Peers for the Fearless: Social norms facilitate preventive behaviour if individuals perceive low COVID-19 health risks

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Abstract

A strategy frequently adopted to contain the COVID-19 pandemic involves three non-pharmaceutical interventions that depend on high levels of compliance in society: maintaining physical distance from others, minimizing social contacts, and wearing a face mask. These measures require substantial changes in established practices of social interaction, raising the question of which factors motivate individuals to comply with these preventive behaviours. Using Austrian panel survey data from April 2020 to April 2021, we show that perceived health risks, social norms, and trust in political institutions stimulate people to engage in preventive behaviour. A moderation analysis shows that the effectiveness of social norms in facilitating preventive behaviour increases when people's perceptions of health risks decrease. No such moderation effect is observed for trust in political institutions. These results suggest that strong social norms play a crucial role in achieving high rates of preventive behaviour, especially when perceived levels of health risks are low.

Introduction

SARS-CoV2, the severe acute respiratory syndrome coronavirus 2, has kept the world in suspense since it began to spread globally in early 2020. The pandemic prompted governments and civil societies to make enormous efforts to contain the spread of this virus. Until a substantial share of the population is vaccinated, “preventive behaviour”, which includes physical distancing, wearing a face mask, and minimizing social contacts, is considered the prime strategy to curb the spread of SARS-CoV2 [1]. While these preventive measures appear effective [2–7], their impact crucially depends on high rates of adoption in the population [8]. Given that preventive behaviour demands significant changes in the lifestyle and the practices of social interaction hitherto perceived as normal [9], individual adherence to these governmental measures is not guaranteed [10]. The resulting volatility in compliance threatens to undermine their ability to curb infection rates, which can lead governments to implement stricter measures entailing great social and economic costs. This paper studies the factors influencing and stabilizing individual willingness to engage in preventive behaviour in different stages of the pandemic.

So far, the literature on preventive behaviour during the COVID-19 pandemic has mostly concentrated on the first few months of the pandemic in early 2020. We argue that this focus has potential drawbacks because developments during the pandemic not only fundamentally changed individual perceptions of the cost and benefits of preventive behaviour but also the “contexts” in which individuals make behavioural decisions [11]. This emphasizes the importance of the emergence and stability of new behavioural “norms” during the pandemic. Similar to Diekmann (2020), who follows the seminal theory of Ullmann-Margalit on the emergence of norms [13], we argue that preventive behaviour constitutes a cooperation problem as individuals profit by deviating from the socially optimal behaviour, which potentially crowds out the norm-conforming behaviour of others [14]. When perceptions of health risk are high, individuals should engage in preventive behaviour without needing further incentives. When risk perceptions are low, individuals may view preventive measures as comparatively costly, which increases the risk of free riding. Thus, low health risk perceptions should increase the strength of, and necessity for, further factors that can effectively guarantee widespread individual compliance with measures mandating preventive behaviour.

Using Austrian panel data, we study two social mechanisms affecting preventive behaviour and provide evidence of their relative strength depending on individually perceived levels of health risks. We show that, beyond health risks, perceived social norms and, to a lesser degree, trust in important governmental institutions are important factors promoting preventive behaviour. Moreover, in line with our expectations, the effect of social norms increases as individual risk perceptions decrease. On the other hand, we find no substantive evidence that the effect of trust in institutions increases with decreasing levels of perceived health risks. These results highlight the importance of social networks and peer groups that provide information about cooperation of others and the effectiveness of governmental measures. Most importantly, we show that social norms stabilize conditional cooperation in form of preventive behaviour in particular when individuals perceive minimal health risks.

In the following sections we provide a literature review of the main social factors that affect preventive behaviour and explain our argument that their explanatory power depends on health risk perceptions. Subsequently, we describe the data and our estimation strategy. After presenting some descriptive data about the development of the pandemic in Austria and our main variables of interest, we present the main findings estimating average marginal effects using two-way fixed effects models. Afterwards, we provide several robustness checks and discuss our findings in light of recent findings in the literature on COVID-19 and previous pandemics. We end by highlighting the potential importance of our findings for policies aiming to foster the uptake of preventive behaviour during pandemics.

Primary predictors of preventive behaviour

To date, the literature on COVID-19 and previous pandemics has highlighted three main social mechanisms that facilitate preventive behaviour: people may believe in the existence of a threat and act in response to their risk perception [15], they may adhere to a social norm [16], or they may act out of trust in the institutions responsible for containing the pandemic [17]. First, multiple studies of previous pandemics [18,19] and on COVID-19 [20,21] have shown that a *concern about health risks* can induce preventive behaviour [22] or increase intentions to accept a vaccine [23]. While there is still a debate about whether the strength of this effect depends on concerns about one's own [24] or others' vulnerability [25] to an infection, recent studies suggest that both factors encourage preventive behaviour [26].

Second, *social norms* refer to mutually expected behaviour [27,28]. The literature distinguishes two main types of social norms: while "descriptive" norms refer to the observed behaviour of others, "injunctive" norms capture the expected moral approval of other people [29]. Jointly, both forms of social norms foster adherence to preventive behaviour in the context of COVID-19 [30,31], as people may engage in preventive behaviour not because of their belief in the benefit of the behaviour itself, but because they care about their social relations and their reputation in the social environment [32–36]. In line with these expectations, empirical evidence in the context of COVID-19 suggests that people who engage in preventive behaviour are perceived as more prosocial [37], and, in turn, these people express less positive attitudes towards those not wearing masks [9]. Furthermore, people feel less strange wearing masks when amongst other people wearing masks [32] and individuals with friends in areas highly affected by the pandemic increase social distancing behaviour [38].

Third, *trust in authorities and legal measures* may promote human behaviour in line with government recommendations [39,40]. Supporting these expectations, studies have shown that low levels of trust undermine a government's ability to enact controversial policies [41] and decrease compliance [42]. Hence, trust in authorities and institutions is expected to facilitate compliance with measures to contain a pandemic, such as preventive behaviour [43]. In line with these arguments, initial empirical results in the context of COVID-19 suggest that political trust indeed promotes preventive behaviour [17,44–47].

Theoretical background

We argue that, though these three factors represent distinct mechanisms, their effects on preventive behaviour are not independent of each other. The goal-framing theory developed in cognitive sociology [48] provides a useful theoretical framework for systematizing these key motivations for preventive behaviour. Central to this framework is the distinction between three layers of goals: "[…] the *hedonic* goal 'to feel better right now,' the *gain* goal 'to guard and improve one's resources,' and the *normative* goal 'to act appropriately.' When such a goal is activated (i.e., when it is the 'focal' goal), it will influence what persons think of at the moment, what information they are sensitive to, what action alternatives they perceive, and how they will act" [49].

We use this perspective on agency theory, in which rationality is interpreted in terms of an interaction between self-regulation and social regulation, as an analytical framework for developing hypotheses on individual behavioural responses to the pandemic. The threat of COVID-19 can be understood as an exogenous shock that disrupts people's hedonic routines and activates their self-regarding motives. Given that health is a priority issue for individuals [48], people who are concerned about their health should not need further inducement to implement measures to avoid infection. However, when people do not perceive the pandemic as a health risk, they may nevertheless engage in preventive behaviour because they believe it is appropriate, either for normative reasons [50,51] or because they trust in the adequacy of policies developed by authorities [52,53].

Previous empirical studies in the context of COVID-19 have reported puzzling results regarding the effects of social norms and political trust on preventive behaviour. While some studies, using data from the first surge of infections in early 2020, suggest that perceived health risks are the single most important factor in facilitating preventive behaviour [20,21], other studies have highlighted the importance of other factors like political trust and social norms [9,30–32]**.** We argue that accounting for the intervening factor of perceived health risks might explain these disparate findings, meaning that elevated perceptions of individual health risks (as reported in many countries at the beginning of the pandemic) should reduce the effects of trust and social norms on preventive behaviour because these social mechanisms are more relevant when health risk perceptions are low and thus do not induce people to take preventive measures out of self-interest.

This idea is also in line with the theory of normative social behaviour [54], which explicitly highlights the important role of outcome expectations for the power of social norms. In this perspective health risks are still crucial, but successful prevention strategies do not depend on high-risk perceptions. Empirical findings in the context of health promotion have shown that perceived benefits moderate the effect of descriptive norms in promoting health-preserving behaviour [55]. Also, in the context of COVID-19, scientists already have argued that social mechanisms facilitating preventive behaviour should become stronger as levels of individually perceived health risks decrease [56]. Moreover, recent results from a field experiment in Bangladesh suggest that people's aversion to a light informal social sanction is important for facilitating mask wearing over a longer period of time [57], even when masks have been distributed free of charge in that area. This again suggests that social norms are important facilitators of preventive behaviour in low-cost contexts. Therefore, the effects of social norms and trust in institutions should depend on the perception of health risks, that is, their effects should increase as the perception of health risks declines.

Research questions and hypotheses

These considerations lead to the following two questions: (Q1) What effect do perceived health risks, social norms, and trust in institutions exert on preventive behaviour to contain the SARS-CoV-2 pandemic? (Q2) How do immediate health concerns influence the effect of other social mechanisms on preventive behaviour?

Based on the theoretical arguments outlined above, we test three hypotheses (H1, H2, H3) corresponding to Q1 and two hypotheses (H4, H5) related to Q2:

(H1) The larger the individual concern about health risks, the higher is adherence to preventive behaviour.
(H2) The stronger individual perceptions of social norms of preventive behaviour, the higher is adherence to preventive behaviour.
(H3) The higher individual trust in institutions managing the pandemic, the higher is adherence to preventive behaviour.
(H4) The smaller the individual concern about health risks, the stronger is the effect of social norms on preventive behaviour.
(H5) The smaller the individual concern about health risks, the stronger is the effect of trust in institutions on preventive behaviour.

To test these hypotheses, we use panel survey data from a representative sample of the Austrian population. We analyse fixed-effects regression models of an index of preventive behaviour based on respondents' self-reported likelihood to stay at home, wear masks, and keep physical distance from others. Together, these measures are considered essential individual contributions to governmental efforts to curb the pandemic, which may contribute to avoiding more severe measures such as the closing of infrastructure (commerce, schools) or regional or nationwide "lockdowns".

Methods

Data

The data comprises eight waves (waves 3, 7, 11, 14, 16, 18, 20 and 22) of the *Austrian Corona Panel Project* (ACPP) [58], which includes questions on preventive behaviour and social norms. The observed period ranges from mid-April 2020 to mid-April 2021. This period includes parts of the first COVID-19 induced lockdown in Austria as well as the successive periods of relaxation and re-intensification of the pandemic and government measures in Austria. The ACPP is carrying out an online panel survey representative of the Austrian population with N = 1500, which is administered by a market research company. Details on the research design, panel attrition, as well as on the quota sampling that matches the Austrian population in terms of sociodemographic characteristics such as gender, age, education, employment status, migration background and region, are documented elsewhere [59]. For further information on data availability refer to the S1 Appendix (D1). The panel study is still ongoing, and we use the latest data containing the survey modules relevant for the present analysis that are available at the moment of writing this study. However, results remain substantially similar even when we do not use the full sample available (see S1 Appendix B2).

Measures

We operationalize the *dependent variable*, preventive behaviour, by means of a normalized additive index comprising three variables: (i) self-reported frequency of staying at home except for necessities, (ii) self-reported frequency of keeping a distance of at least one meter from others, and (iii) self-reported frequency of wearing a mask whenever physical distancing is not possible, with all items measured by a five-level Likert scale ranging from “almost always” to “almost never”. Cronbach’s alpha for this index is .69.

The *independent variables* we use to test our hypotheses comprise (1) perceptions of health risks coming from COVID-19, (2) social norms, and (3) trust in institutions. Again, we operationalize these three aspects through normalized additive indices based on 5-level (1,2) and 11-level (3) Likert scales:

(1) The index of perceived health risks is based on respondents’ assessments of (i) the health risks COVID-19 entails for themselves and (ii) for the Austrian population in general. Cronbach’s alpha for this index is .76.

(2) The index of social norms consists of (i) descriptive norms and (ii) injunctive norms regarding preventive behaviour. Descriptive norms refer to perceptions of other people's behaviour, while injunctive norms refer to beliefs about other people's opinions [60–63]. Thus, the items on injunctive norms asked respondents to “think of the *opinions of other people in Austria*. Please specify *how many* Austrians *hold the following opinions*.” The items on descriptive norms told respondents to think “of the *actual behaviour of other people in Austria*. From your perspective, please specify *how many* Austrians *engage in the following behaviour*” (emphasis in the original). Like the dependent variable, the social norms index includes items referring to descriptive and injunctive norms regarding staying at home (“They stay at home, except for necessary trips.”), keeping a distance (“In public, they keep a minimum distance of 1m from people who do not live in their household.”), and wearing a mask (“In public, they always wear protective masks.”). Cronbach’s alpha for this index is .82.

(3) The index on trust in institutions consists of items on trust in four public institutions: (i) the government, (ii) the health care system, (iii) the parliament, and (iv) the police. Cronbach’s alpha for this index is .87. For all indices, the results of corresponding principal component analyses and the correlation of the relevant components to the additive indices used in the analyses can be found in the S1 Appendix (C1).

We control for the sociodemographic characteristics of gender, age, education, household size, migration background, and employment status. Employment status is also included in the FE-regressions and contains a dummy for flexible work arrangements (home office), which has been recommended as a means of social distancing [64]. As the decision to work in home-office can be a deliberate choice for preventive behaviour (by staying at home), we checked whether including this variable in our models decreases the other coefficient estimates. This was not the case (refer to S1 Appendix B7). We recoded all variables in a way that aligns the direction and range of the scales (normalization), thus easing comparability. Hence, every variable ranges from 0 to 1, whereby 0 indicates the lowest and 1 the highest value of the corresponding concept (i.e. frequency, trust, agreement to statements, estimations of opinions and behaviour). The exact wording of all questions and the corresponding answer options in German as well as their translation into English can be found in the S1 Appendix (C2). We provide basic descriptive statistics for all variables used in the analyses in the S1 Appendix (A1).

A total of 2,631 individuals, including replacements for panel attrition, participated in the eight waves of the survey included in this analysis. Listwise deletion of missing values reduces the number of respondents to 2,408. Because we focus on variation within individuals, we further reduce the sample to respondents who participated in at least two of the aforementioned waves, which results in 2,030 individuals, providing a total of 10,210 observations. We provide balance checks on these samples in the S1 Appendix (B4). These results show that those who dropped out are on average more likely to have a migration background, to be female, younger, less educated and from larger households. However, with the exception of age, these effects are relatively small and inconsequential for the hypothesis tests. To avoid confounding by important socio-demographic characteristics like age (which may explain perceived health risks as well as preventive behaviour), we rely on within-individual variation in our main analyses. Crucially, those remaining in the sample are quite similar to those who dropped out with regard to the attitudes, perceptions and behaviours appearing in our main hypotheses. The only notable difference is that those who dropped out had, on average, lower levels of trust in institutions managing the crisis. 22 respondents (1.08%) reported a constant value on the preventive behaviour index over all waves in which they participated, thus providing no information for the fixed effects analysis.

