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ORIGINAL PAPER

The Association Between Receiving the Flu and COVID-19 Vaccines and Related Factors, Data from the StopFlu Campaign in Eight States and the District of Columbia, 2022

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Abstract
Given the evolving nature of the COVID-19 pandemic and the importance of vaccines, it is imperative to understand the relationships between receiving the COVID-19 vaccine and other vaccines, such as the flu vaccine. Data were obtained from a survey as part of an evaluation of the StopFlu Kaiser Permanente media campaign, promoting the flu and COVID-19 vaccines in communities of color across eight states and the District of Columbia. The outcome considered was receiving the COVID-19 vaccine. The exposure considered was receiving the flu vaccine. Covariates included demographic factors, and sources of trusted health information. Overall, 4,185 participants had complete data and were included the analysis. Logistic regression was used to assess the relationship between receiving the flu vaccine and COVID-19 vaccine. Among participants, 77.8% reported receiving the COVID-19 vaccine and 55.4% received the flu vaccine. After adjusting for demographics and sources of trusted health information, participants reporting receiving the flu vaccine had 5.18 times the odds of also receiving the COVID-19 vaccine [Adjusted Odds Ratio (AOR): 5.18 95% Confidence Interval (CI): 4.24–6.32]. Trusting advice from a doctor and healthcare organization also had increased odds of receiving the COVID-19 vaccine. (AOR: 1.84 95%CI: 1.45–2.33, AOR: 2.08 95%CI: 1.64–2.63). This study demonstrates that promotion of one vaccine may influence uptake of other vaccines, which is important given the highly politicized nature of the COVID-19 vaccine. Further research could provide more insight into how promotion of a vaccine could impact behavior with regards to another.

Keywords COVID-19 vaccine · Influenza vaccine · Vaccine promotion · Sources of health information

Introduction

Each year, seasonal influenza (flu) infects millions of people across the United States (U.S.), resulting in 12,000–52,000 deaths annually and 40,000–710,000 hospitalizations [1]. While incidences of the flu were lower between 2020–2022 in comparison prior years [2], the SARS-CoV-2 pandemic (COVD-19) disrupted global systems and became a public health priority. More than one million people have lost their lives to the virus in the United States [3]. Looking ahead to the 2022–2023 winter, early evidence suggests a stronger and earlier than normal flu season. Coupled with the continued spread of COVID-19, this forces public health officials across the United States to grapple with both viruses while not overwhelming medical systems [4–6], increasing the urgency and necessity for vaccinations across all audiences for both viruses.

Even though vaccines are the most effective tools in combating the spread and severity of infectious disease outbreaks, both the COVID-19 and flu vaccines have faced low acceptance rates and have been the targets of misinformation and controversy [7, 8]. In the case of flu vaccines, this occurs despite most adults in the U.S. believing that the vaccine is the best way to protect oneself [8]. While these issues impact all demographics, communities of color are particularly affected due to deeply rooted feelings of mistrust towards traditional healthcare systems, social norms that discourage vaccination, structural racism, and negative perceptions of the flu and COVID-19 vaccines [9–12]. Studies have also demonstrated the effects of structural racism in the American healthcare system, as Asian, Black, and Hispanic patients experience lower quality

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of patient-physician interactions and have more mistrust of physicians and healthcare systems compared to white patients [13, 14].

All groups besides Asian Americans have seen lower vaccination rates than their white counterparts [15] for both flu and COVID-19 vaccines, but the lowest vaccination rates vary by vaccine type. Flu vaccination rates are lowest in Hispanic and Black populations, with current evidence suggesting that the gap has been growing over the past decade [16]. Regarding COVID-19 vaccination, Pacific Islander and American Indian / Alaska Natives have the lowest coverage rates with respective gaps of 24% and 30.9% lower than their Asian counterparts who have the highest rate at 69.6% [17]. The low vaccination rates contribute to the disparate infection and death rates seen across all communities of color, including Asian Americans [18–21].

