

# Attitudes Toward The Use Of Quarantine In A Public Health Emergency In Four Countries

The experiences of Hong Kong, Singapore, Taiwan, and the United States are instructive in assessing national responses to disease threats.

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**ABSTRACT:** Countries worldwide face the threat of emerging infectious diseases. To understand the public's reaction to the use of widespread quarantine should such an outbreak occur, the Harvard School of Public Health, with the U.S. Centers for Disease Control and Prevention, undertook a survey of residents of Hong Kong, Taiwan, Singapore, and the United States. A sizable proportion of the public in each country opposed compulsory quarantine. Respondents were concerned about overcrowding, infection, and inability to communicate with family members while in quarantine. Officials will need specific plans to deal with the public's concerns about compulsory quarantine policies. [*Health Affairs* 25 (2006): w15-w25 (published online 24 January 2006; 10.1377/hlthaff.25.w15)]

COUNTRIES WORLDWIDE FACE THE GLOBAL THREAT of newly emerging infectious diseases such as severe acute respiratory syndrome (SARS) and pandemic influenza. These types of diseases can create serious problems for international and local public health authorities and health professionals: They can be highly contagious and can lead to death or serious illness. Such diseases also can have major economic impacts.<sup>1</sup> These concerns are often heightened by the lack of proven vaccines or effective treatments for those who become infected. Thus, the importance of containing these diseases before widespread transmission occurs becomes a priority for public health policy and planning.<sup>2</sup>

Measures available to public health authorities around the world to control such epidemics include encouraging citizens to wear masks in public to prevent

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the spread of airborne illness, canceling public events or closing schools, isolating cases and quarantining contacts, monitoring and enforcing compliance, and screening for illness. In many countries, public health officials have the authority to make these measures compulsory.

To understand the public's reaction to the possible use of widespread quarantine, we conducted a survey of residents of Hong Kong, Taiwan, and Singapore, where the use of quarantine for these purposes was widespread during the SARS epidemic, and residents of the United States, who have had very little recent experience with widespread quarantine. The survey was conducted by the Harvard School of Public Health, in collaboration with researchers at the U.S. Centers for Disease Control and Prevention (CDC), with assistance from public health officials in the other countries or regions surveyed.

We undertook this study to provide public health officials with useful insights in case they need to consider the use of quarantine procedures. Although Canada has experienced a large number of SARS cases, it is not included in this survey, because Canada's experience with SARS has been studied, and another survey could be a burden on Canadian respondents.<sup>3</sup> In addition, the People's Republic of China, with the exception of Hong Kong, is not included because of difficulties in obtaining official permission to survey in non-Hong Kong areas of the country.

The widespread use of quarantine presents a number of planning and implementation challenges. These include where the quarantine period would be spent, how the health status and the compliance of those in quarantine would be monitored, how their basic needs would be met, and whether those in quarantine would suffer economic consequences or social discrimination. Historically, case studies have shown that quarantine compliance in major epidemics is lower when the public does not support its use.<sup>4</sup> Addressing these challenges before quarantine is used could ease the public's anxieties and increase compliance.

## Study Data And Methods

The quarantine survey instrument was designed by researchers at the Harvard School of Public Health and the CDC. It was translated by the subcontracted survey research firm TNS into English, Malay, Mandarin, Tamil, Cantonese, and Spanish. The instrument was pretested for length and to ensure that informational objectives were being met.

■ **Selecting respondents.** In each region, the survey firm followed standard practices for selecting respondents. Of the four regions, only the United States has a formal, recognized random-digit-dialing (RDD) system. There were some coverage losses in the other regions because of the absence of an RDD system. However, in each region the survey firm used a sampling approach that would ensure a representative sample, using the sources available: In Singapore, a random selection of telephone numbers were drawn from the telephone directory of listed phone numbers, which includes more than 90 percent of all households; in Hong Kong, a random se-

lection of listed telephone numbers was also used, with an additional 20 percent of all numbers generated from directory-assisted random digits; and in Taiwan, phone numbers were randomly drawn from the phone directory, and the last two digits were randomized to ensure the inclusion of unlisted households. Approximately 500 interviews were completed with adults age eighteen and older in each of the four countries (U.S., 500; Hong Kong, 501; Singapore, 511; and Taiwan, 500). All interviews took place between 18 November and 16 December 2004.

