

Compliance with Covid-19 sanitary measures: don't forget the precautionary principle

Respect des mesures sanitaires contre le COVID-19 : n'oublions pas le principe de précaution

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⇒ Abstract

Which factors can predict that someone complies with Covid-19 sanitary measures, like wearing masks or staying under lockdown? This paper investigates agents' precautionary attitudes through the declared degree of support for the precautionary principle. The latter is particularly relevant for the situations faced with Covid-19, as it states that, in the face of possible significant harm, measures should be taken even if causal relationships have not been scientifically fully established. We administered a web survey on a representative sample (N=1154) of the French population in May 2020. The results show, also when controlled by risk aversion, that adherence to the PP is positively correlated with compliance with each of the six considered sanitary measures.

Keywords: Precautionary principle, risk, Covid-19, sanitary measures, individual behavior.

⇒ Résumé

Quels facteurs peuvent prédire qu'une personne respectera les mesures sanitaires liées au COVID-19, comme le port du masque ou le confinement ? Cet article examine la précaution des individus, en mesurant leur degré d'adhésion déclaré au principe de précaution. Ce dernier est particulièrement pertinent pour les situations liées au COVID-19, car il stipule que, face à un risque potentiellement important, des mesures devraient être prises quand bien même les relations de causalité n'auraient pas été scientifiquement totalement établies. Nous avons réalisé une enquête en ligne auprès d'un échantillon représentatif (N = 1 154) de la population française en mai 2020. Les résultats montrent, même après avoir contrôlé l'aversion au risque, que l'adhésion au principe de précaution est positivement corrélée au respect de chacune des six mesures sanitaires considérées.

Mots-clés : Principe de précaution ; Risque ; COVID-19 ; Mesures sanitaires ; Comportement individuel.

1. Introduction

The COVID-19 pandemic has emphasized the importance of sanitary measures such as washing hands, wearing masks, and staying at home during lockdowns. However, since adopting these measures has been heterogeneous across individuals, it is pertinent to investigate which factors predict or explain compliance. Previous studies have explored various determinants: social and

psychological traits, moral, religious or political beliefs, trust in science, and preferences [1]. This paper focuses on an unstudied decision-theoretic aspect relevant to the COVID-19 situation: the precautionary attitude. That is, the willingness to take measures that will counter the materialization of some possible harm or catastrophe, even if its likelihood and extent are not really known. For instance, to prevent dying from Covid-19 because of having met friends, I can be precautionary in respecting a physical distance of 2 meters with them, even if I cannot evaluate the chances of infection, transmission, and death.

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The precautionary attitude has been formulated as the precautionary principle (PP hereafter), and one of its most famous versions – the Wingspread version [2] – states that “when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically” [3]. The PP is triggered when (1) the potential harm is significant enough — there is a threshold in harm (typically death) below which the PP does not apply — and (2) the causal relationship between the disputed activity and the harm is not known with certainty. In particular, it applies to situations where probabilities cannot be assigned to the outcomes scientifically meaningfully or the outcome space is not fully known [4]. The PP is therefore generally considered to apply in situations where expected utility theories cannot apply, which does not make them direct competitors [5–12]. It must be noted that not all scholars consider the PP as a sound decision rule (see [12–15] for reviews).

Famous cases of application of the PP include climate change mitigation, asbestos, growth hormones, and neonicotinoids [12]. More recently, when the COVID-19 outbreak began in 2020, the two conditions that triggered the PP were satisfied: (1) a sufficiently bad outcome, with possible catastrophic damage expected (millions of deaths worldwide), (2) an unclear causal relationship, since the propagation means of the virus and the chance of dying from it were scientifically unclear, with no accurate probabilistic models [16]. Consequently, sanitary measures such as wearing a mask or being under lockdown could be considered at that time as measures recommended by the PP — rather than the optimal behaviors from an expected utility model.

Despite the relevance of precautionary measures in the COVID-19 pandemic, there is a gap in academic studies on the relationship between individual attitudes toward the PP and compliance with sanitary measures. To address this gap, we measured those variables with an online survey administered at the beginning of the COVID-19 outbreak on a representative sample of the French population. Our study aims to investigate two research questions. The first question is whether an individual's precautionary attitude predicts their compliance with sanitary measures. We anticipated an affirmative answer, given the relevance of the PP back in 2020 in Covid-19 situations. The second question is how the precautionary attitude provides supplementary information compared

to the risk attitude as a predictor of compliance with sanitary measures. This research question is motivated by the fact that risk attitude has been proposed as a natural predictor and by the theoretical proximity between precaution and risk attitudes.¹

It is important to note that this paper is agnostic about the relevance of the PP in general² and its effectiveness during the Covid-19 pandemic. It aims to study the correlates of precautionary decisions, not to convince readers that the PP should have been used or not in 2020.

2. Material and Methods

This study is part of a comprehensive project to study individual behavior and preferences during the first lockdown in France. We administrated a web survey on a sample (N=1154) representative (in terms of age, gender, professional status, and living area) of the French population from 2020-05-04 to 2020-05-16, where we measured compliance with sanitary measures, adherence to the PP, and risk attitudes.³ All the variables analyzed in this article are self-stated attitudes. First, respondents report on 1-4 scales their compliance with the following recommendations: washing hands (**Hands**); not touching one's face (**Face**); coughing in sleeves (**Coughing**); keeping physical distance (**Distance**); wearing a mask (**Mask**). Compliance with the lockdown (**Lockdown**) is measured on a 0-10 scale. Our primary explanatory variable is individuals' adherence to the PP (**PP**), reported on a 1 (strongly disagree) to 5 (strongly agree) scale. Then, willingness to take risks in general (**WTR general**), and specifically regarding health

¹ For example [7] (p. 306) notes that PP could be reduced to a “cluster of vaguely related intuitions about risk aversion, burdens of proof, irreversible damage, and normative obligations”. See [17] for a tentative connection between PP, risk, and prudence.