There is a need to improve vaccination rates for both viruses to protect communities across the U.S. Given the similarities between the flu and COVID-19 [22], coupled with simultaneous promotion of both vaccines [23], it is imperative to understand how the perceptions of the two viruses and vaccines influence each other. Studies from around the world have identified a connection between the ongoing pandemic and vaccine intent, though consistency in findings has changed over time [24–26]. In the first year of the COVID-19 pandemic, uptake of the COVID-19 vaccine drove flu vaccine uptake [27]. Over a quarter of respondents in one U.S. study reported the ongoing pandemic made them more likely to get vaccinated against the flu [8]. However, in the second year of the pandemic another study found the widespread availability of the COVID-19 vaccine resulted in decreased flu vaccination rates in states with low COVID-19 vaccination uptake and the inverse in states with high COVID-19 vaccine acceptance [28]. Another study found that parents who resisted the flu vaccine for their child were over five times more likely to reject the COVID-19 vaccine [29]. However, there is little understanding and literature of this correlation in communities of color.

Since 2018, Kaiser Permanente (KP) and The Public Good Projects (PGP) have collaborated through the StopFlu campaign to address racial disparities and build trust in flu vaccination rates through the use of social media influencers in KP's service regions [30]. The StopFlu campaign utilized a ground-up approach to reach higher risk populations that typically experience lower flu vaccination rates [31]. This partnership has since expanded to improve COVID-19 vaccination uptake in these same areas. This study seeks to better understand the dynamic between flu and COVID-19 vaccines in communities of color to improve future communications of the vaccines and better understand driving factors behind vaccine acceptance.

Methods

Data for this study were obtained from a survey as part of an ongoing evaluation of the StopFlu Kaiser Permanente (KP) media campaign promoting the flu and COVID-19 vaccines in communities of color. Data from this evaluation were used to assess changes in knowledge/attitudes about the flu vaccine as well as to gauge campaign awareness. Surveys were conducted in partnership Ipsos, a panel-survey provider. Surveys were programmed in Qualtrics and distributed by Ipsos. Eligible participants resided in states where the media campaign was conducted, which coincided with KP service regions (California, Colorado, Georgia, Hawaii, District of Columbia, Maryland, Virginia, Oregon, and Washington), had access to the internet, could take the survey in English or Spanish, were 18 years of age or older, and were individuals of color, particularly those identifying as Black, Hispanic, or Asian. Ipsos did not provide information on participants who were screened out or did not meet eligibility criteria. This analysis consisted of cross-sectional survey data collected in May 2022. Overall, 4,185 respondents met the eligibility criteria and had complete data and were included in the final analysis.

The exposure considered in this analysis was reporting getting the flu vaccine. Individuals who answered "yes" to the question "did you get the flu vaccine for the past flu season (fall and winter 2021–2022)?" were considered the exposure group and those who answered "no" were considered in the unexposed group.

The outcome considered was reporting receiving a COVID-19 vaccine. Individuals who answered "yes" to the question "Have you gotten a vaccine for coronavirus?" were compared to those who answered "no." Individuals who answered "I don't know" were excluded from the analysis.

Covariates considered were demographic factors as well as attitudes about trusted sources of health advice and the COVID-19 pandemic. Demographic variables included age, gender (male, female), race/ethnicity, household income, education level, and insurance status. Other covariates included whether individuals trusted advice from their doctor, family, friends, and healthcare organization with respect to the flu or COVID-19. Responses to questions regarding trusted sources of health advice ranged from strongly agree, agree, unsure, disagree, and strongly disagree. These responses were collapsed so that individuals who strongly agreed, or agreed were compared to those who were unsure, disagreed, or strongly disagreed. Only participants that had complete data for exposure, outcome, and the relevant covariates were included in the analysis.

Logistic regression was used to compare the association between reporting receiving the flu vaccine and receiving