Analytic strategy

We use a two-way fixed-effects (2FE) panel model to avoid confounding by unobserved heterogeneity within individuals (refer to the S1 Appendix D2 for a link to the code used in this paper).

Replacing individual fixed effects with time-invariant socio-demographic characteristics does not alter our substantive results for the variables of interest reported in the main analyses. This also holds true if we add further sociodemographic controls (see S1 Appendix A2, model 3). Because perceiving higher levels of social norms could potentially decrease respondents' perceived health risks, we analysed whether this issue biases our estimates in S1 Appendix (B8). We find that the medium - sized correlation between these variables decreases substantially when including individual fixed effects and that excluding perceived risks from our models did not substantially change the effect of social norms on preventive behaviour. This suggests that the potential bias should be rather small. Furthermore, we included individuals' perceived effectiveness of governmental measure in our models to control for some of the effect that social norms might have on preventive behaviour due to their correlation with risk perceptions. Again, this does not substantially change the estimates.

Because the dependent variable is censored at 0 and 1 by our normalization, we compare the linear approximation to a fractional probit model. We also compare our results to a tobit model because our estimates might be biased due to the truncation of the Likert scale measuring the three dimensions of preventive behaviour. However, both fractional probit and tobit models yield potentially inconsistent estimators in FE models, especially in unbalanced panels with small T [65,66]. Thus, we report the results of standard linear two-way fixed effect models in our main analyses. However, we also provide regression estimates of both the tobit and the fractional model in the S1 Appendix (A2, model 6 and 7). These models do not yield substantially different results.

As suggested in the literature, we test whether the hypothesized moderations can be approximated by a linear interaction (see S1 Appendix B1) [67]. Wald tests provide p-values of 0.33 (social norms) and 0.04 (trust in institutions), suggesting that we should reject the NULL-hypothesis that, for the interaction of trust in institutions with perceived health risks, the point estimates of the binning estimators are statistically equivalent to linear interaction models. Hence, we also calculated the interactions without assuming linearity using kernel estimators. As these results are effectively similar to the linear model at important points in the distribution of the moderator (perceived health risks) and the explanatory variables of interest (perceived social norms and trust in institutions), we report the linear model in the main text and provide the results of binning as well as kernel estimators in the S1 Appendix (B1). Furthermore, we explore the plausibility of the parallel trends assumption, immanent in analyses using two-way fixed effects estimators [68]. We show that our results remain essentially robust after the inclusion of leads of the main variables analysed here and only slightly decrease in size if we add individual specific wave trends (see S1 Appendix B3).

Results

Fig 1 relates the evolution of preventive behaviour, perceptions of health risks, perceived social norms, and trust in institutions to the development of the pandemic over time. At the outset of the crisis, average adherence to preventive behaviour reached its maximum (.84; 95% CI [.83, .85]) to date on an index ranging 0 – 1 and then gradually declined following the reduction in the number of infections until it reached a minimum (.61; 95% CI [.59, .62]) in August 2020. Afterwards adherence increased again as the second, more severe, “wave” of COVID-19 infections hit Austria and the government (re)introduced strict measures to curb infection rates (December: .77; 95% CI [.76, .79]). In early 2021, adherence only decreased slightly as infection rates started to decrease and then picked up again (April: .72; 95% CI [.70, .73]). Similarly, average perceptions of health risks declined during spring 2020 (April: .51; 95% CI [.50, 52], June: .35; 95% CI [.33, .36]) and later rose in line with the incidence of infections, albeit at a slower rate than preventive behaviour (December: .50; 95% CI [.48, .51]). Also, the perception of a social norm of preventive behaviour, i.e. individual perceptions that others are adopting preventive behaviour and that they think this is the right thing to do, continuously declined during spring 2020 (April: .67; 95% CI [.66, .68], June: .39; 95% CI [.38, .41]). After remaining on a low level over the summer, it slightly increased in autumn and winter 2020 (December: .52; 95% CI [.51, .54]), but did not reach the earlier peak level despite the fact that similar governmental measures were in place. Trust in institutions also started at a high level (April: .68; 95% CI [.67, .70]) and exhibited a gradual decline during the crisis (June: .61; 95% CI [.59, .62]), but different from the other indicators it remained at low levels throughout the second half of 2020 and continued to decline in 2021 (April: 53; 95% CI [.51, .54]). Overall, the increase in infections from the end of the summer onwards did not trigger a behavioural response in the population as strongly as it did earlier in the pandemic. Even more so, however, people thought that others were not as strict in adopting preventive behaviours in the second and third waves of the pandemic compared to the first wave in 2020 despite much higher COVID-19 incidence rates.

Fig 1. Evolution of preventive behaviour, perceived risk, perceived social norms, trust in institutions, infections and government measures

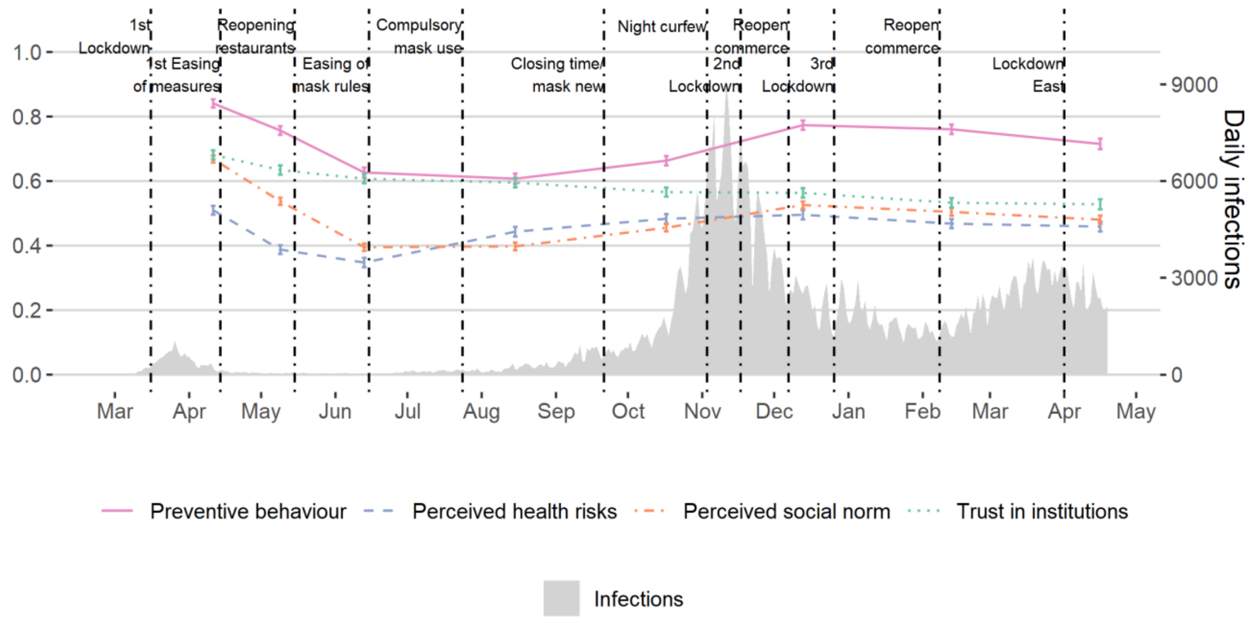

Fig 1: Evolution of preventive behaviour, perceived risk, perceived social norms and trust in institutions (N=10210 obs. of 2030 individuals), along with official numbers of daily infections and date of introduction or relaxation of government measures. Each line displays the weighted values of corresponding normalized additive indices. Whiskers indicate 95% confidence intervals. See Methods for detailed descriptions of these variables and the S1 Appendix for descriptive statistics (A1) and question wordings (C2).

While these observations indicate that, on average, perceptions of health risks, social norm perceptions and, to a lesser degree, trust in institutions changed in synchronicity, these variables are also cross-sectionally associated with preventive behaviour (Fig 2). Averaging over waves and respondents, we observe that respondents who perceive health risks to be high exhibit a value of .81 (95% CI [.80, .82]) on our 0 – 1 scale of preventive behaviour, compared to .61 (95% CI [.59, .62]) when they perceive the risks to be low ($t = 37.1$, $p < .001$, two-tailed). At the same time, preventive behaviour also increases with rising levels of respondents' perceived social norms (high = .85 (95% CI [.84, .86]); low = .57 (95% CI [.55, .58]); $t = 50.6$, $p<.001$, two-tailed) and trust in institutions (high = .80 (95% CI [.79, .80]); low = .62, (95% CI [.61, .63]); $t = 28.5$, $p < .001$, two-tailed). However, the sizes of these associations substantially decrease when respondents perceive health risks to be high (social norm =.13 (95% CI [.11, .15]), trust in institution =.07 (95% CI [.06, .10])) compared to when they perceive them to be low (social norm =.34 (95% CI [.32, .36]), trust in institution =.18 (95% CI [.16, .20])).

Fig 2. Evolution of preventive behaviour by different tertiles of perceived health risks, perceived social norm and trust in institutions

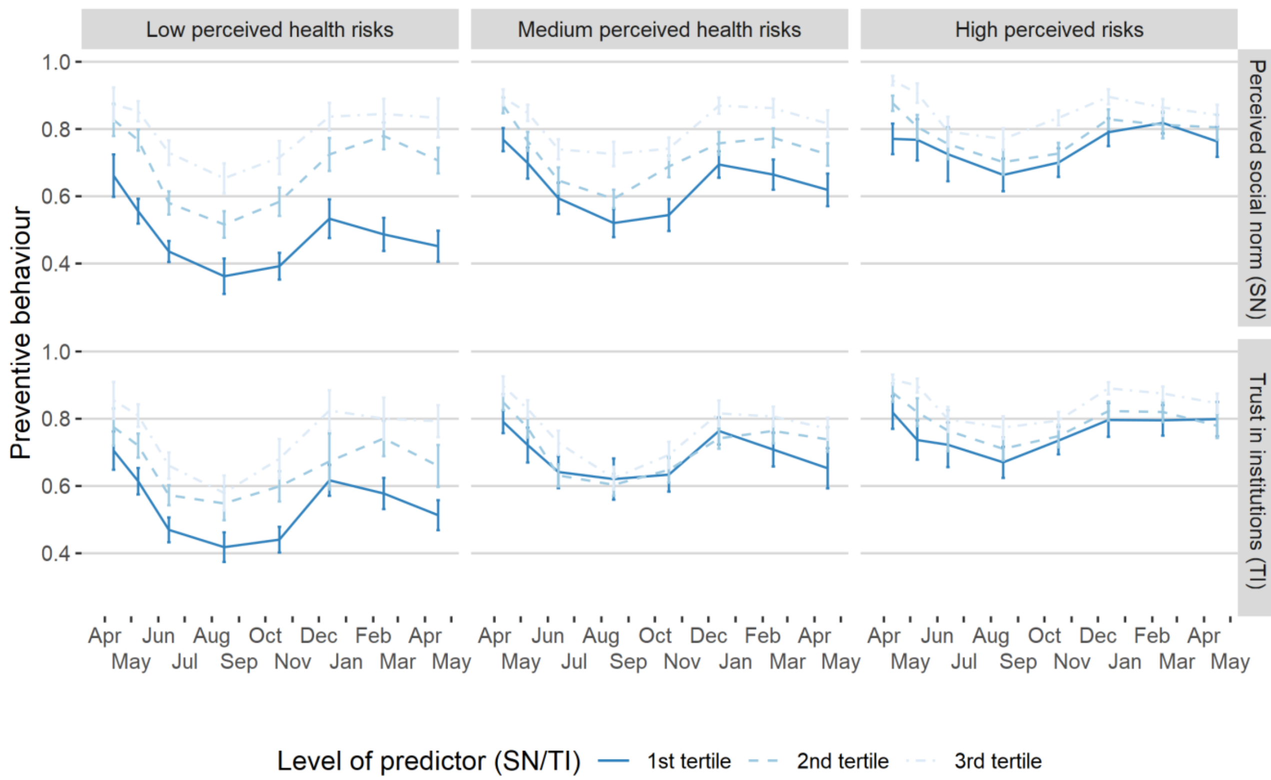

Fig 2: Evolution of preventive behaviour by different tertiles of perceived health risks, perceived social norm and trust in institutions (N=10210 obs. of 2030 individuals). SN = Perceived social norms; TI = Trust in institutions. Whiskers indicate 95% confidence intervals. Levels of predictors (1st, 2nd, and 3rd tertile) are calculated using within wave tertiles, each containing one third of our observations per wave. Low, medium and high perceived risk levels are calculated using overall perceived risk tertiles. See Methods for detailed descriptions of these variables.

To test whether these associations also hold when accounting for potential confounding factors due to changing conditions between waves (e.g. because of changing governmental measures), as well as to control for varying employment conditions (e.g. home office), we next focus on the results of the linear regression models (see Methods). The baseline model (Model 1 in Table 1) tests the effects of perceived health risks, social norms and trust in institutions on preventive behaviour. It shows that an increase in perceived health risks corresponds to an increase in individual preventive behaviour, supporting H1. Similarly, the perception of social norms is positively associated with preventive behaviour in line with H2, as is trust in institutions in line with H3. However, the latter effect is substantially smaller in size. Model 2 includes interaction terms to test whether the effect of social norms and the effect of trust in institutions depend on the level of perceived health risks. All coefficients show effects in the expected direction, indicating higher effects of perceived social norms and trust in institutions when perceived health risks are low. Model 3 presents estimates from a two-way fixed effects panel regression that additionally accounts for unobserved heterogeneity that is constant within individuals in the observed period. Although the focus on within-individual variation decreases coefficient sizes, the estimates generally support the results of the OLS with wave fixed effects. However, the interaction between trust and perceived risk, now fails to reach statistically significant levels. Model 4 additionally controls for the local infection rate, which might explain risk perceptions as well as the adoption of preventive behaviour, by including the 7-day incidence rate on the regional level (see Methods). Estimates in Table 1 indicate that this macro-level indicator is statistically insignificant, marginal in size, and has nearly no effect on the coefficients of the other variables in the model ($\beta = .003$, $t = 1.34$, $p = .223$; 95% CI [-.003, .009]. The coefficient implies that a tenfold increase in the regional incidence rate would increase preventive behaviour by less than .01). To interpret the significance and assess the strength and relevance of the estimated effects of social norms and trust in institutions on preventive behaviour at different levels of individual perceived health risks, we next focus on marginal effects plots [69].

Fig 3 shows the effect of social norm perceptions on preventive behaviour for low, medium, and high levels of health risk perceptions (values of low, medium, and high health risk perception correspond to the 15, 47, and 86 percentiles, respectively). Holding other variables at their means and focusing on a medium level of risk, a one within-individual standard deviation increase in the perceived level of social norms from the mean is associated with a .05 ($z=22.22$, $p < .001$; 95% CI [.05, .06]) increase in preventive behaviour. Relative to the observed within-individual standard deviation in preventive behaviour (henceforth called SD), this amounts to a .38 SD increase ($z=22.22$, $p < .001$; 95% CI [.35, .41]), which is a moderately strong effect. Translated into our substantive measures this means that an increase of average perceived norms from thinking that “some people engage in preventive behaviour” to “most people engage in preventive behaviour”, results in an increase of our index of preventive behaviour by .25 (0= almost never practice these behaviours, 1= almost always practice these behaviours).

