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Émilien Schultz, Léo Mignot, Jeremy K Ward, Daniela Boaventura Bomfim,
Christian Chabannon, Julien Mancini

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1 **Public perceptions of the association between drug effectiveness and drug novelty in**
2 **France during the COVID-19 pandemic**

3 *Short title: Perception of the association between drug novelty and effectiveness*

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5 É.Schultz^{1,2,*}, L. Mignot^{3,4}, J. Ward^{5,6}, D. Boaventura^{3,7}, C., Chabannon⁸, J. Mancini^{2,9}

6 * corresponding author : emilien.schultz@ird.fr

7 ¹ CEPED (UMR 196), Université de Paris, IRD, 75006 Paris, France

8 ² SESSTIM, Sciences Economiques & Sociales de la Santé & Traitement de l'Information
9 Médicale, CANBIOS Team (Équipe Labellisée LIGUE 2019), Aix-Marseille University,
10 INSERM, IRD, 13009 Marseille, France

11 ³ Univ. Bordeaux, CNRS, CED, UMR 5116, F-33600 Pessac, France

12 ⁴ Sciences Po Bordeaux, CNRS, CED, UMR 5116, F-33600 Pessac, France

13 ⁵ CERMES3, INSERM, CNRS, EHESS, Université de Paris, 94801 Villejuif, France

14 ⁶ VITROME, Aix-Marseille University, IRD, AP-HM, SSA, 13005 Marseille, France

15 ⁷ SIRIC BRIO, CHU de Bordeaux, Institut Bergonié, Université de Bordeaux, INSERM,
16 CNRS, 33000 Bordeaux, France.

17 ⁸ Module Biothérapies du Centre d'Investigations Cliniques en Biothérapies, Inserm CBT-
18 1409, Aix-Marseille Université, Institut Paoli-Calmettes Comprehensive Cancer Center,
19 Marseille, France

20 ⁹ BioSTIC, APHM, Timone, 13005 Marseille, France

21 **Abstract**

22 Objectives:

23 During the COVID-19 pandemic, public debates overtly addressed the promises of new
24 innovative treatments. Many of these debates pitted those who advocated for the
25 development of new treatments by pharmaceutical companies against those who favored

26 the repositioning of existing drugs. Our study explored perceptions of the association
27 between drug novelty and effectiveness as well as perceptions of the role of the
28 pharmaceutical industry in drug development.

29 Methods

30 Data were collected in January 2021 from a quota sample of the French population aged
31 18–75 years (N = 1,000) during the second round of the “Health Literacy Survey 2019”
32 (HLS₁₉).

33 Results

34 We tested the hypothesis that individuals with a high level of familiarity with the health care
35 system and those with a high level of trust in institutions are more likely to agree that new
36 drugs are more effective than old ones and that drug development should be driven by the
37 pharmaceutical industry. A quarter (25%) of respondents agreed that new drugs are always
38 more effective than old ones. Agreement with this statement was stronger among
39 respondents with a high level of familiarity with the health care system (as measured by the
40 Navigational Health Literacy score, OR 3.34 [2.13-5.24]) and among those with a high level
41 of trust in pharmaceutical companies or politicians. A high level of trust in pharmaceutical
42 companies was reported by 42% of respondents, and 43% agreed that drug development
43 should be driven by the pharmaceutical industry. Respondents who agreed that new drugs
44 are always more effective than old ones were almost four times more likely to agree that
45 drug development should be driven by the pharmaceutical industry (OR 3.85 [2.76-5.39]).

46 Conclusion

47 A better understanding of public attitudes towards new treatments is needed to elucidate
48 individual preferences in health care and their consequences on health behavior.