■ **Survey content.** Respondents were read the following background information to explain the use of quarantine: “Recently public health authorities have talked about the possible need to quarantine people if there were an outbreak of SARS, smallpox, or avian flu (sometimes called bird flu). In order to keep the disease from spreading, people who were exposed to the disease would be quarantined in special health facilities or asked to restrict their movements or to remain at home for a period of time.” The multinational questionnaire included questions in the following areas of interest: concern about becoming ill with an infectious disease, support for measures to protect the public, preferences for where they would be quarantined, support for measures to monitor compliance with quarantine, worries about quarantine, and preferred sources of information in the event of an epidemic.

■ **Data analysis.** All data were analyzed using STATA 6, which accounts for complex sampling designs and weighted data.<sup>5</sup> Subgroups were compared using Fisher’s exact test for differences between proportions.

■ **Limitations.** All surveys are subject to nonsampling error. Possible sources of nonsampling error include nonresponse bias, as well as question wording and ordering effects. Nonresponse in telephone surveys produces some known biases in survey-derived estimates because participation tends to vary among population subgroups. To compensate for these known biases, sample data were reweighted using a common weighting scheme across the four regions. Data were weighted by sex, age, income, number of people in the household, and number of phone lines in the household. Other techniques—including RDD, replicate subsamples, callbacks staggered over times of day and days of the week, and systematic respondent selection within households—were used to make the sample as representative as possible.

As discussed above, the process of sample selection differed across the four regions surveyed. Some of the differences between countries may be attributable to the sampling methodologies in each country. The use of a common weighting scheme across the regions should reduce some of the sampling variability.

## Study Findings

■ **Concern about infectious diseases.** Prior research has shown that when people are more concerned about a health threat, they are more likely to change their behavior.<sup>6</sup> In countries with higher numbers of SARS cases, respondents reported significantly higher levels of concern about the disease. Respondents in Hong Kong, Singapore, and Taiwan were significantly more worried than U.S. respondents that

they or a family member would become ill with SARS in the next twelve months (Exhibit 1). Those in Singapore also were significantly more likely than those in the United States to report being very concerned about becoming ill with avian flu.

■ **Support for preventive measures.** The survey asked about support for three measures that public health officials could take to protect the health of the public and prevent the spread of a contagious disease (Exhibit 1).

*Wearing a mask.* In areas where most respondents had worn a mask in public, there was a higher level of support for requiring everyone to wear one. In Hong Kong and Taiwan, approximately 90 percent of the public reported wearing a mask in public in the past two years to protect themselves against becoming ill. Similarly, support for requiring masks ranged from a high of 96 percent in Taiwan to a low of 53 percent in the United States. However, when people were told that they could be arrested for noncompliance, support for this measure in Hong Kong fell to a level similar to that of the United States and Singapore, but 67 percent of Taiwanese respondents still supported the measure (Exhibit 1).

*Having temperature taken.* There was a high level of support (99–84 percent) in Taiwan, Singapore, and Hong Kong for requiring everyone to have their temperature taken to screen for illness before entering public places during an epidemic (Exhibit 1). As found previously, when told that people who refused could be arrested, support for this measure declined.

*Quarantines.* Strong majorities in each of the countries favored quarantining peo-

**EXHIBIT 1**  
**Concerns About Infectious Diseases And Ways To Protect Unexposed People, Four Countries, 2004**

	U.S.	Hong Kong	Singapore	Taiwan
Very worried that you or someone in family might get sick from:				
SARS in the next twelve months	6% <sup>a,b,c</sup>	21%	29%	28%
Regular or seasonal flu in the next twelve months	11	9	14	13
Avian or bird flu	6 <sup>b</sup>	14	23	16
Have worn a mask in public in the past two years	5 <sup>a,b,c</sup>	93 <sup>b,c</sup>	28 <sup>c</sup>	88
Favor in the event of an outbreak of a serious contagious disease:				
Requiring everyone to wear a mask in public	53 <sup>a,b,c</sup>	86 <sup>b,c</sup>	64 <sup>c</sup>	96
Still favor if people could be arrested for refusing	27	35	36	67
No longer favor if people could be arrested for refusing	23 <sup>a</sup>	46 <sup>b</sup>	26	23
Requiring everyone to have their temperature taken to screen for illness before entering public places	44 <sup>a,b,c</sup>	84 <sup>c</sup>	88 <sup>c</sup>	99
Still favor if people could be arrested for refusing	23 <sup>a,b,c</sup>	43	51	77
No longer favor if people could be arrested for refusing	19 <sup>a,b</sup>	37	34	18
Quarantining people suspected of having been exposed to the disease	76 <sup>b,c</sup>	81 <sup>b,c</sup>	89 <sup>c</sup>	95
Still favor if people could be arrested for refusing	42 <sup>a,b,c</sup>	54 <sup>b</sup>	68	70
No longer favor if people could be arrested for refusing	29 <sup>b</sup>	25	18	22