² Not all scholars consider the PP as a sound decision rule (see [15] for reviews).

³ Other studies have used the same sample to address different research questions. An overview of the project is provided by [18]. For example, [19, 20] designed a discrete choice experiment to study preferences regarding health measures; [21] tested the effectiveness of a nudge to enhance (anticipated) compliance with a hypothetical future lockdown; [1, 22] examined the respective roles of economic preferences and mindfulness in adherence to health measures. [23] studied the relationship between age and preferences.

(WTR health) are asked on 0-10 scales (see Appendix for question verbatim).

Other variables such as **gender**, **age**, being a vulnerable person (**vulnerable person**, i.e. a person with chronic diseases that increase the severity of infection), **living with a vulnerable person**, **living in a highly-infected area**, **political opinion** (left, right or center), **household income** (in thousand euros) and **level of education** (in years) are used as controls but not analyzed nor discussed here (see [1] for a discussion of the effect of those variables on compliance)

We estimated the relationship between adherence to the PP and compliance with sanitary measures, with ordinary least square (OLS) and cumulative logit regressions, with and without controls. All specifications are presented in the Appendix and lead to qualitatively similar results. We thus present in the main text only simple pairwise Pearson correlation tests and OLS regression.⁴

3. Results

Table 1 presents the correlations between response (compliance with sanitary measures) and explanatory (adherence to the PP, willingness to take risk) variables.

Adherence to the PP is significantly and positively correlated with compliance with all the sanitary measures and negatively correlated with the willingness to take risk in general and in the health domain. The correlation between adherence to the PP and WTR is moderate, suggesting those measures capture different concepts.

Table 2 presents results of OLS regressions, with compliance with sanitary measures as response variables and adherence to the PP as explanatory variable (models 1a to 6a). Models 1b to 6b present regressions with precaution and risk attitudes as explanatory variables and controls. Response and explanatory variables have been normalized before regression, so coefficients can be interpreted as the effect of an increase of one standard deviation (SD) of the PP, expressed in terms of compliance SD.

Adherence to the PP is positively correlated with compliance with all sanitary measures: an increase of one SD in the precautionary attitude increases compliance from 0.072 SD (physical distancing) to 0.237 SD (lockdown compliance). Those effects remain significant when controlling for declared WTR and including controls. In contrast, declared WTR are significantly associated only with mask-wearing and lockdown compliance (see Appendix for alternative specifications leading to similar results).

Table 1: Correlation table

	Sanitary measures						Willingness to Take Risk	
	Hands	Face	Coughing	Distance	Mask	Lockdown	_general	_health
PP	0.109***	0.113***	0.093**	0.072*	0.219***	0.237***	-0.238***	-0.258***
Hands		0.241***	0.341***	0.174***	0.148***	0.114***	-0.040	-0.031
Face			0.211***	0.272***	0.177***	0.126***	-0.037	-0.087**
Coughing				0.205***	0.062*	0.057	0.013	-0.042
Distance					0.051	0.087**	-0.012	-0.051
Mask						0.231***	-0.171***	-0.198***
Lockdown							-0.218***	-0.239***
WTR_general								0.550***

Note: Significance levels for Pearson correlation: *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

⁴ Data and code are available at https://osf.io/6mkrq/?view_only=f9c aa9b264c94589b4bf8184a7e8a266

Table 2: Correspondence between adherence to the PP and compliance with sanitary measures.

Models without control variables						
	Hands	Face	Coughing	Distance	Mask	Lockdown
	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)
PP	0.109*** (0.029)	0.113*** (0.030)	0.093** (0.030)	0.072* (0.029)	0.216*** (0.029)	0.237*** (0.029)
Controls	Non	Non	Non	Non	Non	Non
Observations	1,152	1,123	1,126	1,151	1,125	1,154
R ²	0.012	0.013	0.009	0.005	0.047	0.056
Adjusted R ²	0.011	0.012	0.008	0.004	0.046	0.055
Residual Std Error	0.994	0.994	0.996	0.998	0.977	0.972
F-Statistic	13.891***	14.441***	9.709**	5.905*	54.805***	68.705***
Models with control variables						
	Hands	Face	Coughing	Distance	Mask	Lockdown
	(1b)	(2b)	(3b)	(4b)	(5b)	(6b)
PP	0.092** (0.033)	0.083* (0.033)	0.092** (0.033)	0.067* (0.034)	0.136*** (0.032)	0.181*** (0.031)
WTR_general	-0.002 (0.038)	0.007 (0.039)	0.065 (0.039)	0.021 (0.039)	-0.054 (0.037)	-0.119** (0.036)
WTR_health	0.004 (0.037)	-0.059 (0.038)	-0.067 (0.038)	-0.049 (0.038)	-0.092* (0.036)	-0.101** (0.036)
Controls	Oui	Oui	Oui	Oui	Oui	Oui
Observations	1,025	1,002	1,000	1,024	1,003	1,027
R ²	0.036	0.032	0.025	0.020	0.111	0.124
Adjusted R ²	0.026	0.021	0.014	0.009	0.101	0.115
Residual Std Error	0.983	0.992	0.992	1.014	0.944	0.940
F-Statistic	3.460***	2.964***	2.273**	1.889*	11.218***	13.074**

Note: *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$. Standard errors in parenthesis. All variables have been standardized before regression. Controls include gender, age, being a vulnerable person, living with a vulnerable person, living in a high-infected area, political opinion (left, right, or center), household income (in thousand euros) and level of education. Full regression details can be found in the Appendix.