49 **Keywords:** drug innovation ; COVID-19 ; public attitude ; sociology

50 Introduction

51 During the COVID-19 pandemic, the development of new treatments, including vaccines,
52 became a global priority[1,2]. Innovative treatments were designed, manufactured, and
53 tested at an accelerated pace. They were also overtly discussed in the media as they
54 became available, sometimes even before their efficacy was robustly validated in clinical
55 trials. Some of the innovations that garnered media attention include mRNA vaccines and
56 the monoclonal antibodies administered to former president Donald Trump for his COVID-19
57 disease. Public debates on how to find a suitable cure pitted two camps against each
58 other[2–4]. On the one side were those who advocated for the development of new
59 treatments (such as Remdesivir [5]) by pharmaceutical companies. On the other were those
60 who favored the repositioning of existing drugs on the grounds that they are massively
61 available at low cost and that their safety has already been demonstrated. In the particular
62 context of France, the controversy over the effectiveness of hydroxychloroquine against
63 COVID-19 increased the demand for the drug, which carried the risk of adverse
64 effects[6,7] and led to drug shortages for other indications[8]. The following question was
65 thus brought to the forefront of public debates: Are new drugs more effective than old ones
66 for the treatment of COVID-19? Insofar as public perceptions of the association between
67 drug novelty and drug effectiveness affect health behavior and drive medical innovation – as
68 illustrated by the issue of vaccine hesitancy[9,10] – it is important that we better understand
69 these perceptions, especially in a social pharmacology perspective [11].

70 The success of modern medicine has largely hinged on the development of medical
71 technologies and on their diffusion in the general population. As a result, medical innovation
72 has become central to how modern medicine is perceived and discussed in the
73 media[12,13]. Expectations for better and more effective treatments, which underpin health
74 and innovation policies[14], are based on trust in scientific and technological

75 progress[15,16]. To fulfill those expectations, most modern democracies have adopted what
76 can be described as the standard model of innovation in medicine. According to this model,
77 academic and clinical researchers and actors of the pharmaceutical industry must
78 collaborate to achieve new effective therapeutic solutions under the regulation of state
79 agencies[17–20].

80 The standard model of innovation, however, is increasingly being criticized, both within the
81 medical profession and in the public space. Studies have demonstrated that novelty does
82 not equal better effectiveness, with only 25% of tested drugs showing increased therapeutic
83 effect[21]. Both the “me-too” marketing model (i.e. the commercialization of a drug that is
84 similar to a pre-existing drug) and economic incentives to market new products appear to
85 have affected the relationship between drug effectiveness and drug novelty[22]. The
86 acceleration of drug approval by regulatory agencies, in particular through mechanisms like
87 the Orphan Drug Designation and PRIME programs put in place by the European Medicines
88 Agency, have weakened the requirement for proof of effectiveness[23]. In this context,
89 physicians have begun publicizing the fact that new drugs are not necessarily better than old
90 ones and that their higher prices are not always justified[24]. Biomedical research, especially
91 when it is clearly driven by the pharmaceutical industry[25], is regularly criticized in the public
92 space, with some pointing out the unknown adverse effects of new drugs or
93 vaccines[26] and others highlighting potential conflicts of interest[27,28]. In particular, the
94 rising cost of innovative oncological treatments has been criticized as unjustified in view of
95 gains in effectiveness that could be considered as marginal or minor[29–31]. Unfortunately,
96 while public criticisms can contribute to a better regulation of the pharmaceutical
97 industry[32], they can also reinforce science-related populism[33].

98 The publicity given to medical controversies is not without consequences, as was made
99 clear during the COVID-19 pandemic. The violent debate over hydroxychloroquine had a
100 marked impact on health behaviors and attitudes[34,35] and on the production of scientific
101 knowledge. Traditional strategies for conducting clinical research were called into question,

102 slowing down enrollment in clinical trials such as Discovery (NCT04315948) and Recovery
103 (NCT04381936). The debate also had lasting consequences on public health policy in
104 countries such as Brazil, precluding the adoption of much-needed prevention strategies[36].
105 As such, it raised broader questions regarding the role of science and research in
106 society[37].