**SOURCE:** Harvard School of Public Health/TNS Survey in Four Regions, 18 November–16 December 2004.

**NOTE:** SARS is severe acute respiratory syndrome.

<sup>a</sup>Significantly different from Hong Kong;  $p \leq .05$ .

<sup>b</sup>Significantly different from Singapore;  $p \leq .05$ .

<sup>c</sup>Significantly different from Taiwan;  $p \leq .05$ .

ple suspected of having been exposed to a contagious disease (Exhibit 1). Majorities still supported this measure in Taiwan, Singapore, and Hong Kong after respondents were told that a person who refused to comply could be arrested.

■ **U.S. perspective on compulsory quarantine.** In the United States, compulsory quarantine, under which those who refuse to comply could be arrested, was supported by 42 percent of the public across all demographic groups (Exhibit 1). African Americans were significantly more likely than whites or Hispanics to move from initially favoring the measure to no longer favoring it when told they could be arrested for noncompliance (Exhibit 2). This difference across racial groups held after age, sex, income, education, and urbanity were adjusted for.

■ **Methods of monitoring compliance with quarantine.** The survey showed wide variations between the United States and the other three regions in respondents' support for various methods of monitoring compliance with a quarantine order (Exhibit 3). In general, Americans were less supportive of the more restrictive monitoring methods than were people living in the other regions.

Across all four regions, most respondents supported monitoring quarantined

**EXHIBIT 2**  
**U.S. Perspective On Compulsory Quarantine, By Population Characteristics, 2004**

	Initially favor (%)	Still favor even if people could be arrested (%)	No longer favor if people could be arrested (%)	Initially oppose (%)
<b>Age (years)</b>				
18–39	77	41	33	19
40–64	76	48	24	21
65 and older	78	37	29	20
<b>Income</b>				
Less than \$40,000	81	42	32	15
\$40,001–\$80,000	72	43	28	24
More than \$80,000	72	47	20	28
<b>Sex</b>				
Male	70	43	23	28
Female	82	41	35 <sup>a</sup>	15
<b>Urbanity</b>				
Rural	66	41	23	32
Suburban	78	43	28	18
Urban	78	40	33 <sup>b</sup>	19
<b>Race/ethnicity</b>				
White	76	46	25	21
African American	90	33	51 <sup>c</sup>	8
Hispanic	88	44	37	8
<b>Education</b>				
Less than high school	94	55	30	6
High school graduate	74	40	30	22
Some college	74	42	28	22

**SOURCE:** Harvard School of Public Health/TNS Survey in Four Regions, 18 November–16 December 2004.

<sup>a</sup> Significantly different from male;  $p \leq .05$ .

<sup>b</sup> Significantly different from rural and suburban;  $p \leq .05$ .

<sup>c</sup> Significantly different from white and African American;  $p \leq .05$ .