4. Discussion

Our study finds a positive relation between precautionary attitudes and compliance with sanitary measures: individuals declaring higher adherence to the PP are more likely to comply. This association remains significant once controlling for the declared level of willingness to take risk, and an association between willingness to take risk and sanitary measures is found for only two out of six measures. These results suggest that the adherence to the PP and the willingness to take risk, although related, capture

different concepts, and that precautionary attitudes play a role in compliance.

However, our study has not been explicitly designed to test whether precaution or risk attitudes have the most important role. Indeed, there might be a gap between the theoretical concepts and what the specific questions of our survey capture (e.g., participants may misunderstand a question, and several questions could be necessary to properly measure a concept). In our study, we did not pretest our question about adherence to the PP, so we cannot establish its psychometric properties and the extent to which it effectively measures adherence to the PP. Because the precautionary attitude has not been studied

much and is not standardized in the literature [24], future work could focus on reducing measurement error.

5. Conclusion: targeting the PP to improve compliance with sanitary measures?

In conclusion, we suggest lines for future research that would build on the present results. Our survey provides evidence that an agent's attitude towards the PP is positively related to compliance with sanitary measures. Thus, one can conjecture that compliance with sanitary measures could be improved by communicating about the PP and removing misconceptions about it.

The communication by doctors, sanitary agencies, or the government could appeal to precautionary semantics to increase compliance with sanitary measures. For instance, appealing to moral arguments ("this is a citizen's duty to stay home") or utility arguments ("stay home, save lives / protect the NHS") could be reinforced with arguments about precaution ("be precautionary, stay home / wear a mask"). How this should be best done in practice, e.g. by using the term "precautionary" itself or only by insisting on current uncertainty, is a question for science communication scholars and psychologists and should be investigated empirically.

Removing misconceptions or misunderstandings about the PP can be expected to increase compliance with sanitary measures. Indeed, the PP is often caricatured and misunderstood by scholars (see [12] on criticisms by [25]), and hence probably by lay people too. For instance, the PP is sometimes criticized for being unscientific because it is not triggered by a scientifically established threat [26]; one can reply that an absence of proof is not proof of absence and that the PP triggers when science is silent, so is not against it.

Overall, the fact that adherence to the PP could imply compliance with sanitary measures should renew academic studies about precaution and the PP, be it regarding the theoretical link between risk and precaution or how policy-makers may mobilize it.

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Ethical Approval Statement

This non-interventional study was conducted in accordance with the ethical standards defined in the 1964 Declaration of Helsinki and its subsequent amendments. This study was approved by the Institutional Review Board (IRB) of the Center for Environmental Economics of Montpellier (Université de Montpellier).

References

- Rafai, I., Blayac, T., Dubois, D., Duchêne, S., Nguyen-Van, P., Ventelou, B., & Willinger, M. (2023). Stated preferences outperform elicited preferences for predicting reported compliance with Covid-19 prophylactic measures. *Journal of Behavioral and Experimental Economics*, 107, 102089.
- Ashford, N. et al. (1998). The Wingspread statement on the precautionary principle. Wingspread, Racine. <http://www.gdrc.org/u-gov/precaution-3.html>.
- UNCED (1992). Rio declaration on environment and development. Rio de Janeiro, June 3-14 1992. United Nations Conference on Environment and Development.
- Bartha, P. et C. T. DesRoches (2021). Modeling the precautionary principle with lexical utilities. *Synthese* 199 (3-4), 8701-8740.
- Al-Najjar, N. I. (2015). A bayesian framework for the precautionary principle. *The Journal of Legal Studies* 44 (S2), S337-S365.
- Aven, T. (2011). On different types of uncertainties in the context of the precautionary principle. *Risk Analysis* 31 (10), 1515-1525.
- Peterson, M. (2006). The precautionary principle is incoherent. *Risk Analysis* 26 (3), 595-601.
- Boyer-Kassem, T. (2017). Is the precautionary principle really incoherent? *Risk Analysis* 37 (11), 2026-2034.
- Peterson, M. (2017). Yes, the precautionary principle is incoherent. *Risk Analysis* 37 (11), 2035-2038.
- Boyer-Kassem, T. (2017). The precautionary principle has not been shown to be incoherent: A reply to Peterson. *Risk Analysis* 37 (11), 2039-2040.
- Sandin, P. (1999). Dimensions of the precautionary principle. *Human and Ecological Risk Assessment: An International Journal* 5 (5), 889-907.
- Steel, D. (2015). *Philosophy and the Precautionary Principle: Science, Evidence, and Environmental Policy*. Cambridge University Press.