Table 1. Preventive behaviour: OLS regression estimates

	(1) Preventive behaviour	(2) Preventive behaviour	(3) Preventive behaviour	(4) Preventive behaviour
Perceived health risks	0.269***	0.689***	0.385***	0.382***
	(0.0244)	(0.0425)	(0.0651)	(0.0637)
Perceived social norm	0.434***	0.763***	0.608***	0.610***
	(0.0166)	(0.0437)	(0.0364)	(0.0332)
Trust in institutions	0.121***	0.173**	0.107+	0.106+
	(0.0173)	(0.0342)	(0.0509)	(0.0481)
Perceived social norm X Perceived health risks		-0.721***	-0.464***	-0.468***
		(0.0769)	(0.0535)	(0.0436)
Trust in institutions X Perceived health risks		-0.147*	-0.119	-0.112
		(0.0565)	(0.0800)	(0.0772)
log(Regional 7day-incidence)				0.00339
				(0.00254)
Wave FE	Yes	Yes	Yes	Yes
Individual FE	No	No	Yes	Yes
Observations	10210	10210	10210	10020
Individuals	2030	2030	2030	1983

Table 1: Preventive behaviour: OLS regression estimates. Controls for changes in employment situation, as well as perceived effectiveness of measures. Robust standard errors in parentheses are clustered by wave and individuals (Models 1-3) or by wave, individuals, and region (Model 4) (* p < .05; ** p < .01; *** p < .001). The estimates are robust against the inclusion of further controls, alternative specifications of the link function (fractional model), and alternative assumptions about the data structure (tobit). For details refer to Methods. Full estimates are provided in the S1 Appendix (A2).

Fig 3. Linear prediction of preventive behaviour by perceived social norm conditional on the level of perceived health risks.

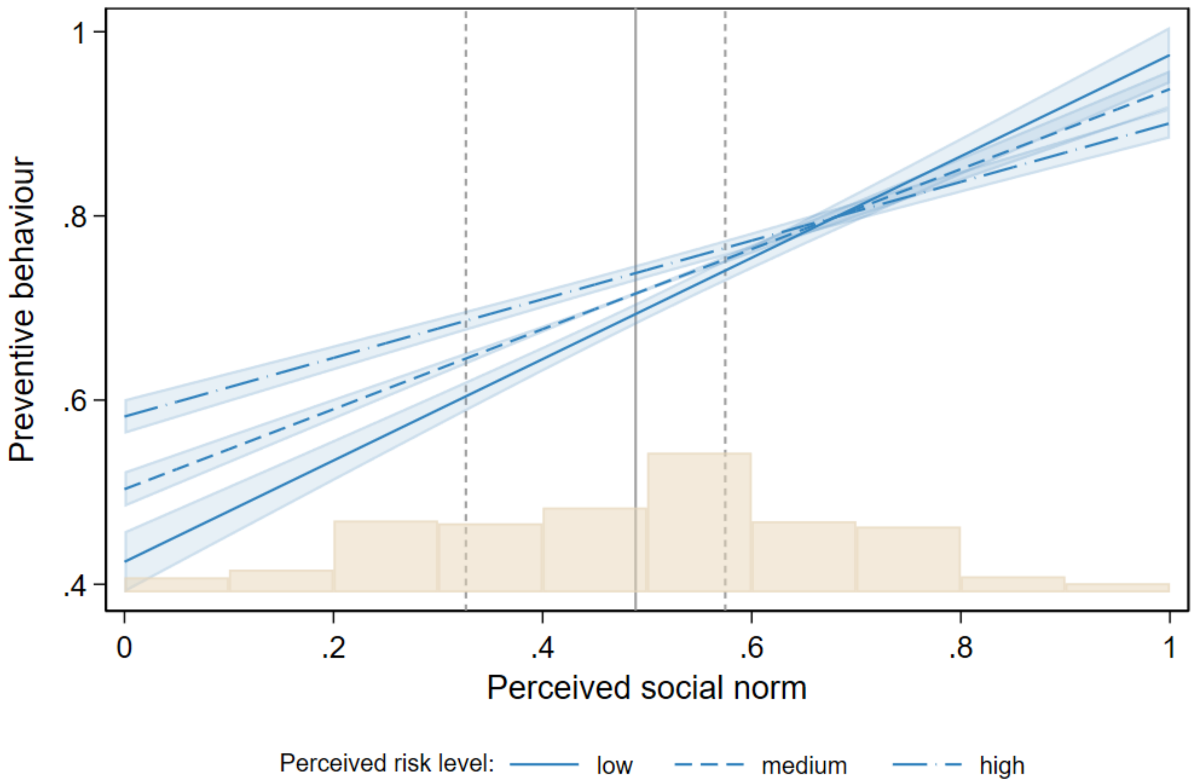

Fig 3: Linear prediction of preventive behaviour by perceived social norm conditional on the level of perceived health risks. Predictions based on estimates in model 3 in Table 1. Linear Fixed Effects model with wave as well as individual fixed effects. 95% confidence intervals (light blue areas) are calculated using two-way clustered standard errors for individuals and waves. The histogram represents the distribution of social norm perceptions in the sample. Dashed lines mark a +/- one within-individual SD from the mean.

As Fig 3 shows, the size of the social norm effect (indicated by the gradient of the lines) depends on the level of individually perceived health risks. While the effect of perceived health risks is comparatively small (.08 SD at the mean; z=4.31, p < .001; 95% CI [.04, .11] if an average individual perceived risk increases from “low” threat to “high” our preventive behaviour index increases by .04), the perceived level of health risk also moderates the size of the effect of perceived social norms. Focusing on empirically observed points that have a high probability of occurring in the distribution of perceived risk in our sample, we observe effect sizes of .43 SD (z=20.81, p < .001; 95% CI [.39, .47]) and .32 SD (z=21.53, p < .001; 95% CI [.29, .35]), respectively, for one standard deviation below and above the mean. Hence, the effect size of social norms decreases by .05 SD for a one SD increase in perceived health risks or, in relative terms, decreases by 25% when individually perceived health risks shift from moderately low to moderately high levels. This difference in the average marginal effects (AMEs) is highly significant according to a Wald test (-.11 SD, p < .001, 95% CI [-.13, -.08]), which provides strong evidence that smaller individual concerns about health risks imply a larger effect of social norms on preventive behaviour, supporting H4. Moreover, Fig 3 also indicates that at high levels of perceived social norms, higher risk perceptions do not substantially increase preventive behaviour.

Fig 4. 2FE linear regression linear prediction of preventive behaviour by trust in institutions conditional on the level of perceived health risks

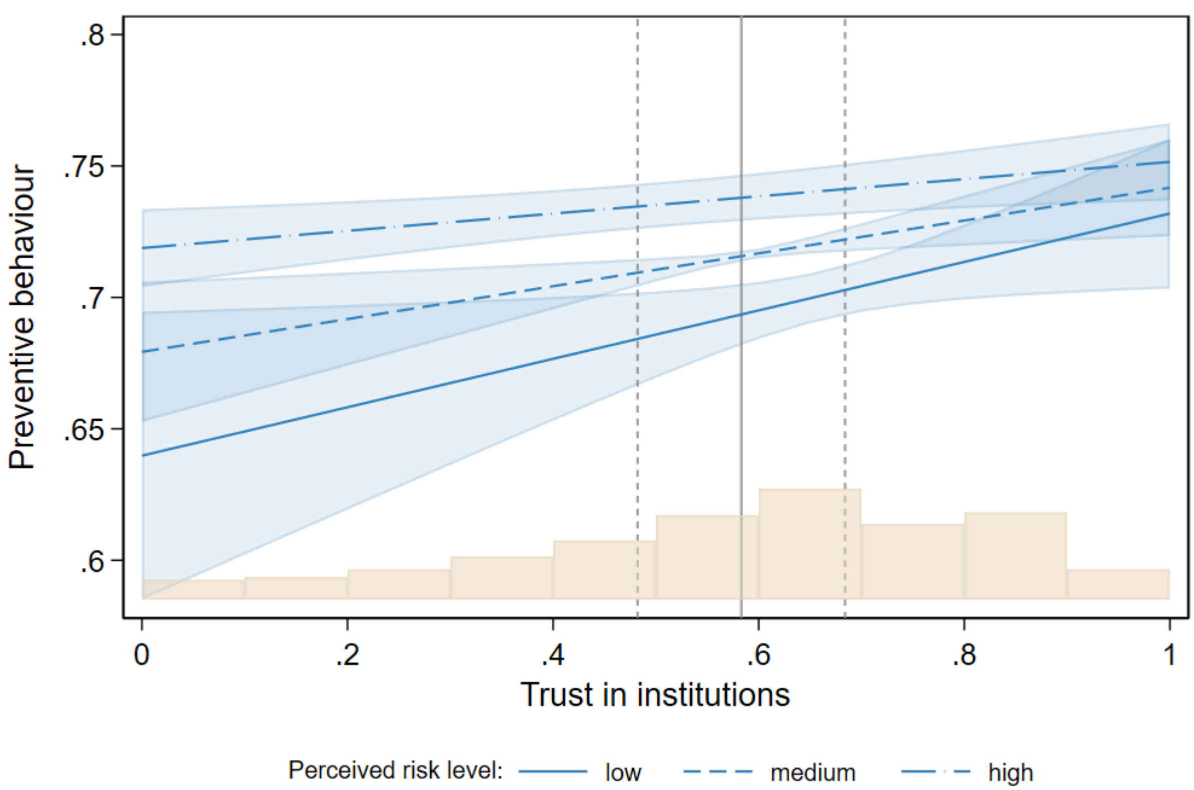

Fig 4: 2FE linear regression linear prediction of preventive behaviour by trust in institutions conditional on the level of perceived health risks. Predictions based on estimates in model 3 in Table 1. Linear Fixed Effects model with wave as well as individual fixed effects. 95% confidence intervals (light blue areas) are calculated using two-way clustered standard errors for individuals and waves. The histogram represents the distribution of social norm perceptions in the sample. Dashed lines mark +/- one within-individual SD from the mean.

Fig 4 shows that, similar to the results on social norms, a rise in the level of trust in institutions increases preventive behaviour. Holding other variables at their means, a one standard deviation increase from the mean in trust in institutions is associated with a .04 SD (z=2.95, p = .003; 95% CI [.01, .06]) increase in preventive behaviour. Thus, while statistically significant, the positive effect of trust on preventive behaviour at mean levels of perceived risks is comparatively small. If average individual trust in institutions increases from moderately low trust (3/10) to moderately high levels of trust (7/10), preventive behaviour increases only by .02. This results not only from the smaller size of the coefficients but also from fact that trust in institutions tends to be more stable within individuals than social norms and health risk perceptions (.10 compared to .13 in social norms and .12 in perceived risk). Focusing again on relevant points in the distribution of perceived health risks, i.e. one standard deviation below and above the mean, effect sizes are .05 SD (z=2.59, p = .010; 95% CI [.01, .09]) and .03 SD (z=3.05, p = .002; 95% CI [.01, .05]), respectively. Hence the size of the effect of trust in institutions on preventive behaviour decreases by .01 SD for a one SD increase in perceived risks. This difference in the AMEs, however, is not statistically significant according to a Wald test (-.02 SD, p = .137, 95% CI [-.05, .01]) (also refer to S1 Appendix B1 for marginal effects plots of the interaction using kernel estimators to account for potential non-linearities in this moderation). Thus, the evidence does not support H5 that smaller perceived health risks lead to a larger effect of trust in institutions on preventive behaviour.

Robustness checks

Besides health risks, social norms, and trust, previous studies have highlighted several other factors affecting preventive behaviour. Empirical results from the US indicate that health risk perceptions may be biased by the selective reception of media reports, as suggested by the theory of political reasoning [70]. These risk perceptions in turn affect preventive behaviour. Further, endorsement of preventive behaviour can depend on personality traits such as psychological entitlement [71] or agreeableness and conscientiousness [72]. As our study relies on within-individual variation, factors such as party affiliation and relatively stable long-term personality traits should not bias our estimates. However, we also tested whether accounting for party affiliation changes the estimates reported in Model 2 in Table 1. We found no effects on preventive behaviour and including party affiliation did not substantially change the coefficients of our main variables (see S1 Appendix A2).

Another factor frequently highlighted in the literature is self-efficacy: people are more likely to behave in accordance with measures if they assume effectiveness [73] and performability [74]. This has also been shown in the context of COVID-19 [56]. To account for the fact that different beliefs about the effectiveness of COVID-19 measures might confound our estimates, we control for individuals' perceived effectiveness of measures in general. These remain insignificant in all our analyses (see

S1 Appendix A2). However, as this captures only one aspect of the concept of self-efficacy, we cannot exclude the possibility that other dimensions of self-efficacy may affect preventive behaviour.

To check the robustness of our results against alternative specifications of preventive behaviour, we tested whether our main variables would explain unessential mobility during the pandemic (meeting friends, going outside because of boredom). Our results remain robust when using this variable (see S1 Appendix B6). In a similar approach, we also did a placebo check, testing whether our main variables of interest would fail to explain essential mobility (buying groceries or medicine, visiting a doctor). As expected, our main variables of interest failed statistical significance tests in this case (see S1 Appendix B6). This implies that our results capture the specific link connecting risks, trust, and social norms with preventive behaviours.

Different kinds of preventive behaviour might constitute different kinds of behavioural dilemmas. While avoiding unnecessary mobility always protects oneself and others, the health benefits and choice options of physical distancing and protective masks can be complex. To test whether the use of separate dimensions instead of an index of preventive behaviour would alter our results, we provide regression estimates using the separate dimensions for each of the variables underlying the index of preventive behaviour as dependent variables in the S1 Appendix (A3). These results indicate that there are no substantial differences in direction or size of the effects for our main independent variables compared to the index of preventive behaviour. This provides evidence that, although some characteristics differ, people tend to view different kinds of preventive behaviour in the same light. For instance, while studies suggested that mask wearing is more effective in protecting others than oneself [6,75], this was not common knowledge at the start of the pandemic. In addition, the Austrian government advertised the (later compulsory) FFP2 masks as a tool to protect others *as well as* oneself. Hence, people had reasons to believe that masks create health benefits for oneself and others.

The ACPP dataset consists of individual-level data facilitating a move beyond the aggregate analysis of behavioural change during the COVID-19 crisis [76,77]. It allows for tests of individual-level mechanisms, thus avoiding ecological fallacies. However, because we cannot directly observe behaviour in a survey, we have to rely on self-reported behaviour. While this represents a limitation of our study, our estimation approach limits the potential of biases in the results. Since we rely on within-individual variation to test the hypotheses, using self-reported data instead of data on actual behaviour only biases our estimates if changes in individual reported behaviour do not relate to changes in actual behaviour. Thus, utilizing variation within individuals over time should minimize the impact of social desirability bias. Moreover, recent empirical studies suggest that estimates of compliance with COVID-19 regulations do not suffer from social desirability tendencies [78,79]. To test whether our data reflects macro-level behavioural changes in Austria, we compare the propensity of staying at home, which is the dimension of our preventive behaviour measure that most closely measures actual mobility, with macro data of mobility patterns provided by Google [80]. We find that our estimates follow average patterns quite well (see S1 Appendix B5). Moreover, we validate these results with other sources that provide aggregated mobility estimates in Austria [81] and again find patterns of change over time similar to our survey estimates. This corroborates results from another study that uses micro data and finds that the reported times people spend outside seem to be externally valid when checked against mobile phone data [82].

