinquents to postpone a sentence and suspend it on probation
23.10.1910	Enteignungsgesetz (Expropriation)	0	Pro	Expropriation Act (new legal regulation of state expropriation of private individuals)
29.10.1911	Einführungsgesetz zum Schweizerischen Z.G.B.	0	Pro	Introductory law to the Swiss Z.G.B. to be newly applied in Grisons
14.09.1913	Uebereinkunft betreffend gegenseitige Rechtshilfe	0	Pro	Agreement on mutual legal assistance
02.03.1919	Beitritt zum Konkordat betr. wohnörtlicher Unterstützung	0	Pro	Joining the concordat on residential support for poor people (inter-cantonal equalization payments)
27.02.1921	Amtliche Inventarisation in Todesfällen	0	Pro	Official inventory in the event of death (affects movable capital to increase tax justice)
13.03.1921	Teilrevision der Zivilprozessordnung	0	Pro	Partial revision of the Code of Civil Procedure (increase the power of judges to increase efficiency)
13.03.1921	Teilrevision des Strafgesetzbuches	0	Pro	Partial revision of the penal code (increase the offence sum for police investigation and adjustment of fines)
04.03.1923	Teilrevision des Straf- und Polizeigesetzes	0	Pro	Partial revision of the criminal and police law (revision of the rejected law and strengthening of district courts)
20.02.1927	Kantonales Strafgesetz	0	Pro	Revision of the cantonal penal code
Panel G: Economic regulation				
17.03.1907	Gesetz betreffend das Führerwesen	0	Pro	Law on Guides to regulate the licensing of mountain guides
24.10.1908	Streikgesetz	0	Pro	Strike law to introduce measures to prevent riots in collective disputes between employees and employers
13.10.1918	Gesetz über die öffentlichen Ruhetage	0	Pro	Law on public rest days (Sunday is protected stronger by law as a day of rest to protect employees)
13.10.1918	Kleinhandel mit Wein, Bier und Most über die Gasse	0	Pro	Introduction of a framework for retail trade in alcoholic beverages (to combat alcoholism)
21.12.1919	Gesetz betreffend Fremdenstatistik	0	Pro	Law w.r.t. foreign worker statistics (keep a register on foreign workers in the hospitality industry)
20.02.1927	Gesetz über das Führer- und Skilehrerwesen	0	Pro	Law on guide and ski instructors (ski instructors need a cantonal license to work as a ski instructor)
07.04.1929	Gesetz betreffend Ausübung von Handel und Gewerbe	0	Pro	Law w.r.t. the practice of trade and commerce (adjustment of the licensing conditions, peddling, etc.)
10.11.1929	Revision des Gesetzes über die öffentlichen Ruhetage	0	Pro	Revision of the law on public rest days (adjustment of the regulation of rest days and increase of)
Panel H: Rules of politics and suffrage				
11.09.1904	Repräsentanzgesetz	0	Pro	Renewal of the representation law of the canton of Graubünden (seat allocation in the parliament)
17.03.1907	Gesetz betreffend Stimmrecht und Stimmpflicht	0	Pro	Canton-wide harmonization of voting rights and mandatory voting obligations
06.03.1932	Revision der Kt.-Verfassung (Amtsdauer Ständeräte)	0	Pro	Revision of the cant. constitution (extension of tenure from 3 to 4 y. of members in the Federal State Council)
06.03.1932	Revision der Kt.-Verfassung (Amtsdauer Kleiner Rat)	0	Pro	Revision of the cant. constitution (term of office of the cant. government and regulation of re-election)
Panel I: Public finance (remuneration and tax policy)				
31.10.1909	Lehrerbesoldungen	0	Pro	Inflation adjustment and general wage increase of teachers
11.11.1917	Gesetz über die Besoldung der Volksschullehrer	0	Pro	Inflation adjustment of wage of teachers due to the war
23.06.1918	Kantonales Steuergesetz	0	Pro	Revision of the tax law (tax-free allowance for wealth, tax-exempt amounts, the progression of income)
02.03.1919	Teuerungszulagen an die Bündner Volksschullehrer	0	Pro	Inflation adjustment of wages of teachers
07.03.1920	Kantonale Gehaltsliste	0	Pro	Inflation adjustment plus general wage adjustment for civil servants and teachers employed by the canton
03.10.1920	Besoldung der Volksschullehrer	0	Pro	Inflation adjustment and general wage increase of teachers
10.09.1933	Revision des kantonalen Steuergesetzes	0	Pro	Formulation of savings measures and new sources of income (tax progression of assets, abolition of tax privileges)
Panel J: Public property regulation (mainly hunting and fishing)				
03.11.1901	Einführung neues Jagdgesetz	0	Pro	Vote on the introduction of a completely revised hunting law (incl. regulations on patents)
16.11.1902	Fischereigesetz	0	Pro	Vote on the introduction of a cantonal fishing law to substitute the federal law
18.03.1906	Wasserrechtsgesetz	0	Pro	Introduction of a law to regulate the use of public waters (ownership claims and fines for violations)
01.03.1908	Gesetz betreffend das Tragen von Waffen	0	Pro	The carrying of weapons (especially pistols and knives) should be restricted for "foreign workers"
31.10.1909	Pflanzenschutzgesetz	0	Pro	Introduction of provisions to protect rare and important plants
23.10.1910	Partialrevision des Jagdgesetzes	0	Pro	Revised of the hunting law (incl. Benefits and fees of patents)
07.03.1915	Fischereigesetz	0	Pro	Financial support and new regulations on fishing volumes to increase profitability
04.03.1917	Fischereigesetz	0	Pro	Revision of the rejected law in 1915: no increase of license fees, and fishing will still not be allowed on Sundays
13.03.1921	Revision des Fischereigesetzes	0	Pro	Increase in license fees and regulations on crab fishing during certain seasons
19.08.1923	Gesetz über das Jagdpatent	0	Pro	Increase in hunting license fees
25.07.1926	Kantonales Jagdgesetz	0	Pro	Adaption of the cant. hunting law to the fed. law (free hunting and a lease system; hunting w/o dogs in some places)
03.04.1932	Kantonales Fischereigesetz	0	Pro	Increase in license fees and reduction in fishing expenses (canton aims to increase revenues)

Notes: The table lists all popular votes at the cantonal level in Grisons from 1901 to 1933 ordered by political domain. Within each Panel, popular votes are ordered chronologically by date (DD.MM.YYYY). The topic of the popular vote displays the original title of the respective bill in German (with some abbreviations). The table lists the forms of the popular vote, which are either mandatory referendums (the popular vote must be held by the cantonal constitution) or popular initiatives (when citizens propose changes to laws or the constitution). The table also lists the voting recommendation by the government, i.e., whether the cantonal government (Kleiner Rat) and the cantonal parliament (Grosser Rat) are in favor or against the bill. The government and the parliament always provide consistent voting recommendations. The last column describes the context of the popular vote (own translation). *Source:* SAG.

A.4 Further data

This section provides detailed data sources and access modality of further covariates that are introduced in Section 3.4 in the main paper.

Decennial census data (1900 to 1930)
Population data and socio-demographic characteristics for 1900, 1910, 1920 and 1930 stem from the Swiss Federal Statistical Office. The data include counts of the population, number of houses and households, sex distribution, religious affiliation, spoken languages, and region of origin.
Access modality: The core data of the decennial census are provided as `.csv` or `.xls` files and are freely accessible via the following link: `https://www.bfs.admin.ch/asset/de/32067220`

Further census data
The historical age structure in 1880 at the municipality level, the commuting statistics from 1910, and the economic sectors of the resident population in 1920 stem from the following three Swiss censuses (hard copies or PDF):

- *Die Bevölkerung nach Geschlecht, Altersperioden, Civilstand, Heimath, Aufenthalt, Konfession und Sprache, nebst der Zahl der Haushaltungen und der bewohnten Häuser und Räumlichkeiten.* Eidgenössische Volkszählung vom 1. Dezember 1880. Erster Band. Bern: Verlag Orell Füssli & Co., Zürich.
- *Wohnort und Arbeitsort der schweizerischen Bevölkerung nach der Volkszählung vom 1. Dezember 1910.* Eidgenössische Volkszählung vom 1. Dezember 1910. Heft 1. Bern: Buchdruckerei Benteli A.G., Bern-Bümpliz.
- *Eidgenösslsche Volkszählung vom 1. Dezember 1920. Kantonsweise Ergebnisse: Kanton Graubünden.* Eidgenössische Volkszählung vom 1. Dezember 1910. Heft 9. Bern: Buchdruckerei Benteli A.G., Bern-Bümpliz.

Access modality: These editions of the Swiss Census can be freely accessed as PDFs via the homepage of the Swiss Federal Statistical Office (`www.bfs.admin.ch`) by entering keywords of the book titles in the search engine, accessible via the following link: `https://www.bfs.admin.ch/bfs/en/home/statistics/catalogues-databases/publications.html`.

Mortality data at the Cantonal level (1901 to 1925)
Overall death numbers by Swiss canton and for all of Switzerland are obtained from the Statistical Yearbook of Switzerland (Statistisches Jahrbuch der Schweiz). We accessed all PDFs for 1900 to 1925 and digitized cantonal mortality statistics for each year.
Access modality: The Statistical Yearbooks of Switzerland are freely accessible via the website of the Federal Statistical Office. Each issue can be downloaded as PDF and is

listed at the bottom of the following webpage: `https://www.bfs.admin.ch/bfs/de/home/statistiken/kataloge-datenbanken/publikationen/uebersichtsdarstellungen/statistisches-jahrbuch.html`.

Doctors/general practitioners in 1918/19

The list of practicing doctors/general practitioners during 1918 and 1919 was initially collected by the "Association of General Practitioners in Grisosn" (German: *Bündnerischer Ärzteverein*). The documents list all general practitioners by year, including their names, place of residence, and fields of specialization (if any).

Access modality: The list of doctors/general practitioners can be freely accessed from the SAG (`https://www.gr.ch/EN/institutions/administration/ekud/afk/sag/`). Users must register online with the SAG and pre-order the respective documents in advance via the library order portal under: `https://staatsarchiv-findsystem.gr.ch/home/#/` [Search for: D V/10 - Bündnerischer Ärzteverein (1820 - 2015)]. The documents will then be delivered to the reading room of the SAG.

Hospitals as of 1918

Operating hospitals are listed by the Health Department of the Canton of Grisons. Each public health institution is introduced with a brief history. We coded whether a hospital already existed in 1918. Private hospitals also existed, but always in the same places as public hospitals (e.g., in Davos).

Access modality: A list of hospitals and their founding histories is freely accessible by the Health Department of the Canton of Grisons under:

`https://www.gr.ch/DE/institutionen/verwaltung/djsg/ga/InstitutionenGesundeitswesens/Spitaeler/Seiten/default.aspx`.

Churches in Glenner

We accessed the names of the church buildings and digitized the names of churches and chapels (both Catholic and Protestant buildings) in the region of Glenner (individual-level data set). We used different language variations and the name root of these names (Latin, Romansh, German, and Italian) to match church names in a municipality to the naming pattern of children in the same municipality.

Access modality: A list of churches and chapels is freely provided by "Kirchen-Online" under the following link:

`http://www.kirchen-online.org/kirchen--kapellen-in-graubuenden-und-umgebung/`.

Students in higher education institutions

We digitized the lists of students in higher education institutions in Grisons from 1900 to 1940 using yearbooks of the respective schools. The lists are organized by school year and include the students' surname and first name, years of birth, and municipalities of residence or origin. We digitized graduating students from the following three gymnasiums and teacher training colleges in Grisons:

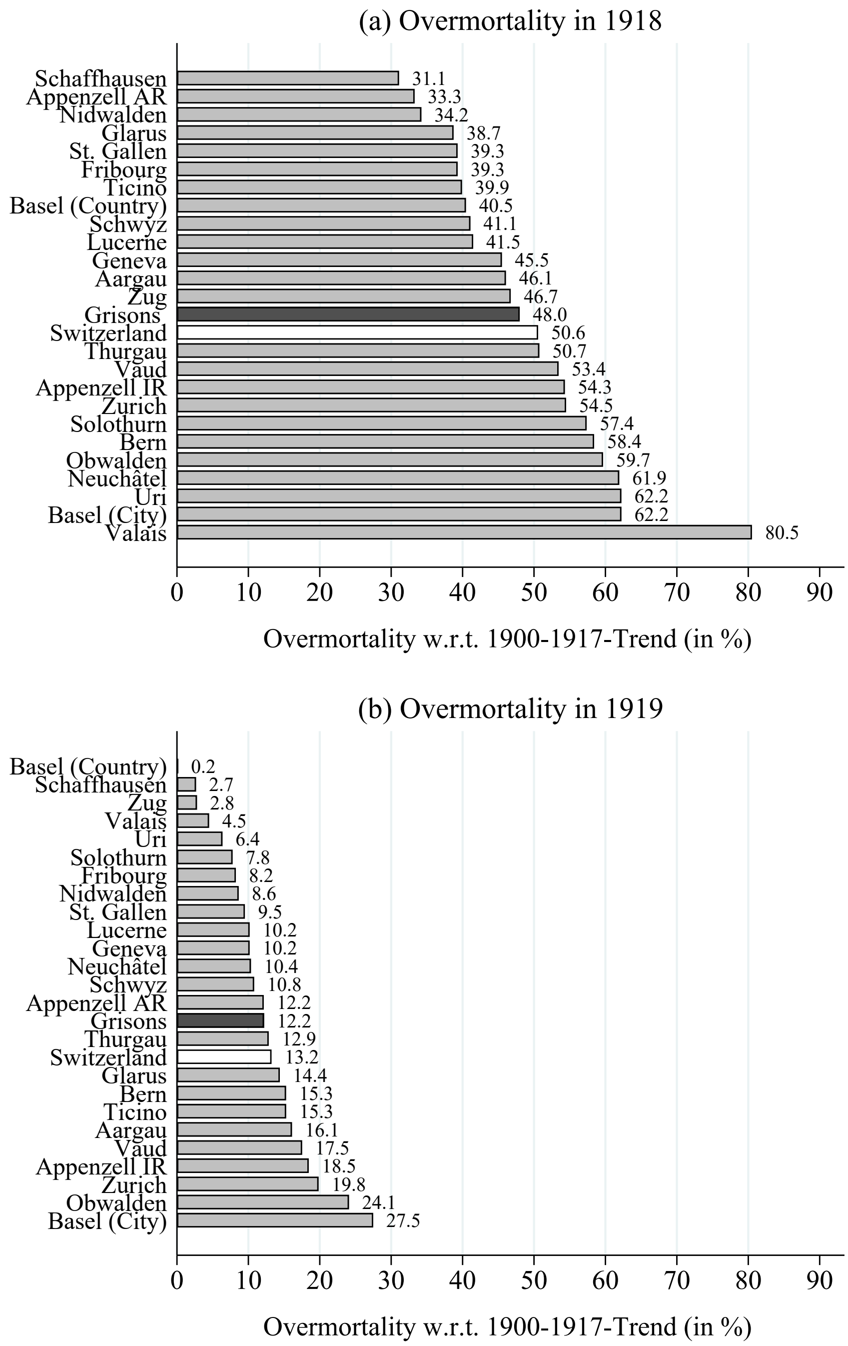
- Kantonsschule Chur
- Evangelische Mittelschule Schiers
- Klosterschule Disentis