Table 1 Demographic characteristics and COVID-19/flu vaccination status, 2022

	n	%	Median	IQR
Total	4185	100.0		
Age (in years)			37	20
Gender				
Male	1825	43.6		
Female	2360	56.4		
Race				
Non-Hispanic Asian	1029	24.6		
Non-Hispanic Black/African American	1380	33.0		
Hispanic	1593	38.1		
Non-Hispanic Other/Multiracial	183	4.4		
Income				
< =$40,000	1682	40.2		
$40,001-$80,000	1310	31.3		
> =$80,000	1193	28.5		
Education				
High School Education or Less/GED	1080	25.8		
Some College/Associate's Degree	1460	60.7		
Bachelor's Degree or Higher	1645	39.3		
Insurance				
Uninsured/Other	483	11.5		
Medicaid/Medicare	2040	48.8		
Private Insurance/Tricare	1662	39.7		
Received flu vaccine				
Yes	2317	55.4		
No	1868	44.6		
Received COVID vaccine				
Yes	3254	77.8		
No	931	22.3		
Trust health advice from doctor				
Disagree/Unsure	1160	27.7		
Agree	3025	72.3		
Trust health advice from friends				
Disagree/Unsure	2300	55.0		
Agree	1885	45.0		
Trust health advice from family				
Disagree/Unsure	1972	47.1		
Agree	2213	52.9		
Trust health advice from healthcare institutions				
Disagree/Unsure	1343	32.1		
Agree	2842	67.9		

IQR= Inter Quartile Range

the COVID-19 vaccine. Individual logistic regression models were run for each exposure and covariate and only significant predictors of COVID-19 vaccination were included in the multivariate adjusted logistic regression model. Separate multivariate logistic regression models were run, adjusting for demographic factors as well as demographic factors and attitudes about trusted sources of health advice. Additional analyses were conducted on sources of trusted health information and comparisons were made by race/ethnicity. Proportions and corresponding 95% confidence limits were calculated among respondents who agreed that they trusted various sources of health information (doctors, healthcare organizations, family, and friends) for each race/ethnicity category and comparisons were made using the 95% confidence limits. All analyses were conducted in STATA/SE 17.0.

Table 2 The unadjusted odds between flu vaccination status, demographic factors, and sources of trusted health information and receipt of the COVID-19 Vaccine, 2022

Factor	Percentage (%) that reported receiving the COVID-19 vaccine	Unadjusted Odds Ratio	95% Confidence Interval		p-value
			Lower Limit	Upper Limit	
Received flu vaccine					
No	59.6	Reference			
Yes	92.4	**8.25**	**6.90**	**9.87**	**< 0.001**
Age (in years)		**1.02**	**1.01**	**1.03**	**< 0.001**
Gender					
Female	78.0	Reference			
Male	77.5	0.97	0.84	1.13	0.71
Race					
Non-Hispanic Asian	90.2	Reference			
Non-Hispanic Black/African American	68.5	**0.24**	**0.19**	**0.30**	**< 0.001**
Hispanic	78.3	**0.39**	**0.31**	**0.50**	**< 0.001**
Non-Hispanic Other/Multiracial	72.7	**0.29**	**0.20**	**0.43**	**< 0.001**
Income					
≤ $40,000	67.3	Reference			
$40,001–$80,000	81.4	**2.12**	**1.79**	**2.52**	**< 0.001**
≥ $80,000	88.5	**3.74**	**3.05**	**4.60**	**< 0.001**
Education					
High School Education or Less/GED	66.6	Reference			
Some College/Associate's Degree	73.6	**1.40**	**1.18**	**1.66**	**< 0.001**
Bachelor's Degree or Higher	88.8	**3.96**	**3.25**	**4.83**	**< 0.001**
Insurance					
Uninsured/Other	60.9	Reference			
Medicaid/Medicare	85.0	**3.64**	**2.93**	**4.54**	**< 0.001**
Private Insurance/Tricare	73.8	**1.81**	**1.46**	**2.24**	**< 0.001**
Trust health advice from doctor					
Disagree/Unsure	55.5	Reference			
Agree	86.3	**5.04**	**4.31**	**5.89**	**< 0.001**
Trust health advice from friends					
Disagree/Unsure	71.7	Reference			
Agree	85.2	**2.28**	**1.95**	**2.66**	**< 0.001**
Trust health advice from family					
Disagree/Unsure	69.6	Reference			
Agree	85.0	**2.49**	**2.14**	**2.89**	**< 0.001**
Trust health advice from healthcare institutions					
Disagree/Unsure	57.5	Reference			
Agree	87.3	**5.10**	**4.37**	**5.95**	**< 0.001**