107 Although medical innovation is central to promises of progress in health, few public health or
108 social sciences studies have explored public perceptions of the association between drug
109 novelty and drug effectiveness. The few available data on the topic appear contradictory.
110 Some studies have shown that branded drugs are perceived more favorably than generic
111 ones[38], with a specific effect of labelling a treatment as 'new'[22]. Others have found that
112 older drugs tend to be perceived as safer and more effective than new ones, except in the
113 case of some innovative oncological treatments[39]. On a different note, a study on patient
114 preferences has suggested that perceptions of novelty are associated with specific
115 psychological characteristics[40]. Studies focusing on the food industry have shown that
116 trust in institutions has a positive impact on perceptions of new food products[41]. However,
117 given the specificities of the health sector, public perceptions of innovation in other domains
118 can hardly be extrapolated to it[42]. Most social science studies examining public
119 perceptions of innovation have focused on attitudes towards science in general and not
120 towards the medical sector. Nevertheless, these studies do provide context for perceptions
121 of medical innovation, with some stressing the effect of overall trust in institutions and others
122 highlighting the pervasiveness of suspicion of corporate influence in medicine[27,43]. Again,
123 vaccine hesitancy again provides a perfect illustration of these issues[10].

124 Our study aimed to explore perceptions of the association between drug novelty and
125 effectiveness from a social science perspective. Data were collected from a representative
126 sample of the French population via an online survey in January 2021. More specifically, we
127 tested the hypothesis that positive perceptions of medical innovation correlate with greater
128 acceptance of the standard model of innovation underlying medical institutions (H1).

129 Following our main hypothesis H1, individuals with a high level of familiarity with the health
130 care system and those with a high level of trust in institutions (doctors, scientists, politicians,
131 and/or pharmaceutical companies) are more likely to agree that new drugs are more
132 effective than old ones and that drug development should be driven by the pharmaceutical
133 industry. Two subsidiary hypotheses were tested, namely that individuals with a more direct
134 and practical experience of the health care system due to illness or ageing (H2a) and those
135 with low socio-economic status (H2b) are less likely to believe that drug novelty and drug
136 effectiveness are associated. Given the ongoing pandemic and massive media exposure of
137 biomedical research[3], we also tested the hypothesis that COVID-19 has had a specific
138 effect on perceptions of the association between drug effectiveness and drug novelty (H3).

139 **Methodology**

140 Design and sample

141 Data were collected the first week of January 2021 from a sample of the French population
142 aged 18–75 years (N = 1000) as part of the second round of the cross-sectional online
143 “Health Literacy Survey 2019” (HLS₁₉ - International Health Literacy Population Survey 2019-
144 2021 from M-POHL). The questionnaire administered during the second round of the survey
145 contained questions – on household income and on perceptions of the role of the
146 pharmaceutical industry in drug development (see *infra*) – that were not in the questionnaire
147 administered during the first round (in June 2020). We made sure that there were no
148 significant differences in responses to the questions that were common to both
149 questionnaires.

150 Participants were selected from a nationally representative French household research
151 panel developed by the survey research firm IPSOS (Paris, France). A total of 23,813
152 individuals were initially invited by email to fill out the questionnaire. Quota sampling was
153 used to match the French general population with regards to gender, age, area of residence
154 (rural vs. urban) and population density in the region of residence (as per official census

155 data). The largest difference between theoretical quotas and our sample was -1.3% for rural
156 area of residence (21.1% of the effective sample compared to 22.4% of the theoretical
157 sample). Collected data were weighed according to participants' demographic profile to
158 match the French general population – which explains why the number of respondents is
159 sometimes written with decimals. The study was approved by the Ethics Committee of the
160 French national biomedical research Institute INSERM (CEEI, IRB 00003888, 2020/04/04).