We did not digitize students from the "Hochalpines Institut Ftan", "Lyceum Alpinum Zuoz", and the predecessor of the "Schweizerische Alpine Mittelschule Davos", as these institutions were residential schools primarily serving (wealthy) foreign students.
Access modality: The yearbooks of higher education institutions in Grisons are available in the reading room of the Cantonal Library of Grisons in Chur. We accessed all yearbooks from the respective schools. The books can be found in the Cantonal Library's online catalogue under the following link: `https://www.opac.gr.ch/discovery/search?vid=41BGR_INST:41BGR_V1&lang=de` [For example, to find yearbooks of 1918/1919 for the "Kantonsschule Chur" search for: Jahresbericht der Kantonschule Chur (1919/20)].

Appendix B: Additional figures and tables

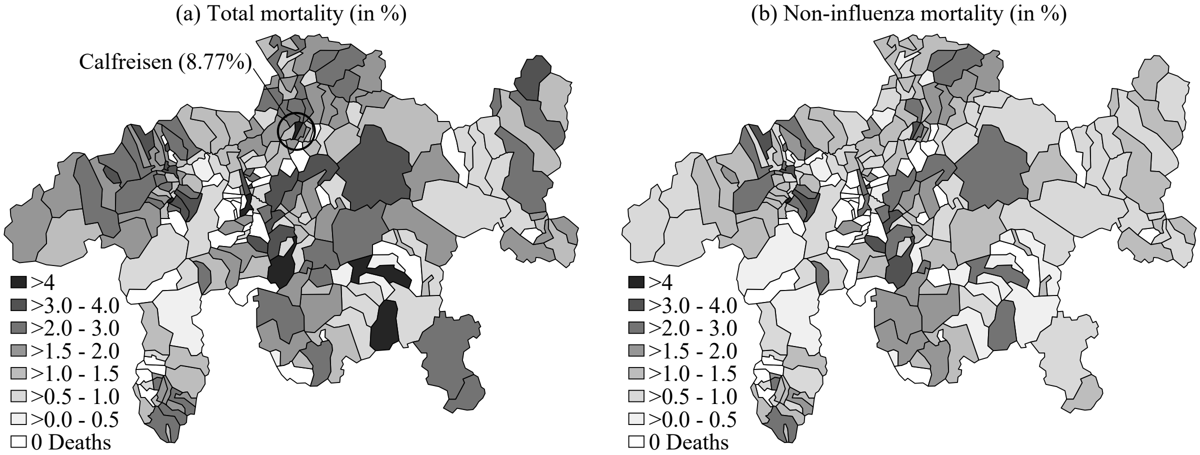
B.1 Additional figures

Figure B.1: Excess mortality by Swiss Cantons, 1918 and 1919



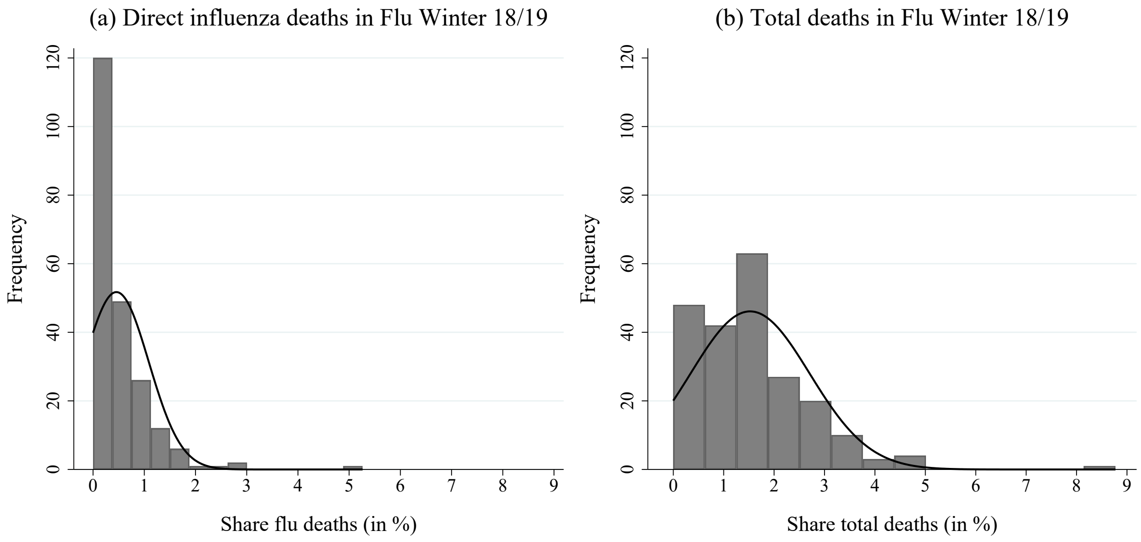
Notes: The figure shows bar charts with excess mortality by 25 Swiss cantons and Switzerland for the main influenza years of 1918 (Graph (a)) and 1919 (Graph (b)). Excess mortality in 1918 and 1919 is defined as the deviation in the cantonal or Swiss-wide mortality rate from the 1900 to 1917 trend (in %). Both graphs are ordered by excess mortality. Grisons (dark gray bar) is in both years close to the Swiss average (white bar). *Source:* Statistisches Jahrbuch der Schweiz (various years).

Figure B.2: Total mortality and non-influenza mortality in Grisons in the winter of 1918/19



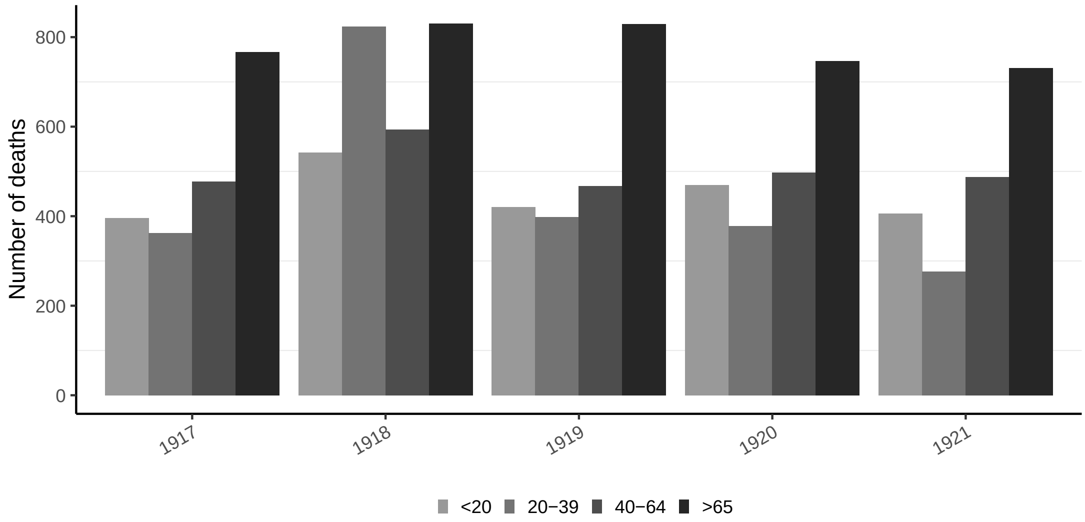
Notes: The figure shows two maps at the level of 218 municipalities in Grisons and reports different mortality rates during the main influenza period. Graph (a) shows the overall mortality rate which is defined as total deaths during the main influenza period from September 1918 to April 1919 as a share of the total pre-influenza population (in %). Graph (a) highlights the municipality of Calfreisen, which has the highest death rate during the influenza period in entire Grisons (5 deaths from October 1918 to February 1919 out of 57 inhabitants according to the census in 1910; the mortality rate is thus: 5/57 = 8.77%). Graph (b) shows the non-influenza mortality rate that is defined as non-influenza deaths (according to the death-register reports) during the main influenza period from September 1918 to April 1919 as a share of the total pre-influenza population (in %).

Figure B.3: Histograms of direct influenza deaths and total deaths during winter of 1918/19



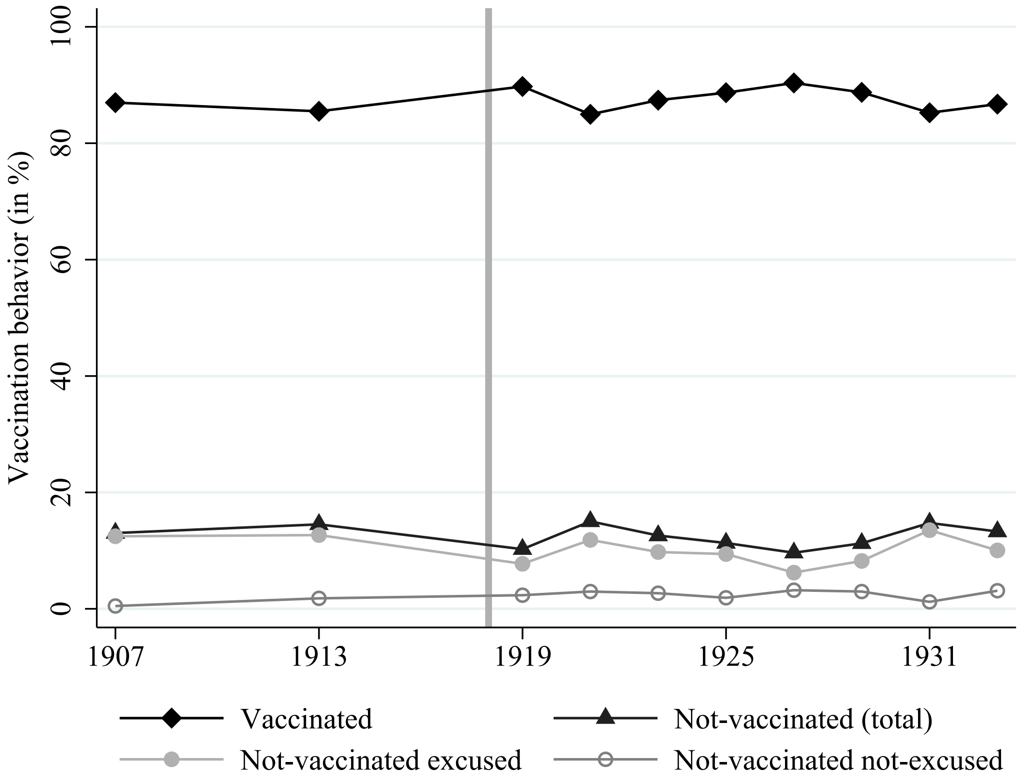
Notes: The figure presents two histograms showing mortality frequencies during the flu winter of 1918/19 across 218 municipalities in Grisons. Graph (a) displays the frequency of influenza deaths, defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population (in %). Graph (b) shows the frequency of total deaths, defined as the number of total deaths during the same period, also expressed as a percentage of the total pre-influenza population (in %). Both graphs also include the normal distribution of the respective mortality rate, based on the observed mean and standard deviation.

