

Aerosol transmission and mask guidance in Spain during COVID-19: An analysis of institutional health communication, 2020–2025

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Abstract

Research background: Institutional health communication during public health emergencies shapes risk understanding, protective behaviour, and public trust. During the COVID-19 pandemic, mask recommendations had direct implications for protection against aerosol transmission, for which scientific evidence increasingly consolidated between 2020 and 2021. High-filtration respirators (FFP2/N95) provide substantially better protection than surgical or hygienic masks, yet official guidance in Spain consistently prioritised the latter.

Purpose: To examine how the Spanish Ministry of Health communicated about mask use between January 2020 and December 2025.

Methodology: A documentary content analysis was conducted on 2,060 press releases and 143 institutional campaign materials.

Findings: Low-filtration masks were referenced substantially more frequently than high-filtration respirators across both sources. Aerosol transmission was not mentioned in any campaign material. A marked dissociation emerged in 2021: the highest proportion of high-filtration references in press releases (58.3%) coincided with a vaccination campaign in which all protagonists wore surgical masks. Influenza campaign materials did not include any reference to high-filtration protection in any annual cycle.

Practical implications: These findings document a systematic pattern of limited visibility of high-filtration protection across the communication formats analysed, with important implications for pandemic preparedness and public health messaging.

Originality / value: This study offers a novel, longitudinal analysis of Spanish health communication that reveals a persistent omission of high-filtration respirators despite evolving evidence on aerosol transmission. It bridges institutional messaging and scientific consensus with direct implications for pandemic risk communication.

Keywords: institutional communication; public health management; face masks; COVID-19; flu; Spain.

JEL classification: I18

1. Introduction

The COVID-19 pandemic placed unprecedented demands on public health communication, requiring institutions to translate rapidly evolving evidence into clear and actionable guidance for the population. Among the most consequential and contested elements of that guidance was the recommendation on face masks, particularly the distinction between community masks, surgical masks, and filtering facepiece respirators such as FFP2/N95. In Spain, official guidance during the pandemic largely prioritised hygienic or

surgical masks for the general public, while reserving FFP2-type respirators for healthcare personnel and selected high-risk groups (Ministerio de Sanidad, 2020; Ministerio de Sanidad, 2022).

By 2020, a growing body of evidence indicated that SARS-CoV-2 spread efficiently through inhalation of aerosols, particularly indoors, challenging the traditional droplet-fomite framework (Setti et al., 2020; Morawska & Cao, 2020; Jarvis, 2020). Hygienic and surgical masks provide source control but do not provide the inward filtration and facial seal afforded by FFP2 respirators, which are designed to reduce inhalation of airborne particles. This distinction matters for institutional messaging because the protective meaning of “mask use” depends on which mask is recommended (Oberg & Brosseau, 2008; Bagheri et al., 2021).

This study examines that gap as a problem of institutional health communication. Specifically, it asks how Spanish official guidance on masks evolved from 2020 to 2025, the extent to which that evolution aligned with the scientific literature on aerosol transmission and respirator efficacy, and what this case reveals about risk communication during a public health emergency. Spain is a particularly relevant case: official documents repeatedly recommended surgical masks for the general population while FFP2 was framed as occupational equipment, a pattern that continued into 2025 (Ministerio de Sanidad, 2025). This study combines a documentary analysis of official Spanish texts with a narrative synthesis of the scientific evidence. The aim is to determine whether public guidance reflected the best available knowledge at the time, or whether it lagged behind in ways that may have influenced how people protected themselves and what they understood about the risks.

2. Literature review

2.1. Risk communication in public health emergencies

Risk communication refers to the interactive exchange of information, concerns, and judgments about risk among institutions, experts, and the public, with the aim of supporting informed decisions and appropriate protective action (Covello & Sandman, 2001). In public health emergencies, it is not a supplementary activity but a core component of response, because the quality, timing, and credibility of official messages can shape trust, compliance, and ultimately health outcomes (WHO, 2018; Sauer et al., 2021). The effectiveness of risk communication depends not only on what is communicated, but also on when, how, and by whom it is communicated.

The Crisis and Emergency Risk Communication (CERC) framework is an integrative model that merges traditional health and risk communication with crisis and disaster management to address complex public health events. A cardinal tenet of this model is that communication must be honest, candid, prompt, accurate, and complete (Reynolds & Seeger, 2005). These core requirements reflect the practical reality that the public evaluates risk messages based not only on technical accuracy but also on the perceived reliability and motives of the information source. Consequently, when authorities communicate with clarity and consistency, social trust is more likely to be preserved. Conversely, when messages are delayed, contradictory, or if authorities fail to disclose uncertainties, public confusion and distrust increase, which can lead to confusion and the propagation of rumors (Berg et al., 2021).

The COVID-19 pandemic served as an unprecedented test for institutional risk communication, revealing significant vulnerabilities in how health authorities disseminated critical information (Berg et al., 2021). Official messaging frequently struggled to keep pace with rapidly evolving and often uncertain scientific evidence, which was sometimes complicated by political sensitivities or a lack of

coordination between agencies. Research indicates that inconsistent or contradictory messaging significantly undermines public trust and reduces adherence to protective behaviours (Kim & Kreps, 2020). This decline in confidence is particularly acute when authorities change recommendations without transparently explaining the scientific basis for the shift or acknowledging inherent uncertainties (Sauer et al., 2021). In this context, institutional communication failures were not limited to factual inaccuracies; they also included simplifications, omissions, and the strategic withholding of information intended to manage public reaction, which ultimately exacerbated confusion and fostered skepticism (Toppenberg-Pejcic et al., 2019).