Discussion

We used individual-level panel data from Austria spanning nearly the full duration of the COVID-19 pandemic thus far to analyse three factors promoting preventive behaviour: perceived health risks, social norms, and trust in institutions. We found that, on average, people with lower health risk perceptions, those who perceive less of a social norm of preventive behaviour among others, and those who have lower levels of trust in institutions responsible for dealing with the crisis, are less likely to adopt preventive behaviour. Moreover, we found that these effects are not independent from each other: a decline in the level of perceived health risks increases the relevance of social norms in facilitating preventive behaviour. We do not find robust evidence that perceived health risks have a similar effect on the impact of trust in institutions on preventive behaviour. Fixed-effects regressions focusing on variation within individuals suggest a small effect of perceived health risks (.08 within standard deviation increase in preventive behaviour after a one within-individual standard deviation increase in health risks), a moderately strong effect of social norms (.38) and a small effect of trust in institutions (.04) on preventive behaviour. Moreover, the effect of social norms decreases by 25% when risk perceptions increase from moderately low to moderately high levels (one within-individual standard deviation below and above the mean). These results are robust against alternative specifications of the link function and against alternative assumptions about the data structure (see Robustness Checks and Methods).

Our study applied a theoretical framework that highlights the mutually reinforcing nature of human behaviour [48], which is a crucial element of preventive behaviour in public health contexts. This approach recognizes that, in most cases, preventive behaviour mainly benefits others [20,83–85], while its costs are primarily borne by the individual. In line with the results of previous studies on norm-violating behaviour [86] and the theory of normative social behaviour [54], our results highlight the potential of social norms to overcome the public goods dilemma inherent in preventive behaviour: in a positive feedback loop, an uptake of preventive behaviour induces similar behaviour among others. This result relates to expectations of conditional cooperation [87,88] and research that highlights people's concern about their reputation [36].

Our finding that perceived health risks function as an important moderator of other factors facilitating preventive behaviour also raises implications for policymaking and may help to explain the varying results of previous research on health behaviour: the conditional effects of social norms may explain the inconsistent results regarding the benefits of health messages in facilitating preventive behaviour during the COVID-19 pandemic [89–93]. While interventions aimed at raising individual risk perceptions may boost preventive behaviour in the short term, they may also lower the impact of other measures aimed at fostering preventive behaviour in the long term. This is especially relevant as the effect of social norms exceeds the effect of risk perceptions: our results show that people who perceive high health risks but observe low compliance with preventive behaviour among others are still less likely to adhere to these norms themselves. Thus, lower degrees of perceived social norms can undermine the individual willingness to comply even when individuals are highly concerned about potential health risks.

Austria had fewer infections per capita in the first wave compared to other countries in the region, but dealt less well with the second rise of infections in late 2020 [94]. While our data is limited to this national context, our study has distinct advantages over some international comparative studies used in the literature. First, it does not rely on convenience samples, which are often used to get fast and easy access to respondents in a variety of countries. Second, the use of panel data over an extended period of time allows us to focus on variation within individuals and hence render constant characteristics that may confound the results irrelevant. Because of the panel structure, we are also able to test the effects of our main variables of interest at different stages of the pandemic, while controlling for changes in nationwide governmental regulations through wave fixed effects. Furthermore, the available literature so far has shown that risk perception correlates with health behaviour in a wide range of countries [95] and that national contexts do not substantially change the effect of individually perceived knowledge efficacy, interpersonal trust, and trust in institutions on preventive behaviour [56].

While focusing on within individual changes has several methodological advantages, this model also constitutes a limitation of the study. Besides the importance of variables that change during the pandemic, stable individual characteristics may influence health risk perceptions, social norm perceptions, and preventive behaviour. For instance, a rich literature in psychology suggests that personality traits (such as agreeableness) influence preventive behaviour and how strongly people regard social conventions to healthy behaviour [11,96,97]. After accounting for time-invariant differences between individuals this effect should be rather small in our case but still may be important to understand stable differences between individuals in their adherence to preventive behaviour. Thus, we would argue that more research is needed to test the influence of these stable characteristics on the context-dependent influence of social norms we highlight here.

In view of the importance of preventive behaviour for curbing infection rates and the high demands it places on individuals to change common practices of social interaction, it is crucial to provide evidence on the heterogeneous factors that promote preventive behaviour [10,26]. The results of this study indicate that high perceptions of social norms render low perceptions of health risks irrelevant, implying that social norms might function as an important lever for facilitating preventive behaviour.. Thus, at the societal level, institutions responsible for dealing with the crisis need to maintain and build support. Transparent communication about expected behaviour [98,99] and exemplary behaviour by officials [100] as well as information campaigns can foster citizens' uptake of the desired behaviour, as recent research on vaccine hesitancy suggest [101]. Furthermore, at the individual level, role models exhibiting compliant behaviour can support the development of social norms and facilitate compliance with pandemic response strategies [82,102].

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S1 Appendix

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S1 Appendix A. Summary statistics and full regression estimates

A1. Summary statistics

Variable	N	Mean	SD	Min	Max
Preventive behaviour	10210	0.72	0.24	0	1
Perceived health risks	10210	0.45	0.24	0	1
Perceived social norm	10210	0.49	0.2	0	1
Trust in institutions	10210	0.58	0.24	0	1
Wave	10210	4.61	2.24	1	8
Wave: 1 (%)	1025	10.04			
Wave: 2 (%)	1288	12.62			
Wave: 3 (%)	1277	12.51			
Wave: 4 (%)	1296	12.69			
Wave: 5 (%)	1379	13.51			
Wave: 6 (%)	1326	12.99			
Wave: 7 (%)	1336	13.09			
Wave: 8 (%)	1283	12.57			
Gender	10171	0.5	0.5	0	1
Gender: male (%)	5134	50.48			
Gender: female (%)	5037	49.52			
Age	10210	47.44	16.65	15	85
Education	10039	1.28	0.93	0	3
Education: primary (%)	1980	19.72			
Education: vocational (Lehre) (%)	4700	46.82			
Education: secondary (%)	1972	19.64			
Education: tertiary (%)	1387	13.82			
Household size	10115	1.5	1.24	0	5
Migration background	10045	0.18	0.39	0	1
Migration background: no (%)	8226	81.89			
Migration background: yes (%)	1819	18.11			
Employment	10210	2.1	1.74	0	4
Employment: (self) employed as usual (%)	3507	34.35			
Employment: short time work (%)	615	6.02			
Employment: home office (%)	1364	13.36			
Employment: unemployed (%)	792	7.76			
Employment: not in labour market (%)	3932	38.51			
Effectiveness of measures	10210	0.56	0.29	0	1
log(Regional 7day-incidence)	10020	3.23	1.82	0	6.19
Staying home	10210	0.62	0.34	0	1
Wearing mask	10210	0.7	0.34	0	1
Keeping distance	10210	0.83	0.24	0	1
2019 general election vote	8486	2.06	2.02	0	6
2019 general election vote: ÖVP (%)	2597	30.6			
2019 general election vote: SPÖ (%)	1561	18.4			
2019 general election vote: FPÖ (%)	1303	15.35			
2019 general election vote: GRÜNE (%)	1139	13.42			
2019 general election vote: NEOS (%)	551	6.49			
2019 general election vote: other (%)	294	3.46			
2019 general election vote: no vote (%)	1041	12.27			

Table AT1: Summary statistics of all variables used in the analyses.
Note: Refer to Appendix C1 for a detailed description of the indices of preventive behaviour, perceived health risks, perceived social norm, and trust in institutions. Refer to Appendix C2 for the full question wordings.

A2. Full regression estimates

Besides providing estimates for the control variables, Table AT2, also displays the regression estimates of both the fractional model (6) and the tobit model (7). In sum, estimates indicate that our results are robust against alternative specifications of the link function and against alternative assumptions about the data structure. In fact, these approaches would suggest that the main effects of all variables of interest (perceived health risks, perceived social norm, and trust in institutions) and their interactions are even larger compared to our statistically more conservative approach of using 2FE (model 4).

	(1) wave FE	(2) wave FE	(3) wave FE	(4) 2FE	(5) 2FE	(6) FM	(7) Tobit
Perceived health risks	0.269***	0.689***	0.670***	0.385***	0.382***	1.040***	0.696***
	(0.0244)	(0.0425)	(0.0488)	(0.0651)	(0.0637)	(0.0911)	(0.0550)
Perceived social norm	0.434***	0.763***	0.767***	0.608***	0.610***	1.704***	0.803***
	(0.0166)	(0.0437)	(0.0406)	(0.0364)	(0.0332)	(0.0774)	(0.0434)
Trust in institutions	0.121***	0.173**	0.178**	0.107^{+}	0.106^{+}	0.443***	0.196***
	0.269***	0.689***	0.670***	0.385***	0.382***	1.040***	0.696***
Perceived social norm X Perceived health risks		-0.721***	-0.709***	-0.464***	-0.468***	-0.920***	-0.640***
		(0.0769)	(0.0714)	(0.0535)	(0.0436)	(0.139)	(0.0761)
Trust in institutions X Perceived health risks		-0.147*	-0.155*	-0.119	-0.112	-0.300*	-0.174*
		(0.0565)	(0.0648)	(0.0800)	(0.0772)	(0.121)	(0.0693)
log(Regional 7day-incidence)					0.00339		
					(0.00254)		
Employment: short time work (ref.: employed)	-0.0175	-0.0164	-0.0110	0.00395	0.00323	-0.0182	-0.0132
	(0.0159)	(0.0147)	(0.0149)	(0.0104)	(0.00960)	(0.0236)	(0.0122)
Employment: home office	0.0269*	0.0250*	0.0222^{+}	0.0268**	0.0268**	0.0638**	0.0322**
	(0.00953)	(0.00879)	(0.00951)	(0.00691)	(0.00754)	(0.0211)	(0.0109)
Employment: unemployed	0.0129	0.0131	0.00725	0.0175*	0.0184*	0.0346	0.0230
	(0.0159)	(0.0161)	(0.0164)	(0.00709)	(0.00597)	(0.0291)	(0.0160)
Employment: not in labour market	0.0451***	0.0452**	0.0128	0.00658	0.000833	0.0438^{+}	0.0199*
	(0.00834)	(0.00838)	(0.00840)	(0.0143)	(0.0145)	(0.0231)	(0.00972)
Measures are effective	0.0476^{+}	0.0354	0.0259	-0.00166	-0.00128	0.0393	0.0408**
	(0.0223)	(0.0222)	(0.0176)	(0.00775)	(0.00862)	(0.0267)	(0.0157)
Gender: female			0.0508***			0.219***	0.0650***
			(0.00837)			(0.0223)	(0.00847)
Age			0.00206***			0.00724***	0.00235***
			(0.000349)			(0.000769)	(0.000294)
Education: vocational (Lehre) (ref.: primary)			-0.0102			-0.0401	-0.0145
			(0.0109)			(0.0319)	(0.0118)
Education: secondary			0.00594			-0.0105	0.00682
			(0.0122)			(0.0363)	(0.0138)
Education: tertiary			0.00516			-0.000184	0.00603
			(0.0158)			(0.0404)	(0.0156)
Household size			-0.000643			-0.00250	-0.00239
			(0.00357)			(0.00911)	(0.00360)
Migration background: yes			-0.0172			-0.0304	-0.0174
			(0.0106)			(0.0289)	(0.0112)
2019 general election vote: SPÖ (ref.: ÖVP)			-0.0118				
			(0.0115)				
2019 general election vote: FPÖ			-0.0192				
			(0.0129)				
2019 general election vote: Greens			0.0265^{+}				
			(0.0125)				
2019 general election vote: NEOS			-0.00605				
			(0.0146)				
2019 general election vote: other			0.0153				
			(0.0210)				
2019 general election vote: no vote			0.0301^{+}				
			(0.0138)				
Constant	0.265***	0.0981**	0.00103	0.316***	0.308***	-0.986***	-0.0261
	(0.0201)	(0.0206)	(0.0332)	(0.0400)	(0.0424)	(0.0755)	(0.0361)
Observations	10210	10210	8420	10210	10020	9976	9976

Table AT2: Full regression estimates: wave Fixed Effects (1, 2, 3), two-way Fixed Effects (4, 5), Fractional Model (6), and Tobit regression (7). Model (4) is the main model. Generally, models (1, 2, 4, 5) are equivalent to models (1, 2, 3, 4) in Table 1. Individual clustered standard errors in parenthesis ($^{+}$ p < .10; * p < .05; ** p < .01; *** p < .001).

A3. Single regressions: aspects of preventive behaviour (staying home, wearing masks, keeping distance)

The following table (AT3) provides separate wave fixed effects and two-way fixed effects regression estimates for each of the variables underlying the preventive behaviour index (*staying home*, *wearing mask*, and *keeping distance*). Each of these regressions on the single aspects of preventive behaviour includes sub-indices of the corresponding descriptive and injunctive norms and is estimated in the same way as the main regression models (Table 1, Models 2 and 3). Generally, the direct effects of the social norm variables and their interaction with perceived health risks remain quite robust in size and statistically significant. The interactions of trust in institutions and perceived health risks remain robust in size as well, however on a smaller level and thus are not always statistically significant.

	(1) wave FE *staying home*	(2) 2FE *staying home*	(3) wave FE *wearing mask*	(4) 2FE *wearing mask*	(5) wave FE *keeping distance*	(6) 2FE *keeping distance*
Perceived health risks	0.648***	0.348**	0.641***	0.363***	0.682***	0.401***
	(0.0407)	(0.0956)	(0.0437)	(0.0464)	(0.0629)	(0.0727)
Trust in institutions	0.215***	0.147^{+}	0.128*	0.129^{+}	0.198***	0.0776^{+}
	(0.0380)	(0.0751)	(0.0493)	(0.0589)	(0.0347)	(0.0345)
Trust in institutions X	-0.201*	-0.130	-0.121	-0.141	-0.191**	-0.148*
Perceived health risks	(0.0665)	(0.121)	(0.0799)	(0.0886)	(0.0543)	(0.0573)
Norms: staying home	0.700***	0.576***				
	(0.0323)	(0.0392)				
Norms: staying home X	-0.603***	-0.436**				
Perceived health risks	(0.0744)	(0.0838)				
Norms: wearing mask			0.959***	0.689***		
			(0.0405)	(0.0356)		
Norms: wearing mask X			-0.595***	-0.412***		
Perceived health risks			(0.0670)	(0.0533)		
Norms: keeping distance					0.613***	0.398***
					(0.0419)	(0.0291)
Norms: keeping distance X					-0.726***	-0.391***
Perceived health risks					(0.0726)	(0.0559)
Employment: short time	-0.00858	0.0203	-0.0245	-0.00647	-0.0209	-0.00161
work (Ref. Employed)	(0.0198)	(0.0131)	(0.0204)	(0.0150)	(0.0145)	(0.0125)
Employment: home office	0.0639**	0.0668***	-0.00180	-0.00706	0.0125	0.0218
	(0.0129)	(0.0110)	(0.0128)	(0.0109)	(0.00926)	(0.0131)
Employment: unemployed	0.0374^{+}	0.0128	0.000243	0.0166	-0.00518	0.0286*
	(0.0184)	(0.0117)	(0.0192)	(0.0134)	(0.0159)	(0.00966)
Employment: not in labour	0.0676***	0.0306	0.0297*	-0.00493	0.0322**	-0.00232
market	(0.0113)	(0.0182)	(0.0105)	(0.0175)	(0.00870)	(0.0159)
Perceived effectiveness of	0.0290	-0.0183	0.0396	0.0110	0.0363	0.0102
measures	(0.0254)	(0.0146)	(0.0212)	(0.0138)	(0.0264)	(0.00774)
Constant	0.0564*	0.268**	-0.0284	0.229***	0.269***	0.512***
	(0.0235)	(0.0544)	(0.0215)	(0.0409)	(0.0304)	(0.0413)
Observations	10210	10210	10210	10210	10210	10210

Table AT3: Results of different regression models (wave Fixed Effects and two-way Fixed Effects) focusing on the single behavioural variables underlying the preventive behaviour index: staying home (1, 2), wearing mask (3, 4), and keeping distance (5, 6). Each regression includes sub-indices of descriptive and injunctive norms (Norms: staying home; Norms: wearing mask; Norms: keeping distance) corresponding to each dependent variable. Reference category for employment status is standard employment. Standard errors in parenthesis ($^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$).