Figure B.4: Deaths by age groups and year, 1917-1921



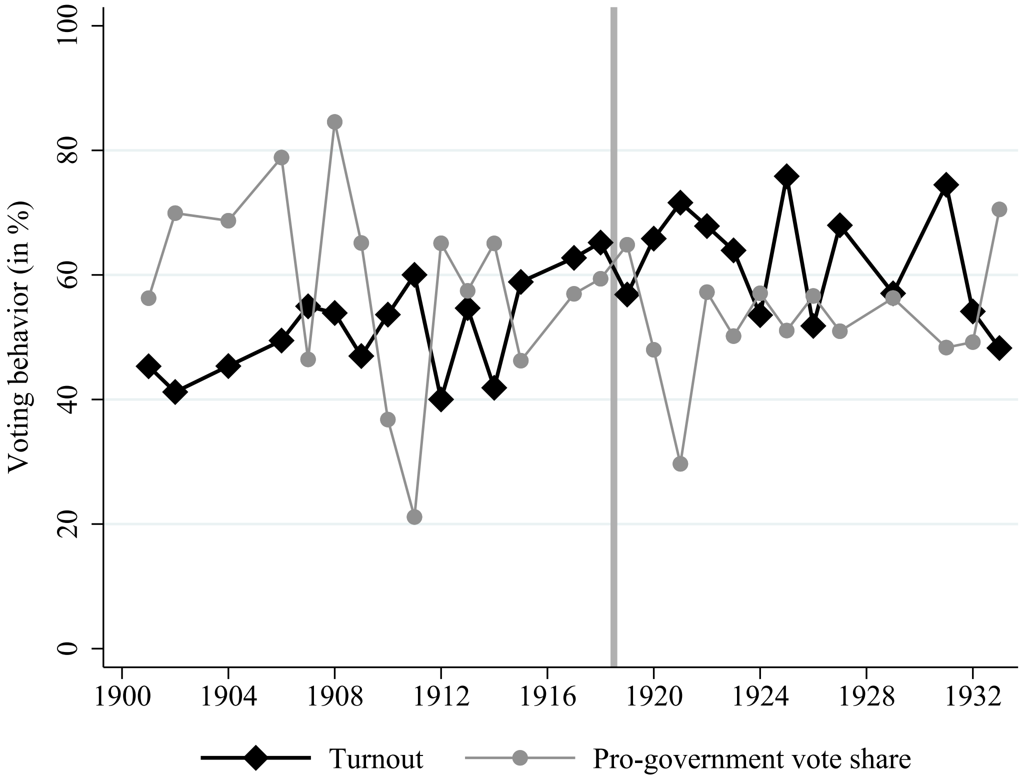
Notes: The figure displays the total number of deaths by age cohort for each year from 1917 to 1921. The respective age cohorts are defined as: under 20 years, 20 to under 40 years, 40 to under 65 years, and 65 years and older. In 1918—the year of the main influenza wave in the fall—excess mortality was highest among younger cohorts, particularly those aged 20 to 40 years.

Figure B.5: Vaccination rate and absence, 1907-1933



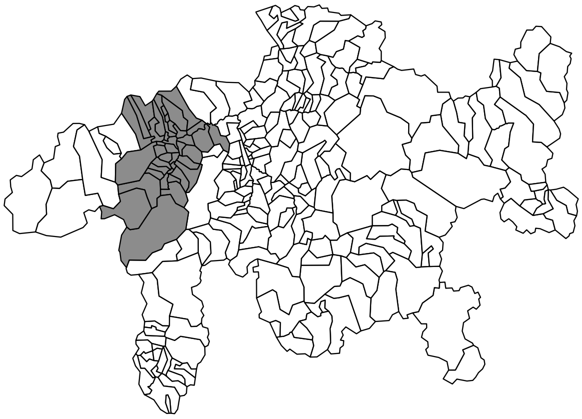
Notes: The figure displays the vaccination and non-vaccination rates from 1907 to 1933, based on municipal averages. The vaccination rate is defined as vaccinated children (including both initial vaccinations and revaccinations) as a percentage of the children who were supposed to be vaccinated. The rate of unvaccinated children is defined as the number of unvaccinated children as a percentage of those who were supposed to be vaccinated. Unvaccinated children can be excused (e.g., due to illness) or unexcused (e.g., not showing up) from the vaccination campaigns. Children who were not vaccinated because they were identified as coming from vaccinated-skeptical families are not reported in the figure—their share is around 0.1%.

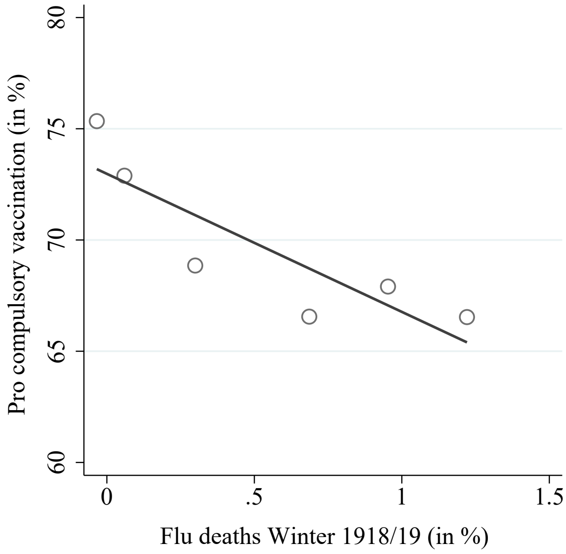
Figure B.6: Voting behavior in cantonal popular votes, 1901-1933



Notes: The figure displays pro-government vote shares and voter turnout in all cantonal popular votes from 1901 to 1933. The respective shares are averaged at the municipal level and by year. The pro-government vote share is defined as the number of votes cast in accordance with the government's recommendation on a given bill, expressed as a percentage of total votes cast for that bill. Turnout is defined as the number of total voters as a percentage of eligible voters for the respective bill. The gray vertical line marks the main wave of the influenza pandemic in the fall of 1918. A complete list of all popular votes (referendums and initiatives) is provided in Table A.1 in Online Appendix A.

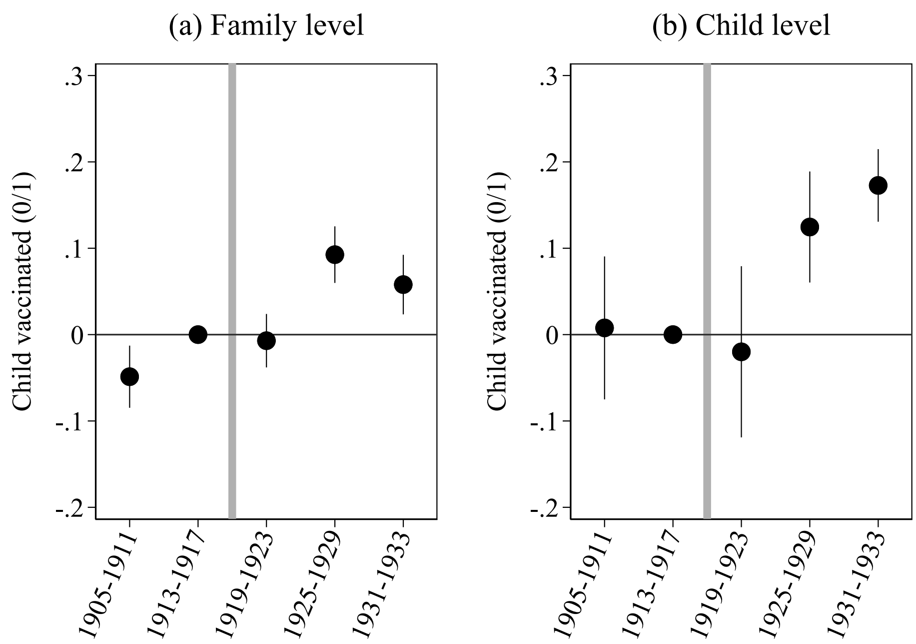
Figure B.7: Location of Glenner within Grisons and influenza effects on voting





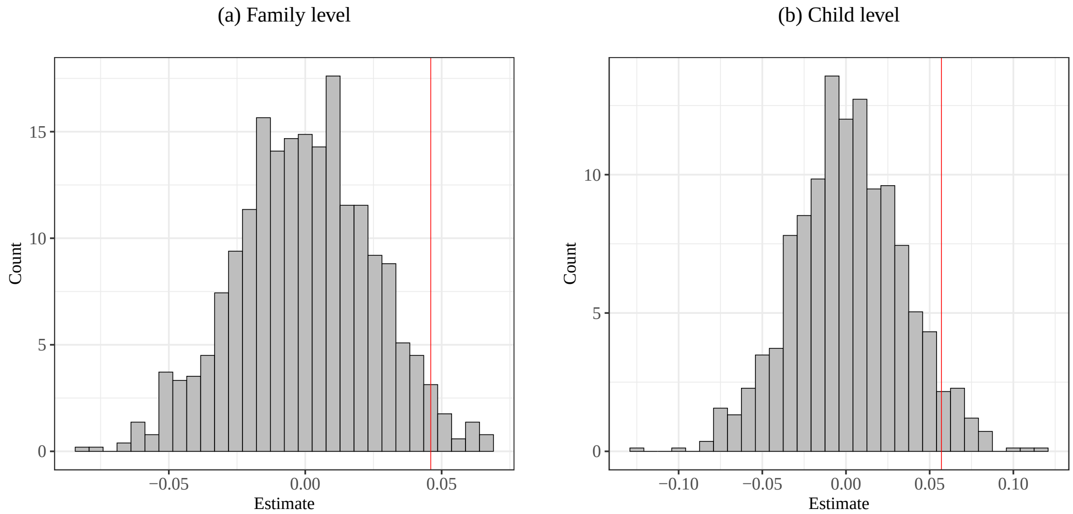
Notes: The figure displays the location of the Glenner region within Grisons and the voting behavior in Glenner in the popular vote on compulsory vaccination in 1922. Graph (a) shows the 38 municipalities belonging to the Glenner region (gray-shaded areas). Graph (b) presents the bin-scatter plot with the corresponding linear fit of the pro-compulsory vaccination vote share (in %) against influenza affectedness. Influenza affectedness is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population. The bin-scatter and the (unconditional) correlation in Glenner are comparable to those for all of Grisons (see Graph (a) in Figure 1).

Figure B.8: Event-study on family and child-level vaccination behavior, 1905-1933



Notes: The figure shows event-study regressions estimating the impact of direct influenza affectedness within the family on children's vaccination rates, with coefficient estimates for different periods. The analysis is based on individual death-register records linked to individual-level vaccination records for the Glenner region, 1905-1933. Influenza affectedness is defined as a binary variable equal to one if a person with the same surname as a child's own surname, mother's maiden name, or father's surname died of influenza during the main influenza period (September 1918 to April 1919) in the same municipality, and zero otherwise. Graph (a) displays the pooled effects at the family level based on an event study regression identical to Equation (3) but with interactions between the treatment group and the time period dummies. Graph (b) presents the pooled effects at the child level based on an event study regression identical to Equation (4) but including interactions between the treatment group and time period dummies. Vaccination rate differences are normalized to zero for the pre-influenza period, 1913-1917. Estimates include time-varying local characteristics and pre-influenza covariates interacted with period fixed effects. The gray vertical bar indicates the influenza period. The vertical lines represent the 90% confidence intervals with spatially and temporally clustered standard errors.

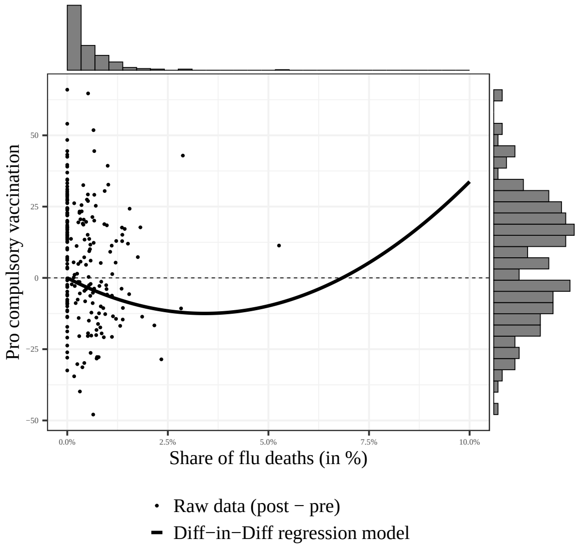
Figure B.9: Randomization inference on individual-level vaccination behavior



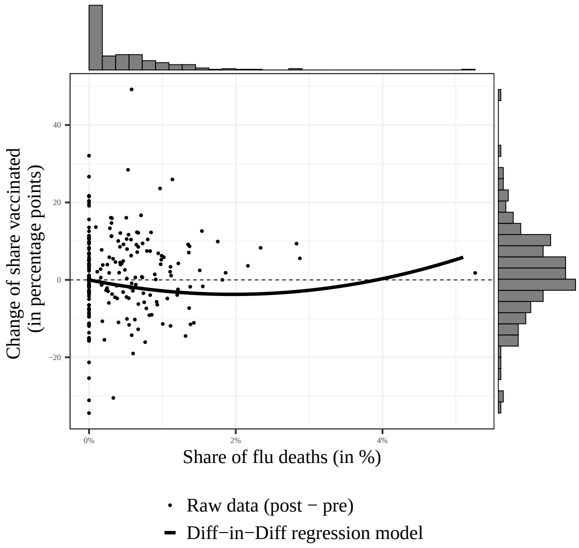
Notes: This figure shows the results from our randomization inference. In Graph (a), we randomly assign the treatment indicator $FluDeath_i$ to families, estimate the regression in Equation (3) 1,000 times, and plot the distribution of the resulting estimated coefficient of interest, $\hat{\beta}$. The red line indicates our observed treatment effect of 0.046, as reported in Column (3) of Table 4. In Graph (b), we repeat the procedure by randomly assigning the treatment indicator $FluDeath_i$ to children, running 1,000 regressions, and plotting the distribution of the estimated coefficient $\hat{\beta}$, as defined in Equation (4). The red line marks our treatment effect of 0.057, as reported in Column (4) of Table 4. The data are based on individual-level vaccination records for the Glenner region 1905-1933. Influenza affectedness is equal to one if a person with the same surname as the child's surname, the father's surname, or the mother's maiden name died of influenza during the main influenza period.