For the present study, omission is especially relevant. Risk communication failures can occur not only when institutions say the wrong thing, but also when they fail to say something important. If official guidance omits evidence relevant to protection choices, such as the difference between source control and personal respiratory protection, or the relative performance of different mask types, then citizens cannot fully evaluate their own risk or select the most appropriate protective measure. This makes transparency a substantive requirement of health communication, not merely an ethical ideal (Paakkari & Okan, 2020).

Beyond its public health dimension, institutional risk communication during emergencies is also a management sciences problem in its own right. From a public-sector management perspective, communicating under emergency conditions requires institutions to make resource-constrained decisions under incomplete and rapidly evolving information, balancing clarity, operational feasibility, and public trust (Reynolds & Seeger, 2005). These choices are a form of accountability in practice: public organizations are evaluated not only on the accuracy of what they communicate, but on the consistency between their formal communicative obligations and their actual practice across channels (Canel & Sanders, 2012). Analysing institutional mask communication as a case of decision-making under uncertainty therefore situates this study within management research on how public organizations translate contested or evolving technical evidence into operational guidance, and how the resulting communicative choices are governed, or left ungoverned, by formal oversight mechanisms such as the Spanish Law of Advertising and Institutional Communication (LCPI) discussed in Section 2.4.

2.2. Aerosol transmission of respiratory viruses

Scientific literature established aerosol transmission as a plausible mechanism for respiratory viruses well before the COVID-19 pandemic, though its relative importance varied by pathogen and context. For influenza A, in 2007 (Brankston et al., 2007) concluded that transmission primarily occurs at close range rather than over long distances, suggesting that traditionally defined airborne transmission was unlikely to be significant in most clinical settings. However, in 2006, Tellier (2006) reviewed published evidence indicating that aerosol transmission of influenza A could be an important mode, with implications for pandemic planning and the use of N95 respirators as personal protective equipment. Similarly, Tellier et al. (2019) used the convention of "airborne transmission" to mean particles $<10\ \mu\text{m}$, noting that for agents like influenza, aerosol potential depends on host, viral, and environmental factors and may be underestimated.

For coronaviruses, the 2004 SARS-CoV-1 outbreak provided direct evidence of aerosol spread. Yu et al. (2004) documented airborne transmission explaining large community outbreaks, which suggested that prevention efforts must account for this route. As SARS-CoV-2 emerged, early laboratory data reinforced these findings: van Doremalen et al. (2020), published March 17, 2020, showed SARS-CoV-2 remained viable and infectious in aerosols for hours, echoing SARS-CoV-1 patterns associated with nosocomial spread and super-spreading events.

The World Health Organization (WHO) initially emphasized handwashing and social distancing, measures insufficient against aerosol inhalation of small, virus-laden droplets traveling meters indoors. In June 2020, Morawska & Cao (2020) criticized this approach, arguing science supported aerosol transmission as significant indoors, yet no authorities addressed it in regulations. On November 1, 2020, Morawska & Milton (2020) appealed for recognition of airborne spread via microscopic respiratory droplets at short-to-medium distances (up to room scale), advocating mitigation measures.

The WHO formally acknowledged aerosol transmission possibility in its July 9, 2020 scientific brief, though cautiously limited to specific contexts (WHO, 2020). Its guidance evolved in 2021 toward more explicit airborne recognition, as in the Roadmap to improve indoor ventilation, following scientific advocacy (WHO, 2021). On May 13, 2021, Greenhalgh et al. (2021) later synthesized ten reasons supporting SARS-CoV-2 airborne transmission, consolidating this shift. In August 2021, Wang et al. (2021) extended this to respiratory viruses broadly, including influenza and COVID-19.

In Spain, the Consejo Superior de Investigaciones Científicas (CSIC) took a decisive stance. In October 2020, Minguión et al. (2020) issued ventilation guidelines for classrooms recognizing aerosol transmission. On October 29, 2020, Alcamí et al. (2020) analysed WHO positions and studies, finding substantial scientific support for aerosols as potentially dominant, especially in super-spreading, and stressed explaining airborne spread via exhaled particles traveling beyond 1-2 meters. The CSIC thus bridged pre-pandemic evidence with COVID-19 realities, advocating ventilation, filtration, and masks ahead of broader institutional shifts.

This chronological progression, from established influenza/coronavirus aerosol evidence, through WHO caution yielding to advocacy, to CSIC's proactive stance, highlights an evolving recognition that is critical to the analysis of institutional communication.

2.3. Mask typology, aerosol protection, and the recommendations of regulators

Not all face masks provide equivalent protection against aerosol transmission. They can be classified into (i) hygienic or community masks, intended to reduce the emission of large respiratory droplets; (ii) surgical masks (Type I and II), designed primarily to protect patients or the environment from the wearer's respiratory secretions while providing limited protection to the wearer; and (iii) filtering facepiece respirators (FFP1, FFP2/N95, FFP3), which are personal protective equipment designed to protect the wearer against airborne particles.

European FFP2 respirators, standardised under EN 149:2001+A1:2009, must achieve $\geq 94\%$ filtration efficiency for sodium chloride ($0.06\text{ }\mu\text{m}$ MMAD) or paraffin oil aerosols ($0.4\text{ }\mu\text{m}$ MMAD), with a maximum inward leakage of 8%; FFP3 respirators achieve 99% filtration under the same conditions. Their U.S. equivalent, the N95 respirator (NIOSH 42 CFR Part 84), requires $\geq 95\%$ filtration efficiency for particles near the most penetrating particle size (approximately $0.3\text{ }\mu\text{m}$; certification tests use NaCl aerosol with MMAD around $0.26\text{ }\mu\text{m}$). NIOSH (2025) identifies respirators as the highest level of respiratory protection because they combine high filtration efficiency with a tight facial seal that minimises inward leakage. By contrast, although surgical masks achieve high bacterial filtration efficiency ($\geq 98\%$ for Type II; EN 14683:2019+AC:2019), they are neither certified for submicron aerosol filtration nor designed to provide a tight seal, allowing substantial peripheral air leakage (Greenhalgh et al., 2021; Tcharkhtchi et al., 2020; NIOSH, 2025).