161 Data collection

162 Participants responded to the online self-administered questionnaire after providing informed
163 consent. The questionnaire focused on five main topics: (1) demographic characteristics
164 (gender, age, level of education, region of residence, household income, financial difficulties,
165 occupation, current health condition); (2) health literacy, health information-seeking behavior,
166 and ability to navigate the health care system; (3) perception of and familiarity with clinical
167 research; (4) trust in institutions (doctors, scientists, politicians, and/or pharmaceutical
168 companies); and (5) knowledge and concerns about the COVID-19 epidemic. The first two
169 topics were shared with HLS₁₉ European survey when the last three were specific to the
170 French survey.

171 The present study focuses specifically on responses to the following two statements: “New
172 drugs are always more effective than old ones” and “Drug development should be driven by
173 the pharmaceutical industry.” Response options were “Completely agree,” “Somewhat
174 agree,” “Somewhat disagree,” and “Completely disagree.”

175 Statistical Analysis

176 Several variables were recoded to ensure comparability and interpretability: “Educational
177 level” was recoded into three groups and “age” was recoded into four groups. Four-point

178 scales were dichotomized into “yes” vs. “no” for the following variables: “trust in doctors,”
179 “trust in politicians,” “trust in scientists,” “trust in pharmaceutical companies,” and “fear of
180 COVID-19.”

181 To measure familiarity with the health care system, we used the pre-existing Navigational
182 Health Literacy (Navigational HL, or NHL in this article) index proposed by Griese et al.[44].
183 This self-assessed measure draws on the 12-item version of the European Health Literacy
184 Scale (HLS-EU). In our study, each item of the NHL index was dichotomized into two
185 responses: “easy” (value 1) and “difficult” (value 0). The final score was calculated by
186 summing up the values obtained for each item. Participants were divided into quartiles
187 ranging from Q1 (low navigating skills) to Q4 (high navigating skills). The consistency of our
188 results was checked using the Health Literacy scale[45].

189 The association between variables was measured using Pearson’s correlation coefficient for
190 numeric variables and the chi-square test for categorical variables. Estimated proportions
191 were interpreted based on the margins of error provided by IPSOS, which ranged from 1.4 to
192 3.1 points.

193 Two binomial logistic regression analyses were performed to identify the (adjusted) factors
194 that influenced perceptions of the association between drug novelty and drug effectiveness
195 and perceptions of the role of the pharmaceutical industry in drug development. The
196 analyses were carried out using a main effect model with purposeful selection of
197 variables[46]. First, we selected variables showing univariate association with a $p=0.20$ and
198 entered them in the binomial regression model. Second, we removed non-significant
199 variables from the model (threshold value of $p=0.05$). Lastly, we re-entered each removed
200 variable in the model and tested it for significance. Statistical analyses were performed using
201 Python (Pandas 1.3.4 – Scipy 1.7.2 – Statsmodel 0.13.1).

202 **Results**

203 *Perceptions of the association between drug novelty and drug effectiveness*

204 A quarter (25%) of respondents agreed that new drugs are always more effective than old
205 ones, with only 3% agreeing completely.

206 Perceptions of the association between drug novelty and drug effectiveness were correlated
207 with familiarity with the health care system (**Table 1**). Indeed, 45% of respondents with a
208 high NHL score agreed that new drugs are always more effective than old ones, compared
209 to 16% of those with a low NHL score. Agreement was stronger among younger
210 respondents (33%) and among respondents situated at the two ends of the income scale
211 (34% for low household income and 37% for high household income). It was also stronger
212 among respondents with a high level of trust in politicians or pharmaceutical companies
213 (45% and 34%).

214 By contrast, respondents with poor health condition were less likely to agree that new drugs
215 are always more effective than old ones. A correlation was also found between perception of
216 risk and perception of the association between drug novelty and drug effectiveness. Thus,
217 16% of respondents who did not fear COVID-19 agreed that new drugs are always more
218 effective than old ones compared to 35% of those who did fear the disease.