Figure B.10: Suggestive U-shaped pattern with aggregated sample (entire Grisons)

(a) Shifts in health voting

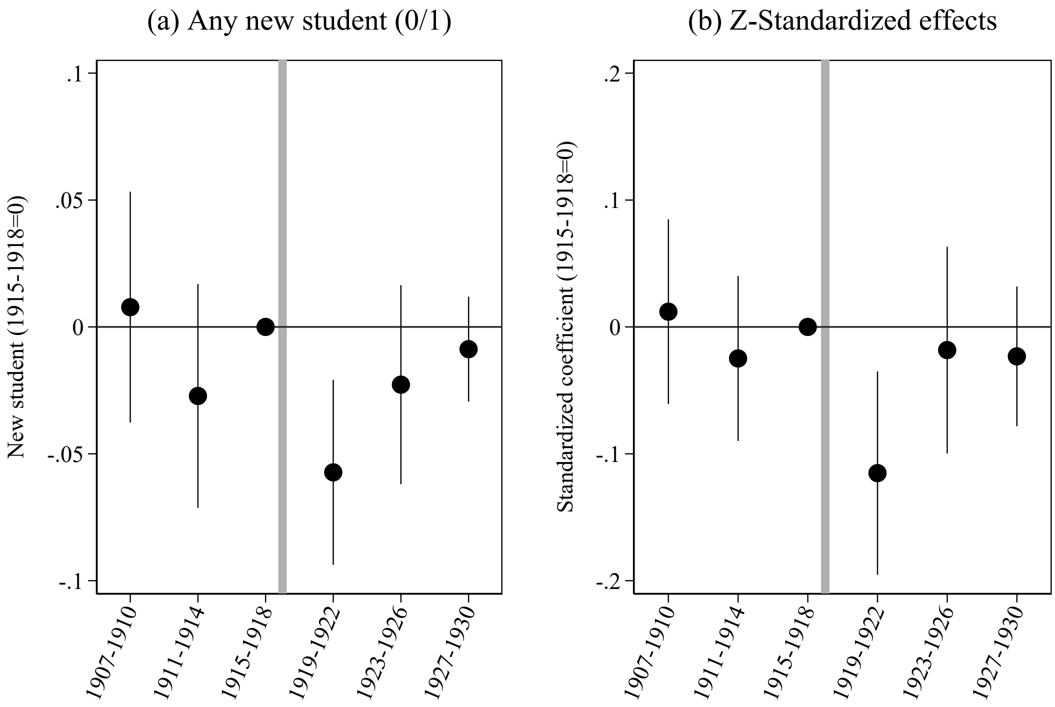


(b) Shifts in vaccination rates



Notes: The figures illustrate the suggested U-shaped patterns in health-related attitudes and behavior across 218 municipalities in Grisons. They show the relationship between influenza affectedness (x-axis) and two outcomes: voting behavior in the popular vote on compulsory vaccination in 1922 (Graph (a)) and changes in vaccination rates (Graph (b)). Influenza affectedness is defined as the number of influenza deaths (based on death-register excerpts) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population. In Graph (a), the black dots represent the vote share (in %) in favor of compulsory vaccination in the 1922 popular vote. The black line shows the parametric fit based on a quadratic regression model that includes district fixed effects. The linear coefficient, $Share\ Flu\ Death$, is -7.295 ($p = 0.001$), and the quadratic coefficient, $(Share\ Flu\ Death)^2$, is 1.067 ($p = 0.038$). The histogram at the top displays the distribution of the share of direct influenza deaths (in %), and the histogram to the right shows the distribution of the pro-compulsory vote share (residual). The black dots in Graph (b) show the change in vaccination rates (in %) from the pre-influenza period (1907-1913) to the post-influenza period (1919-1929). The black line shows the parametric fit from a quadratic difference-in-differences regression model that includes district fixed effects interacted with year fixed effects. The linear coefficient, $Share\ Flu\ Death \times Post\ 1918$, is -3.813 ($p = 0.084$), and the quadratic coefficient, $(Share\ Flu\ Death \times Post\ 1918)^2$, is 0.972 ($p = 0.118$). The histogram at the top shows the distribution of the share of direct influenza deaths (in %), and the histogram to the right shows the distribution of changes in vaccinated children.

Figure B.11: Event-study on the shift in entering into high school, 1907-1930



Notes: The figures display coefficients from event-study regressions on locality-specific high school entrances of students across 218 municipalities in Grisons. Coefficients are pooled over four subsequent years and standardized to zero for the last pre-influenza period from 1915 to 1918. Graph (a) reports the change in the likelihood of observing at least one student from a given municipality entering high school, conditional on local influenza affectedness. Influenza affectedness is measured as direct influenza deaths from September 1918 to April 1919, divided by pre-influenza population. Graph (b) reports the same estimates but uses z-standardized variables for both influenza affectedness and school entrances. The gray vertical lines represent the period of the influenza pandemic in the winter of 1918/19. All estimates include municipality fixed effects, year fixed effects, district fixed effects interacted with year fixed effects, and time-varying controls and pre-treatment controls interacted with year fixed effect (analog to the regressions in Table 3). Vertical lines represent the 90% confidence intervals (spatially and temporally clustered standard errors).

B.2 Additional tables

Table B.1: Representativeness of data availability of vaccination campaigns

	Dependent variable: Data availability (0/1)		
	Entire Canton of Grisons		Region of Glenner
	Share any campaign	Share campaigns	Share campaigns
	(1)	(2)	(3)
Share Flu Deaths	-0.005	-0.004	0.047
	(0.009)	(0.009)	(0.040)
Mean of Dep. Var.	0.901	0.873	0.580
Obs.	218	218	38
District FE	Yes	Yes	Yes
R2	0.842	0.797	0.193

Notes: The table displays the impact of direct influenza deaths on the availability of vaccination campaign records for the entire canton (Columns (1) and (2), 1907-1933) and for the Glenner region (Column (3), 1905-1933). The dependent variable in Column (1) is the share of years for which data are available on either vaccinations and/or re-vaccinations per municipality. In Columns (2) and (3), the dependent variable is the share of campaigns for which data are available per municipality. All regressions include district fixed effects. Standard errors are clustered at the district level. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.2: Descriptive statistics

	Period	Obs.	Mean	Std. Dev.	Min.	Max.
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Mortality statistics (as share of total population, in %)						
Share total deaths in main influenza period	Sept 1918—April 1919	218	1.524	1.182	0	8.772
Share non-influenza deaths	Sept 1918—April 1919	218	1.068	0.879	0	4.412
Share influenza deaths	Sept 1918—April 1919	218	0.456	0.632	0	5.263
Share influenza deaths female	Sept 1918—April 1919	218	0.230	0.380	0	3.509
Share influenza deaths male	Sept 1918—April 1919	218	0.226	0.385	0	2.299
Share influenza deaths, below 20 years	Sept 1918—April 1919	218	0.108	0.217	0	1.818
Share influenza deaths, 20 to 39 years	Sept 1918—April 1919	218	0.198	0.337	0	1.754
Share influenza deaths, 39 to 64 years	Sept 1918—April 1919	218	0.091	0.217	0	1.754
Share influenza deaths, above 65 years	Sept 1918—April 1919	218	0.059	0.198	0	1.754
Share influenza deaths, agriculture	Sept 1918—April 1919	218	0.209	0.492	0	5.263
Share influenza deaths, industry	Sept 1918—April 1919	218	0.046	0.131	0	0.855
Share influenza deaths, services/trade	Sept 1918—April 1919	218	0.051	0.130	0	0.690
Share influenza deaths, w/o sector	Sept 1918—April 1919	218	0.149	0.262	0	1.462
Indicator (=1) if influenza deaths ⩾1	Sept 1918—April 1919	218	0.573	0.496	0	1
Share total influenza deaths	July 1918—Dec 1921	218	0.580	0.723	0	5.263
Share child mortality (<5 years, annualized)	1917-1924	218	0.249	0.214	0	1.270
Panel B: Voting statistics in popular votes (in %)						
Yes share (pro-government voting)	1901-1933	18,059	55.250	30.425	0	100
Turnout	1901-1933	18,059	57.683	21.779	0.253	100
Panel C: Vaccination statistics at the locality level (in %)						
Share vaccinated children in all campaigns	1907-1933	3,614	87.436	16.155	0	100
Share vaccinated children initial vaccination	1907-1933	1,851	86.215	15.740	0	100
Share vaccinated children re-vaccination	1907-1933	1,763	88.719	16.487	0	100
Share of not-vaccinated children (absent)	1907-1933	3,614	12.564	16.155	0	100
Share of excused children	1907-1933	3,614	10.183	14.646	0	100
Share of not-excused children	1907-1933	3,614	2.268	7.582	0	100
Share of awkward families	1907-1933	3,614	0.118	1.215	0	50
Panel D: Time-invariant controls and measures as of 1918						
Train connection (0/1)	1918	218	0.390	0.489	0	1
Sea level of locality (in meters)	1918	218	1,134.505	362.690	285	1,949
No. of Doctors per 1.000 capita	1918	218	0.037	0.188	0	1
Panel E: Historical age structure						
Share age <15 years	1880	218	0.294	0.050	0.179	0.425
Share age >15 and < 60 years	1880	218	0.580	0.048	0.446	0.732
Share age >60 years	1880	218	0.126	0.033	0.053	0.222
Panel F: Socio-economic controls in 1910						
Population	1910	218	537.014	1,251.843	30	14,639
Population w/o main cities Chur and Davos	1910	216	428.356	486.505	30	3,676
Share male	1910	218	0.497	0.044	0.349	0.649
Share female	1910	218	0.503	0.044	0.351	0.651
Share foreigners	1910	218	0.092	0.120	0	0.511
Share German	1910	218	0.382	0.403	0	1
Share Romansh	1910	218	0.450	0.410	0	1
Share Italian	1910	218	0.164	0.318	0	1
Share Catholic	1910	218	0.479	0.418	0	1
Share Protestant	1910	218	0.519	0.418	0	1
Share working population	1910	218	0.545	0.086	0.356	0.818
Share out-commuters	1910	218	0.026	0.051	0	0.389
Share in-commuters	1910	218	0.006	0.013	0	0.137
No. of households	1910	218	117.716	242.253	10	3016
Population per household	1910	218	4.179	0.695	2.850	8.240
Panel G: Socio-economic controls in 1920						
Population	1920	218	549.789	1,300.092	31	15,600
Population w/o main cities Chur and Davos	1920	216	437.625	498.063	31	3,659
Share male	1920	218	0.499	0.040	0.357	0.643
Share female	1920	218	0.501	0.040	0.357	0.643
Share foreigners	1920	218	0.069	0.087	0	0.422
Share German	1920	218	0.387	0.401	0	1
Share Romansh	1920	218	0.457	0.412	0	1
Share Italian	1920	218	0.152	0.315	0	1
Share Catholic	1920	218	0.473	0.418	0	1
Share Protestant	1920	218	0.524	0.418	0	1
Share agriculture	1920	218	0.720	0.211	0.026	1
Share industry	1920	218	0.170	0.124	0	0.638
Share services	1920	218	0.110	0.110	0	0.682
No. of houses	1920	218	86.766	123.163	10	1342
No. of households	1920	218	122.202	273.717	10	3436
Population per household	1920	218	4.269	0.609	3.000	6.849

Notes: The table presents summary statistics for the main variables. Column (1) indicates during which each variable was generated. Column (2) reports the number of observations at the level of 218 municipalities in Grisons. Columns (3) to (6) display the mean, standard deviation, minimum, and maximum for each variables. Panel A reports self-compiled measures of overall and influenza-specific mortality, based on local death-register excerpts (independent variable). Panels B and C report self-compiled data on voting and vaccination behavior, respectively (dependent variables). Panels D to G present time-invariant and time-varying covariates. Detailed data sources and definitions are provided in Online Appendix A.

Table B.3: Descriptive statistics for individual-level data from Glenner

	Period	Obs.	Mean	Std. Dev.	Min.	Max.
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: *All children*						
Family Flu Death (Yes)	1905-1933	10,966	0.440	0.496	0	1
Child vaccinated	1905-1933	10,966	0.789	0.408	0	1
Child vaccinated initial vaccination	1905-1933	6,443	0.826	0.379	0	1
Child vaccinated re-vaccination	1905-1933	4,523	0.736	0.441	0	1
Age	1905-1933	10,619	7.147	6.782	0	29.5
Panel B: *Children in balanced child panel data*						
Family Flu Death (Yes)	1905-1933	2,078	0.520	0.500	0	1
Child vaccinated	1905-1933	2,078	0.814	0.389	0	1
Child vaccinated initial vaccination	1905-1933	1,039	0.850	0.357	0	1
Child vaccinated re-vaccination	1905-1933	1,039	0.778	0.416	0	1
Age	1905-1933	2,033	8.386	7.015	0.083	21

Notes: The table presents summary statistics for the main independent and dependent variables, as well as covariates for the individual (child-level) dataset covering 38 municipalities in Glenner. Column (1) indicates the observation period for each variable. Column (2) reports the number of observations at the child-vaccination level. Columns (3) to (6) display the mean, standard deviation, minimum, and maximum of the respective variables. *Family flu death* is defined as all official influenza deaths from September 1918 to April 1919, and all deaths in the main wave of the Great Influenza period from September 1918 to December 1918. Panel A includes all children recorded in the vaccination reports throughout the sample period and corresponds to Columns (1) and (2) in Table 4 and to all columns in Table B.27. Panel B only includes those children who can be matched with both a pre-influenza vaccination entry and a post-influenza revaccination entry and corresponds to the Columns (3) and (4) in Table 4.