Before COVID-19, evidence already showed that masks and respirators reduced clinical respiratory illness and influenza-like illness compared with no intervention (Offeddu et al., 2017). However, randomized trials comparing respirators with surgical masks produced less conclusive results. Smith et al. (2016) found insufficient evidence to demonstrate that N95 respirators were

consistently superior for preventing transmissible acute respiratory infections in healthcare workers, despite their clear laboratory advantage. They reported greater protection against clinical respiratory illness and laboratory-confirmed bacterial infections, but not against viral infections or influenza-like illness. These findings reflect real-world factors such as poor fit, inconsistent use, variable adherence, and heterogeneous study designs.

During the COVID-19 pandemic, the evidence became more consistent. Wu et al. (2023) found that N95 respirators significantly reduced COVID-19 risk, particularly among healthcare workers, whereas surgical masks did not. Kim et al. (2020) confirmed that surgical masks were less effective than N95 respirators in blocking SARS-CoV-2 emitted by coughing patients. MacIntyre et al. (2025) concluded that respirators provide greater protection than masks in healthcare settings when worn continuously and, in community settings, that N95 respirators outperform surgical masks, which outperform cloth masks, although even cloth masks confer some protection. Collectively, these findings suggest that the technical advantages of respirators can translate into clinical and public health benefits when they are used correctly and consistently, while the uncertainty reported in earlier meta-analyses reflects methodological limitations rather than contradictions with established evidence on filtration efficiency and facial seal.

For clarity, this study uses the following terminology consistently throughout: “high-filtration respirators” refers to FFP2, FFP3, N95, or equivalent filtering facepiece devices; “low-filtration masks” refers collectively to surgical masks (Type I/II) and hygienic/fabric (community) masks, distinguished as “surgical masks” and “hygienic/fabric masks” respectively where the source material allows this distinction.

2.4. Institutional communication of the Ministry of Health of Spain

The Ministry of Health (Ministerio de Sanidad) is the central institutional actor in Spanish public health communication. As part of the Administración General del Estado, it has a dual mandate: implementing national health policy and ensuring transparent, accurate, and public-interest communication with citizens (Ley 29/2005, de 29 de diciembre, de Publicidad y Comunicación Institucional). Institutional communication is therefore a constitutive element of democratic legitimacy and accountability. In public health, the quality of official messaging is particularly important because it shapes risk perception, influences protective behaviour, and affects trust in public institutions. The Ministry thus functions not only as an administrative body but also as a primary epistemic authority whose communicative decisions have direct implications for population health.

The principal legal framework governing this activity is Ley 29/2005, de 29 de diciembre, de Publicidad y Comunicación Institucional (LPCI), which regulates institutional advertising and communication campaigns promoted by the Administración General del Estado and its dependent public entities. It requires such campaigns to comply with the principles of general interest, institutional loyalty, veracity, transparency, efficacy, responsibility, and budgetary austerity, while limiting their purpose to informing, alerting, and serving citizens and prohibiting political self-promotion or ideological persuasion. The LPCI is implemented through the annual Plan de Publicidad y Comunicación Institucional, prepared by the Comisión de Publicidad y Comunicación Institucional and approved by the Council of Ministers. Only communications involving the purchase of advertising space or external creative services qualify as institutional campaigns under the LPCI and are therefore subject to its oversight, prohibition, and rectification mechanisms.

However, the communicative output of the Ministry of Health extends well beyond these formally regulated campaigns. Institutional communication scholars have consistently distinguished between

planned, mediated communication (corresponding to contracted campaigns) and the broader corpus of government communication, encompassing all deliberate acts through which public institutions produce and disseminate information toward publics (Canel et al., 2012). In the case of the Ministry of Health, this broader corpus comprises at least five distinct formats: (i) press releases (*notas de prensa*) published on the official website; (ii) press conferences and public appearances (*ruedas de prensa*) by ministerial officials; (iii) technical and scientific documents (*documentos técnicos*, guidelines, and *preguntas frecuentes*); (iv) audiovisual and graphic materials (video content, posters, banners, and GIFs); and (v) formal informational campaigns (*campañas informativas*), which alone fall within the strict scope of the LPCI. Formats (i) through (iv), while excluded from the LPCI's procedural controls, since they do not involve advertising space purchases or external creative contracts, constitute quantitatively dominant and practically influential vectors of institutional health messaging, reaching audiences equivalent to or greater than those of formally regulated campaigns (Graber, 2003).

This regulatory asymmetry has important analytical implications. As Graber (2003) argues, public organizations shape citizens' decisions through both formal communication campaigns and routine information releases. In health crises, official websites, press releases, and press conferences become the main sources of information for citizens and the media, regardless of their legal status under the LPCI (Canel, 2018). The Ministry of Health's official website (www.sanidad.gob.es) integrates these formats into a single digital platform, providing access to press releases, technical documents, campaign materials, and related resources, thereby blurring the regulatory distinction between campaign and non-campaign communication.