S1 Appendix B. Checks of model assumptions and robustness of the moderation

B1. Test linearity of moderation effects

We apply a binning estimator to check whether the multiplicative interactions of risk perceptions, on the one hand, and trust in institutions or social norms, on the other hand, are linear. The analyses were carried out by the STATA command *interflex* (see Hainmueller et al., 2019). As suggested by Hainmueller et al., we use three bins at a low, medium, and high level of the moderator (median values of tertiles of perceived health risks). As Fig BF1 shows, the binning estimator of all points of the interaction between perceived health risks and perceived social norms remain quite close to the prediction of a linear interaction. Contrary to that, the binning estimator of the interaction between perceived health risks and trust in institutions indicates possible non-linearities. Wald tests provide p-values of .33 (social norms) and .04 (trust in institutions), showing that the NULL-hypothesis (that the binning estimator is statistically equivalent to the linear interaction model) is rejected for the interaction of trust in institutions with risk perceptions.

To further investigate the functional form of the moderations, we calculate the interactions using a kernel estimator (Figs BF3 and BF4). Again, we find that the interaction between social norms and perceived health risks remains linear for the majority of the distribution of the moderator. Only for observations that feature very high and very low risk perceptions is the size of these moderations lower than a linear model would predict. BF4 showing the interaction between perceived risks and trust in institutions suggest a more non-linear relationship. Here we see that trust affects participants' average preventive behaviour positively only at medium levels of perceived health risks. However, in contrast to the predictions of a linear model, using a kernel estimator suggests that this effect of trust remains close to zero when perceived risk levels are higher or lower. In sum these results suggest that the interaction between social norms and risk perceptions is approximately linear, while we find more variation in the size of the interaction between trust in institutions and risk perceptions. Kernel estimators suggest that trust in institutions fail to facilitate preventive behaviour when levels of perceived health risks are low, while social norms remain important facilitators of preventive behaviour. However, further experimental research would be necessary to test this non-linear relationship because our sample has only a limited number of respondents with very low and high levels of trust in institutions.

Binning estimator

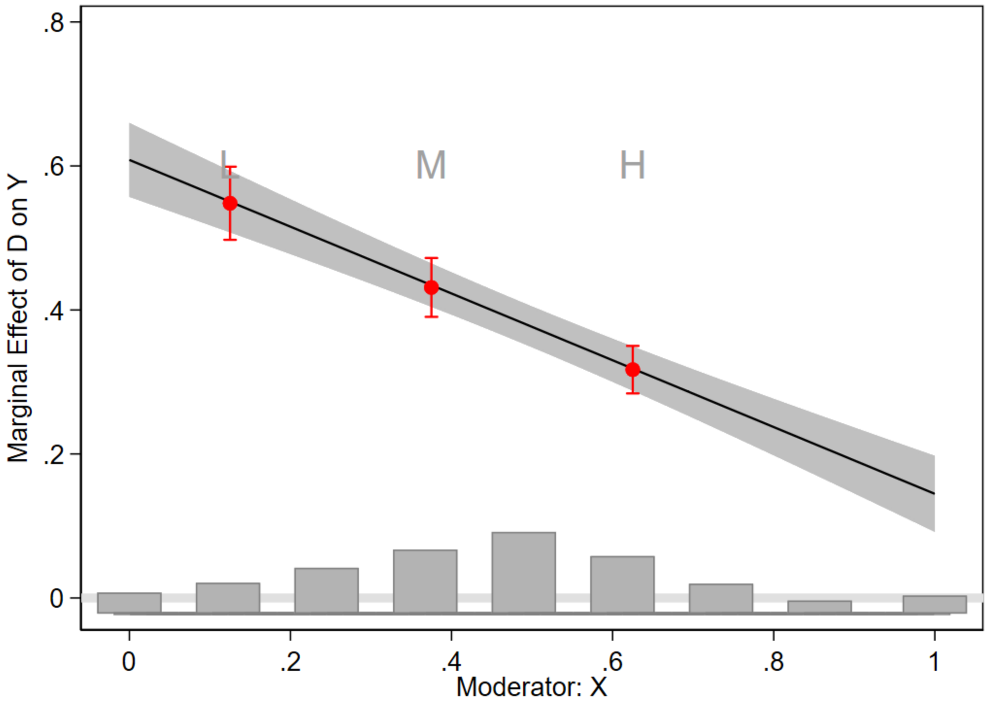

Fig BF1: Marginal effect of social norms (D) on preventive behaviour (Y), moderated by perceived health risks (X). Point estimates are based on a binning estimator for important values in the distribution (the median values of the tertiles of the moderator variable). The histogram shows the distribution of perceived health risks in our sample. The regression includes all variables of model 3 in Table 1 in the main text. Linear Fixed Effects model with wave as well as individual fixed effects. 95% confidence intervals (grey areas) are calculated using individually clustered standard errors.

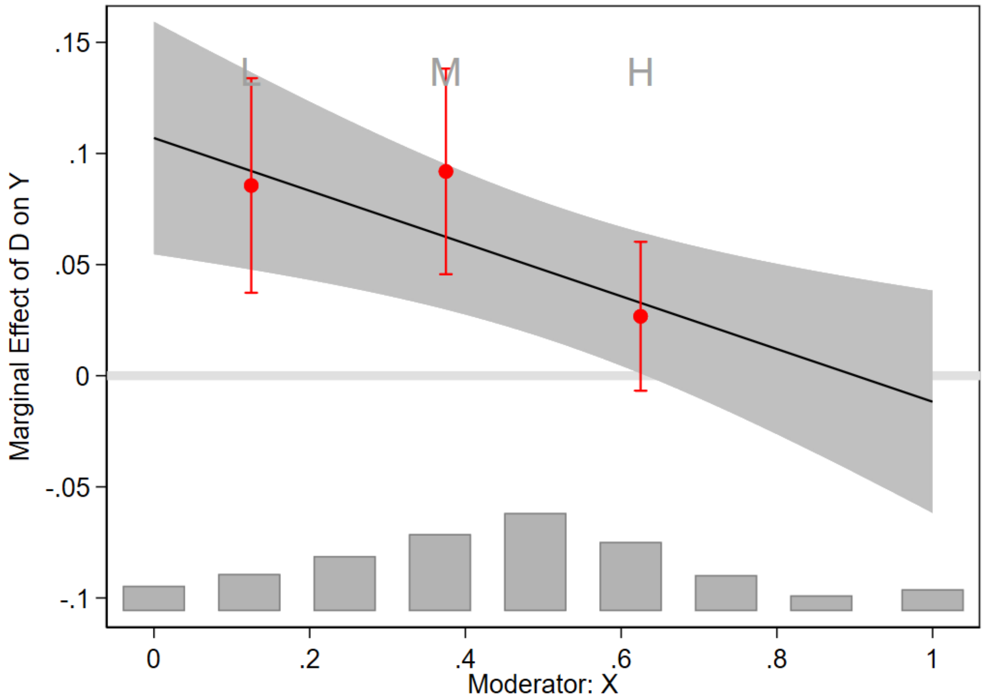

Fig BF2: Marginal effect of trust in institutions (D) on preventive behaviour (Y), moderated by perceived health risks (X). Point estimates are based on a binning estimator for important values in the distribution (the median values of the tertiles of the moderator variable). The histogram shows the distribution of perceived health risks in our sample. The regression includes all variables of model 3 in Table 1 in the main text. Linear Fixed Effects model with wave as well as individual fixed effects. 95% confidence intervals (grey areas) are calculated using individually clustered standard errors.

<u>Kernel estimator</u>

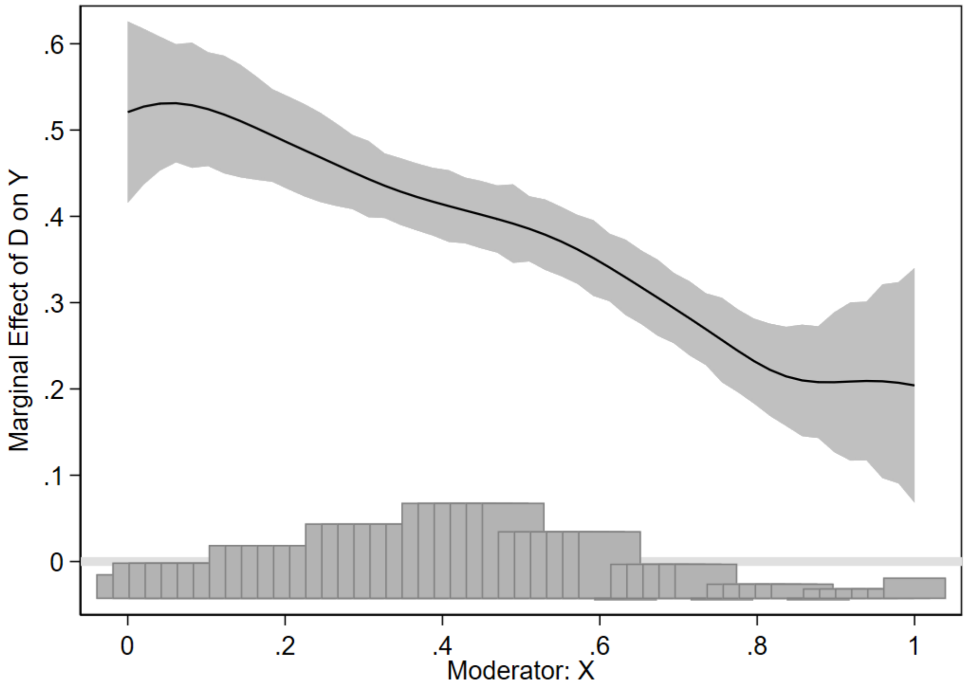

Fig BF3 Marginal effect of social norms on preventive behaviour, moderated by perceived health risks. Estimates show results of a kernel estimator. The histogram shows the distribution of perceived health risks in our sample. The regression includes all variables of model 3 in Table 1 in the main text. Linear Fixed Effects model with wave as well as individual fixed effects. 95% confidence intervals (grey areas) are calculated using bootstrapped standard errors.

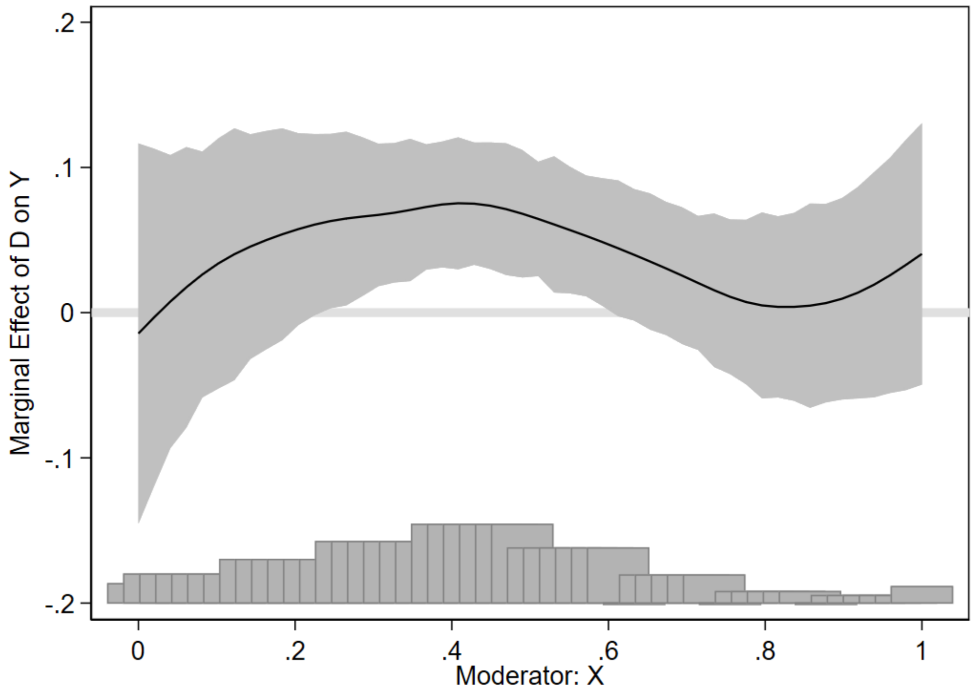

Fig BF4: Marginal effect of trust in institutions on preventive behaviour, moderated by perceived health risks. Estimates show results of a kernel estimator. The histogram shows the distribution of perceived health risks in our sample. The regression includes all variables of model 3 in Table 1 in the main text. Linear Fixed Effects model with wave as well as individual fixed effects. 95% confidence intervals (grey areas) are calculated using bootstrapped standard errors.

B2. Check robustness of moderation against sample restrictions

To show the robustness of our estimates regarding sample restrictions we re-run the full model excluding all observations of one wave at a time. This also tests whether our results depend on one outlying wave, which would suggest that the observed relationships are not stable over time but rather depend on specific circumstances. Figs BF5 and BF6 demonstrate that the size and direction of the moderation of social norms as well as trust in institutions by perceived health risks is not substantially affected by this exercise. Focusing again on the relative change in the size of the effects of social norms and trust in institutions from moderately low to moderately high levels of perceived risks (one within standard deviation above and below the mean), we find that increasing levels of risk reduce the effect of social norms by 23% – 27% (full sample: 25%) and reduce the effect of trust in institutions by 25% – 50% (full sample: 43%). The latter effect, however, is much smaller in size. In sum, excluding specific waves from our analysis changes little in the interaction between social norms and perceived health risks, suggesting that the findings are robust to sample restrictions and do not depend on single wave outliers.