Table B.4: Summary statistics and unconditional correlation with mortality measures

	Summary Statistics		Unconditional correlation			
			Share Flu Deaths		Share Total Deaths	
	Mean	Std. Dev.	Correlation	p-value	Correlation	p-value
	(1)	(2)	(3)	(4)	(5)	(6)
Train Connection (Yes=1)	0.390	0.489	0.160	0.018	0.121	0.074
Sea Level of Locality	1134.505	362.690	-0.029	0.676	-0.017	0.806
Population size (log)	5.629	1.021	0.242	0.000	0.196	0.004
Doctors (per 1,000 capita)	0.455	1.078	0.049	0.468	0.090	0.186
Hospital (Yes=1)	0.037	0.188	0.238	0.000	0.274	0.000
Share German	0.382	0.403	0.040	0.554	-0.013	0.851
Share Romansh	0.450	0.410	0.030	0.659	0.137	0.044
Share Catholic	0.479	0.418	0.151	0.026	0.174	0.010
Share Female	0.503	0.044	-0.025	0.716	-0.048	0.478
Share Age >15 and <60 years [a]	0.580	0.048	-0.100	0.140	-0.045	0.506
Share Age above 60 years [a]	0.126	0.033	-0.052	0.446	-0.060	0.380
Population per Household	4.179	0.695	0.081	0.232	0.048	0.477
Share Agriculture [b]	0.720	0.211	-0.104	0.127	-0.120	0.078
Share Industry [b]	0.170	0.124	0.101	0.138	0.109	0.110
Share Working population	0.545	0.086	0.000	0.996	0.027	0.694
Share Out-commuters	0.026	0.051	-0.049	0.469	-0.047	0.492
Share In-commuters	0.006	0.013	0.024	0.729	0.007	0.922
Δ Population$_{1880-1910}$	0.178	1.992	0.041	0.543	0.080	0.240
Δ Share German$_{1880-1910}$	0.013	0.098	-0.055	0.420	-0.062	0.363
Δ Share Catholic$_{1880-1910}$	0.032	0.088	0.037	0.583	0.013	0.853
Δ Share Foreigners$_{1880-1910}$	0.047	0.085	-0.017	0.807	-0.039	0.566
Δ Number of Houses$_{1880-1910}$	0.050	0.665	0.077	0.260	0.112	0.099
Δ Number of Households$_{1880-1910}$	-0.06	0.684	-0.019	0.784	-0.083	0.220
Obs.	218	218	218	218	218	218

Notes: The table displays the main variables' mean (Column (1)), standard deviation (Column (2)) and unconditional correlations between measures of influenza affectedness and a set of covariates along with their respective p-values, at the municipal level (Columns (3) to (6)). Influenza affectedness in Columns (3) and (4) is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population. Influenza affectedness in Columns (5) and (6) is defined as total deaths from September to December 1918 (the period of the main influenza wave), expressed as a percentage of the total pre-influenza population. Unconditional correlations and p-values are derived using Stata's *pwcorr*-command. Most covariates are taken from the last pre-influenza census in 1910. Exceptions due to data limitations include: a) Data from 1880; b) Data from 1920. Δ refers to changes in socio-economic characteristics over the decades preceding 1910.

Table B.5: Regression-based balance table

	Dependent variable: Mortality measures (in %)	
	Share Flu Deaths (Sept 1918—April 1919)	Share Total Deaths (Sept 1918—Dec 1918)
	(1)	(2)
Train Connection (Yes=1)	0.310***	0.192
	(0.107)	(0.195)
Sea Level of Locality	0.000	-0.000
	(0.000)	(0.000)
Population size (log)	0.049	0.048
	(0.061)	(0.091)
Doctors (per 1.000 capita)	-0.018	-0.013
	(0.017)	(0.034)
Hospital (Yes=1)	0.783***	1.521***
	(0.298)	(0.453)
Share German	0.012	0.449
	(0.616)	(1.240)
Share Romansh	0.008	0.663
	(0.661)	(1.201)
Share Catholic	0.722***	0.891***
	(0.189)	(0.273)
Share Female	1.581	0.431
	(2.198)	(3.401)
Share Age >15 and <60 years [a]	-2.269	-1.618
	(1.617)	(2.188)
Share Age above 60 years [a]	0.795	1.370
	(1.094)	(2.111)
Population per Household	-0.071	-0.215
	(0.105)	(0.147)
Share Agriculture [b]	-0.248	-0.889
	(0.431)	(0.696)
Share Industry [b]	-0.351	-0.946
	(0.763)	(0.879)
Share Working population	1.245	1.123
	(0.803)	(1.090)
Share Out-commuters	-0.665	0.171
	(0.569)	(1.086)
Share In-commuters	1.077	2.566
	(2.797)	(3.691)
Δ Population$_{1880-1910}$	-0.097	0.154
	(0.114)	(0.161)
Δ Share German$_{1880-1910}$	0.161	-0.106
	(0.383)	(0.461)
Δ Share Catholic$_{1880-1910}$	0.293	0.303
	(0.679)	(1.160)
Δ Share Foreigners$_{1880-1910}$	-0.677	-0.137
	(0.549)	(0.792)
Δ Number of Houses$_{1880-1910}$	0.313	-0.317
	(0.287)	(0.435)
Δ Number of Households$_{1880-1910}$	0.072	-0.051
	(0.133)	(0.092)
Mean of Dep. Var.	0.456	0.927
Obs.	218	218
District FE	Yes	Yes
R2 centered	0.554	0.688

Notes: The table displays the regression-based coefficients of different measures of influenza affectedness with municipality characteristics. Each column is based on a multivariate regression. The dependent variable in Column (1) is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919 as a share of the total pre-influenza population (in %). The dependent variable in Column (2) is defined as total deaths from September 1918 to December 1918 (the period of the main influenza wave) as a share of the total pre-influenza population (in %). The independent variables mainly stem from the last pre-influenza census in 1910. Exceptions due to data limitations are: a) Data from 1880; b) Data from 1920. Δ refers to the evolution of socio-economic characteristics in the decades before 1910. Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.6: Balance table with conditional means and its shift

	Independent variable: Share influenza death (in %)		
	Pre-influenza (Census 1910)	After influenza (Census 1920)	Diff-in-Diff (Shift from 1910 to 1920)
Dependent variable:	(1)	(2)	(3)
Train Connection (Yes=1) [a]	0.079**	0.079**	—
	(0.038)	(0.038)	
Sea Level of Locality [a]	-24.119	-24.119	—
	(16.820)	(16.820)	
Population size (log)	0.260*	0.257*	-0.004
	(0.156)	(0.162)	(0.009)
Doctors (per 1.000 capita) [a]	0.081	0.081	—
	(0.082)	(0.082)	
Hospital (Yes=1) [a]	0.075*	0.075*	—
	(0.041)	(0.041)	
Share German	-1.031	-0.880	0.150
	(2.173)	(2.304)	(0.672)
Share Romansh	0.530	0.624	0.095
	(1.833)	(2.032)	(0.688)
Share Catholic	8.197**	7.725**	-0.472
	(3.815)	(3.849)	(0.373)
Share Female	0.236	0.115	-0.121
	(0.502)	(0.298)	(0.675)
Share Age >15 and <60 years [b]	-0.938	N/A	—
	(0.674)		
Share Age above 60 years [b]	0.036	N/A	—
	(0.513)		
Population per Household	0.049	0.056	0.007
	(0.084)	(0.051)	(0.061)
Share Agriculture	N/A	-3.804	—
		(3.775)	
Share Industry	N/A	1.852	—
		(2.174)	
Share Working population	0.336	N/A	—
	(1.037)		
Share Out-commuters	-0.463	N/A	—
	(0.303)		
Share In-commuters	0.103	N/A	—
	(0.173)		
Obs.	218	218	336
District FE	Yes	Yes	-
Year FE	-	-	Yes
Municipality FE	-	-	Yes
District FE × Year FE	-	-	Yes

Notes: The table shows the conditional correlation of local characteristics with local influenza affectedness for the pre-influenza (Column (1)), the post-influenza period (Column (2)) and its shifts (Column (3)). Each coefficient and its standard error stem from a separate cross-sectional regression (Columns (1) and (2)) or from a difference-in-differences estimation (Column (3)), where the local characteristic is the dependent variable and the local influenza affectedness is the independent variable. All shares are in percentages. Influenza affectedness is defined as the number of direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, as a percentage of the total pre-influenza population. a) Data for the main influenza period of the fall/winter of 1918/19. b) Data from the 1880 Census. Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.7: Diff-in-Diff model with triple interaction term on health voting

	Dep. var.: Pro-governmental vote share (in %)			
	Vaccination popular vote		All health popular votes until 1930	
	(1)	(2)	(3)	(4)
Health Votes × Share Flu Death × Post Flu	-4.534**	-4.532***	-3.093**	-3.091*
	(1.521)	(1.639)	(1.578)	(1.624)
Share Flu Death × Post Flu	1.958**	0.382	1.250	-0.007
	(0.991)	(0.934)	(0.860)	(0.844)
Mean of Dep. Var.	55.86	55.86	55.13	55.13
Obs.	12,391	12,391	16,097	16,097
No. of popular votes in the sample	57	57	74	74
No. of health popular votes in the sample	6	6	8	8
No. of post-flu health popular votes	1	1	3	3
Start of sample period	Mar 1901	Mar 1901	Mar 1901	Mar 1901
End of sample period	Apr 1922	Apr 1922	Dec 1930	Dec 1930
Municipality FE	Yes	Yes	Yes	Yes
Popular vote FE	Yes	Yes	Yes	Yes
District FE × Post Flu	No	Yes	No	Yes
Time-variant controls	No	Yes	No	Yes
R2 centered	0.440	0.452	0.417	0.432

Notes: The table displays the impact of direct influenza deaths on the shift in post-influenza health voting. The two-way fixed effect model with the triple interaction term is: $Y_{it} = \alpha_i + \beta_1(Share\,Flu\,Death_i \times Post\,Flu_t) + \beta_2(Health\,Votes_t \times Share\,Flu\,Death_i \times Post\,Flu_t) + \delta_t + (\lambda_d \times Post\,Flu_t) + X'_{it}\gamma + \epsilon_{it}$ where Y_{it} is the pro-governmental (=pro-reform) vote share (in %) in municipality i in the popular vote t, $Share\,Flu\,Death_i \times Post\,Flu_t$ is the number of direct influenza deaths (based on death-register data) during the main influenza period (September 1918–April 1919), expressed as a percentage of the pre-influenza population (based on the 1910 census), $Post\,Flu_t$ is a dummy variable equal to one for popular votes after June 1918 (beginning of the influenza pandemic), and zero otherwise. The triple-interaction term $Health\,Votes_t \times Share\,Flu\,Death_i \times Post\,Flu_t$ tests for shifts in general anti-government voting in more affected municipalities. $Health\,Votes_t$ is a dummy variable equal to one for health-related popular votes, and zero for all other popular votes. α_i are municipality fixed effects. δ_t are the popular vote fixed effects. λ_d are district fixed effects, interacted with post-influenza popular votes. X_{it} is a set of time-varying control variables. ϵ_{it} is the error term. Columns (1) and (2) restrict the post-influenza sample to popular votes held up to the vaccination bill in March 1922. Columns (3) and (4) include all popular votes up to 1930. See Table A.1 in Online Appendix A for a complete list of popular votes. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.8: Alternative definitions of influenza mortality (Voting)

	Dependent variable: Votes for pro-compulsory vaccination (in %)					
	(1)	(2)	(3)	(4)	(5)	(6)
Log(1+Flu Deaths)	-2.138***					
	(0.216)					
asinh(Flu Deaths)		-1.729***				
		(0.389)				
Share Flu Deaths$_{1918-1921}$			-1.645***			
			(0.122)			
Share Flu Deaths$_{Fall1918}$				-2.365***		
				(0.590)		
Share Total Deaths$_{Fall1918}$					-1.651**	
					(0.695)	
Share Total Deaths$_{Year1918}$						-1.637**
						(0.647)
Mean of Dep. Var.	74.617	74.617	74.617	74.617	74.617	74.617
Obs.	218	218	218	218	218	218
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R2 centered	0.976	0.976	0.976	0.976	0.976	0.976

Notes: The table displays the impact of different definitions of influenza affectedness on health policy support at the municipal level. The dependent variable is the vote share in favor of pro-compulsory vaccination in the popular vote in 1922 (in %). The independent variables reflect alternative definitions of local influenza affectedness: Column (1) uses the logarithm of the number of direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, with one added to avoid dropping zeros. Column (2) applies the inverse hyperbolic sine transformation to the number of direct influenza deaths during the same period. Column (3) uses direct influenza deaths from the influenza's first occurrence in July 1918 until the end of 1921 (based on death-register data), as a percentage of the total pre-influenza population. Column (4) uses direct influenza deaths during the first main wave of the pandemic (September to December 1918), also as a percentage of the total pre-influenza population. Columns (5) and (6) use total (all-cause) deaths during fall 1918 and during the entire year 1918, respectively, as a percentage of the total pre-influenza population. All specifications include district fixed effects and the full set of control variables. Control variables include all variables that are reported in the balance tests in Table B.4 and B.5 in the Online Appendix; these are locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), housing conditions, and the pre-influenza trends of socio-demographic variables (change in population, language, religion, foreigners, and living conditions). Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.9: Pseudo periods with total mortality in other years (Voting)

	Dependent variable: Votes for pro-compulsory vaccination (in %)					
	(1)	(2)	(3)	(4)	(5)	(6)
Share Total Deaths$_{Fall1917}$	2.537					2.660
	(1.990)					(1.846)
Share Total Deaths$_{Fall1918}$		-1.651**				-1.766***
		(0.695)				(0.638)
Share Total Deaths$_{Fall1919}$			-1.740			-1.527
			(2.801)			(2.679)
Share Total Deaths$_{Fall1920}$				-0.185		0.368
				(2.090)		(2.321)
Share Total Deaths$_{Fall1921}$					-0.926	-1.177
					(2.521)	(2.266)
Mean of Dep. Var.	74.617	74.617	74.617	74.617	74.617	74.617
Obs.	218	218	218	218	218	218
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R2 centered	0.976	0.976	0.976	0.976	0.976	0.977