Accordingly, this study analyzes the Ministry's communication during 2020–2025 through two complementary sources: (i) press releases (*notas de prensa*) published on the official website and (ii) institutional information campaigns formally designated by the Ministry, together with their associated materials. This approach treats institutional communication as an integrated ecosystem, encompassing both communications governed by the LPCI and the broader body of official messaging through which guidance on respiratory protection, including recommended mask types, was conveyed to the Spanish public.

3. Methods

This study employed a documentary content analysis to examine the full spectrum of institutional health communication produced by the Spanish Ministry of Health (Ministerio de Sanidad) between January 2020 and December 2025. Rather than restricting the corpus to formally regulated campaigns under Ley 29/2005 de Publicidad y Comunicación Institucional, the analysis encompasses all communicative outputs disseminated through the Ministry's official website during the study period, reflecting the objective of capturing the complete informational ecosystem through which official guidance on respiratory protection reached the public. Two complementary data sources were analysed: the press releases (*notas de prensa*) published on the website, and the informational campaigns formally designated as such by the Ministry, together with all directly associated materials accessible via hyperlinks.

For the press releases, a web scraping script was developed using Python in the Google Colaboratory environment to systematically retrieve all items published within the defined time frame. The full script is provided in the supplementary materials to ensure reproducibility. The extraction covered 2,060 press releases, spanning from the first item in the study period (<https://www.sanidad.gob.es/gabinete/notasPrensa.do?id=4765>) to the last

(<https://www.sanidad.gob.es/gabinete/notasPrensa.do?id=6824>). In a first filtering step, the script selected all items containing the Spanish-language terms "mascarilla" or "mascarillas" (face mask / face masks), resulting in 144 documents. Since all source materials are published in Spanish, all search terms were applied in that language. In a second step, the script identified within those 144 items whether terminology associated with high-filtration respiratory protection appeared, specifically: 'ffp2', 'ffp3', 'n95', 'kn95', 'epi', 'aerosol', 'aerosoles', 'filtrado' (FFP2, FFP3, N95, KN95, personal protective equipment, aerosol, aerosols, filtration), or, alternatively, terms associated with lower-filtration protection: 'quirúrgica/s' (surgical), 'tela' (fabric/cloth), 'higiénica/s' (hygienic).

The initial filtering criterion was based on the terms "mascarilla"/"mascarillas" because, in Spanish institutional discourse, references to filtration performance, aerosol transmission, or respirator types (FFP2, FFP3, N95) are only communicatively meaningful when embedded within an item that also addresses mask use as such.

For the campaigns, all communications formally designated as "informational campaigns" (campañas informativas) on the Ministry's website were identified and arranged chronologically for analysis. All associated materials, including graphic files, PDFs, and video content, were retrieved and stored either as hyperlinks or local files.

For each identified item across both sources, the following variables were recorded: date of publication; descriptive summary; whether the subject matter concerned influenza, COVID-19, or both; and the format of the material, coded as: (1) press release, (2) technical document, (3) graphic material (poster, banner, or GIF), (4) video material, or (5) press conference. Additionally, it was recorded whether the concept or image of a face mask appeared, and if so, which mask typology was represented: hygienic, surgical, or high filtration. The presence or absence of any reference to aerosol transmission was also coded. For campaigns comprising multiple associated materials (e.g., a poster, a video, and a set of GIFs released under a single campaign name), each individual material was treated as a separate unit of analysis and coded independently, while the campaign name was retained as a grouping variable for descriptive purposes. Visual classification of mask type in graphic and video materials was based on three criteria: overall shape (FFP2/FFP3 respirators typically present a distinctive moulded, duck-billed shape, in contrast to the flatter rectangular or pleated shape of surgical and hygienic masks), facial seal (a close, contoured fit against the face, without visible lateral gaps, is characteristic of high-filtration respirators), and surface texture (the non-woven, rigid texture of FFP2/FFP3 material is visually distinguishable from the thinner, more flexible material of surgical masks and the woven texture of fabric masks in most cases). Cases considered uncertain by the two authors were flagged separately in a shared record (five cases in total across both coders). Among the non-flagged cases, coding was fully consistent between the two authors, with no disagreements. For the five uncertain cases, the final classification was determined jointly by consensus between the two coders. All documentation is freely available in Zenodo: <https://doi.org/10.5281/zenodo.19658987>

4. Results

4.1. Press releases published on the official Ministry website

Of the 2,060 press releases retrieved for the 2020–2025 period, 144 (6.99%) contained the term mascarilla or mascarillas. Table 1 summarizes the distribution of references to mask typology within this subset.

Table 1. Press releases mentioning face masks and references to low- and high-filtration protection (2020–2025)

	High-filtration	Low-filtration	Press releases mentioning mask(s)
Number of press releases	14	47 (10 hygienic/fabric; 44 surgical)*	144
Number of mentions	24	123	—

* The combined count of hygienic/fabric (10) and surgical (44) references exceeds the total of 47 low-filtration press releases because seven items mentioned both subtypes simultaneously.

Source: authors' own elaboration.

Of the 144 press releases containing any mask-related term, 51 referred explicitly to a specific mask typology. Low-filtration masks were mentioned in 47 items (32.6% of the total corpus), with surgical masks accounting for the majority of these items (44 items; 30.6%) and hygienic or fabric masks representing a smaller proportion (10 items; 6.9%). By contrast, high-filtration respirators (FFP2 and/or FFP3) were mentioned in only 14 items (9.7%). Ten press releases referred to both mask categories simultaneously.

To formally test whether the asymmetry between low- and high-filtration mentions reflected a statistically significant pattern, a McNemar test was applied to the paired 144-item corpus (Table 2). The result confirmed that low-filtration masks were mentioned significantly more frequently than high-filtration respirators (McNemar $\chi^2(1) = 26.56$, $p < 0.0001$).