Bolded figures are statistically significant

Results

The sample was 56.4% female, and the median age was 37 years. 38.1% of the sample was Hispanic, 33% was non-Hispanic Black/African American, and 24.6% was non-Hispanic Asian. Forty percent of the sample had an annual household income of $40,000 or less. Additionally, respondents were surveyed on their highest level of education; nearly 40% had a bachelor's degree or higher and 25.8% had a high school diploma/equivalent or less. Nearly half of respondents reported having Medicaid/Medicare. 55.4% of the respondents received their flu vaccine for 2021–2022 flu season and 77.8% reported receiving a COVID-19 vaccine. Respondents also reported their agreement with statements measuring their trust of health information from various sources. 72.3% reported trusting health information from their doctor, 67.9% trusted health information from healthcare institutions, 52.9%

trusted their family, and 45% trusted advice from friends (Table 1).

In the unadjusted logistic regression model, respondents who reported receiving their COVID-19 vaccine had eight times the odds of reporting receiving their flu vaccine (OR: 8.25 95%CI: 6.90–9.87) compared to respondents who did not report receiving their COVID-19 vaccine. Individuals who agreed that they trusted health advice from their doctor and those who reported trusting healthcare institutions both had five times higher odds of reporting getting their COVID-19 vaccine compared those who disagreed or were unsure (OR: 5.04 95%CI: 4.31–5.89 and OR:5.10 95%CI: 4.37–5.95 respectively). Additionally, those who trusted friends and those trusted family with health advice had roughly twice the odds of receiving the COVID vaccine compared those who did not/were unsure (Table 2).

After adjusting for demographic factors, the magnitude association between receiving the flu vaccine and the COVID-19 vaccine remained high and statistically significant (AOR: 7.28 95%CI: 6.03–8.78). Additionally, when sources of trusted health information were added to the model, the relationship between receiving the COVID-19 vaccine and flu vaccine was attenuated, but still significant (AOR: 5.18 95%CI: 4.24–6.32). In the fully adjusted model, the associations between receiving a COVID-19 vaccine and trusting health advice was attenuated for all sources. Only the associations between receiving the COVID-19 vaccine and trusting health advice from doctors (AOR: 1.84 95%CI: 1.45–2.33) and from healthcare institutions (AOR: 2.08 95%CI: 1.64–2.63) remained significant in the fully adjusted model. Additionally in the fully adjusted model, respondents of each racial/ethnic group had lower odds of reporting receiving their COVID-19 vaccine compared to non-Hispanic Asian respondents (Tables 3, 4).

When sources of trusted health information were compared by race/ethnicity, similar patterns were observed for differences between race/ethnicity and each source of trusted health information (Table 5). 78.8% of non-Hispanic Asian respondents reported that they agreed that they trusted their doctor with respect to health information regarding COVID-19/flu. This was significantly higher than agreement among non-Hispanic Black respondents (67.6%), and Hispanic respondents (72.1%). A significantly higher proportion of non-Hispanic Asian respondents also reported trusting healthcare organizations (75.1%) compared to non-Hispanic Black respondents, Hispanic respondents (69.4%), and those reporting multiracial or another race/ethnicity (63.9%). A statistically significantly lower proportion of non-Hispanic Black respondents reported trusting healthcare organizations compared to Hispanic respondents. Similarly, 57.5% of non-Hispanic Asian respondents agreed that

Table 3 The adjusted odds between flu vaccination status and receipt of the COVID-19 Vaccine, adjusted for demographic factors, 2022

Factor	Adjusted Odds Ratio	95% Confidence Interval		p-value
		Lower Limit	Upper Limit	
Received flu vaccine				
No	Reference			
Yes	**7.28**	**6.03**	**8.78**	**< 0.001**
Age (in years)	**1.01**	**1.01**	**1.02**	
Race				
Non-Hispanic Asian	Reference			
Non-Hispanic Black/African American	**0.43**	**0.33**	**0.55**	**< 0.001**
Hispanic	**0.57**	**0.44**	**0.75**	**< 0.001**
Non-Hispanic Other/Multiracial	**0.43**	**0.28**	**0.67**	**< 0.001**
Income				
≤ $40,000	Reference			
$40,001–$80,000	**1.51**	**1.23**	**1.84**	**< 0.001**
≥ $80,000	**1.61**	**1.25**	**2.07**	**< 0.001**
Education				
High School Education or Less/GED	Reference			
Some College/Associate's Degree	**1.26**	**1.04**	**1.54**	**0.02**
Bachelor's Degree or Higher	**2.10**	**1.65**	**2.67**	**< 0.001**
Insurance				
Uninsured/Other	Reference			
Medicaid/Medicare	**1.58**	**1.23**	**2.03**	**< 0.001**
Private Insurance/Tricare	1.19	0.93	1.51	0.17