13. Stirling, A. (2009). The Precautionary Principle, Chapter 43, pp. 248-262. John Wiley & Sons, Ltd.
14. Ahteensuu, M. et P. Sandin (2012). The Precautionary Principle, pp. 961-978. Dordrecht : Springer Netherlands.
15. Munthe, C. (2020). Precautionary Principle, pp. 1-10. John Wiley & Sons, Ltd.
16. Aven, T. et F. Boudier (2020). The covid-19 pandemic: how can risk science help? *Journal of Risk Research* 23 (7-8), 849-854.
17. Gollier, C., B. Jullien, et N. Treich (2000). Scientific progress and irreversibility: an economic interpretation of the 'precautionary principle'. *Journal of Public Economics* 75 (2), 229-253.
18. Blayac, T., Dubois, D., Duchene, S., Nguyen-Van, P., Rafai, I., Ventelou, B., & Willinger, M. (2022). Les attendus d'une approche d'économie comportementale pour les décisions individuelles face à la pandémie de COVID-19: succès et déceptions. *médecine/sciences*, 38(6-7), 594-599.
19. Blayac, T., D. Dubois, S. Duchêne, P. Nguyen-Van, B. Ventelou, et M. Willinger (2021). Population preferences for inclusive covid-19 policy responses. *The Lancet Public Health* 6 (1), e9.
20. Blayac, T., D. Dubois, S. Duchêne, P. Nguyen-Van, B. Ventelou, et M. Willinger (2022). What drives the acceptability of restrictive health policies: An experimental assessment of individual preferences for anti-covid 19 strategies. *Economic Modelling* 116, 106047.
21. Blayac, T., D. Dubois, S. Duchêne, P. Nguyen-Van, I. Rafai, B. Ventelou, et M. Willinger (2022). Nudging for lockdown: Behavioral insights from an online experiment. *Social Psychology*.
22. Wen, X., I. Rafai, S. Duchêne, et M. Willinger (2022). Did mindful people do better during the covid-19 pandemic? mindfulness is associated with well-being and compliance with prophylactic measures. *International Journal of Environmental Research and Public Health* 19 (9), 5051.
23. Wang, Z., Rafai, I., & Willinger, M. (2023). Does age affect the relation between risk and time preferences? Evidence from a representative sample. *Southern Economic Journal*, 90(2), 341-368.
24. Sjöberg, L. (2009). Precautionary attitudes and the acceptance of a local nuclear waste repository. *Safety Science* 47 (4), 542-546.
25. Sunstein, C. R. (2005). *Laws of Fear: Beyond the Precautionary Principle*. The Seeley Lectures. Cambridge University Press.
26. Resnik, D. B. (2003). Is the precautionary principle unscientific? *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 34 (2), 329-344.

Appendix

1. Sampling method

The present study utilized a quota sampling methodology to conduct a survey between 4 May 2020 and 16 May 2020, a period coinciding with the first French national lockdown from 17 March to 10 May 2020. The survey institute, Viavoice, reached out to a sample of over 7500 individuals via telephone in late March 2020 and requested their participation in an online study that encompassed the survey in question. In cases where prospective participants declined the invitation, the research

team endeavored to substitute them with individuals bearing similar profiles. Ultimately, a cohort of 5331 persons agreed to partake and was issued a dedicated server link to facilitate survey completion. These participants were deemed representative of the French population across various categories, including gender, age, professional and social categories (PCS, INSEE definitions), geographical area (UDA-9), and the size of their urban unit (INSEE definition). Of the 5331 individuals who agreed to participate, 1154 ultimately completed the survey and signed informed consent forms, indicating a response rate of 21.6%. Notably, the surveyed sample demonstrated a satisfactory representation of the French population concerning gender, age, and geographical area. Nevertheless, a slight over-representation of high-social- status males aged over 50 was observed. Table 3 illustrates the relevant

Table 3: Sample representativeness (Wen et al. 2022).

	INSEE Census	Accepted (N = 5331)	Completed (N = 1154)
Gender			
Male	47.72%	47.77%	51.17%
Female	52.28%	52.23%	48.83%
Age			
[18,24]	10.66%	8.59%	8.25%
[25, 34]	15.72%	15.52%	13.90%
[35, 49]	25.59%	25.44%	24.24%
[50, 64]	24.72%	27.45%	28.32%
[65, +∞]	23.31%	23.00%	25.28%
Professional and Social Categories (INSEE definition: PCS)			
Agriculteurs exploitants (Farmers)	0.94%	0.86%	0.78%
Artisans, commerçants, chefs entreprise (Craftsmen, merchants, business leaders)	3.33%	3.56%	4.17%
Cadres, professions intellectuelles sup, professions libérales (Executives, superior intellectual professions, liberal professions)	8.83%	9.01%	16.94%
Professions intermédiaires (Intermediate professions)	13.96%	15.57%	18.16%
Employés (Employees)	16.57%	16.87%	14.60%
Ouvriers (Workers)	13.38%	13.00%	7.73%
Retraités (Retired)	26.44%	28.24%	29.89%
Autres sans activité professionnelle (Others without professional activity)	16.55%	12.89%	7.73%
Geographical Area (UDA-9 definition)			
REGION PARISIENNE	18.79%	18.69%	17.29%
BP QUEST	9.31%	9.25%	8.34%
BP EST	7.76%	7.75%	7.73%
NORD	6.41%	6.34%	5.13%
QUEST	13.63%	13.51%	13.64%
EST	8.52%	8.52%	10.08%
SUD QUEST	10.94%	11.26%	12.16%
SUD EST	12.10%	12.12%	12.60%
MEDITERANEE	12.53%	12.57%	13.03%
Urban Unit (INSEE definition)			
< 2000 inhabitants	22.51%	22.29%	21.98%
Between 2k and 20k	17.38%	17.67%	17.99%
Between 20k and 100k	13.55%	13.73%	13.55%
More than 100k	29.88%	30.02%	31.28%
Parisian urban unit	16.67%	16.29%	15.20%

statistics of the INSEE official national panel for the original cohort of 5331 participants and the 1154 individuals who completed the survey.