Notes: The table displays the impact of different (pseudo-)influenza periods on health policy voting at the municipal level. The dependent variable is the vote share in favor of pro-compulsory vaccination in the popular vote in 1922 (in %). The independent variables are total deaths during different fall periods (September to December) as a share of the total pre-influenza population (in %). Columns (1), (3), (4), and (5) show the impact of pseudo-influenza periods on pro-compulsory vaccination support, while Column (2) uses total deaths during the first main wave of the influenza pandemic in fall 1918. Column (6) shows the combined view of the main influenza period and pseudo-influenza periods. All specifications include district fixed effects and the full set of control variables. Control variables include all variables that are reported in the balance tests in Table B.4 and B.5 in the Online Appendix; these are locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), housing conditions, and the pre-influenza trends of socio-demographic variables (change in population, language, religion, foreigners, and living conditions). Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.10: Infant mortality and health policy voting

	Dependent variable: Votes for pro-comp. vaccination (in %)			
	(1)	(2)	(3)	(4)
Share Death Children 0-5years	-0.305		-0.417	
	(0.442)		(0.347)	
Share Death Children 6-10years		4.772	4.891	
		(3.594)	(3.485)	
Share Death Children below 10years				0.069
				(0.656)
Mean of Dep. Var.	74.617	74.617	74.617	74.617
Obs.	218	218	218	218
District FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R2 centered	0.976	0.976	0.976	0.976

Notes: The table examines the potential impact of infant mortality on health policy support at the municipal level. The dependent variable is the vote share in favor of pro-compulsory vaccination in the popular vote in 1922 (in %). The independent variables represent different measures of total infant and child deaths during the five years preceding the vote (1917 to 1921), expressed as a percentage of the total pre-influenza population. Columns (1) and (2) use infant mortality of children who died before 5 years of age and between the ages of 6 and 10 years, respectively. Column (3) gives the combined view. Column (4) uses infant mortality of children who died below 10 years of age. All specifications include district fixed effects and the full set of control variables. Control variables include all variables that are reported in the balance tests in Table B.4 and B.5 in the Online Appendix; these are locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), housing conditions, and the pre-influenza trends of socio-demographic variables (change in population, language, religion, foreigners, and living conditions). Statistical inferences are based on spatially clustered standard errors. Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.11: Exclusion of outliers (Voting)

	Dependent variable: Votes for pro-compulsory vaccination (in %)			
	w/o region Vorderrhein	w/o highest influenza mortality	w/o Hospitals	w/o Doctors
	(1)	(2)	(3)	(4)
Share Flu Deaths	-3.207***	-3.250***	-3.122***	-2.915***
	(0.735)	(0.910)	(0.970)	(1.014)
Mean of Dep. Var.	75.361	74.631	74.738	75.350
Obs.	211	208	210	176
District FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R2 centered	0.977	0.976	0.977	0.978

Notes: The table displays the impact of direct influenza deaths on health policy support at the municipal level, using various sample restrictions. The dependent variable is the vote share in favor of pro-compulsory vaccination in the popular vote in 1922 (in %). The independent variable is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population. Column (1) excludes the region of "*Vorderrhein*" from the baseline sample (7 municipalities). This restricted sample mirrors the main sample in Section 5, where we examine the impact of influenza affectedness on vaccination behavior. Column (2) excludes the municipalities with the 5% highest direct influenza death rate during the main influenza period (September 1918 to April 1919). Column (3) excludes municipalities with an operating hospital during the pandemic (8 municipalities, which are mainly the largest towns in Grisons). Column (4) excludes all municipalities with an operating doctor or general practitioner during 1918/1919 (42 municipalities). All specifications include district fixed effects and the full set of control variables. Control variables include all variables that are reported in the balance tests in Tables B.4 and B.5 in the Online Appendix; these are locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), housing conditions, and the pre-influenza trends of socio-demographic variables (change in population, language, religion, foreigners, and living conditions). Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.12: Sample restriction with key local characteristics (Voting)

	Dependent variable: Votes for pro-compulsory vaccination (in %)					
	Train connection		Population size w/o		Catholic share w/o	
	Yes	No	Top 25%	Top 50%	Bottom 25%	Bottom 50%
	(1)	(2)	(3)	(4)	(5)	(6)
Share Flu Deaths	-4.306***	-3.219*	-3.329**	-4.038*	-2.307*	-3.308***
	(1.252)	(1.781)	(1.420)	(2.213)	(1.232)	(1.098)
Mean of Dep. Var.	71.743	76.454	76.842	77.823	74.845	78.496
Obs.	85	133	163	108	163	109
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R2 centered	0.992	0.979	0.978	0.979	0.981	0.988

Notes: The table displays the impact of direct influenza deaths on health policy support at the municipality level, applying sample restrictions based on key local variables. These local variables are correlated with influenza affectedness, as shown in the balancing exercise in Section 4.1. The dependent variable is the vote share in favor of pro-compulsory vaccination in the popular vote in 1922 (in %). The independent variable is defined as the number of direct influenza deaths (based on death-register data) during the main influenza period (September 1918 to April 1919), expressed as a percentage of the total pre-influenza population. Columns (1) and (2) test the impact of influenza affectedness on pro-compulsory vaccination voting in places with and without train connections, respectively. Columns (3) and (4) exclude the top 25% and the top 50% largest municipalities in terms of population in 1910. Columns (5) and (6) exclude the bottom 25% and the bottom 50% municipalities, based on the share of Catholics in 1910. All specifications include district fixed effects and the full set of control variables. Control variables include all variables that are reported in the balance tests in Tables B.4 and B.5 in the Online Appendix; these are locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), housing conditions, and the pre-influenza trends of socio-demographic variables (change in population, language, religion, foreigners, and living conditions). Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.13: Turnout and voting outcomes w.r.t. total eligible voters

	Dependent variable: Votes for compulsory vaccination and turnout (in %)			
	Baseline (Pro vaccination)	Share «No» (Pro vaccination)	Share «Yes» (Against vaccination)	Turnout
	(1)	(2)	(3)	(4)
Share Flu Deaths	-2.913***	-4.015***	1.735**	-2.280**
	(0.711)	(1.159)	(0.805)	(1.121)
Mean of Dep. Var.	74.617	49.425	16.872	66.298
Obs.	218	218	218	218
District FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R2 centered	0.976	0.941	0.837	0.967

Notes: The table examines the impact of direct influenza deaths on health policy support and voter turnout at the municipal level, comparing specifications that use actual voters (baseline) versus eligible voters in the denominators of the dependent variables. The independent variable is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919 as a share of the total pre-influenza population (in %). Column (1) repeats the main result from Column (3) in Table 2 using the vote share in favor of pro-compulsory vaccination in the popular vote in 1922 (measured as the number of pro-voters divided by total actual voters, in %) as the dependent variable. Columns (2), (3), and (4) examine the number of pro-voters (people who voted "No" in the popular vote), contra-voters (those who voted "Yes"), and overall turnout, respectively, each as a share of total eligible voters. All specifications include district fixed effects and the full set of control variables. Control variables include all variables that are reported in the balance tests in Table B.4 and B.5 in the Online Appendix; these are locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), housing conditions, and the pre-influenza trends of socio-demographic variables (change in population, language, religion, foreigners, and living conditions). Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.14: Turnout and voting outcomes with influenza deaths as potential voters

	Dependent variable: Adapted vote share and turnout (in %)					
	Pro-compulsory vaccination			Turnout		
	(1)	(2)	(3)	(4)	(5)	(6)
Share Flu Deaths	-3.906**	-2.651***	-1.466**	-0.325	-0.682	-1.308
	(1.592)	(0.895)	(0.725)	(0.889)	(0.740)	(1.103)
Mean of Dep. Var.	75.422	75.422	75.422	66.893	66.893	66.893
Obs.	218	218	218	218	218	218
District FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
R2 centered	0.954	0.970	0.978	0.937	0.961	0.969

Notes: The table presents the impact of direct influenza deaths on health policy support at the municipality level, incorporating direct influenza deaths as hypothetical voters. This approach addresses potential concerns about selective sorting into treatment, i.e., the possibility that only voters in favor of compulsory vaccination may have died from influenza. The independent variable is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population. Columns (1) to (3) use the number of pro-compulsory vaccination voters in the 1922 popular vote plus the number of direct influenza deaths as the dependent variable, divided by the total number of voters plus direct influenza deaths (in %). Columns (4) to (6) use the total number of voters in the 1922 popular vote as the dependent variable, plus the number of direct influenza deaths, divided by the number of eligible voters plus direct influenza deaths (in %). Columns (1) and (4) report the baseline specification without controls and fixed effects. Columns (2) and (5) include district fixed effects. Columns (3) and (6) include the full set of controls to the baseline specifications. Control variables include all variables that are reported in the balance tests in Table B.4 and B.5 in the Online Appendix; these are locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), housing conditions, and the pre-influenza trends of socio-demographic variables (change in population, language, religion, foreigners, and living conditions). Statistical inferences are based on spatially clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.15: Inference with alternative specifications of clustered standard errors

	Dependent variable: Vote share and vaccination rates					
	Municipality level				Individual level	
	Pro-compul. vacc. vote share (in %)		Share vaccinated children (in %)		Child vaccinated (0/1)	
	(1)	(2)	(3)	(4)	(5)	(6)
Share Flu Deaths	-5.468	-2.913				
Share Flu Deaths × Post 1918			-2.183	-2.817		
Family Flu Death (Yes) × Post 1918					0.047	0.057
Panel A: *Spatially correlated standard errors*						
Spatial cutoff 5 km	(1.453)	(1.186)	(1.122)	(1.111)	(0.009)	(0.005)
Spatial cutoff 10 km	(1.494)	(1.548)	(1.289)	(1.282)	(0.009)	(0.016)
Spatial cutoff 15 km	(1.643)	(0.711)	(1.118)	(1.168)	(0.010)	(0.011)
Spatial cutoff 20 km	(1.375)	(0.622)	(1.057)	(1.071)	(0.007)	(0.011)
Spatial cutoff 25 km	(1.484)	(0.378)	(1.095)	(1.063)	N/A	N/A
Spatial cutoff 30 km	(1.765)	(0.597)	(1.082)	(1.037)	N/A	N/A
Spatial cutoff 40 km	(1.794)	(0.648)	(0.859)	(0.800)	N/A	N/A
Spatial cutoff 50 km	(0.936)	(0.495)	(0.804)	(0.706)	N/A	N/A
Panel B: *Temporally correlated standard errors (spatial cutoff at 15 kilometers)*						
Temporal cutoff 2 years	—	—	(1.100)	(1.149)	—	—
Temporal cutoff 4 years	—	—	(1.078)	(1.126)	—	—
Temporal cutoff 8 years	—	—	(1.128)	(1.181)	—	—
Temporal cutoff 12 years	—	—	(1.157)	(1.235)	—	—
Temporal cutoff 16 years	—	—	(1.240)	(1.351)	—	—
Panel C: *Conventional clustered standard errors*						
Clustered at the municipality level	(1.647)	(1.754)	(1.319)	(1.322)	(0.020)	(0.026)
Clustered at the district level	(1.662)	(1.792)	(1.099)	(1.326)	—	—
Clustered at the region level	(1.552)	(1.630)	(1.345)	(1.685)	—	—
Clustered at the family level	—	—	—	—	(0.026)	(0.035)
Clustered at the child level	—	—	—	—	—	(0.036)
Mean of Dep. Var.	74.617	74.617	87.418	87.711	0.800	0.814
Obs.	218	218	3,559	2,911	4,115	2,078
Number of children	—	—	—	—	10,966	1,039
Sample / Sample Period	All	All	1907-1933	1907-1929	Family	Child
District FE	No	Yes	—	—	—	—
Controls	No	Yes	Yes	Yes	Yes	Yes
Municipality FE	—	—	Yes	Yes	Yes	Yes
Year FE	—	—	Yes	Yes	Yes	Yes
Year FE × District FE	—	—	Yes	Yes	—	—
Year FE × Pre-flu controls	—	—	Yes	Yes	—	—
Period FE	—	—	—	—	Yes	Yes
Period FE × Pre-flu controls	—	—	—	—	Yes	Yes
Family FE	—	—	—	—	Yes	Yes
Child FE	—	—	—	—	Yes	Yes

Notes: The table shows robustness exercises using alternative clustering approaches for standard errors, applied to the main outcomes at two levels: all 218 municipalities in Grisons (Columns (1) to (4)) and the family- and child-level dataset for the Glenner region (Columns (5) and (6)). Columns (1) and (2) show the cross-sectional impact of direct influenza deaths on pro-compulsory vaccination in the popular vote in 1922 (in %). Hereby, the specifications parallel the estimates in Columns (1) and (3) in Table 2. Columns (3) and (4) report the difference-in-differences estimates of the impact of direct influenza deaths on children's vaccination rates, matching the specifications in Columns (1) and (3) of Table 3. Columns (5) and (6) present the difference-in-differences estimates at the family and child levels, respectively, paralleling the specifications in Columns (2) and (4) of Table 4. Panel A reports clustered standard errors with varying spatial cutoffs (from 5 kilometers up to 50 kilometers). Temporal cutoffs are set to zero in Panel A. Panel B reports clustered standard errors with varying time lags (from 2 years to 16 years) for difference-in-differences estimates in Columns (3) and (4). Hereby, the spatial cutoff is set to 15 kilometers for all specifications of temporally clustered standard errors. Columns (5) and (6) only show spatial cutoffs of up to 20 kilometers, as the maximum distance of municipalities in the family and child level data set in the region of Glenner is around 24 kilometers. Temporally clustered standard errors are not reported for these specifications due to the pooled nature of the dataset. Panel C presents "conventional" clustered standard errors at the level of municipalities ($n = 218$ for all of Grisons, $n = 38$ for Glenner), as well as at the district ($n = 34$) and region ($n = 14$) levels within Grisons. Family and child level estimates also report standard errors clustered at the family and child level, respectively.