**EXHIBIT 3**  
**Preferences For Monitoring Quarantine Compliance And Where Quarantine Period Should Be Spent, Four Countries, 2004**

	U.S.	Hong Kong	Singapore	Taiwan
Favor or oppose public health officials monitoring quarantined people by				
Periodic telephone calls				
Favor	75% <sup>a,b,c</sup>	60% <sup>b,c</sup>	85% <sup>c</sup>	90%
Oppose	24 <sup>a,c</sup>	35 <sup>b,c</sup>	14	7
Periodic video screening				
Favor	31 <sup>b,c</sup>	31 <sup>b,c</sup>	50	52
Oppose	67 <sup>b,c</sup>	66 <sup>b,c</sup>	46	44
Daily visit to check the health of those who are quarantined				
Favor	84 <sup>a</sup>	97 <sup>b,c</sup>	84	88
Oppose	16 <sup>a</sup>	3	14	11
Electronic bracelets				
Favor	40 <sup>a,b,c</sup>	56 <sup>c</sup>	54 <sup>c</sup>	68
Oppose	57	36	43	23
Guards stationed outside the place where people are quarantined				
Favor	43 <sup>a,b,c</sup>	74 <sup>b,c</sup>	52	55
Oppose	57 <sup>a,b,c</sup>	25 <sup>b,c</sup>	44	40
If a family member had to be quarantined				
Prefer that they be quarantined at home	71 <sup>a,b,c</sup>	36 <sup>b,c</sup>	59 <sup>c</sup>	48
Prefer that they be quarantined in a separate facility	25 <sup>a,b,c</sup>	59 <sup>b,c</sup>	36	43
If YOU had to be quarantined				
Prefer to be quarantined at home	70 <sup>a,b,c</sup>	28 <sup>b</sup>	55 <sup>c</sup>	37
Prefer to be quarantined somewhere else	30 <sup>a,b,c</sup>	70 <sup>b,c</sup>	42 <sup>c</sup>	59
Still want to be quarantined at home if you were required to wear a mask at all times	60 <sup>a,b,c</sup>	22 <sup>b</sup>	40 <sup>c</sup>	28
Would rather be quarantined somewhere else if you were required to wear a mask at all times	7	4	14	8
Very worried about infecting healthy family members if quarantined at home				
	42 <sup>b,c</sup>	47 <sup>c</sup>	54 <sup>c</sup>	68

**SOURCE:** Harvard School of Public Health/TNS Survey in Four Regions, 18 November–16 December 2004.

<sup>a</sup>Significantly different from Hong Kong;  $p \leq .05$ .

<sup>b</sup>Significantly different from Singapore;  $p \leq .05$ .

<sup>c</sup>Significantly different from Taiwan;  $p \leq .05$ .

people through periodic telephone calls (Exhibit 3). Citizens in Hong Kong were significantly less likely than those in the other three countries to support this measure; however, a majority in Hong Kong still favored it. Periodic video screening was seen as a much less favorable option in all four regions. Approximately half of those in Singapore and Taiwan supported this method of monitoring compliance, while only 31 percent of both U.S. and Hong Kong respondents supported it. Public health officials proposed periodic checking of compliance by using a video technique that would be similar to using teleconferencing technology. Respondents might have believed that public health officials could use the video technology to view them without their knowledge.

Majorities in Hong Kong, Singapore, and Taiwan favored using electronic bracelets to monitor quarantined people, compared with 40 percent in the United

States. Similarly, at least half of respondents living in Hong Kong, Singapore, and Taiwan favored stationing guards outside the place where people were quarantined. Forty-three percent of U.S. respondents favored this option (Exhibit 3).

■ **Preferences for place of quarantine.** The survey asked people if they would like to have their family members quarantined at home or elsewhere. It also asked about where they themselves would like to be quarantined, should the need arise (Exhibit 3). There were significant differences on both of these measures, with U.S. respondents strongly preferring home quarantine in both cases. In comparison, smaller numbers of those in the other three countries would prefer to have family members quarantined at home and to be quarantined at home themselves (Exhibit 3). When asked if they would still want to be quarantined at home if they were required to wear a mask at all times to protect healthy family members, 60 percent of those in the United States, 22 percent of those in Hong Kong, 28 percent in Taiwan, and 40 percent in Singapore said yes.

Majorities in both Singapore and Taiwan reported that they would be very worried about infecting health family members if quarantined at home. Approximately four in ten U.S. respondents would be very worried about this, as would 47 percent of Hong Kong respondents (Exhibit 3).

■ **Worries about being quarantined.** Respondents were asked about a series of problems that they might face if quarantined for at least one week. These worries were similar across the United States, Hong Kong, and Singapore, with Taiwanese respondents being significantly more likely than the others to report being very worried about all measures (Exhibit 4). Between 44 and 69 percent reported that they would be very worried about not being able to get the health care or prescription drugs they needed during the quarantine period; 40–66 percent reported that they would be very worried about possibly not getting paid for the time when they were not at work or about losing their job or business.