2. Variables

The variables used in this study have been collected by asking the following questions (translated from French by the authors):

- Can you estimate how much you have increased these barrier behaviors since February 2020, driven by the Covid19 crisis :
 - **Washing hands (Hands)** - (1, "Less than before"), (2, "No more/no less than before"), (3, "A little more than before"), (4, "Much more than before"), (0, "Do not know")
 - **Not touching own face (Face)** - (1, "Less than before"), (2, "No more/no less than before"), (3, "A little more than before"), (4, "Much more than before"), (0, "Do not know")
 - **Coughing in sleeves (Coughing)** - (1, "Less than before"), (2, "No more/no less than before"), (3, "A little more than before"), (4, "Much more than before"), (0, "Do not know")
 - **Keeping physical distance (Distance)** - (1, "Less than before"), (2, "No more/no less than before"), (3, "A little more than before"), (4, "Much more than before"), (0, "Do not know")
 - **Wearing a mask (Mask)** - As long as the virus is circulating in France, when you go out in public places (stores, city center), will you wear a mask? (1, "Never"), (2, "Rarely"), (3, "Frequently"), (4, "Always"), (0, "Do not know / never go out")

- **Respecting the lockdown (Lockdown)** - Would you say you scrupulously followed the government's containment policy? Place your answer on a scale of 0 to 10, where 0 is "Not at all" and 10 is "Scrupulously".
- **Adherence to the PP (PP)** - "The precautionary principle can be expressed as follows: when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically. In your opinion, should this precautionary principle currently apply with Covid-19?" (1= Strongly Disagree; 2= disagree ; 3=neutral; 4=agree; 5=Strongly agree)
- **Willingness to take risk in general (WTR_general)** - In general, are you a risk-taker, or do you try to avoid taking risks? Please select your response on a scale of 0 to 10, where 0 is "Not at all willing to take risks" and 10 is "Very willing to take risks".
- **Willingness to take risk in health (WTR_health)** - People may behave differently in different situations. How would you rate your willingness to take risks with your health? Please select your response on a scale of 0 to 10, where 0 is "Not at all willing to take risks" and 10 is "Very willing to take risks".

3. Regression Details & Robustness analysis

The following table presents the details of the regression presented in the main text.

Table 4: OLS regression with PP as explanatory variable (without WTR)

	Dependent variable:											
	Hands		Face		Coughing		Distance		Mask		Lockdown	
	(1a)	(1c)	(2a)	(2c)	(3a)	(3c)	(4a)	(4c)	(5a)	(5c)	(6a)	(6c)
PP	0.109*** (0.029)	0.092** (0.032)	0.113*** (0.030)	0.095** (0.032)	0.093** (0.030)	0.094** (0.032)	0.072* (0.029)	0.074* (0.033)	0.216*** (0.029)	0.168*** (0.031)	0.237*** (0.029)	0.227*** (0.031)
age	0.007*** (0.002)	0.007*** (0.002)	0.001 (0.002)	0.001 (0.002)	0.004 (0.002)	0.004 (0.002)	0.003 (0.002)	0.003 (0.002)	0.010*** (0.002)	0.010*** (0.002)	0.010*** (0.002)	0.004* (0.002)
male	-0.047 (0.062)	-0.047 (0.062)	-0.198** (0.064)	-0.198** (0.064)	-0.005 (0.064)	-0.005 (0.064)	-0.085 (0.064)	-0.085 (0.064)	-0.236*** (0.061)	-0.236*** (0.061)	-0.236*** (0.061)	-0.296*** (0.061)
vulnerable	-0.060 (0.075)	-0.060 (0.075)	0.136 (0.077)	0.136 (0.077)	-0.066 (0.077)	-0.066 (0.077)	0.040 (0.078)	0.040 (0.078)	0.205** (0.073)	0.205** (0.073)	0.205** (0.073)	0.143 (0.073)
liv with vulnerable	0.066 (0.078)	0.066 (0.078)	0.041 (0.079)	0.041 (0.079)	0.016 (0.079)	0.016 (0.079)	-0.001 (0.080)	-0.001 (0.080)	0.141 (0.076)	0.141 (0.076)	0.141 (0.076)	0.073 (0.076)
highly infected area	-0.034 (0.071)	-0.034 (0.071)	0.048 (0.072)	0.048 (0.072)	0.048 (0.072)	0.048 (0.072)	-0.061 (0.073)	-0.061 (0.073)	0.001 (0.069)	0.001 (0.069)	0.001 (0.069)	0.094 (0.069)
political	-0.034* (0.015)	-0.034* (0.015)	-0.008 (0.015)	-0.008 (0.015)	-0.011 (0.015)	-0.011 (0.015)	-0.005 (0.015)	-0.005 (0.015)	0.024 (0.015)	0.024 (0.015)	0.024 (0.015)	0.002 (0.015)
income	0.025* (0.011)	0.025* (0.011)	0.025* (0.011)	0.025* (0.011)	0.022 (0.011)	0.022 (0.011)	0.024* (0.012)	0.024* (0.012)	-0.008 (0.011)	-0.008 (0.011)	-0.008 (0.011)	0.015 (0.011)
education	-0.004 (0.014)	-0.004 (0.014)	0.010 (0.014)	0.010 (0.014)	0.017 (0.014)	0.017 (0.014)	0.018 (0.014)	0.018 (0.014)	0.006 (0.014)	0.006 (0.014)	0.006 (0.014)	0.015 (0.013)
Constant	0.0002 (0.029)	-0.249 (0.131)	-0.0003 (0.030)	-0.078 (0.134)	0.00000 (0.030)	-0.260 (0.134)	0.00002 (0.029)	-0.240 (0.135)	-0.002 (0.029)	-0.542*** (0.128)	-0.000 (0.029)	-0.266* (0.128)
Observations	1,152	1,025	1,123	1,002	1,126	1,000	1,151	1,024	1,125	1,003	1,154	1,027
R ²	0.012	0.036	0.013	0.029	0.009	0.021	0.005	0.019	0.047	0.096	0.056	0.092
Adjusted R ²	0.011	0.028	0.012	0.020	0.008	0.012	0.004	0.010	0.046	0.088	0.055	0.084
Residual Std. Error	0.994	0.982	0.994	0.992	0.996	0.992	0.998	1.014	0.977	0.951	0.972	0.957
F Statistic	13.891***	4.236***	14.441***	3.293***	9.709**	2.339*	5.905*	2.124*	54.805***	11.706***	68.705***	11.417***