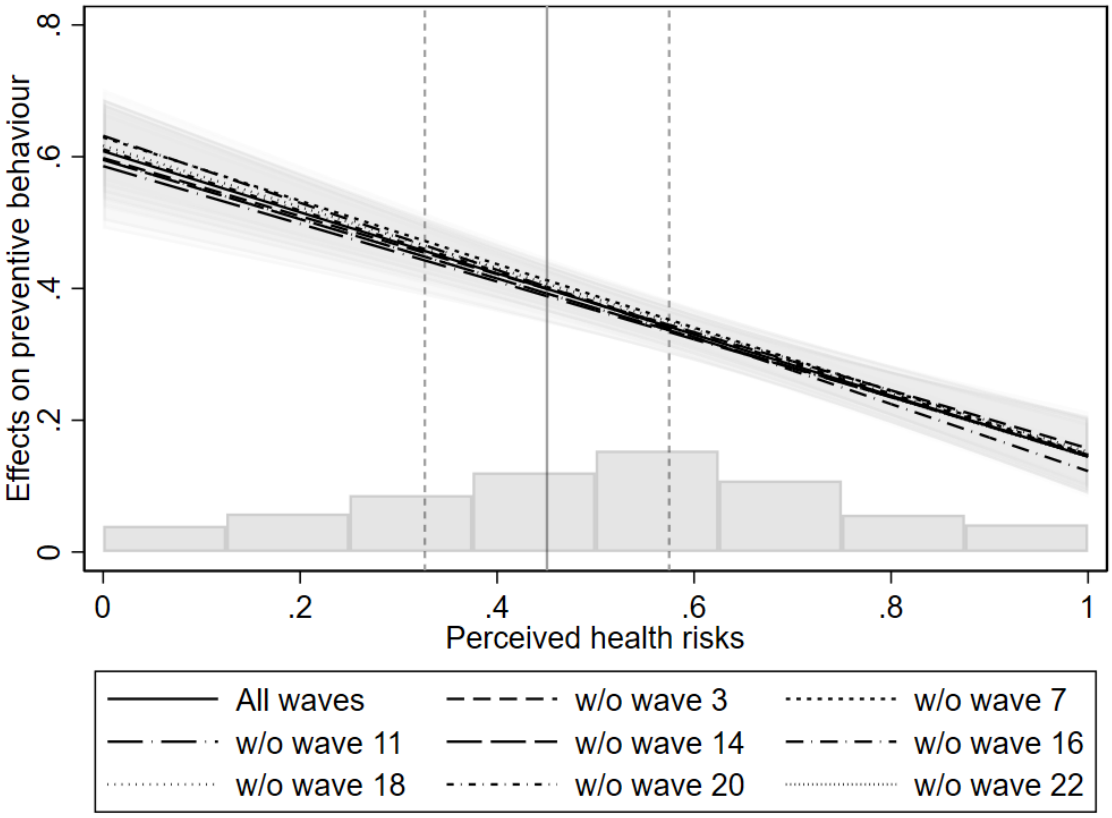

Fig BF5: Average marginal effects of social norms on preventive behaviour depending on level of risk by sample. Predictions based on estimates in model 3 in Table 1 in the main text (all waves) and similar models depending on sample restrictions as specified in the legend. Linear Fixed Effects model with wave as well as individual fixed effects. 95% confidence intervals (grey areas) are calculated using two-way clustered standard errors for individuals and waves. The histogram represents the distribution of social norm perceptions in the full sample. Dashed lines mark +/- one within-individual SD from the mean.

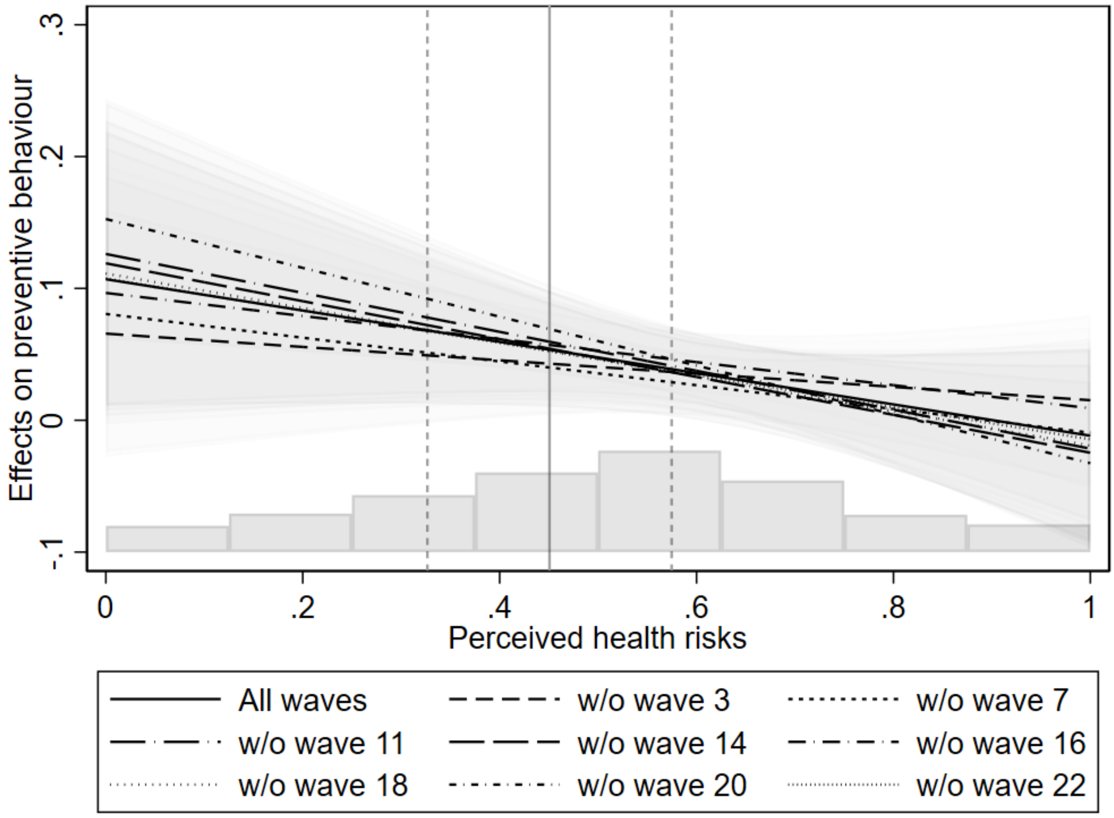

Fig BF6: Average marginal effects of trust in institutions on preventive behaviour depending on level of risk by sample. Predictions based on estimates in model 3 in Table 1 in the main text (all waves) and similar models depending on sample restrictions as specified in the legend. Linear Fixed Effects model with wave as well as individual fixed effects. 95% confidence intervals (grey areas) are calculated using two-way clustered standard errors for individuals and waves. The histogram represents the distribution of social norm perceptions in the full sample. Dashed lines mark +/- one within-individual SD from the mean.

B3. Check of parallel trends assumption

The following table (BT1) provides the information for assessing the plausibility of the parallel trends assumption, immanent in analyses using two way fixed effects estimators (Angrist and Pischke, 2008). First, we add a lead on the effect of the three independent variables of perceived health risks, social norms, and trust in institutions (model 2) and compare it to our main results (model 1). All three leads are insignificant and marginal in size, which is in line with the parallel trends assumption. Second, we include individual-specific time trends (model 3). As Table BT1 shows, the sizes of the social norms coefficients decrease slightly compared to our main model (1) but remain substantial in size. This again provides evidence that the parallel trends assumption is plausible for this effect. The estimates of the main effect of trust in institutions and its interaction with perceived health risks lose statistical significance in model 3. This suggests that it is unclear whether the parallel trends assumption holds in the case of trust in institutions, and again emphasizes the smaller effect size of trust compared to social norms.

	(1) 2FE	(2) 2FE check 1	(3) 2FE check 2
Perceived health risks	0.385^{***}	0.360^{***}	0.285^{***}
	(0.0651)	(0.0395)	(0.0549)
Perceived social norm	0.608^{***}	0.590^{***}	0.563^{***}
	(0.0364)	(0.0304)	(0.0399)
Trust in institutions	0.107^{+}	0.102^{**}	0.0573
	(0.0509)	(0.0320)	(0.0451)
Perceived social norm X Perceived health risks	-0.464^{***}	-0.431^{***}	-0.377^{***}
	(0.0535)	(0.0532)	(0.0726)
Trust in institutions X Perceived health risks	-0.119	-0.106^{*}	-0.0457
	(0.0800)	(0.0498)	(0.0718)
Lead: Perceived health risks		0.00497	0.00249
		(0.0150)	(0.0212)
Lead: Perceived social norm		-0.000500	-0.00959
		(0.0146)	(0.0218)
Lead: Trust in institutions		-0.00439	-0.000612
		(0.0189)	(0.0299)
Controls	Yes	Yes	Yes
Wave X id	No	No	Yes
Observations	10210	6679	6679

Table BT1: Parallel trends assumption checks. Model (1) represents our main model similar to Model 3 Table 1 in the main manuscript, model (2) includes leads of our three independent variables, and model (3) additionally includes individual-specific time trends. Controls include dummies for Employment status and a variable indicating perceived effectiveness of governmental measures (see Methods). Standard errors clustered by id in parenthesis ($^{+}$ p < .10; * p < .05; ** p < .01; *** p < .001).

B4. Balance checks of data

The tests were conducted in STATA by the *ietoolkit* (https://blogs.worldbank.org/impactevaluations/ie-analytics-introducing-ietoolkit).
See the STATA code provided online for further details in Appendix D2.

Variable	N/[Clusters]	(1) *included* Mean/[SE]	N/[Clusters]	(2) *excluded* Mean/[SE]	t-test Difference (1)-(2)
Preventive behaviour	9811	0.715	2124	0.725	-0.010
	[1914]	[0.005]	[1173]	[0.008]	
Trust in institutions	9811	0.586	1695	0.493	0.093***
	[1914]	[0.005]	[931]	[0.009]	
Perceived social norms	9811	0.488	1766	0.509	-0.021*
	[1914]	[0.003]	[1043]	[0.006]	
Perceived health risks	9811	0.450	2480	0.442	0.008**
	[1914]	[0.005]	[1246]	[0.007]	
Gender	9771	0.495	2590	0.549	-0.054***
	[1906]	[0.012]	[1260]	[0.017]	
Age	9811	47.827	2600	39.820	8.007***
	[1914]	[0.402]	[1264]	[0.587]	
Education	9655	1.272	2499	1.185	0.087**
	[1877]	[0.023]	[1225]	[0.033]	
Household size	9727	1.488	2568	1.704	-0.216***
	[1891]	[0.030]	[1248]	[0.047]	
Employment: (self) employed as usual	9663	0.182	2483	0.209	-0.027*
	[1877]	[0.010]	[1219]	[0.015]	
Employment: short time work	9811	0.341	2475	0.337	0.004
	[1914]	[0.010]	[1237]	[0.015]	
Employment: home office	9811	0.061	2475	0.059	0.002
	[1914]	[0.004]	[1237]	[0.007]	
Employment: unemployed	9811	0.134	2475	0.109	0.025***
	[1914]	[0.007]	[1237]	[0.009]	
Employment: not in labour market	9811	0.078	2475	0.099	-0.021**
	[1914]	[0.005]	[1237]	[0.009]	
Migration background	9811	0.387	2475	0.396	-0.010
	[1914]	[0.012]	[1237]	[0.017]	
Perceived effectiveness of measures	9811	0.566	2201	0.557	0.009**
	[1914]	[0.005]	[1184]	[0.007]	

Table BT2 Balance checks between retained and dropped observations of the dependent, independent, and control variables. The value displayed for t-tests are the differences in the means across the groups. Standard errors are clustered at participant level. Fixed effects using survey waves are included in all estimated t-tests. Number of clusters and standard errors in parenthesis (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

B5. Comparison of survey and mobile data (external validity)

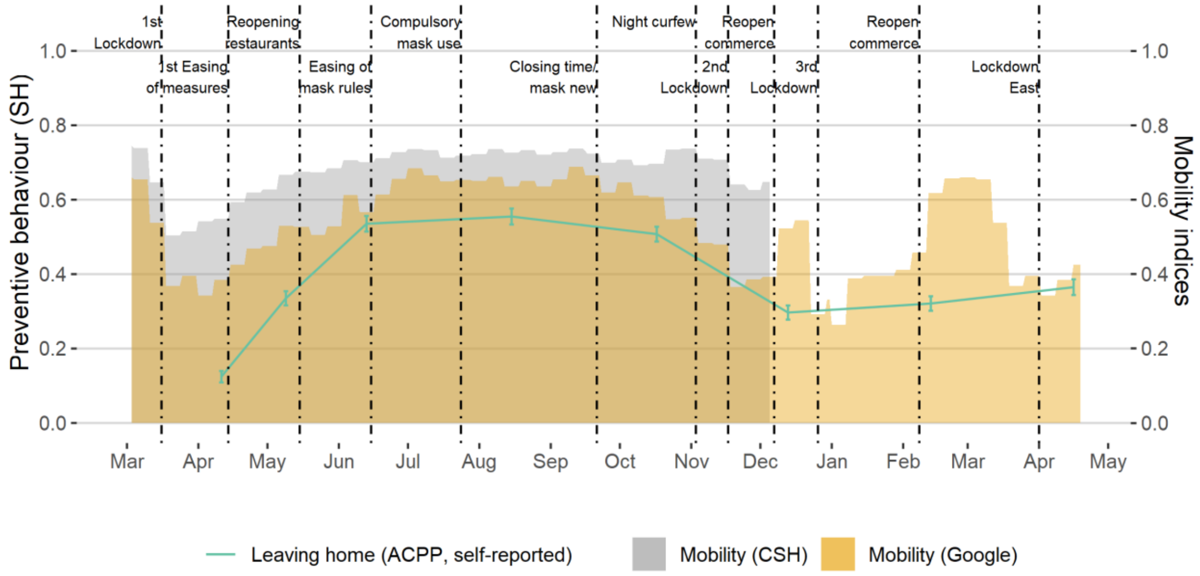

Fig BF7: Evolution of average self-reported propensity to leave one's home (disagreement to the statement "stay at home except for necessities" measured by a 5-level Likert scale ranging from "almost never" to "almost always"), the Google mobility index, and mobility data from CSH (Complexity Science Hub Vienna) over the course of the pandemic. Note: "Staying at home" is one of three dimensions of the preventive behaviour index used in the main analyses (see Methods and Appendix C1). Google COVID-19 Community Mobility Reports are publicly available at (Google, 2020). Our google mobility measure is a summarised index of movement pattern changes in retail and recreation, grocery and pharmacy, transit stations, workplaces, and residential areas (reversed) per week. The numbers reflect relative changes compared to the baseline measure: the average movement in the first week of the Google dataset (week 6 of 2020). The CSH mobility averages are an updated version of Fig 4 Panel A in Heiler et al. (2020).[1] The indices indicate the share of mobile phone devices with a ROG (radius of gyration) between 0 and 500 meters in Austria per week. Thus, the CSH mobility measure approximates the share of people who did not leave their neighbourhood in Austria. Remaining dissimilarities between Google GPS data and ACPP survey data in December 2020 may result from differences in the measurement strategies: while the Google GPS data captures the mobility at a certain date, our survey measures asks respondents to report frequencies of leaving the house in the last week. Thus, the mobility captured by the survey data should lag behind. This might explain the lower mobility reported in the survey in December and February shortly after commerce reopened.