219 The binary logistic regression analysis (**Table 2**, $R^2=0.11$) found a significant effect of
220 familiarity with the health care system on perceptions of the association between drug
221 novelty and drug effectiveness. Indeed, respondents with a high NHL score were more likely
222 to agree that new drugs are always more effective than old ones (OR 3.34 [2.13-5.24])
223 compared to respondents with a low NHL score. Perception of risk also appeared to have a

224 strong effect, as respondents who did not fear COVID-19 were more than two times less
225 likely to agree with this statement than those who did (OR 0.38 [0.18-0.82]).

226 Trust in doctors and scientists had a non-significant effect on perceptions of the association
227 between drug novelty and drug effectiveness. Respondents with a low level of trust in
228 pharmaceutical companies or politicians were two times less likely to agree that new drugs
229 are always more effective than old ones compared to those with a high level of trust in these
230 institutions (OR 0.63 [0.42-0.95] and OR 0.68 [0.49-0.94], respectively).

231 Finally, older respondents were two times less likely than younger ones to agree with this
232 statement (OR 0.57 [0.31-1.03]). Neither gender nor health information-seeking behavior
233 had a statistically significant effect in the final model.

234 *Perceptions of the role of the pharmaceutical industry in drug development*

235 Respondents had a high level of trust in doctors (92%) and scientists (87%) but a low level
236 of trust in politicians (only 15%). They were much more split concerning pharmaceutical
237 companies (42% trusted them).

238 Most respondents (86%) agreed that doctors need to collaborate with the pharmaceutical
239 industry to develop new treatments. Less than half (43%) agreed that drug development
240 should be driven by the pharmaceutical industry.

241 Different factors were associated with perceptions of the role of the pharmaceutical industry
242 in drug development. Thus, 71% of respondents who agreed that new drugs are always
243 more effective than old ones also agreed that drug development should be driven by the
244 pharmaceutical industry. Likewise, 67% of respondents with a high NHL score agreed with
245 the latter statement, compared to only 31% of respondents with a low NHL score. Low

246 educational level (51%), high household income (60%), low health information-seeking
247 behavior (54%), trust in pharmaceutical companies (66%) or politicians (60%), and good
248 health condition (48%) were all associated with the belief that drug development should be
249 driven by the pharmaceutical industry.

250 However, this belief did not exclude positive attitudes towards public intervention. Almost all
251 respondents felt that the state should be directly involved in drug development when the
252 disease is serious (86%). Even those who agreed that the pharmaceutical industry should
253 drive drug development considered that direct state action was sometimes necessary (41%),
254 with only 2% of respondents stating that drugs should be developed by the pharmaceutical
255 industry alone.

256 The logistic regression analysis (**Table 3**, $R^2=0.15$) showed that perceptions of the
257 association between drug novelty and drug effectiveness had an important effect on
258 perceptions of the role of the pharmaceutical industry in drug development. Respondents
259 who agreed that new drugs are always more effective than old ones were almost four times
260 more likely to agree that drug development should be driven by the pharmaceutical industry
261 (OR 3.85 [2.76-5.39] compared to respondents who disagreed). The NHL score had an
262 independent effect, as respondents with a high NHL score were more than twice as likely to
263 agree that drug development should be driven by the pharmaceutical industry (OR 2.62
264 [1.73-3.97] compared to respondents with a low NHL score). By contrast, respondents with a
265 low level of trust in pharmaceutical industry were less likely to agree with that statement (OR
266 0.38 [0.28-0.50] compared to respondents with a high level of trust). Likewise, respondents
267 with poor health condition were less likely to agree that drug development should be driven
268 by the pharmaceutical industry (OR 0.60 [0.44-0.82] for respondents with average health
269 condition compared to those with good health condition; low statistical significance for the
270 difference between respondents with poor health condition and those with good health
271 condition, $p=0.35$).