Note: * p < 0.05; ** p < 0.01; *** p < 0.001

Table 5: OLS regression with PP and WTR as explanatory variables

Model	Dependent variable:																	
	Hands			Face			Coughing			Distance			Mask			Lockdown		
	(1b)	(1d)	(2b)	(2d)	(3b)	(3d)	(4b)	(4d)	(5b)	(5d)	(6b)	(6d)						
PP	0.107*** (0.031)	0.092*** (0.033)	0.100** (0.031)	0.083* (0.033)	0.095** (0.031)	0.092** (0.033)	0.066* (0.031)	0.067* (0.034)	0.168*** (0.030)	0.136*** (0.032)	0.178*** (0.029)	0.181*** (0.031)						
WTR general	-0.018 (0.035)	-0.002 (0.038)	0.029 (0.036)	0.007 (0.039)	0.066 (0.036)	0.065 (0.039)	0.033 (0.035)	0.021 (0.039)	-0.061 (0.035)	-0.054 (0.037)	-0.099** (0.034)	-0.119** (0.036)						
WTR health	0.006 (0.036)	0.004 (0.037)	-0.077* (0.036)	-0.059 (0.038)	-0.055 (0.036)	-0.067 (0.038)	-0.052 (0.036)	-0.049 (0.038)	-0.129*** (0.035)	-0.092* (0.036)	-0.138*** (0.034)	-0.101** (0.036)						
age	0.007*** (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.066 (0.002)	0.004 (0.002)	0.003 (0.002)	0.003 (0.002)	0.009*** (0.002)	0.009*** (0.002)	0.009*** (0.002)	0.003 (0.002)						
male	-0.048 (0.063)	-0.048 (0.063)	-0.185** (0.064)	-0.185** (0.064)	-0.002 (0.064)	-0.002 (0.064)	-0.077 (0.065)	-0.077 (0.065)	-0.202*** (0.061)	-0.202*** (0.061)	-0.250*** (0.060)	-0.250*** (0.060)						
vulnerable	-0.060 (0.075)	-0.060 (0.075)	0.132 (0.077)	0.132 (0.077)	0.016 (0.077)	0.016 (0.077)	0.038 (0.078)	0.038 (0.078)	0.187* (0.073)	0.187* (0.073)	0.116 (0.072)	0.116 (0.072)						
liv with vulnerable	0.066 (0.078)	0.066 (0.078)	0.039 (0.079)	0.039 (0.079)	0.016 (0.079)	0.016 (0.079)	-0.001 (0.080)	-0.001 (0.080)	0.138 (0.076)	0.138 (0.076)	0.066 (0.074)	0.066 (0.074)						
highly infected area	-0.035 (0.071)	-0.035 (0.071)	0.051 (0.072)	0.051 (0.072)	0.051 (0.072)	0.051 (0.072)	-0.058 (0.073)	-0.058 (0.073)	0.006 (0.069)	0.006 (0.069)	0.095 (0.068)	0.095 (0.068)						
political	-0.034* (0.015)	-0.034* (0.015)	-0.009 (0.015)	-0.009 (0.015)	-0.013 (0.015)	-0.013 (0.015)	-0.006 (0.015)	-0.006 (0.015)	0.025 (0.014)	0.025 (0.014)	0.005 (0.014)	0.005 (0.014)						
income	0.025* (0.011)	0.025* (0.011)	0.026* (0.011)	0.026* (0.011)	0.021 (0.011)	0.021 (0.011)	0.024* (0.012)	0.024* (0.012)	-0.006 (0.011)	-0.006 (0.011)	0.019 (0.011)	0.019 (0.011)						
education	-0.003 (0.014)	-0.003 (0.014)	0.010 (0.014)	0.010 (0.014)	0.014 (0.014)	0.014 (0.014)	0.018 (0.014)	0.018 (0.014)	0.009 (0.014)	0.009 (0.014)	0.022 (0.013)	0.022 (0.013)						
Constant	0.0002 (0.029)	-0.250 (0.132)	-0.0003 (0.030)	-0.063 (0.134)	-0.0002 (0.030)	-0.243 (0.134)	0.0001 (0.029)	-0.226 (0.136)	-0.002 (0.029)	-0.515*** (0.128)	-0.000 (0.028)	-0.236 (0.126)						
Observations	1,152	1,025	1,123	1,002	1,126	1,000	1,151	1,024	1,125	1,003	1,154	1,027						
R ²	0.012	0.036	0.017	0.032	0.012	0.025	0.007	0.020	0.073	0.111	0.097	0.124						
Adjusted R ²	0.010	0.026	0.014	0.021	0.009	0.014	0.004	0.009	0.071	0.101	0.094	0.115						
Residual Std. Error	0.995	0.983	0.993	0.992	0.995	0.992	0.998	1.014	0.964	0.944	0.952	0.940						
F Statistic	4.708**	3.460***	6.425***	2.964***	4.511**	2.273**	2.693*	1.889*	29.512***	11.218***	41.065***	13.074***						