Table 2. Paired 2×2 contingency table for the McNemar test on high- vs. low-filtration mentions (144 press releases)

	Low-filtration: Yes	Low-filtration: No
High-filtration: Yes	10	4
High-filtration: No	37	93

Note: No continuity or exact correction was applied (McNemar $\chi^2(1) = (|4-37|)^2/(4+37) = 26.56$, $p < 0.0001$).

Source: authors' own elaboration.

With respect to thematic context, 49 of the 51 press releases mentioning a specific mask type did so exclusively in relation to COVID-19. The remaining two, both published in 2025 (15 January and 3 December), addressed respiratory infections as a broader clinical category encompassing influenza, the common cold, pneumonia, and COVID-19 among others.

A temporal analysis of the 51 items reveals a notable pattern. Among the 37 press releases from 2020 that referred to specific mask types, 7 (18.9%) mentioned high-filtration respirators and/or aerosol transmission. This proportion rose markedly in 2021, when 7 of the 12 relevant press releases (58.3%) included such references. Notably, no press releases containing explicit references to mask typology were identified for the years 2022, 2023, or 2024, representing a complete absence of ministerial messaging on this topic during a three-year interval. The two press releases from 2025, by contrast, contained no mention of either high-filtration protection or aerosol transmission. Taken together, this temporal distribution suggests that explicit acknowledgment of aerosol-related evidence and high-filtration respirators peaked during 2021, coinciding with the period of greatest scientific debate on airborne transmission, before disappearing entirely from ministerial messaging in the final years of the study period.

4.2. Institutional campaign materials

A total of 143 campaign items were identified and analysed during the study period (IDs 62–204), spanning formats including technical documents, graphic materials (posters, banners, GIFs), video

content, and press conferences. Of these, 125 were classified as COVID-related, 14 as influenza-related, and 4 as addressing both or other acute respiratory infections. Overall, 55 items (38.5%) contained any visual or textual reference to face masks. Among these, references to surgical masks were by far the most frequent (33 items), followed by hygienic or fabric masks (13 items), while high-filtration respirators (FFP2 or equivalent) appeared in only 6 items across the entire corpus. Table 3 summarizes this distribution by year and thematic category.

Table 3. Distribution of campaign materials by year, theme, and mask typology (2020–2025)

Year	Theme	Total items	Items with mask	Hygienic/fabric	Surgical	High-filtration
2020	COVID	95	31	8	17	5
2020	Flu	3	2	0	2	0
2020	COVID and other respiratory viruses	1	1			
2021	COVID	29	17	3	10	1
2021	Flu	2	0	0	0	0
2022	COVID	1	1	1	1	0
2022	Flu	3	3	1	3	0
2023	COVID, flu, and other respiratory viruses	3	0	0	0	0
2024	Flu	6	0	0	0	0
2025	—	0	0	0	0	0
Total		143	55	13	33	6

Source: authors' own elaboration.

4.2.1. COVID-related campaign materials

Emergency response (March–December 2020)

The earliest campaign materials, produced during the declaration of the state of emergency and the subsequent phases of de-escalation, were predominantly focused on hand hygiene, physical distancing, and emotional support. When masks did appear, they were represented visually and textually as hygienic or surgical devices, with few references to high-filtration respirators.

A particularly significant item is ID 99 (¿Qué debes tener en cuenta al comprar una mascarilla? [What to consider when buying a mask], May 2020), a technical document that described hygienic and surgical masks as providing adequate protection provided they were combined with hand hygiene and a physical distance of 1.2 metres — a framing that, given the emerging aerosol evidence reviewed in Section 2.2, implicitly presented low filtration masks as sufficient barriers against airborne transmission. ID 133 (Uso de mascarillas quirúrgicas en la población general [Use of surgical masks in the general population], December 2020) constituted an explicit mask typology recommendation for the general public during this phase, formally endorsing surgical masks and extending their use to vulnerable populations — again without acknowledging the limitations of surgical masks with respect to aerosol inhalation. In the accompanying video (ID 135, El mejor regalo es cuidarnos [The best gift is to take care of each other]), all protagonists appear wearing surgical masks, with the single exception of one young adult whose mask appears to be hygienic rather than high filtration (Figure 1).

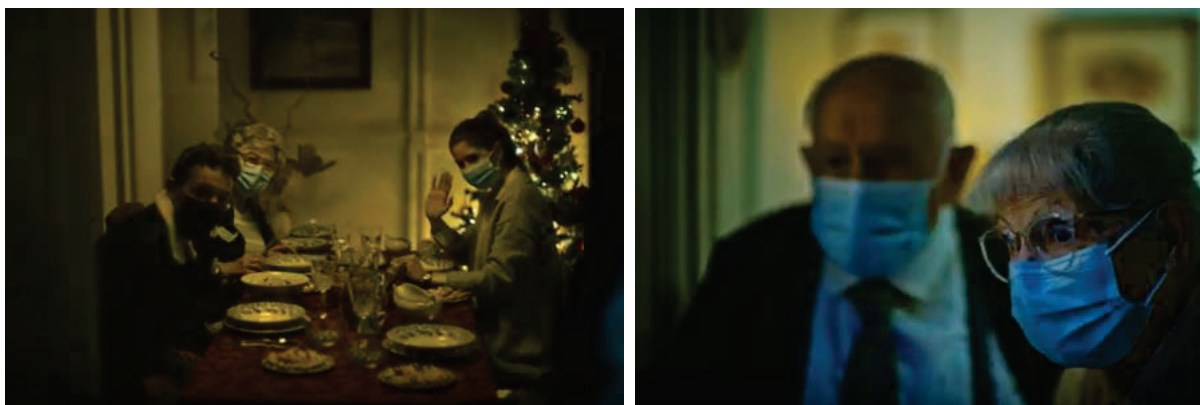


Figure 1. Frames of the COVID-19 video campaign "El mejor regalo es cuidarnos" [The best gift is to take care of each other], December 2020. All the people shown wore surgical masks except for one, who wears a hygienic mask

Source: The Spanish Ministry of Health.