Table B.16: Influenza deaths and reasons for vaccination absence

	Dependent variable: Share of absent children by reason (in %)			
	Total	Excused	Unexcused	Awkward
	(1)	(2)	(3)	(4)
Share Flu Deaths × $\text{Year}_{1919-21}$	4.528**	2.410	2.104*	-0.009
	(2.285)	(1.831)	(1.096)	(0.013)
Share Flu Deaths × $\text{Year}_{1923-25}$	0.879	1.593	-0.745	-0.032**
	(2.366)	(1.802)	(1.445)	(0.014)
Share Flu Deaths × $\text{Year}_{1927-29}$	3.106	2.851	0.229	0.008
	(1.921)	(2.042)	(1.183)	(0.015)
Share Flu Deaths × $\text{Year}_{1931-33}$	0.064	0.119	-0.049	0.031*
	(2.490)	(2.445)	(0.921)	(0.016)
Mean of Dep. Var.	18.632	14.996	3.643	0.028
Obs.	2,337	2,337	2,337	2,352
Sample Period	1907-33	1907-33	1907-33	1907-33
Municipality FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes	Yes
Year FE x District FE	Yes	Yes	Yes	Yes
Year FE x Pre-flu controls	Yes	Yes	Yes	Yes
R2 centered	0.449	0.425	0.499	0.408

Notes: The table displays the impact of direct influenza deaths on shifts in health behavior at the municipal level, focusing on reasons for vaccination absence across two subsequent vaccination campaigns. The dependent variable is the child's vaccination absence rate by reason (total, excused, unexcused, vaccination-skeptical families), defined as the number of unvaccinated children in each category as a percentage of all children supposed to be vaccinated. The vaccination data include the initial vaccination of young children and revaccination campaigns of adolescents from 1907 to 1933. The independent variable is defined as direct influenza deaths (based on death-register data) during the main influenza period (from September 1918 to April 1919), expressed as a percentage of the total pre-influenza population, and interacted with year-specific dummy variables *Year YYYY*, which equal one for two subsequent vaccination campaigns after 1918, and zero otherwise. All estimates include municipality fixed effects, year fixed effects, and district fixed effects interacted with year fixed effects. Time-varying control variables include the logarithms of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. Pre-influenza control variables, which are interacted with year fixed effects, include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), and housing conditions. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.17: Alternative definitions of influenza mortality (Vaccination)

	Dependent variable: Child vaccination rate (in %)					
	(1)	(2)	(3)	(4)	(5)	(6)
Log(1+Flu Deaths) × Post 1918	-3.575***					
	(1.307)					
asinh(Flu Deaths) × Post 1918		-2.905***				
		(1.030)				
Share Flu Deaths$_{1918-1921}$ × Post 1918			-2.210**			
			(0.905)			
Share Flu Deaths$_{Fall1918}$ × Post 1918				-2.832**		
				(1.387)		
Share Total Deaths$_{Fall1918}$ × Post 1918					-1.448	
					(0.898)	
Share Total Deaths$_{Year1918}$ × Post 1918						-1.143**
						(0.490)
Mean of Dep. Var.	87.711	87.711	87.711	87.711	87.711	87.711
Obs.	2,911	2,911	2,911	2,911	2,911	2,911
Sample Period	1907-29	1907-29	1907-29	1907-29	1907-29	1907-29
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE x District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE x Pre-flu controls	Yes	Yes	Yes	Yes	Yes	Yes
R2 centered	0.390	0.390	0.389	0.389	0.389	0.389

Notes: The table displays the impact of different definitions of influenza affectedness on the shift in health behavior at the municipal level. The dependent variable is the child vaccination rate, defined as the number of vaccinated children as a percentage of all children supposed to be vaccinated. The vaccination data include the initial vaccination of young children and the revaccination campaigns of adolescents, covering the period from 1907 to 1929. The various definitions of influenza affectedness are interacted with *Post 1918*, a dummy variable equal to one for all vaccination campaigns conducted after 1918 (i.e., post-pandemic), and zero otherwise. Column (1) uses the logarithm of the number of direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, with one added to avoid dropping zeros. Column (2) applies the inverse hyperbolic sine transformation to the number of direct influenza deaths during the same period. Column (3) uses direct influenza deaths from influenza's first occurrence in July 1918 through the end of 2021 (based on death-register data), expressed as a percentage of the total pre-influenza population. Column (4) uses direct influenza deaths during the first main wave of the pandemic in fall 1918 (September to December 1918), also as a percentage of the total pre-influenza population. Columns (5) and (6) use total deaths (all-cause mortality) during fall 1918 and during the entire year 1918, respectively, expressed as a percentage of the total pre-influenza population. All estimates include municipality fixed effects, year fixed effects, and district fixed effects interacted with year fixed effects. Time-varying control variables include the logarithms of population and population per household, as well as the shares of females, religious denominations, foreigners, and spoken languages. Pre-influenza control variables, which are interacted with year fixed effects, include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), and housing conditions. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.18: Pseudo periods with total mortality in other years (Vaccination)

	Dependent variable: Child vaccination rate (in %)					
	(1)	(2)	(3)	(4)	(5)	(6)
Share Total Deaths$_{1917}$ × Post 1918	-0.479					-0.274
	(0.517)					(0.394)
Share Total Deaths$_{1918}$ × Post 1918		-1.143**				-1.135**
		(0.490)				(0.536)
Share Total Deaths$_{1919}$ × Post 1919			-1.427**			-1.240*
			(0.645)			(0.655)
Share Total Deaths$_{1920}$ × Post 1920				0.922		1.011
				(0.739)		(0.698)
Share Total Deaths$_{1921}$ × Post 1921					-1.137	-0.898
					(0.711)	(0.676)
Mean of Dep. Var.	87.711	87.711	87.459	87.459	87.846	87.846
Obs.	2,911	2,911	2,591	2,591	2,242	2,242
Sample Period	1907-29	1907-29	1907-29	1907-29	1907-29	1907-29
Excluded campaigns	None	None	1919	1919	1919&21	1919&21
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE x District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE x Pre-flu controls	Yes	Yes	Yes	Yes	Yes	Yes
R2 centered	0.388	0.389	0.389	0.388	0.391	0.394

Notes: The table displays the impact of different (pseudo-)influenza years on shifts in health behavior at the municipality level. The dependent variable is the child vaccination rate, defined as the number of vaccinated children as a percentage of the number of all children who are supposed to be vaccinated. The vaccination data include both the initial vaccination of young children and the revaccination campaigns of adolescents, covering the period from 1907 to 1929. To avoid contamination, we exclude vaccination campaigns that overlap with pseudo- and post-influenza years: Columns (3) and (4) exclude the 1919 vaccination campaigns, while Columns (5) and (6) exclude the 1919 and 1921 campaigns. The independent variables are defined as total deaths during each of the following years—before (1917), during (1918 and 1919), and after the pandemic (1920 and 1921)—expressed as a percentage of the total pre-influenza population, and interacted with *Post YYYY*, a dummy variable equal to one for all vaccination campaigns following the respective (pseudo-)treatment year *YYYY*, and zero otherwise. Columns (1) to (5) show the impact of each (pseudo-)influenza year on vaccination behavior separately, while Column (6) shows the combined results. All estimates include municipality fixed effects, year fixed effects, and district fixed effects interacted with year fixed effects. Time-varying control variables include the logarithms of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. Pre-influenza control variables, which are interacted with year fixed effects, include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), and housing conditions. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.19: Infant mortality and vaccination rate

	Dep. var.: Child vaccination rate (in %)			
	(1)	(2)	(3)	(4)
Share Death Children 0-5 Years × Post 1918	1.088*		1.110*	
	(0.576)		(0.582)	
Share Death Children 6-10 Years × Post 1918		-0.410	-0.772	
		(2.185)	(2.208)	
Share Death Children below 10 Years × Post 1918				0.921*
				(0.534)
Mean of Dep. Var.	87.711	87.711	87.711	87.711
Obs.	2,911	2,911	2,911	2,911
Sample Period	1907-29	1907-29	1907-29	1907-29
Municipality FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes	Yes
Year FE x District FE	Yes	Yes	Yes	Yes
Year FE x Pre-flu controls	Yes	Yes	Yes	Yes
R2 centered	0.389	0.388	0.389	0.389

Notes: The table examines the potential impact of infant mortality on shifts in health behavior at the municipal level. The dependent variable is the child vaccination rate, defined as the number of vaccinated children as a percentage of all children who are supposed to be vaccinated. The vaccination data include both the initial vaccination of young children and the revaccination campaigns of adolescents from 1907 to 1929. The independent variables are different measures of total infant deaths from 1917 to 1921, expressed as a percentage of the total pre-influenza population, and interacted with *Post 1918*, a dummy variable equal to one for all vaccination campaigns after 1918, and zero before. Columns (1) and (2) use child mortality for those who died under the age of 5 and between the ages of 6 and 10, respectively. Column (3) presents a combined measure of both age groups. Column (4) uses total mortality for children who died under the age of 10 years. All specifications include municipality fixed effects, year fixed effects, and district fixed effects interacted with year fixed effects. Time-varying control variables include the logarithms of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. Pre-influenza control variables, which are interacted with year fixed effects, include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), and housing conditions. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.20: Inclusion of Vorderrhein and exclusion of outliers (Vaccination)

	Dependent variable: Child vaccination rate (in %)			
	Incl. region Vorderrhein	w/o highest flu mortality	w/o Hospitals	w/o Doctors
	(1)	(2)	(3)	(4)
Share Flu Deaths × Post 1918	-2.832**	-7.379***	-2.691**	-2.897**
	(1.152)	(1.937)	(1.264)	(1.364)
Mean of Dep. Var.	87.705	87.711	87.717	88.084
Obs.	2,938	2,768	2,803	2,376
Sample Period	1907-29	1907-29	1907-29	1907-29
Municipality FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes	Yes
Year FE x District FE	Yes	Yes	Yes	Yes
Year FE x Pre-flu controls	Yes	Yes	Yes	Yes
R2 centered	0.391	0.392	0.387	0.396

Notes: The table presents the impact of direct influenza deaths on shifts in health behavior at the municipal level, applying various sample restrictions. The dependent variable is the child vaccination rate, defined as the number of vaccinated children as a percentage of the number of all children who are supposed to be vaccinated. The vaccination data include the initial vaccination of young children and the revaccination campaigns of adolescents from 1907 to 1929. The independent variable is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population interacted with *Post 1918*, a dummy variable equal to one for all vaccination campaigns after 1918, and zero otherwise. Column (1) includes the region of *"Vorderrhein"* to the vaccination sample (7 municipalities). This full sample parallels the main sample in Section 4, where we test the impact of influenza affectedness on health attitudes. Column (2) excludes the municipalities with the top 5% direct influenza death rates during the main influenza period. Column (3) excludes municipalities that had an operating hospital during the pandemic (8 municipalities, primarily the largest towns in Grisons). Column (4) excludes all municipalities with an operating doctor/general practitioner during 1918/1919 (42 municipalities). All estimates include municipality fixed effects, year fixed effects, and district fixed effects interacted with year fixed effects. Time-varying control variables include the logarithms of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. Pre-influenza control variables, which are interacted with year fixed effects, include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), and housing conditions. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.21: Sample restriction with key local characteristics (Vaccination)

	Dependent variable: Child vaccination rate (in %)					
			Median splits w.r.t.:			
	Train connection		Population size		Protestant share	
	Yes	No	Below	Above	Below	Above
	(1)	(2)	(3)	(4)	(5)	(6)
Share Flu Deaths × Post 1918	-4.605***	-2.791*	-3.026**	-5.025*	-2.145*	-4.717**
	(1.522)	(1.662)	(1.326)	(2.671)	(1.103)	(2.016)
Mean of Dep. Var.	85.163	89.256	90.017	85.315	89.110	86.346
Obs.	1,099	1812	1,483	1,428	1,437	1,474
Sample Period	1907-29	1907-29	1907-29	1907-29	1907-29	1907-29
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE x District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE x Pre-flu controls	Yes	Yes	Yes	Yes	Yes	Yes
R2 centered	0.518	0.410	0.404	0.518	0.474	0.444

Notes: The table presents the impact of direct influenza deaths on shifts in health behavior at the municipality level, applying sample restrictions based on key local variables. These local variables are correlated with influenza affectedness, as shown in the balancing exercise in Section 4.1. The dependent variable is the child vaccination rate, defined as the number of vaccinated children as a percentage of the number of all children who are supposed to be vaccinated. Vaccination data include the initial vaccination of young children and the revaccination campaigns of adolescents from 1907 to 1929. The independent variable is defined as direct influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919, expressed as a percentage of the total pre-influenza population interacted with *Post 1918*, a dummy variable equal to one for all vaccination campaigns after 1918, and zero otherwise. Columns (1) and (2) test the impact of direct influenza deaths on the shift in health behavior in places with and without a train connection, respectively. Columns (3) and (4) test the effects separately for municipalities below and above the median population size in terms of population in 1910. Columns (5) and (6) test the effects separately for municipalities below and above the median share of Protestants in 1910. All estimates include municipality fixed effects, year fixed effects, and district fixed effects interacted with year fixed effects. Time-varying control variables include the logarithms of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. Pre-influenza control variables, interacted with year fixed effects, include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), and housing conditions. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.22: Vaccination behavior in Glenner (municipality level)

	Dependent variable: Child vaccination rate (in %)			
	(1)	(2)	(3)	(4)
Share Flu Deaths × Post 1918	-9.441***	-2.462	-9.264***	-8.336
	(2.693)	(4.727)	(3.485)	(6.765)
Mean of Dep. Var.	87.363	87.363	85.784	85.784
Obs.	500	500	1,881	1,881
Sample Period	1907-21	1907-21	1907-29	1907-29
Municipality FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Time-variant controls	No	Yes	No	Yes
Year FE x District FE	No	Yes	No	Yes
Year FE x Pre-flu controls	No	Yes	No	Yes
R2 centered	0.311	0.564	0.272	0.534