Note: * p < 0.05; ** p < 0.01; *** p < 0.001

Table 6: Cumulative Logit Regressions with PP as explanatory variable (without WTR)

Model	Dependent variable:																
	Hands			Face			Coughing			Distance			Mask			Lockdown Model	
	(1e)	(1f)	(2e)	(2f)	(3e)	(3f)	(4e)	(4f)	(5e)	(5f)	(6e)	(6f)		(5e)	(5f)	(6e)	(6f)
PP	0.224*** (0.058)	0.191** (0.063)	0.219*** (0.056)	0.191** (0.061)	0.184** (0.057)	0.188** (0.062)	0.288** (0.091)	0.292** (0.099)	0.428*** (0.059)	0.346*** (0.065)	0.448*** (0.056)	0.439*** (0.061)		0.202*** (0.004)	0.020*** (0.004)	0.448*** (0.056)	0.439*** (0.061)
age	0.014*** (0.004)	0.002 (0.004)	0.002 (0.004)	0.002 (0.004)	0.007 (0.004)	0.007 (0.004)	0.010 (0.006)	0.010 (0.006)	0.010 (0.006)	0.010 (0.006)	0.010 (0.006)	0.010 (0.006)	0.008* (0.004)	0.020*** (0.004)	0.020*** (0.004)	0.008* (0.004)	0.008* (0.004)
male	-0.118 (0.125)	-0.118 (0.125)	-0.395** (0.121)	-0.395** (0.121)	-0.035 (0.122)	-0.035 (0.122)	-0.099 (0.200)	-0.099 (0.200)	-0.099 (0.200)	-0.099 (0.200)	-0.099 (0.200)	-0.099 (0.200)	-0.583*** (0.121)	-0.517*** (0.128)	-0.517*** (0.128)	-0.583*** (0.121)	-0.583*** (0.121)
vulnerable	-0.091 (0.153)	-0.091 (0.153)	0.237 (0.146)	0.237 (0.146)	-0.132 (0.145)	-0.132 (0.145)	0.046 (0.247)	0.046 (0.247)	0.046 (0.247)	0.046 (0.247)	0.046 (0.247)	0.046 (0.247)	0.278 (0.147)	0.462** (0.160)	0.462** (0.160)	0.278 (0.147)	0.278 (0.147)
liv with vulnerable	0.207 (0.161)	0.207 (0.161)	0.083 (0.151)	0.083 (0.151)	0.021 (0.152)	0.021 (0.152)	0.040 (0.257)	0.040 (0.257)	0.040 (0.257)	0.040 (0.257)	0.040 (0.257)	0.040 (0.257)	0.139 (0.148)	0.308 (0.164)	0.308 (0.164)	0.139 (0.148)	0.139 (0.148)
highly infected area	-0.054 (0.141)	-0.054 (0.141)	0.103 (0.137)	0.103 (0.137)	0.085 (0.139)	0.085 (0.139)	-0.183 (0.221)	-0.183 (0.221)	-0.183 (0.221)	-0.183 (0.221)	-0.183 (0.221)	-0.183 (0.221)	0.175 (0.135)	0.043 (0.143)	0.043 (0.143)	0.175 (0.135)	0.175 (0.135)
political	-0.055 (0.030)	-0.055 (0.030)	-0.012 (0.029)	-0.012 (0.029)	-0.018 (0.029)	-0.018 (0.029)	-0.055 (0.048)	-0.055 (0.048)	-0.055 (0.048)	-0.055 (0.048)	-0.055 (0.048)	-0.055 (0.048)	0.001 (0.029)	0.047 (0.031)	0.047 (0.031)	0.001 (0.029)	0.001 (0.029)
income	0.045 (0.024)	0.045 (0.024)	0.047* (0.022)	0.047* (0.022)	0.039 (0.023)	0.039 (0.023)	0.096* (0.048)	0.096* (0.048)	0.096* (0.048)	0.096* (0.048)	0.096* (0.048)	0.096* (0.048)	0.030 (0.021)	-0.020 (0.022)	-0.020 (0.022)	0.030 (0.021)	0.030 (0.021)
education	-0.008 (0.028)	-0.008 (0.028)	0.019 (0.027)	0.019 (0.027)	0.035 (0.027)	0.035 (0.027)	0.055 (0.047)	0.055 (0.047)	0.055 (0.047)	0.055 (0.047)	0.055 (0.047)	0.055 (0.047)	0.032 (0.026)	0.004 (0.028)	0.004 (0.028)	0.032 (0.026)	0.032 (0.026)
Observations	1,152	1,025	1,123	1,002	1,126	1,000	1,151	1,024	1,125	1,003	1,154	1,027		1,003	1,003	1,154	1,027
Log Likelihood	-1,064.502	-932.396	-1,175.330	-1,038.620	-1,165.317	-1,031.757	-490.668	-432.635	-1,085.518	-934.032	-1,217.400	-1,067.221		-934.032	-934.032	-1,217.400	-1,067.221