Bolded figures are statistically significant

Table 4 The adjusted odds between flu vaccination status and receipt of the COVID-19 Vaccine, adjusted for demographic factors and sources of trusted health information, 2022

Factor	Adjusted Odds Ratio	95% Confidence Interval		p-value
		Lower Limit	Upper Limit	
Received flu vaccine				
No	Reference			
Yes	**5.18**	**4.24**	**6.32**	**< 0.001**
Age (in years)	**1.01**	**1.01**	**1.02**	**< 0.001**
Race				
Non-Hispanic Asian	Reference			
Non-Hispanic Black/African American	**0.42**	**0.32**	**0.55**	**< 0.001**
Hispanic	**0.57**	**0.43**	**0.74**	**< 0.001**
Non-Hispanic Other/Multiracial	**0.43**	**0.27**	**0.67**	**< 0.001**
Income				
≤ $40,000	Reference			
$40,001–$80,000	**1.53**	**1.25**	**1.85**	< 0.001
≥ $80,000	**1.58**	**1.21**	**2.04**	**0.001**
Education				
High School Education or Less/GED	Reference			
Some College/Associate's Degree	**1.24**	**1.01**	**1.52**	**0.04**
Bachelor's Degree or Higher	**2.00**	**1.56**	**2.57**	**< 0.001**
Insurance				
Uninsured/Other	Reference			
Medicaid/Medicare	**1.53**	**1.18**	**1.98**	**0.002**
Private Insurance/Tricare	1.12	0.87	1.44	0.37
Trust health advice from doctor				
Disagree/Unsure	Reference			
Agree	**1.84**	**1.45**	**2.33**	**< 0.001**
Trust health advice from friends				
Disagree/Unsure	Reference			
Agree	0.89	0.71	1.12	0.65
Trust health advice from family				
Disagree/Unsure	Reference			
Agree	1.05	0.84	1.32	0.33
Trust health advice from healthcare institutions				
Disagree/Unsure	Reference			
Agree	**2.08**	**1.64**	**2.63**	**< 0.001**

Bolded figures are statistically significant

their family was a trusted source of health information regarding COVID-19/flu, and this was significantly higher than agreement reported among Black respondents (49.6%) and non-Hispanic multiracial or those identifying as another race (45.4%). A significantly higher proportion of Asian respondents (48.9%) and Hispanic respondents (47.2%) reported trusting their friends with health information compared to Black respondents (41.3%) and non-Hispanic Other/Multiracial respondents (32.8%).

Discussion

As this study demonstrates, there is a particularly strong association between receiving a flu vaccine as well as a COVID-19 vaccine in this study sample. This association was strong despite controlling for demographic variables and sources of trusted health information. Further research should be expanded from these cross-sectional analyses to explore whether changes in behavior regarding flu vaccine uptake can also predict changes in behavior regarding the

Table 5 Sources of trusted health information by race/ethnicity, 2022

		n	%	95% Confidence Interval	
				Lower Limit	Upper Limit
Trust health advice from one's doctor: Agree					
Total		3,025	72.3	70.9	73.6
Race	Non-Hispanic Asian	811	78.8	76.2	81.2
	Non-Hispanic Black/African American	933	67.6	65.1	70.0
	Hispanic	1,148	72.1	69.8	74.2
	Non-Hispanic Other/Multiracial	133	72.7	65.7	78.7
Trust health advice from one's healthcare organization: Agree					
Total		2,842	67.9	66.5	69.3
Race	Non-Hispanic Asian	773	75.1	72.4	77.7
	Non-Hispanic Black/African American	847	61.4	58.8	63.9
	Hispanic	1,105	69.4	67.1	71.6
	Non-Hispanic Other/Multiracial	117	63.9	56.7	70.6
Trust health advice from family: Agree					
Total		2,213	52.9	51.4	54.4
Race	Non-Hispanic Asian	592	57.5	54.5	60.5
	Non-Hispanic Black/African American	685	49.6	47.0	52.3
	Hispanic	853	53.5	51.1	56.0
	Non-Hispanic Other/Multiracial	83	45.4	38.2	52.7
Trust health advice from friends: Agree					
Total		1,885	45.0	43.5	46.6
Race	Non-Hispanic Asian	503	48.9	45.8	54.2
	Non-Hispanic Black/African American	570	41.3	38.7	43.9
	Hispanic	752	47.2	44.8	49.7
	Non-Hispanic Other/Multiracial	60	32.8	26.3	40.0