In a December 2020 press conference (IDs 143, 145), the Minister of Health, Salvador Illa, wore a surgical mask while announcing the vaccination strategy. In the accompanying vaccination promotion video (ID 144), all three experts who appeared also wore surgical masks (Figure 2).



Figure 2. Frames of the COVID-19 vaccination video campaign, December 2020. All three experts appearing in the video wore surgical masks

Source: The Spanish Ministry of Health.

The sole materials in this phase containing any element suggestive of high filtration protection or airborne transmission were ID 113 (Salimos más fuertes [We come out stronger], May 2020), in which healthcare workers appear wearing what can be identified as FFP2 type respirators alongside surgical masks (Figure 3), and IDs 127/150 (Esto no es un juego [This is not a game], September 2020), in which professionals using full PPE are visible (Figure 4). However, neither item contains any explicit textual reference to FFP2 respirators or aerosol transmission, and their visual presence appears incidental to the main communicative message.

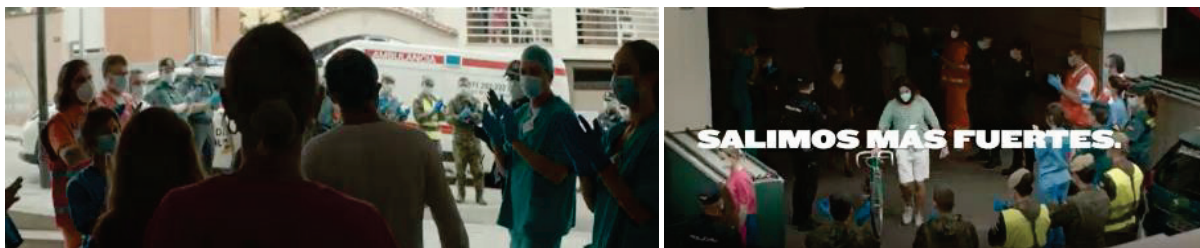


Figure 3. Frames of the COVID-19 video campaign "Salimos más fuertes" [We come out stronger], May 2020. Almost everyone shown wore surgical or hygienic masks, with the exception of a few healthcare workers

Source: The Spanish Ministry of Health.



Figure 4. Frames of the COVID-19 video campaign "Esto no es un juego" [This is not a game], September 2020. All the people shown wore surgical or hygienic masks, except for the healthcare workers

Source: The Spanish Ministry of Health.

Vaccination rollout and transition (January–September 2021)

The 2021 campaign corpus is dominated by the Yo me vacuno seguro campaign (IDs 181–186, April 2021) [I get vaccinated safely], in which all protagonists: a nurse, a virologist, a retired person, and two young persons, appear in surgical masks throughout. Notably, this campaign coincides with the period in which, as reported in Section 4.1, the highest proportion of press releases (58.3%) referenced high filtration masks or aerosol transmission — a dissociation between the press release corpus and the visual campaign messaging that warrants attention (Figure 5).



Figure 5. GIFs from the COVID-19 campaign "Yo me vacuno Seguro" [I get vaccinated safely], April 2021. All the people shown wore surgical masks

Source: The Spanish Ministry of Health.

Two items in this phase merit particular qualitative attention. ID 171 (Mascarillas higiénicas para la población general [Hygienic masks for the general population], August 2021) constituted a dedicated document establishing the mandatory use of hygienic masks across a wide range of indoor and outdoor settings, including crowded outdoor events and all forms of public transport — environments where aerosol exposure is plausible and where, as established in Section 2.3, hygienic masks do not provide certified inward filtration protection. The framing of obligation in the absence of efficacy qualification is communicatively significant: citizens were legally required to use a device whose protective mechanism against aerosol inhalation was not addressed. ID 176 (Preguntas frecuentes sobre mascarillas higiénicas [Frequently asked questions about hygienic masks], March 2021) is the only document in the entire corpus to explicitly acknowledge, on page 27, that hygienic masks are not comparable to high filtration FFP2 respirators, a technically accurate statement that was, however, embedded within a document whose primary purpose was to standardize and promote the use of hygienic masks, and which did not translate this technical distinction into actionable guidance for the general public.

Normalization (2022 onwards)

Only one COVID-specific item was identified after 2021: ID 191 (Preguntas y respuestas sobre COVID-19 y centros educativos [Questions and answers about COVID-19 and educational settings], May 2022). This document recommended reusable hygienic masks as the preferred option for healthy school-age populations on the grounds of breathability and sustainability, explicitly positioning hygienic masks as preferable to both surgical masks and FFP2 respirators — the latter being mentioned solely for individuals with specific health vulnerabilities. No further COVID campaign materials containing mask references were recorded for 2023, 2024, or 2025.