Note: * p < 0.05; ** p < 0.01; *** p < 0.001

Table 7: Cumulative Logit regressions with PP and WTR as explanatory variables

Model	Dependent variable:																	
	Hands			Face			Coughing			Distance			Mask			Lockdown Model		
	(1g)	(1h)	(2g)	(2h)	(3g)	(3h)	(4g)	(4h)	(5g)	(5h)	(6g)	(6h)						
PP	0.215*** (0.060)	0.190** (0.065)	0.200*** (0.058)	0.172** (0.062)	0.191** (0.059)	0.187** (0.064)	0.278** (0.094)	0.274** (0.102)	0.339*** (0.062)	0.282*** (0.067)	0.345*** (0.058)	0.355*** (0.063)						
WTR general	-0.046 (0.070)	-0.008 (0.076)	0.079 (0.069)	0.038 (0.074)	0.129 (0.069)	0.125 (0.075)	0.095 (0.114)	0.046 (0.123)	-0.133 (0.070)	-0.127 (0.077)	-0.196** (0.068)	-0.241** (0.075)						
WTR health	0.006 (0.070)	0.001 (0.075)	-0.163* (0.068)	-0.126 (0.072)	-0.096 (0.070)	-0.113 (0.074)	-0.124 (0.110)	-0.114 (0.114)	-0.259*** (0.070)	-0.189* (0.075)	-0.276*** (0.069)	-0.208** (0.073)						
age	0.014*** (0.004)	0.001 (0.004)	0.001 (0.004)	0.001 (0.004)	0.007 (0.004)	0.007 (0.004)	0.010 (0.006)	0.010 (0.006)	0.018*** (0.004)	0.018*** (0.004)	0.018*** (0.004)	0.005 (0.004)						
male	-0.117 (0.126)	-0.117 (0.126)	-0.374*** (0.122)	-0.374*** (0.122)	-0.029 (0.123)	-0.029 (0.123)	-0.081 (0.202)	-0.081 (0.202)	-0.456*** (0.130)	-0.456*** (0.130)	-0.456*** (0.130)	-0.507*** (0.122)						
vulnerable	-0.092 (0.154)	-0.092 (0.154)	0.206 (0.146)	0.229 (0.146)	-0.125 (0.146)	-0.125 (0.146)	0.041 (0.247)	0.041 (0.247)	0.429** (0.161)	0.429** (0.161)	0.429** (0.161)	0.218 (0.148)						
liv with vulnerable	0.206 (0.161)	0.206 (0.161)	0.078 (0.151)	0.078 (0.151)	0.028 (0.152)	0.028 (0.152)	0.045 (0.257)	0.045 (0.257)	0.307 (0.165)	0.307 (0.165)	0.307 (0.165)	0.124 (0.149)						
highly infected area	-0.054 (0.141)	-0.054 (0.141)	0.113 (0.137)	0.113 (0.137)	0.093 (0.139)	0.093 (0.139)	-0.181 (0.221)	-0.181 (0.221)	0.061 (0.144)	0.061 (0.144)	0.061 (0.144)	0.207 (0.136)						
political	-0.055 (0.030)	-0.055 (0.030)	-0.014 (0.029)	-0.014 (0.029)	-0.021 (0.029)	-0.021 (0.029)	-0.057 (0.048)	-0.057 (0.048)	0.050 (0.031)	0.050 (0.031)	0.050 (0.031)	0.007 (0.029)						
income	0.046 (0.024)	0.046 (0.024)	0.047* (0.022)	0.047* (0.022)	0.037 (0.023)	0.037 (0.023)	0.097* (0.048)	0.097* (0.048)	-0.016 (0.022)	-0.016 (0.022)	-0.016 (0.022)	0.037 (0.021)						
education	-0.007 (0.028)	-0.007 (0.028)	0.018 (0.027)	0.018 (0.027)	0.030 (0.027)	0.030 (0.027)	0.053 (0.048)	0.053 (0.048)	0.011 (0.028)	0.011 (0.028)	0.011 (0.028)	0.047 (0.027)						
Observations	1,152	1,025	1,123	1,002	1,126	1,000	1,151	1,024	1,125	1,003	1,154	1,027						
Log Likelihood	-1,064.239	-932.390	-1,172.480	-1,037.030	-1,163.456	-1,030.044	-489.996	-432.120	-1,069.010	-925.460	-1,192.231	-1,048.643						

Note: * p < 0.05; ** p < 0.01; *** p < 0.001