Worries about social stigma were more common in Taiwan than in the other

**EXHIBIT 4**  
**Worries About Being Quarantined, Four Countries, 2004**

	U.S.	Hong Kong	Singapore	Taiwan
Percent saying very worried if YOU had to be quarantined for at least one week				
You might be unable to get the health care or Rx you need	45% <sup>c</sup>	50% <sup>c</sup>	44% <sup>c</sup>	69%
You might not get paid for the time when you are not at work	40% <sup>c</sup>	48% <sup>c</sup>	49% <sup>c</sup>	66
You might lose your job or business	40% <sup>b,c</sup>	42% <sup>b,c</sup>	53% <sup>c</sup>	69
You might be treated unfairly after the quarantine period was over because people will think you are contagious	33% <sup>c</sup>	35% <sup>c</sup>	36% <sup>c</sup>	65
You might be treated unfairly because of your economic or social status	32% <sup>c</sup>	35% <sup>c</sup>	39% <sup>c</sup>	69

**SOURCE:** Harvard School of Public Health/TNS Survey in Four Regions, 18 November–16 December 2004.

<sup>b</sup>Significantly different from Singapore;  $p \leq .05$ .

<sup>c</sup>Significantly different from Taiwan;  $p \leq .05$ .

three countries. Approximately two-thirds of those in Taiwan said that they would be very worried about being treated unfairly after the quarantine period was over because people might think that they were still contagious or because of their economic or social status. In contrast, approximately one-third in each of the other regions reported that they would be very worried that they might be treated unfairly for these reasons.

Respondents were read a list of potential problems they might experience if they were quarantined in a designated health care facility (Exhibit 5) and were asked what their level of worry about each problem might be. In all four countries, being exposed to someone with the contagious disease was one of the top two worries.

■ **Trusted sources of information.** Respondents varied across the four regions with regard to whom they would trust as a source of useful and accurate information about an outbreak of a serious contagious disease (Exhibit 6). Although strong majorities in all four regions said that they would trust their own doctor or another health professional a lot as a source of information, they differed in their level of trust of other sources. In Hong Kong, Singapore, and Taiwan, majorities said that they would trust government public health authorities a lot, compared with only 40 percent in the United States. U.S. blacks were significantly more likely than U.S. whites or Hispanics to report that they would not trust the government at all (data not shown). Slightly more than half of Hong Kong and Singapore respondents would trust the news media a lot, while only one-quarter of U.S. and Taiwanese respondents would do so. Employers were generally not seen as a trusted source of information across the four regions. In the United States, half of the public would trust a family member or friend a lot, compared with approximately one-third in the other three regions.

**EXHIBIT 5**  
**Worries About Being Quarantined In A Designated Health Care Facility, Four Countries, 2004**

Top two worries if quarantined	Percent responding
U.S.	
Being exposed to someone with the disease	56
Being unable to communicate with family members	56
Hong Kong	
Being unable to communicate with family members	46
Being exposed to someone with the disease	44
Singapore	
The place where you were quarantined would be overcrowded	60
Being exposed to someone with the disease	53
Taiwan	
The place where you were quarantined would be overcrowded	84
Being exposed to someone with the disease	75

**SOURCE:** Harvard School of Public Health/TNS Survey in Four Regions, 18 November–16 December 2004.



**EXHIBIT 6**  
**Trusted Sources Of Information During An Infectious Disease Outbreak, Four Countries, 2004**

	U.S.	Hong Kong	Singapore	Taiwan
Trust "a lot" as a source of useful and accurate information about an outbreak				
Your doctor or other health care professional	78%	79%	82%	81%
Government public health authorities	40 <sup>a,b,c</sup>	68 <sup>b,c</sup>	77 <sup>c</sup>	54
Newspapers, magazines, TV, or radio	27 <sup>a,b</sup>	52 <sup>c</sup>	56 <sup>c</sup>	27
Your employer	30	22	27	30
A family member or friend	52 <sup>a,b,c</sup>	33	36	31

**SOURCE:** Harvard School of Public Health/TNS Survey in Four Regions, 18 November–16 December 2004.

<sup>a</sup>Significantly different from Hong Kong;  $p \leq .05$ .