4.2.2. Influenza campaign materials

Influenza campaign materials were identified for 2020 (IDs 62–64), 2021 (IDs 189–190), 2022 (IDs 192–194), and 2024 (IDs 199–204). Across all four cycles, the pattern is consistent: no item in any influenza campaign contained a reference to high filtration respirators or to aerosol transmission. Where masks appeared visually — as in the 2020 flu campaign poster featuring an elderly man, the 2022 animated video (ID 193), and the multi scene 2022 promotional video (ID 194) — the masks depicted were uniformly surgical, with a single exception: one healthcare professional in ID 194 appears to wear a high filtration device. The 2024 campaign (Que la gripe no te/les/nos pare [Don't let the flu stop you/them/us], IDs 199–204) contained no mask references whatsoever across its six items. The Q&A documents for citizens and healthcare professionals (IDs 189–190, 2021) similarly omit any mask typology discussion. This unbroken uniformity across five years of influenza communication reinforces the pattern identified in the COVID corpus: the visual and textual language of official respiratory infection campaigns systematically foregrounded low filtration protection and rendered high filtration respirators communicatively invisible outside of explicitly occupational or acute clinical contexts (Figures 6–9).

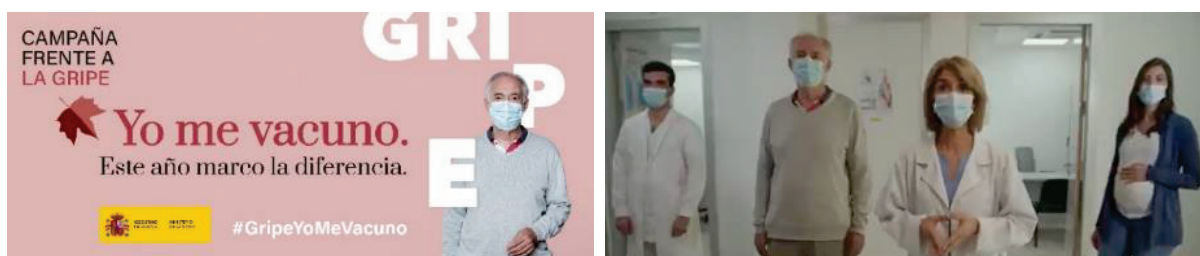


Figure 6. GIF (left) and video frame (right) from the flu campaign "Gripe: yo me vacuno" [Flu: I get vaccinated], September 2020

Source: The Spanish Ministry of Health.



Figure 7. Frame from the animated video (left) and banner (right) of the flu campaign "Orgullosos de vacunarnos" [Proud to get vaccinated], October 2022

Source: The Spanish Ministry of Health.



Figure 8. Frames from the video of the flu campaign "Orgullosos de vacunarnos" [Proud to get vaccinated], October 2022. One person can be identified as wearing a high-filtration mask based on shape and facial seal; the others are visually consistent with surgical masks

Source: The Spanish Ministry of Health.



Figure 9. GIFs from the flu campaign "Animales a vacunarse" [Encourage them to get vaccinated], October 2024. No person wore any mask

Source: The Spanish Ministry of Health.

5. Discussion

The results document a systematic pattern: across six years, low-filtration masks were referenced far more frequently than high-filtration respirators in both press releases and campaign materials, despite robust scientific consensus on aerosol transmission and the superior protection of FFP2 respirators (WHO, 2020; Greenhalgh et al., 2021; Wu et al., 2023; MacIntyre et al., 2025). What is analytically significant is its structure: the asymmetry is temporally organized, internally consistent across format types, and it persists even after the scientific case for airborne transmission had been formally acknowledged by international bodies (WHO, 2020; 2021) and by Spain's own CSIC (Minguillón et al., 2020; Alcamí et al., 2020).

Three dimensions of this pattern deserve particular discussion. First, the communicative invisibility of FFP2 respirators as a public health tool: Throughout the study period, high-filtration respirators were never constructed, in the Ministry's messaging, as an option for the general public. Their occurrence in the corpus (14 press releases out of 144, and 6 campaign items out of 143) were predominantly incidental: healthcare workers visible in the background of videos, or technical references buried in documents whose primary purpose was to promote other mask types. The one document that explicitly acknowledged the technical superiority of FFP2 over hygienic masks (ID 176) simultaneously framed that superiority as irrelevant to the general public, burying the comparison in page 27 of a document entitled Frequently Asked Questions on Hygienic Masks. This placement limited the practical accessibility of the information to its intended audience, even though the underlying technical content was accurate. The CERC framework's requirement that communication be honest, candid, and complete is not satisfied by accurate information that is systematically rendered inaccessible to its intended recipients. From a health literacy perspective (Paakkari & Okan, 2020), the epistemic asymmetry between what the Ministry knew, as evidenced by the technical content of ID 176, and what it chose to foreground in its public-facing materials constitutes precisely the kind of omission that erodes informed decision-making without appearing, on the surface, to be dishonest.

Second, the intra-corpus dissociation of 2021: Perhaps the most structurally revealing finding in this study is the temporal coincidence, in 2021, between the highest rate of high-filtration and aerosol references in press releases (58.3% of relevant items) and a campaign corpus, specifically the *Yo me vacuno seguro* campaign, in which every protagonist appeared in surgical masks, with no exception. This dissociation is not easily explained by logistical lag or production timelines: the campaign was designed, contracted, and launched in April 2021, months after the scientific debate on aerosol transmission had been widely reported in Spanish media and formally addressed by the WHO (2020) and CSIC (Minguillón et al., 2020; Alcamí et al., 2020). The technical register of press releases evolved with emerging evidence, while the visual register of campaigns remained simpler, suppressing the distinction between mask types. This pattern is consistent with a communicative emphasis on behavioural compliance rather than on detailed technical explanation. Whether this reflects a deliberate strategic choice or an emergent effect of routine institutional practice cannot be established from the documentary record alone, and this distinction should be treated as an open question for future research rather than as a finding of this study.