[1] We thank Heiler et al. for providing the data. For more details see their paper.

B6. Alternative operationalization of preventive behaviour and placebo check

To check whether our results do or do not depend on the similarity of measurement instruments of perceived social norms and preventive behaviour (refer to question wording in Appendix C2) and their close proximity in the questionnaire (which could lead to anchoring bias), we use an alternative variable to operationalize preventive behaviour. This variable measures the amount of nonessential mobility and consists of an additive index of respondents' self-reported frequency of going out (i) to meet friends and (ii) because they were bored. Both behaviours were strongly discouraged by the government or, in the case of meeting friends, even banned for an extended period of time during the pandemic (with minor exceptions). We invert the variable to get a measure indicating how strongly people avoid nonessential mobility. Table BT3 shows estimates from a 2FE regression with similar specifications compared to our main model (Table 1 in the main text, model 4). The coefficients suggest that our conclusion also holds when using a different variable to indicate preventive behaviour as perceived health risk, social norms, and trust in institutions have positive effects on preventive behaviour, and the effects of perceived social norms and trust in institutions decrease when levels of perceived health risks increase.

In a second step, we constructed a variable indicating whether people avoided essential mobility and again tested whether our main variables of interest would affect this behaviour. This approach enables us to check if our variables of interest also affect behaviours that are not banned or discouraged. Hence, this regression essentially provides a placebo check for our results, and we do not expect to find any sizeable effects. The variable indicating whether people avoided essential mobility consists of an additive index of the inverted answers to questions about how often respondents went out (i) to buy groceries or (ii) to buy medicine or to visit a doctor. Model 2 shows the estimates of this regression. In line with our expectations, all main effects are small and fail to reach statistically significant levels. The same is the case with the interaction effects. Although the interaction between social norms and health risks reaches weak levels of statistical significance (p<.1), the effect points in the opposite direction than its equivalent in our main model. Thus, as expected, the placebo check indicates that the effects we describe are limited to discouraged or banned behaviours during the pandemic.

	(1) 2FE Avoiding unessential mobility	(2) 2FE Avoiding essential mobility
Perceived health risks	0.221***	-0.0107
	(0.0361)	(0.0323)
Perceived social norm	0.115**	0.000436
	(0.0316)	(0.0193)
Trust in institutions	0.0744*	-0.00466
	(0.0288)	(0.0269)
Perceived social norm X	-0.138*	0.0680+
Perceived health risks	(0.0518)	(0.0343)
Trust in institutions X	-0.0923+	-0.00346
Perceived health risks	(0.0479)	(0.0420)
Employment: short time work	-0.0113	0.00311
	(0.00971)	(0.00830)
Employment: home office	-0.00307	0.00480
	(0.00692)	(0.00621)
Employment: unemployed	-0.0355*	0.00473
	(0.0124)	(0.0113)
Employment: not in labour	-0.0148	-0.000192
market	(0.0134)	(0.00986)
Measures are effective	0.00585	0.0104
	(0.0102)	(0.00648)
Constant	0.626***	0.731***
	(0.0237)	(0.0158)
Observations	10021	10076

Table BT3: Full regression estimates: OLS with two-way Fixed Effects. Individual clustered standard errors in parenthesis (+ p < .10; * p < .05; ** p < .01; *** p < .001).

B7. Testing the influence of home-office

We decided to include home-office here because we focused on the mostly "involuntary" aspect of home-office being, in part, a decision made by the employer. However, in the sense that a lot of employees could in some ways decide on the frequency of being in home office, we should not control for it. To check whether this biases our estimates we calculate the results of regression models excluding the home office dummy. Comparing the coefficient estimates reported in Table BT4 to those reported in Table 1 in the main manuscript suggests that excluding this dummy did not substantially change any of the main effects we are interested in.

	(1) Preventive behaviour	(2) Preventive behaviour	(3) Preventive behaviour	(4) Preventive behaviour
Perceived health risks	0.269^{***}	0.696^{***}	0.385^{***}	0.383^{***}
	(0.0245)	(0.0416)	(0.0653)	(0.0637)
Perceived social norm	0.440^{***}	0.770^{***}	0.610^{***}	0.612^{***}
	(0.0170)	(0.0419)	(0.0360)	(0.0329)
Trust in institutions	0.146^{***}	0.196^{***}	0.107^{+}	0.106^{+}
	(0.0197)	(0.0352)	(0.0518)	(0.0493)
Perceived social norm X Perceived health risks		-0.727^{***}	-0.466^{***}	-0.470^{***}
		(0.0761)	(0.0535)	(0.0441)
Trust in institutions X Perceived health risks		-0.157^{*}	-0.117	-0.110
		(0.0558)	(0.0796)	(0.0766)
log(Regional 7day-incidence)				0.00348
				(0.00252)
Controls w/o Home office	Yes	Yes	Yes	Yes
Wave FE	Yes	Yes	Yes	Yes
Individual FE	No	No	Yes	Yes
Observations	10210	10210	10210	10020
Individuals	2030	2030	2030	1983

Table BT4: Regression estimates: OLS with Fixed Effects. Individual clustered standard errors in parenthesis (+ p < .10; * p < .05; ** p < .01; *** p < .001).

B8. Assessing multicollinearity between perceived social norms and perceived health risks and testing for potential mediating effects

To get a first impression about the potential size of multicollinearity due to social norms and risk perceptions we calculated the Pearson correlation coefficient within each wave. These coefficients indicate that the correlation varies between .14 and .25. This correlation is also visible if we regress social norms on risk perceptions. With rising levels of social norms risk levels rise, on average, by factor of .26 (Table BT5, model 1). However, we would argue that this relationship is mainly driven by time-invariant confounders. If we account for this issue by including individual fixed effects the coefficient decreases to .07 (Table BT5, model 2). This correlation is still statistically significant but substantially smaller. Thus, our strategy of using 2-FE substantially reduces the potential for biases due to multicollinearity.

In addition to that, we test whether the exclusion of perceived risks in our main models would substantially decrease the effect of social norms on preventive behaviour, which would be the expected outcome if social norms negatively affect perceived health risks. This is not the case as (Table BT5, model 3-6) shows. Neither the comparison between models 3 and 4 which only include wave FE nor the comparison between models 5 and 6 indicate that the inclusion of perceived health risks leads to an overestimation of the effect of perceived social norms on preventive behaviour. As expected the coefficients change even less in the 2-FE model due to the reduced size of correlation between perceived social norms and perceived health risks.

	(1) Perceived health risks	(2) Perceived health risks	(3) Preventive behaviour	(4) Preventive behaviour	(5) Preventive behaviour	(6) Preventive behaviour
Perceived social norm	0.263***	0.0749**	0.485***	0.434***	0.406***	0.400***
	(0.0242)	(0.0165)	(0.0200)	(0.0166)	(0.0221)	(0.0211)
Trust in institutions			0.177***	0.121***	0.0590*	0.0543*
			(0.0209)	(0.0173)	(0.0203)	(0.0198)
Employment: short time work			-0.00654	-0.0175	0.00578	0.00415
			(0.0153)	(0.0159)	(0.0112)	(0.0107)
Employment: home office			0.0293*	0.0269*	0.0286**	0.0276**
			(0.0106)	(0.00953)	(0.00714)	(0.00704)
Employment: unemployed			0.0185	0.0129	0.0190*	0.0201*
			(0.0151)	(0.0159)	(0.00692)	(0.00705)
Employment: not in labour market			0.0525***	0.0451***	0.00651	0.00455
			(0.00887)	(0.00834)	(0.0149)	(0.0143)
Measures are effective			0.0425+	0.0476+	-0.00301	-0.000399
			(0.0223)	(0.0223)	(0.00799)	(0.00799)
Perceived health risks				0.269***		0.0867**
				(0.0244)		(0.0169)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	No	Yes	No	No	Yes	Yes
Observations	10210	10210	10210	10210	10210	10210
Individuals	2030	2030	2030	2030	2030	2030

Table BT5: Regression estimates: OLS with Fixed Effects. Individual clustered standard errors in parenthesis ($^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$).

S1 Appendix C. Variables, indices, and question wordings

C1. Variables and indices

To operationalize the core variables, we use additive indices. For better comparison, these indices have been normalized so that each ranges from 0 – 1. We also studied principal components analyses (PCAs) for every set of variables underlying the indices, and calculated correlation coefficients between the first components and the additive indices to check validity. The results are discussed in the following.

Preventive behaviour (DV)

A PCA shows that one component is sufficient to condense the three underlying variables *staying at home except for necessities*, *keeping distance of at least 1 meter*, and *wearing masks whenever distance cannot be maintained* (see Fig CF1). The first component loads all three variables rather equally (see Table CT1), and the correlation coefficient with the additive index is 0.92.

	Comp1	Comp2	Comp3
Wearing mask	0.574	-0.670	0.472
Staying home	0.570	0.740	0.357
Keeping distance	0.588	-0.064	-0.806

Table CT1: Principal components of the preventive behaviour index. The first component is considered sufficient, as the scree plot of eigenvalues in Fig CF1 shows.

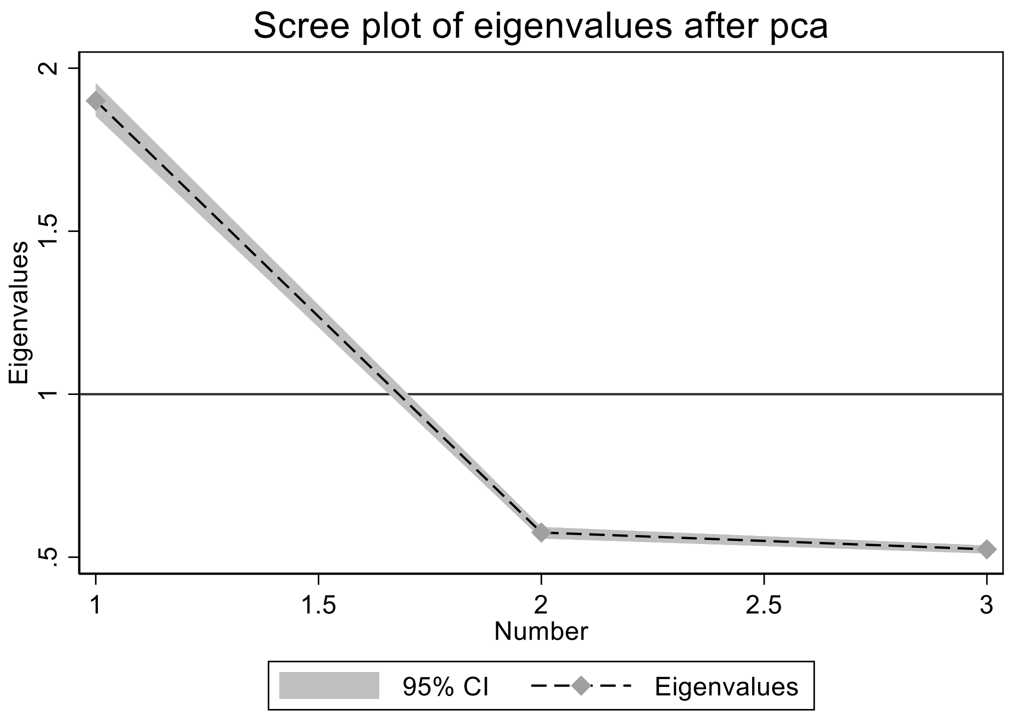

Fig CF1: Scree plot of eigenvalues after principal component analysis for the preventive behaviour index.

Trust in institutions (IV)

According to the PCA, one component is sufficient for aggregating the four variables *trust in the government*, *trust in the health care system*, *trust in the parliament*, and *trust in the police* (see Fig CF2). The first component loads rather equally on all underlying variables (see Table CT2) and the correlation coefficient with the additive index is 0.92. As a side remark, the items on trust in public institutions have not been asked in wave three. To provide a continuous picture, we imputed the values for this wave as the means of the waves two and four.

	Comp1	Comp2	Comp3	Comp4
Trust in the government	0.523	-0.418	0.179	-0.721
Trust in the health care system	0.488	0.322	-0.811	-0.034
Trust in the parliament	0.516	-0.504	0.082	0.687
Trust in the police	0.471	0.684	0.551	0.082

Table CT2: Principal components of the trust in institutions index. The first component is considered sufficient, as the scree plot of eigenvalues in Fig CF2 shows.

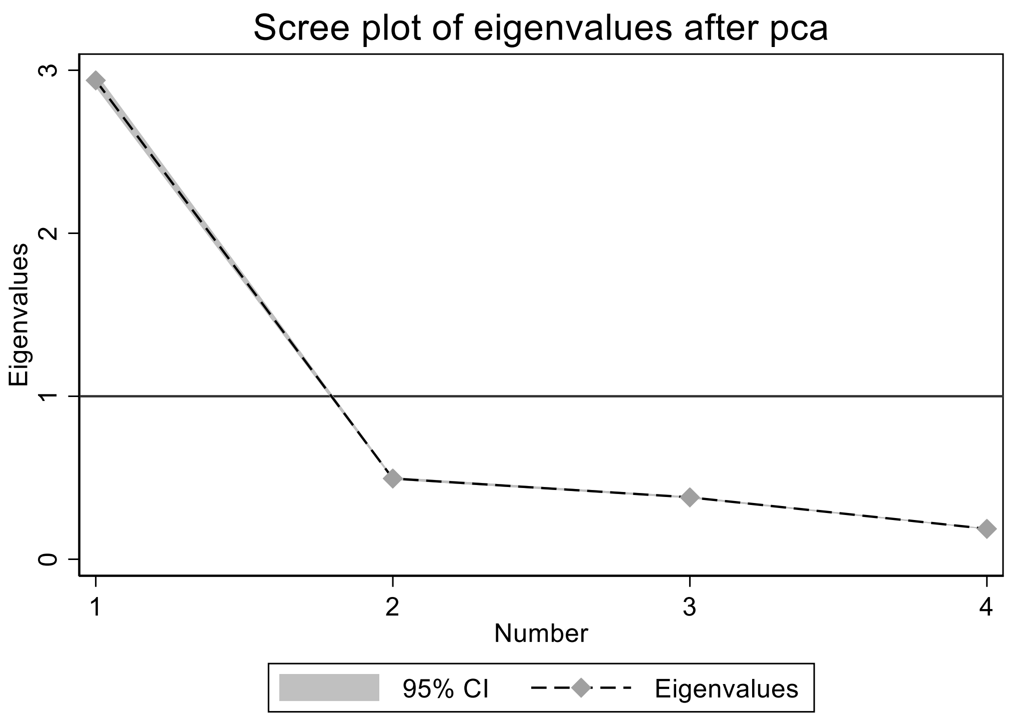

Fig CF2: Scree plot of eigenvalues after principal component analysis for the trust in institutions index.