COVID-19 vaccine. While the association between uptake of one vaccine potentially influencing another may seem intuitive, it is particularly important to investigate given the political climate around various vaccines. If the link between these changes in behavior could be established, then resources could be focused and targeted to strategically promote vaccines. Given the highly politicized and polarizing nature of discourse surrounding the COVID-19 vaccine, it would be useful to understand if promoting uptake of the flu vaccine could also make progress in uptake of the COVID-19 vaccine. If progress could be made in the adoption of highly politicized vaccines, such as the COVID-19 vaccine, by promoting less politicized vaccines, such as the flu vaccine, it would provide useful information for public health to target their limited resources. This is particularly important given the large amount of misinformation surrounding the COVID-19 vaccine on social media and the Internet.

Additionally, this study provides important implications for sources of trusted health information. In the study sample overall, the majority of respondents trusted doctors, followed by healthcare organizations, family members, and lastly friends. Asian respondents had higher agreement of trust compared to Black and Hispanic respondents for each source of information. Prior research has shown that individuals who are Asian, Black, and Hispanic face discrimination and have lower levels of trust towards physicians and healthcare systems compared to White individuals [13, 14]. The strength of this analysis is in its ability to measure differences between these marginalized groups given its focus on communities of color. It is worth noting that despite issues of trust in these communities, physicians remained the top trusted source of health information for each race/ethnicity group. Health educators and physicians should still be a focus of providing information regarding vaccine promotion.

Additionally, although friends and family were less often cited sources of health information, nearly half of all respondents reported trusting these sources. Friends and family members could potentially either be valuable sources of accurate vaccine information or potentially harmful sources of misinformation, potentially undermining public health efforts. Public health professionals should consider these avenues of information when developing messaging campaigns around vaccines.

This study addresses a need in understanding the relationship between behavior in getting both the COVID-19

and flu vaccines. This research is in line with prior findings that showed the relationship between flu vaccination rates and COVID-19 vaccine uptake [27, 28]. This research is also compatible with findings that show that a correlation between hesitancy around flu vaccines and COVID-19 vaccines [29]. As the COVID-19 pandemic continues to change, further research will need to assess the potentially evolving relationships between the uptake of the COVID-19 vaccine, the flu vaccine, and sources of trusted health information.

This study had strengths and limitations. This research fills a gap, as to our knowledge, this is among the first to assess the association between COVID-19 vaccine adoption and flu vaccine adoption. This study also had sufficient sample size to assess these associations and covariates. The study population is also important to public health in eliminating health disparities, as the StopFlu campaign aimed to increase flu vaccine adoption in communities of color, as research shows that these communities often have lower vaccination rates for both flu and COVID-19. This study is limited by geographic distribution of survey respondents, as the StopFlu campaign operated in eight states and the District of Columbia. Additionally, as the StopFlu campaign was focused on communities of color, the demographics of the study population are not fully representative of these geographic areas, limiting the generalizability of the results. The cross-sectional study design of this research is another limitation, as this analysis can only assess the association between receiving the flu vaccine and the COVID-19 vaccine. Further research is needed to determine whether changes in behavior with respect to adoption of one vaccine can lead to future changes in behavior with respect to another vaccine, especially in vaccine-hesitant individuals. This would provide greater insight into how public health systems could address vaccine hesitancy in their communities, especially considering growing disinformation and the increasingly politicized nature of certain vaccines.

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Declarations

Conflict of interest The authors have declared that no competing interests exist, including interests related to employment, consultancy, patents, products in development, or marketed products.

Ethical approval This protocol was reviewed and determined to be exempt from IRB oversight by Advarra IRB.

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