272 Discussion

273 The notion of techno-scientific progress has been intertwined with biomedical
274 advances[47] and the organization of modern medicine[48] at least since the eighteenth
275 century. Health innovations are now ubiquitous and range from targeted drugs in genomic
276 medicine[49] to imaging technologies based on Artificial Intelligence[50]. Innovations are
277 introduced in medical practices at such a high pace that some of them remain on the market
278 for short periods of time, before they are replaced with the next wave. With the COVID-19
279 pandemic, medical debates surrounding innovative treatments have come to the attention of
280 the general public as never before[3,4]. The main opposition is observed between those who
281 advocate for the development of new drugs to treat COVID-19 and those who favor the
282 repositioning of old drugs with proven efficacy. Indeed, despite being a major achievement,
283 new vaccines are being criticized due to their purported uncertainty[10]. Research on
284 treatments for COVID-19 is ongoing and continues to impact both health behavior and public
285 perceptions of the disease.

286 The paternalistic approach that prevailed in medicine up to the end of the twentieth century
287 left little room for patients and their families to intervene in medical decisions. While the
288 therapeutic decision is still up to doctors, shared decision-making is gaining ground, with
289 patients and patients' advocates increasingly demanding that patients be actively involved in
290 medical decisions and evaluations[51]. The advent of patient participation in their own care
291 was an important change, but it also created a space for the pharmaceutical industry to exert
292 direct influence on consumers and end-users (in particular through patients' associations).
293 Patients can now pressure their doctors to develop or prescribe treatments that they believe
294 to be "useful." Moreover, the greater emphasis on individual responsibility for health
295 decisions has led many patients to engage in what some refer to as "doctor shopping" or
296 "medical tourism." Indeed, some people may now choose to refuse a novel treatment (e.g., a

297 new vaccine), while others may favor a specific medical center or may decide to travel
298 abroad to receive innovative treatment[52]. However, in the context of clinical trial
299 recruitment, the narrative that stresses the value of drug novelty can be misleading given the
300 uncertain benefits of the tested treatments[53]. Instances of unproven therapies and
301 unfulfilled promises have led some people to criticize the pharmaceutical lobby, with frequent
302 denunciations of its economic power, influence on health policy, and nefarious effect on
303 citizen health. In view of this, a better understanding of public attitudes towards new
304 treatments, and more generally towards medical innovation, is needed to elucidate individual
305 preferences in health care.

306 Our findings support our hypothesis that respondents with a high level of trust in institutions
307 and those with a high level of familiarity with the health care system are more likely to
308 believe that new drugs are more effective than old ones (H1). Familiarity with the health care
309 system was measured using the NHL index. This indicator was developed to evaluate
310 people's difficulties in accessing, understanding, appraising, and applying information for
311 navigating the health care system[44]. Compared to standard health literacy indexes, which
312 focus more broadly on health and illness, the NHL index measures respondents' familiarity
313 with their own national health care system. From a sociological perspective, it captures
314 familiarity with specific health practices and health contexts. Such familiarity is often
315 described as a specific form of what sociologists, following Pierre Bourdieu, have referred to
316 as cultural capital[54]. In the context of health care, the possession of cultural capital has
317 been shown to affect health choices and the way that people navigate the health care
318 system[55]. The strong effect of the NHL index observed in our study indicates that it is also
319 correlated with attitudes towards medical innovation.

320 In addition, the strong effect of the NHL index reflects the value attributed to innovation in
321 French medical culture. Indeed, the value of medical innovation is not only promoted by
322 professionals and health policies in France, but is also embodied by individuals with a high

323 level of familiarity with the health care system and by the beneficiaries of new treatments. As
324 such, our finding is consistent with earlier studies on public understandings of science, which
325 found institutional proximity to affect attitudes towards science and technology[56].
326 Moreover, our study supports the claim that attitudes towards new treatments reflect broader
327 attitudes towards the health care system and towards institutions in general. Positive
328 perceptions of medical innovation were also found to correlate with greater acceptance of
329 the standard model of innovation, as the belief that new drugs are more effective than old
330 ones was associated with a high level of trust in politicians, and/or pharmaceutical
331 companies.