Social norms (IV)

As in the above cases, a PCA shows that one component is sufficient for combining the underlying variables of descriptive and injunctive norms (see Fig CF3). The single norm items cover the same aspects of preventive behaviour as in the dependent variable: *staying at home except for necessities*, *keeping distance of at least 1 meter*, and *wearing a mask whenever distance cannot be maintained*. The first component once again loads all underlying variables fairly equally (see Table CT3), and the correlation coefficient with the additive index is 0.75.

	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6
Descriptive norm: staying home	0.421	-0.531	0.075	0.292	-0.276	-0.611
Descriptive norm: wearing mask	0.383	0.464	0.476	0.442	0.459	-0.077
Descriptive norm: keeping distance	0.415	0.104	-0.537	0.475	-0.271	0.479
Injunctive norm: staying home	0.406	-0.570	0.208	-0.281	0.377	0.496
Injunctive norm: wearing mask	0.418	0.337	0.359	-0.464	-0.600	0.088
Injunctive norm: keeping distance	0.406	0.231	-0.555	-0.447	0.371	-0.370

Table CT3: Principal components of the social norms index. The first component is considered sufficient, as the scree plot of eigenvalues in Fig CF3 shows.

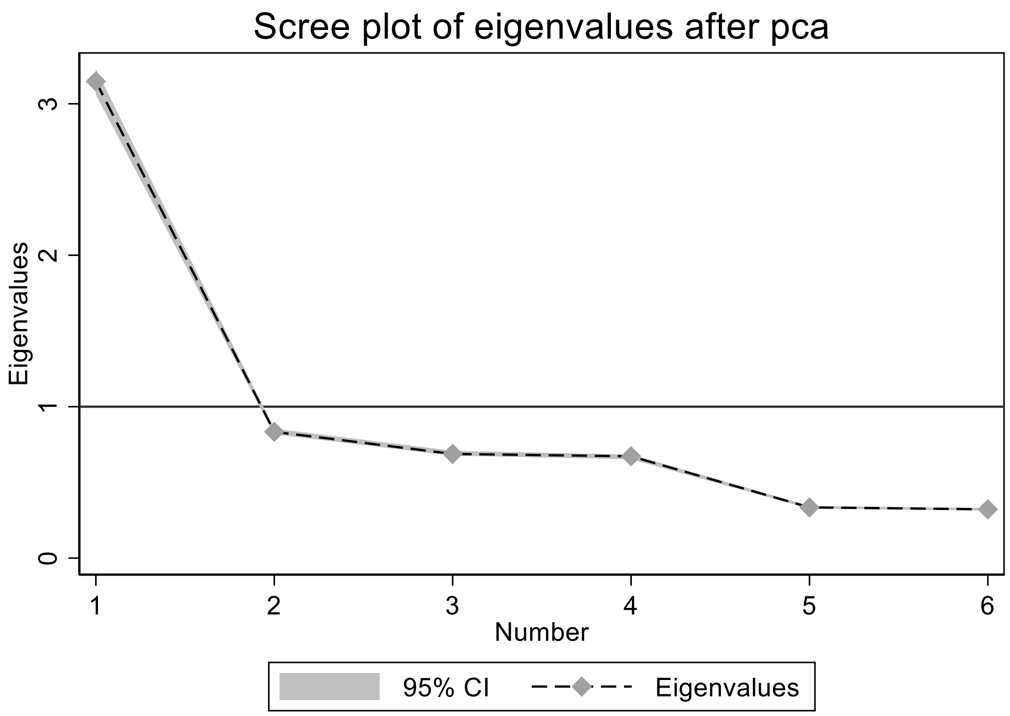

Fig CF3: Scree plot of eigenvalues after principal component analysis for the social norms index.

Health risks (IV)

According to the PCA, one component is sufficient for representing the two underlying variables *perceived personal health risk* and *perceived public health risk* (see Fig CF4). The first component loads both variables equally (see Table CT4). The correlation coefficient with the additive index is 0.91.

	Comp1	Comp2
Perceived health risk: for the public	0.707	0.707
Perceived health risk: for oneself	0.707	-0.707

Table CT4: Principal components of the perceived health risks index. The first component is considered sufficient, as the scree plot of eigenvalues in Fig CF4 shows.

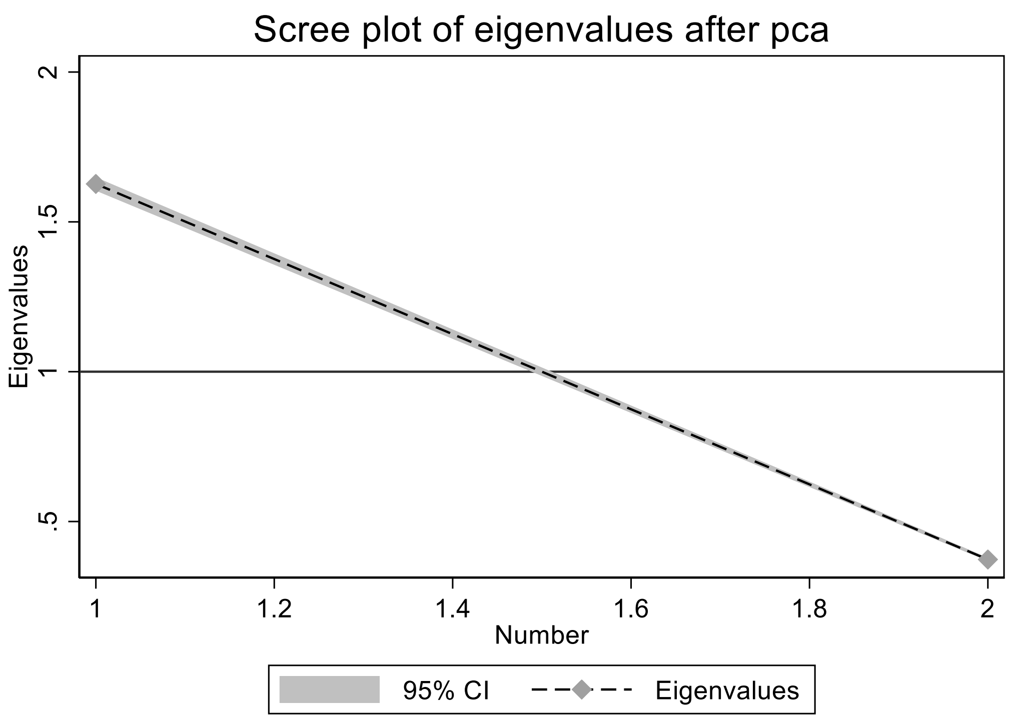

Fig CF4: Scree plot of eigenvalues after principal component analysis for the perceived health risks index.

Controls

Next to the dependent and independent variables described above, we use individuals' perceived effectiveness of governmental measures as a control variable. Furthermore, we control for the sociodemographic characteristics of gender, age, education, household size, migration background, and employment status. Employment status is also included in the FE-regressions (see Table 1 in the main text and Appendix A2 and A3) and contains a dummy for flexible work arrangements (home office), which has been argued to affect possibilities for social distancing (Papageorge et al., 2020). We recoded all variables in a way that aligns the direction and range of the scales (normalization), thus easing comparability. Hence, every variable ranges from 0 to 1, whereby 0 indicates the lowest and 1 the highest value of the corresponding concept (i.e. frequency, trust, agreement to statements, estimations of opinions and behaviour). The exact wording of all questions and the corresponding answer options in German as well as their translation into English can be found in Appendix C2. We provide basic descriptive statistics for all variables used in the analyses in Appendix A1.

C2. Questions and answer options

Question wordings for all variables in the ACPP, in English and the German original, can also be found online (Kittel et al. 2020b).

DV: index preventive behaviour

In the following, think of **your personal behaviour** in the last week. Please specify **how often** you have **engaged in the following behaviour**: (randomized answer items)

a. You stay at home, except for necessary trips.
b. In public, you keep a minimum distance of 1m from people who do not live in your household.
c. In public, you always wear protective masks.

Answer options:
1 = Almost always
2 = Most of the time
3 = Sometimes
4 = Rarely
5 = Almost never
don’t know [88]
no answer [99]

Denken Sie im Folgenden an **Ihr persönliches Verhalten** in der letzten Woche. Bitte geben Sie an, **wie oft** Sie sich **wie folgt verhalten haben**: (randomisierte Antwort-Items)

a. Sie bleiben zu Hause, außer für Notwendigkeiten.
b. Sie halten im öffentlichen Raum immer mindestens 1m Abstand von Menschen, die nicht mit Ihnen im Haushalt leben.
c. Sie tragen immer Schutzmasken, wenn Sie sich im öffentlichen Raum bewegen.

Matrix-Labels:
1 = Nahezu immer
2 = Meistens
3 = Manchmal
4 = Selten
5 = Nahezu nie
weiß nicht [88]
keine Angabe [99]

IV: index social norms

Injunctive norms

In the following, think of the **opinions of other people in Austria**. Please specify **how many** Austrians **hold the following opinions**. There is no right or wrong answer here, it is about your personal estimation. (randomized answer items)

a. Everybody has to stay at home, except for necessary trips.
b. In public, everybody has to keep a minimum distance of 1m from people who do not live in their household.
c. In public, everybody must wear protective masks.

Answer options:
1 = Almost everybody takes that view
2 = Most people take that view
3 = Approximately half of the people take that view
4 = Some people take that view
5 = Almost nobody takes that view
don't know [88]
no answer [99]

Denken Sie im Folgenden an die **Meinungen anderer Menschen in Österreich**. Bitte geben Sie an, **wie viele** Österreicherinnen und Österreicher die **folgenden Meinungen vertreten**. Es gibt hier kein richtig oder falsch, es geht nur um Ihre persönliche Schätzung. (randomisierte Antwort-Items)

a. Alle müssen unbedingt zu Hause bleiben, außer für Notwendigkeiten.
b. Alle müssen im öffentlichen Raum unbedingt immer mindestens 1m Abstand von Menschen halten, die nicht mit ihnen im Haushalt leben.
c. Alle müssen unbedingt Schutzmasken tragen, wenn sie sich im öffentlichen Raum bewegen.

Matrix-Labels:
1 = Nahezu alle sind dieser Meinung
2 = Die meisten sind dieser Meinung
3 = Etwa die Hälfte ist dieser Meinung
4 = Einige sind dieser Meinung
5 = Nahezu niemand ist dieser Meinung
weiß nicht [88]
keine Angabe [99]

Descriptive norms

In the following, don't think of the opinions, but of the **actual behaviour of other people in Austria** instead. From your perspective, please specify **how many** Austrians **engage in the following behaviour**. There is no right or wrong answer here, it is about your personal estimation. (randomized answer items)

a. They stay at home, except for necessary trips.
b. In public, they keep a minimum distance of 1m from people who do not live in their household.
c. In public, they always wear protective masks.

Answer options:
1 = Almost everybody behaves like this
2 = Most people behave like this
3 = Approximately half of the people behave like this
4 = Some people behave like this
5 = Almost nobody behaves like this
don't know [88]
no answer [99]

Denken Sie im Folgenden nicht mehr an die Meinung, sondern an das **tatsächliche Verhalten anderer Menschen in Österreich**. Bitte geben Sie an, **wie viele** Österreicherinnen und Österreicher sich Ihrer Meinung nach **wie folgt verhalten**. Es gibt hier kein richtig oder falsch, es geht nur um Ihre persönliche Schätzung. (randomisierte Antwort-Items)

a. Sie bleiben zu Hause, außer für Notwendigkeiten.
b. Sie halten im öffentlichen Raum immer mindestens 1m Abstand von Menschen, die nicht mit ihnen im Haushalt leben.
c. Sie tragen immer Schutzmasken, wenn sie sich im öffentlichen Raum bewegen.

Matrix-Labels:
1 = Nahezu alle verhalten sich so
2 = Die meisten verhalten sich so
3 = Etwa die Hälfte verhält sich so
4 = Einige verhalten sich so
5 = Nahezu niemand verhält sich so
weiß nicht [88]
keine Angabe [99]

IV: index trust in institutions

Please look at the following list: **In regards to the Corona crisis**, do you have a lot of, some, little, or no **trust** in the corresponding **institutions**? (randomized answer items)

a. The police
b. The parliament
c. The health care system
d. The federal government

Answer options:
0 = No trust at all
1
2
3
4
5
6
7
8
9
10 = A lot of trust
don’t know [88]
no answer [99]

Wenn Sie auf die folgende Liste sehen: Haben Sie sehr viel, ziemlich viel, wenig oder überhaupt kein **Vertrauen** in die jeweils genannten **Institutionen im Rahmen der Coronakrise**? (randomisierte Antwort-Items)

a. Die Polizei
b. Das Parlament
c. Das Gesundheitswesen
d. Die Bundesregierung

Matrix-Labels:
0 = Überhaupt kein Vertrauen
1
2
3
4
5
6
7
8
9
10 = Sehr viel Vertrauen
weiß nicht [88]
keine Angabe [99]

IV: index risk perception

How high do you estimate the **health threat** that the **coronavirus** poses for you personally and the Austrian population to be?

a. for **me** personally
b. for the **Austrian population**

Answer options:
1 = very high
2 = high
3 = moderate
4 = low
5 = very low
no answer [99]

Wie groß schätzen Sie die **gesundheitliche Gefahr** ein, welche von dem **Coronavirus** für Sie persönlich und für die österreichische Bevölkerung ausgeht?

a. für **mich** persönlich
b. für die **österreichische Bevölkerung**

Answer options:
1 = sehr groß
2 = groß
3 = mittelmäßig
4 = klein
5 = sehr klein
keine Angabe [99]

<u>CV: effectiveness of measures</u>

How effective, do you think, have been the **measures enacted by the Austrian government to slow the spread of the disease**?

1 = not effective at all
2 = rather ineffective
3 = partly effective
4 = rather effective
5 = very effective
don't know [88]
no answer [99]

Wie effektiv, denken Sie, sind die gesetzten **Maßnahmen der österreichischen Regierung** bis jetzt, um die **Ausbreitung der Krankheit zu verlangsamen**?

1 = überhaupt nicht effektiv
2 = eher nicht effektiv
3 = teils effektiv
4 = eher effektiv
5 = sehr effektiv
weiß nicht [88]
keine Angabe [99]

S1 Appendix D. Data and Code Availability

D1. Data Availability

This study is based on data from the Austrian Corona Panel Project (ACPP, see Kittel et al., 2020a, 2020b). The first 20 waves of data have been published and can be downloaded after agreeing to sharing restrictions and ethics guidelines here: https://doi.org/10.11587/28KQNS

The ACPP processes requests to access pre-release editions of the dataset for academic purposes only. This dataset also includes wave 22 used in this study. A guide to apply for access can be found here: https://viecer.univie.ac.at/coronapanel/austrian-corona-panel-data/access-request/

Data on weekly COVID-19 cases in Austria can be accessed here: https://info.gesundheitsministerium.at/data/Epikurve.csv.

We are not authorized to share the data on individual cases per week by region but scientific institutions can apply for data access here: https://datenplattform-covid.goeg.at/english.

D2. Code Availability

The R code (used to recode the data and produce the descriptive Figs) as well as the STATA code (used for the regressions and the interaction plots) to reproduce all our analyses and tests described in this manuscript can be accessed online at https://osf.io/5pz26/?view_only=954cef37d8e84dfebce9278b7e2971cb.

S1 Appendix References

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