And third, the mandatory use of a device whose limitations were not communicated: Document ID 171, published in August 2021, established the legal obligation for citizens to wear hygienic masks across a wide range of settings (31 *san* public spaces, crowded outdoor events, and all forms of public transport). By this point, the aerosol route of transmission was not a matter of scientific controversy: van Doremalen and colleagues had demonstrated SARS-CoV-2 viability in aerosols as early as March 2020 (van Doremalen et al., 2020), the WHO had formally acknowledged aerosol transmission in July 2020, WHO (2020) and Greenhalgh et al. (2021) had synthesized ten reasons supporting airborne spread in May 2021. Mandating a protective measure without explaining what it protects against and what it does not deprives citizens of the information required to make supplementary protective decisions, such as improving ventilation or choosing a higher-filtration device for high-risk scenarios.

The influenza campaign data reinforce this argument. Although influenza 31 *san* aerosol-transmitted pathogen (Brankston et al., 2007; Tellier, 2006), none of the campaigns over the five-year period referred to airborne transmission or high-filtration respirators. Instead, they promoted the same framework applied to COVID-19: surgical masks for symptomatic individuals, no masks for the healthy population, and vaccination as the primary preventive measure. This consistency suggests that

the Ministry's communication was driven less by pathogen-specific aerosol dynamics than by an institutional source-control paradigm inherited from pre-pandemic infection control, in which masks are presented primarily as protecting others rather than the wearer. This paradigm persisted despite growing scientific evidence supporting a more differentiated approach.

Finally, the regulatory structure documented in Section 2.4 offers a partial systemic explanation for these findings. The Ley 29/2005 de Publicidad y Comunicación Institucional subjects only formally contracted campaigns to principles of veracity and transparency. The vast majority of the Ministry's communications (press releases, technical documents, press conferences, and informational graphic materials) operate outside this regulatory perimeter. The result is a system in which the most widely consumed public health messages are subject to the weakest formal accountability requirements. As Canel and Sanders (2012) have argued, the legitimacy of government communication rests on the consistency between its formal obligations and its actual practice across all channels. When the channels most likely to reach a general audience (a poster, a GIF, a 60-second video) are also those least subject to formal veracity controls, the regulatory architecture of institutional communication is systematically misaligned with its communicative function.

5.1. Limitations

Several limitations of this study warrant acknowledgment. First, the analysis is restricted to the national Ministry of Health. Because Spain's decentralised system delegates substantial public health authority to the seventeen autonomous communities—each producing its own pandemic campaigns—this study cannot capture regional variation. Future research should analyze regional health authority outputs to assess heterogeneity across Spain's territorial governance.

Second, this documentary analysis precludes causal inferences regarding the relationship between official messaging and population behaviour. While demonstrating a pattern of omission in official communication, the study does not prove that this omission altered mask selection or health outcomes. Establishing such causal links would require complementary data on media exposure, public attitudes, and behavioural compliance, which fall outside the current scope.

Third, the analysis treats all communicative items as equivalent in analytical weight. A national television broadcast and a technical PDF are analysed equally, despite vast differences in reach and salience. While standard in content analysis, this equivalence assumption limits conclusions about the actual informational environment. Thus, these findings document the structure and thematic emphases of the Ministry's output rather than public exposure or communication effectiveness. Future studies could weight items by audience metrics or media spend to enhance ecological validity.

Fourth, during the 2020–2025 study period, scientific understanding of aerosol transmission evolved substantially. Although the Ministry was evaluated against the best available evidence at each time point, determining the precise lag required to translate scientific consensus into policy communication remains a matter of institutional judgment.

Fifth, although explicit criteria were used for the visual classification of mask type (shape, facial seal, and surface texture; see Methods), this classification necessarily involves a degree of interpretive judgment, particularly for materials where a mask is shown briefly, at a distance, or partially out of frame. This uncertainty is lower for items where mask type was stated explicitly in the accompanying text, but higher for purely visual identification. Future studies could address this by incorporating a formal visual-coding reliability check (e.g., a subsample re-coded by external raters).

Sixth, as a documentary content analysis, this study can describe patterns of presence and absence of specific references in institutional communication, but it cannot establish whether these

patterns resulted from deliberate omission, routine institutional practice, or other unobserved factors. Distinguishing between these explanations would require additional evidence, such as internal institutional records or interviews with communication staff, which fall outside the scope of this study.

6. Conclusion

This study examined how the Spanish Ministry of Health communicated about face masks between 2020 and 2025, and how that communication aligned with the scientific evidence on aerosol transmission and respirator efficacy. Overall, the pattern was consistent: official messaging repeatedly highlighted low-filtration masks, while FFP2 respirators remained largely absent as a public health option. This was especially evident in campaign materials, where references to high-filtration protection were rare and aerosol transmission was never mentioned.

These findings point to a broader tension in public health communication between simplicity and completeness. The evidence suggests that it is entirely possible to explain the hierarchy of respiratory protection to the general public in a clear and accessible way. Yet across six years of materials, that distinction was consistently left out of public-facing communication, suggesting a preference for simplified guidance over fuller explanation, or possibly institutional constraints that limited what could be communicated.

Beyond the Spanish case, the study has clear implications for future respiratory emergencies. It shows that the challenge is not a lack of scientific knowledge, but how that knowledge is translated into official messages across different channels. In that sense, the study provides a concrete example of what happens when public health communication falls short of being fully transparent and evidence-based.

Data Availability Statement

The datasets generated and analysed for this study can be found in the Zenodo repository: <https://doi.org/10.5281/zenodo.19658987>

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