332 While pandemics have historically prompted the intervention of public actors in biomedical
333 research[57], pharmaceutical companies remain the main actors of medical innovation
334 today. However, public perceptions of the role of the pharmaceutical industry are
335 increasingly polarized, with criticisms generally focusing on the industry's excessive role in
336 the medical innovation process and on potential conflicts of interest[28]. This is a major
337 concern, as the association between public research and the pharmaceutical industry has
338 consequences for the legitimacy of science[25]. As several studies have shown, overall trust
339 in pharmaceutical companies is especially low in France[43,58]. There is currently little
340 explanation for this mistrust, though a series of public scandals, including the Mediator
341 case[59], may have contributed to this. Interestingly, in our study, respondents who believed
342 that new drugs are more effective than old ones were more likely to consider that drug
343 development should be driven by the pharmaceutical industry. Likewise, respondents with a
344 high level of familiarity with the health care system had a high level of trust in pharmaceutical
345 companies. In a context where industrial R&D is both central to the innovation process and
346 negatively depicted in the news, a better understanding of the factors associated with trust in
347 the pharmaceutical industry is needed to reduce polarization and, consequently, to ensure
348 adequate public vigilance of biomedical research.

349 Our findings appear also to support our hypothesis of a specific effect of health condition and
350 age on perceptions of the association between drug novelty and drug effectiveness (H2a).
351 This effect, however, was statistically significant in bivariate analysis only. The lack of
352 statistical significance in multivariate analysis may be explained by the limited statistical
353 power of our survey, but also by the fact that statistical models do not account for individual
354 trajectories and experiences. Some studies have shown that the experience of chronic
355 disease leads to specific navigating skills and favors specific attitudes towards medical
356 innovation[52]. One could suppose that people with chronic diseases, who tend to have a
357 high level of familiarity with the health care system, are more likely to develop a critical view
358 of this system. This is especially likely if the disease is deadly or debilitating, with little hope
359 for improvement or recovery. By contrast, our findings did not support our hypothesis of a
360 specific effect of socio-economic status (H2b). Beyond the limited statistical power of the
361 survey, this absence of effect may be explained by the fact that the NHL index already
362 accounts for health condition or socio-economic status. In other words, familiarity with the
363 health care system as measured by the NHL index likely acts as a mediating factor between
364 socio-economic status and perceptions of the association between drug novelty and
365 effectiveness. By contrast, our hypothesis H3 was supported by our findings, as fear of
366 COVID-19 appeared to correlate with the belief that new drugs are more effective than old
367 ones. This finding suggests that in an epidemic context, people who are more anxious about
368 the disease are more likely to support medical innovation. More generally, one could argue
369 that perceptions of the association between drug novelty and drug effectiveness are
370 influenced by health policy, the availability of existing treatments, the actual and perceived
371 severity of the disease, and the global or restricted nature of the health threat.

372 This study extends the analysis initiated in June 2020 with the first round of HLS₁₉[43]. Our
373 findings indicate that trust in institutions and perceptions of clinical research in France have
374 remained stable during the COVID-19 pandemic (**Table 1**). They also go beyond the original
375 findings by showing that the role of the pharmaceutical industry in drug development is