<sup>b</sup>Significantly different from Singapore;  $p \leq .05$ .

<sup>c</sup>Significantly different from Taiwan;  $p \leq .05$ .

**Conclusions**

The issue of how to make quarantine effective is important to countries worldwide and is not only related to the SARS epidemic. President George W. Bush, through an executive order, recently added pandemic influenza to the list of quarantinable diseases.<sup>7</sup> The threat of pandemic flu or an epidemic of disease caused by bioterrorism makes it imperative that we understand the lessons learned about the use of quarantine in prior epidemics.

■ **Preparation for quarantine.** The survey found widespread support for the use of quarantine in all four countries. However, the U.S. public has had very little experience with it. Findings from other sources suggest that regions with quarantine experience still had problems with compliance, as evidenced by increasing fines and arrest penalties.<sup>8</sup> It seems reasonable to conclude, therefore, that the United States would have an even higher rate of noncompliance. To increase compliance, public health authorities need to plan in advance. They should prepare trusted spokespeople to explain to the public the steps that need to be taken to halt the spread of the disease and stress the need for compliance.

In countries with greater experience with quarantine, the respondents expressed less willingness than the U.S. respondents did to be quarantined at home. This may be because of the difficulty of following quarantine procedures, such as the wearing of masks, designed to protect unexposed family members. If institution-based quarantine is required, findings from Taiwan and Singapore suggest that there will be a high level of worry about overcrowding, becoming infected while in quarantine, and being unable to communicate with family members. Planning for and responding to these concerns should be a high priority for public health officials. Establishing communication systems to allow those in quarantine to keep in touch with family members will help to ease the public's anxieties.

The survey points to a number of other issues that should also be addressed in advance. These include meeting the health care needs of those in quarantine and

compensating people financially for the time they spend in quarantine to reduce their economic hardship. The compensation issue needs further study. Its solution is complicated and could include federal, state, local, and private industry approaches to providing paid leave for the quarantine period.

Our recommendations are similar to those made by Clete DiGiovanni, based on a study conducted in the greater Toronto metropolitan area.<sup>9</sup> Those findings suggest that public health authorities should have plans in place to compensate those in quarantine for lost time from work and to help them meet basic daily needs, and should have clear communication plans spelled out in advance.

■ **Minority differences.** Multiple studies have found that in the United States, African Americans might have different or heightened worries about the actions taken by public health authorities to control the spread of an epidemic than those in nonminority communities.<sup>10</sup> They might be less willing than others to trust government authorities and comply with recommendations, because of concern about prior discrimination, experimentation, and inadequate service provision by public health authorities.<sup>11</sup> Public health officials should work with African American health professionals and civic leaders to develop approaches that will be acceptable to those communities.

■ **Public cooperation.** Every effort should be made to elicit the voluntary cooperation of the public, should the need for widespread quarantine arise. At the time of an outbreak, major efforts will have to be made to educate the public about the critical need for compulsory quarantine policies should there be cases of noncompliance. Public health officials should be prepared to deal with the general public's concerns about fairness, safety, and appropriateness of care for those quarantined.

■ **Trust in public health officials.** Lastly, trust in public health authorities is much lower in the United States than in the other three regions. Other studies have shown that this is not a unique situation facing public health officials but represents a broader U.S. cultural phenomenon. Over time, U.S. citizens have become less respectful of and confident in those who serve in both elective and appointed government roles.<sup>12</sup> This might have been exacerbated by perceptions of the government's response to Hurricane Katrina in the fall of 2005. Recent surveys, taken after Katrina by national media organizations, indicate that the government's response to the hurricane caused the majority of the public to become less confident in the government's ability to respond to a major crisis.<sup>13</sup> These findings might mean that Americans will be less willing to cooperate with a range of mandatory public health requirements in the future, such as mandatory vaccinations.

Others have suggested that public cooperation can be increased with major educational efforts to inform people of the seriousness of a disease threat. In addition, public health authorities must provide evidence of managerial competence and preparedness; choose trusted spokespeople to articulate the need for compulsory policies; and seek endorsements for these policies from independent professional groups, scientists, and opinion leaders.<sup>14</sup>

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**NOTES**

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