Notes: The table displays the impact of direct influenza deaths on shifts in health behavior for 38 municipalities in the region of Glenner (the region covered by our individual data). The dependent variable is the child vaccination rate, defined as the number of vaccinated children as a percentage of the number of all children who are supposed to be vaccinated. The vaccination data include the initial vaccination of young children and the revaccination campaigns of adolescents from 1907 to 1921 in Columns (1) and (2), and from 1907 to 1929 in Columns (3) and (4). The independent variable is defined as direct influenza deaths (based on death-register data) during the main influenza period (September 1918 to April 1919) as a percentage of the total pre-influenza population interacted with *Post 1918*, a dummy variable that is equal to one for all vaccination campaigns after 1918, and zero before. All estimates include municipality fixed effects and year fixed effects. Columns (2) and (4) also include the full set of control variables. The time-varying control variables are the logarithms of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. Pre-influenza control variables, which are interacted with year fixed effects, include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), and housing conditions. The effects within Glenner are somewhat similar to the effects for Grisons as a whole—larger without any control variables, and less precise when all controls are applied. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.23: Vaccination behavior in Glenner, Robustness to treatment definition

	Dependent variable: Child vaccinated (0/1)			
	Family level		Child level	
	(1)	(2)	(3)	(4)
Family Flu Deaths (Yes) × Post 1918	0.027**	0.051***	0.076***	0.078***
	(0.013)	(0.009)	(0.019)	(0.011)
Mean of Dep. Var.	0.800	0.800	0.814	0.814
Obs.	3,245	3,245	1,535	1,535
Period FE	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes
Time-variant controls	No	Yes	No	Yes
Year FE × Pre-flu controls	No	Yes	No	Yes
Family FE	Yes	Yes	Yes	Yes
Child FE	-	-	Yes	Yes
R2 centered	0.879	0.890	0.427	0.461

Notes: The table displays the impact of direct influenza deaths on shifts in health behavior using individual-level vaccination records for the Glenner region from 1905 to 1933, excluding all children from families with the most common surnames in a given municipality. The dependent variable is a binary indicator of whether a child was vaccinated. *Flu Death (Yes)* is a binary variable equal to one if at least one person with the same surname as the child, the mother, or the father died in a specific municipality directly of influenza during the influenza period, and zero otherwise. The pre-treatment period is defined as 1905–17, and the post-treatment period as 1919–33. The family-level sample in columns (1) and (2) includes children assigned to be vaccinated during the entire sample period. The balanced child-level sample in columns (3) and (4) includes children who were assigned to be vaccinated for the first time in the pre-treatment period and who were assigned to be re-vaccinated in the post-treatment period. For all balanced child-level samples, we apply the same restrictions as in our main analysis: we exclude children vaccinated in a different locality, children from a different locality, children deferred to the following year, children who were too young, and children who had died. The balanced sample is further restricted to panel observations with at least one vaccination entry before 1918 and at least one revaccination entry after 1918. Time-fixed effects are pre-treatment and post-treatment fixed effects. Statistical inferences are based on spatially and temporally clustered standard errors as in our main analysis. Columns (1), (3), and (4) slightly diverge from our standard 15-kilometer spatial cutoff to achieve feasible standard errors with cutoffs of 14 kilometers and 16 kilometers. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.24: Vaccination behavior in Glenner (individual level), Robustness to health environment

	Dependent variable: Child vaccinated (0/1)							
	Excluding municipality with hospital				Excluding municipalities with a doctor			
	Family level		Child level		Family level		Child level	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Family Flu Deaths (Yes) × Post 1918	0.027***	0.052***	0.052***	0.057***	0.020**	0.043***	0.047***	0.048***
	(0.007)	(0.011)	(0.005)	(0.008)	(0.008)	(0.004)	(0.019)	(0.013)
Mean of Dep. Var.	0.800	0.800	0.814	0.814	0.800	0.800	0.814	0.814
Obs.	3,803	3,802	1,997	1,997	3,542	3,541	1,881	1,881
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant controls	No	Yes	No	Yes	No	Yes	No	Yes
Year FE × Pre-flu controls	No	Yes	No	Yes	No	Yes	No	Yes
Family FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child FE	-	-	Yes	Yes	-	-	Yes	Yes
R2 centered	0.882	0.889	0.414	0.443	0.890	0.895	0.423	0.449

Notes: The table displays the impact of direct influenza deaths on shifts in health behavior using individual-level vaccination records for the Glenner region from 1905 to 1933. The dependent variable is a binary indicator of whether a child was vaccinated. *Flu Death (Yes)* is a binary variable equal to one if at least one person with the same surname as the child, the mother, or the father died in a specific municipality directly of influenza during the influenza period, and zero otherwise. The pre-treatment period is defined as 1905–17, and the post-treatment period as 1919–33. In Columns (1) to (4), we exclude the municipalities with a hospital. In Columns (5) to (8), we exclude municipalities with a practicing doctor. The family-level sample in columns (1), (2), (5), and (6) includes children assigned to be vaccinated during the entire sample period. The balanced child-level sample in columns (3), (4), (7), and (8) includes children who were assigned to be vaccinated for the first time in the pre-treatment period and who were assigned to be re-vaccinated in the post-treatment period. For all balanced child-level samples, we apply the same restrictions as in our main analysis: we exclude children vaccinated in a different locality, children from a different locality, children deferred to the following year, children who were too young, and children who had died. The balanced sample is further restricted to panel observations with at least one vaccination entry before 1918 and at least one revaccination entry after 1918. Time-fixed effects are pre-treatment and post-treatment fixed effects. Statistical inferences are based on spatially and temporally clustered standard errors as in our main analysis. Columns (1), (5), (6), and (8) slightly diverge from our standard 15-kilometer spatial cutoff to achieve feasible standard errors (minimum cutoff: 13 kilometers, maximum cutoff: 18 kilometers). Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.25: Synthesis of the U-shaped pattern of suffering

	Dependent variable: Share vaccinated children (0/1)			
	Quadratic specification		Linear specification	
	(1)	(2)	(3)	(4)
SDAF × Post 1918	-0.396***	-0.304	0.013	0.030
	(0.094)	(0.199)	(0.063)	(0.068)
$[\text{SDAF} \times \text{Post 1918}]^2$	0.528**	0.428		
	(0.232)	(0.322)		
Mean of Dep. Var.	0.830	0.830	0.830	0.830
Obs.	178	178	178	178
Period FE	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes
Time-variant controls	No	Yes	No	Yes
R2 centred	0.425	0.442	0.414	0.436

Notes: The table displays the impact of direct influenza deaths on shifts in health behavior using individual-level vaccination records for the Glenner region, 1903-1933. The dependent variable is the share of children vaccinated. We define two pre-treatment periods (1903-11, 1913-17) and three post-treatment periods (1919-23, 1925-29, 1931-33). In all samples, we apply the same restrictions as in our main analysis: we exclude children vaccinated in a different locality, children from a different locality, children deferred to the following year, children who were too young, and children who had died. The sample is restricted to panel observations with at least one entry in one of the vaccination campaigns before 1918 and at least one entry in a revaccination campaign after 1918. Period fixed effects refer to the periods as specified above. Time-varying control variables include the logarithms of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. Columns (1) and (2) present the results of a model with a linear and a squared interaction term between *Post 1918* and $SDAF_i$, the share of directly affected families as defined in Equation (5), columns (3) and (4) present the results of a model with a linear interaction term only. *Post 1918* is a dummy variable equal to one for all vaccination campaigns after 1918 (after the pandemic), and zero before. Statistical inferences are based on spatially clustered standard errors as in our main analysis. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.26: Heterogeneous treatment effects by gender and type of vaccination

	Dependent variable: Child vaccination rate (in %)					
	All campaigns		Initial vaccination		Re-vaccination	
	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
Sh. F. Flu Deaths$_z$ × Year$_{1919-21}$	-1.610**		-1.988**		-1.308	
	(0.774)		(0.934)		(1.214)	
Sh. F. Flu Deaths$_z$ × Year$_{1923-25}$	-2.443***		-2.704***		-2.303	
	(0.924)		(0.874)		(1.486)	
Sh. F. Flu Deaths$_z$ × Year$_{1927-29}$	-1.596**		-2.660**		-0.734	
	(0.707)		(1.076)		(0.844)	
Sh. F. Flu Deaths$_z$ × Year$_{1931-33}$	0.409		-0.112		1.059	
	(1.023)		(1.354)		(1.464)	
Sh. M. Flu Deaths$_z$ × Year$_{1919-21}$		-1.528**		-0.782		-2.732**
		(0.678)		(1.024)		(1.109)
Sh. M. Flu Deaths$_z$ × Year$_{1923-25}$		-0.262		0.190		-0.948
		(0.683)		(0.969)		(1.029)
Sh. M. Flu Deaths$_z$ × Year$_{1927-29}$		-0.852		0.014		-2.175***
		(0.596)		(1.164)		(0.769)
Sh. M. Flu Deaths$_z$ × Year$_{1931-33}$		0.117		-0.291		0.385
		(0.895)		(1.564)		(1.166)
Mean of Dep. Var.	87.418	87.418	86.123	86.123	88.778	88.778
Obs.	3,559	3,559	1,823	1,823	1,736	1,736
Sample Period	1907-33	1907-33	1907-33	1907-33	1907-33	1907-33
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Time-variant controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE x District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE x Pre-flu controls	Yes	Yes	Yes	Yes	Yes	Yes
R2 centered	0.383	0.381	0.520	0.517	0.554	0.555

Notes: The table displays the impact by the gender of the direct influenza deaths on shifts in health behavior at the municipality level. The dependent variable is the children' vaccination rate, defined as the number of vaccinated children as a percentage of the number of all children who are supposed to be vaccinated. Vaccination data in Columns (1) and (2) include the initial vaccination of young children and the revaccination campaigns of adolescents from 1907 to 1933, while Columns (3) and (4) show the effects on the initial vaccination and Columns (5) and (6) on the revaccination campaigns separately. *Sh. F. Flu Deaths* is defined as direct female influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919 as a percentage of the total pre-influenza population. *Sh. M. Flu Deaths* is defined as direct male influenza deaths (based on death-register data) during the main influenza period from September 1918 to April 1919 as a share of the total pre-influenza population (in %). $Year_{YY}$ are dummy variables that are equal to one for the respective vaccination campaigns in the years indicated with YY, and zero otherwise. All estimates include municipality fixed effects, year fixed effects, and district fixed effects interacted with year fixed effects. Time-varying control variables include the logarithms of population and population per household, the shares of females, religious denominations, foreigners, and spoken languages. Pre-influenza control variables, which are interacted with year fixed effects, include locality characteristics (population size, train connection, sea level, presence of doctors and hospitals in 1918), demographic characteristics of residents (composition in terms of age, sex, language, religion), economic characteristics (sector shares, working population, in- and out-commuters), and housing conditions. Statistical inferences are based on spatially and temporally clustered standard errors. Significance levels: *** 0.01, ** 0.05, * 0.10.

Table B.27: Impact of influenza deaths on religious naming patterns of newborns

	Dependent variable: Local saint's first name (0/1)	
	Full sample	Catholic places
	(1)	(1)
Family Flu Death (Yes) × Post 1918	0.169*	0.232**
	(0.094)	(0.117)
(Family Flu Death (Yes) × Post 1918)^2	-0.267**	-0.386***
	(0.118)	(0.103)
Mean of Dep. Var.	0.111	0.111
Obs.	178	130
Municipality FE	Yes	Yes
Time FE	Yes	Yes
Family FE	Yes	Yes
Time-variant controls	Yes	Yes
Year FE × Pre-flu controls	Yes	Yes
R2	0.941	0.964

Notes: The table displays the impact of direct influenza deaths on shifts in naming patterns, based on individual-level vaccination records for the Glenner region 1903-1933. The dependent variable is a binary indicator of whether a child was vaccinated. We define two pre-treatment periods (1903-11, 1913-17) and three post-treatment periods (1919-23, 1925-29, 1931-33). In all samples, we apply the same restrictions as in our main analysis, dropping children vaccinated in a different locality as well as children coming from a different locality, children deferred to the next year, children who are too young, and children who died. Time-fixed effects are period fixed effects. *Flu Death (Yes)* is a binary variable that is equal to one if at least one person with the same surname as the child, the mother, or the father in a specific municipality died directly of influenza during the influenza period, and zero otherwise. *Post 1918* is a dummy variable that is equal to one for all vaccination campaigns after 1918 (after the pandemic), and zero before. Statistical inferences are based on spatially and temporally clustered standard errors as in our main analysis. Significance levels: *** 0.01, ** 0.05, * 0.10.

Abstrakt

Zkoumáme dopady největšího nepříznivého zdravotního šoku v moderní medicíně – pandemie chřipky v roce 1918 – na následné změny v postojích a chování v oblasti zdraví, a na hospodářskou politiku orientovanou na budoucnost. Naše analýza vychází ze samostatně digitalizovaných výpisů z registru úmrtí na úrovni jednotlivců, záznamů o očkování a sčítání hlasů voličů. Zjišťujeme, že větší vystavení chřipce vede k poklesu společenské podpory opatření v oblasti veřejného zdraví na agregátní úrovni, který vyvolávají především zemřelí vrstevníci. Údaje na individuální úrovni však odhalují zvýšenou míru očkování v rodinách, které zažily úmrtí v souvislosti s chřipkou. Tyto rozdíly před pandemií neexistovaly. Naše zjištění odkazují na vztah ve tvaru písmene U mezi utrpením způsobeným pandemií a podporou účinných zdravotnických opatření. Místa s převážně nepřímo postiženými rodinami jsou hnací silou celkového odporu. To zpochybňuje myšlenku, že minulé zdravotní šoky zlepšují očekávanou délku života prostřednictvím společenského učení.

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