376 perceived as normal, even necessary, with almost half of respondents agreeing that drug
377 development should be driven by this industry. This finding is especially interesting given
378 that the pharmaceutical lobby is regularly criticized, both in France and beyond, in terms of
379 regulation failures and potential conflicts of interests[60]. Our findings also suggest that
380 perceptions of the association between drug novelty and drug effectiveness vary depending
381 on the terms used in public debates to refer to pharmaceutical actors. Thus, the
382 questionnaire used in the first round of HLS₁₉ measured respondents' level of trust in
383 "*l'industrie pharmaceutique*" (the pharmaceutical industry), while that used in the second
384 round measured respondents' level of trust in "*les laboratoires pharmaceutiques*"
385 (pharmaceutical companies). Interestingly, the level of trust rose from 25% in the first round
386 to 42% in the second one, which may be explained by the fact that the term "laboratory"
387 evokes the scientific field while that of "industry" is associated with the economic domain. It
388 should be noted, however, that the high level of trust reported in the second round may also
389 reflect the increased presence of pharmaceutical actors in the media during the COVID-19
390 pandemic – and especially the success of the new vaccines.

391 Today, public acceptance of the standard model of innovation in medicine is a major political
392 issue. The economic influence exerted by the pharmaceutical industry on the orientation and
393 supervision of biomedical research, and especially on the conduct of clinical trials[61], has
394 been well documented[17,18]. In France, public funding of biomedical research by
395 international private companies has been regularly criticized. For instance, a major
396 controversy erupted over the important public funds allocated to the pharmaceutical
397 company Sanofi (via the *Crédit d'Impôt Recherche*), which laid off many workers and failed
398 to develop a "French" vaccine. Moreover, the economic domination of the pharmaceutical
399 industry was loudly denounced when Pfizer decided to raise the cost of vaccines. In a recent
400 book, Fierlbeck et al. argued that "*there is plenty of controversy surrounding*
401 *pharmaceuticals, but it cannot be denied that the pharmaceutical industry is both socially*
402 *beneficial and profitable.*" However, they also recognized that "*the fact that citizens believe*

403 *medicines are reasonably safe and that the medications work is based more on trust than on*
404 *the scientific evidence (p.4)”[32]. Because the innovation process is an important component*
405 *of health care, the way it is framed in public debates can have a lasting impact on trust in the*
406 *medical system, in regulatory agencies, and even in science in general.*

407 **Limitations**

408 This study has several limitations. First, our study was an exploratory analysis of an
409 understudied topic that aimed to test a series of hypotheses. Our findings are therefore
410 tentative and will need to be confirmed in future studies. Second, only two questions
411 concerning the topic of interest were analyzed, which precluded the development of an
412 explanatory model. Political orientation, knowledge of specific aspects of the health care
413 system, and perceptions of the cost of innovations will also need to be investigated in the
414 future. Third, our sample was not probabilistic. However, it was representative of the French
415 population since we used quota sampling. Lastly, our questionnaire could not fully capture
416 the diversity of attitudes towards medical innovation, suggesting a need for qualitative
417 studies on the topic. Such studies could determine the extent to which the COVID-19
418 pandemic changed people’s perceptions of the association between drug novelty and drug
419 effectiveness.

420 **Conclusion**

421 Today, medical research and innovation are framed both as a solution and as a problem in
422 public debates. While drugs and vaccines with proven efficacy allow for sound health policy,
423 pharmaceutical regulation failures and the overwhelming role of the pharmaceutical industry
424 in drug development have created legitimate suspicion in the general public. Because the
425 positive value assigned to medical innovation is directly linked to the belief in scientific
426 progress that underpins medical institutions, public criticism of medical research has an

427 impact on the process of drug development and, consequently, on the level of trust in
428 experts and scientists. In fact, public attitudes towards medical innovation can be
429 ambivalent, as novelty increases both the perceived value of a given product and the
430 perceived risk associated with it[41]. This ambivalence is not limited to drugs and can be
431 extended to other innovations – for instance, the contact tracing apps developed during the
432 COVID-19 pandemic[62,63]. In a global context where trust in institutions, and especially in
433 science, has a major impact on health behavior and democratic life, there is a growing need
434 for a better understanding of public perceptions of medical innovation.

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437 **Bibliography**

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