



The Influence of COVID-19 Stay at Home Measures on Fire Statistics Sampled from New York City, London, San Francisco, and Tokyo

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Abstract. The COVID-19 pandemic kept people at home, in either a voluntary or non-voluntary capacity, in many countries. These suggested countermeasures were prominent in the so-called initial waves of the pandemic, especially from March 2020 to May 2020. As people stayed home, in many cases restaurants were closed. As a result, people spent more time in their kitchen, not only to cook meals but also as a personal hobby. It is well known that cooking fires are a main cause of fires in residential homes. In this study, the change in the number of cooking fires in residential homes as well as the number of residential fires during these COVID-19 countermeasure periods were examined in four cities: New York City (USA), San Francisco (USA), Tokyo (Japan), and London (UK). The time period examined was from January to June in 2020 in order to grasp overall effects of stay-at-home measures on fire incidents. The number of cooking fires and residential fires increased in Tokyo and San Francisco, while the number of cooking fires in New York City (no data was obtained for cooking fires in London.) and the number of residential fires in New York City and London remained similar to previous years.

Keywords: Fire statistics, Cooking fires, Residential fires, COVID-19, Stay-at-home measures

1. Introduction

The global pandemic from COVID-19 resulted in not only loss of lives but a major adjustment to millions of people's situations in many countries. The COVID-19 pandemic forced people to stay at home. In some countries, this was voluntary while in other countries, this was in a non-voluntary capacity. People stayed home, and it was impossible to dine-in as restaurants were ordered to close their dine-in service. As a result, people spent more time in their kitchens, not only to cook meals but also as a personal hobby [1, 2].

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It is well known that cooking fires are a main cause of fires in residential homes, along with cigarette induced fires [3–5]. The number of residential fires increases in the afternoon to night, when people stay home, and are awake, peaking around dinner time. Cigarette induced fires, and resulting deaths, increase at night when people are sleeping [3–5].

In the case of the COVID-19 pandemic, many people stayed home and worked from home. While it is not possible to determine cooking habits of all of residents on a global basis, it is reasonable to assume people cooked more due to the restaurant closures. Thus, it is expected people staying home and cooking more often may have effects on fire incidents during the COVID-19 pandemic. In this study, the change in the number of cooking fires in residential homes, as well as the number of residential fires, during so-called initial waves of the COVID-19 pandemic were investigated. Four cities were examined: New York City (USA), San Francisco (USA), Tokyo (Japan), and London (UK).

2. Methods

2.1. Selection of Cities

An important part of understanding fire losses in many countries consider the collection and reporting of annual fire statistics. In the UK, statistics were collected and reported from the loss of urban structures during World War II. In 1976, the USA created the National Fire Incident Reporting System, known simply as NFIRS. Similarly, in Japan, urban fire statistic collection began after World War II.

Four cities, New York City (USA), San Francisco (USA), Tokyo (Japan), and London (UK), were selected in this study. These cities were investigated based on the following considerations: (1) these cities are large enough to have relatively large number of cooking fires per month, (2) it was easy to access raw data, and (3) they had different COVID-19 situations and countermeasures.

During the period of examination, New York City was considered one of the hardest hit by the COVID-19 pandemic, as evidenced by the large number of reported cases as shown in Fig. 1. San Francisco reported far fewer cases of COVID-19 during this period. New York City and San Francisco implemented lockdown measures [6–9]. Tokyo did not have so many reported COVID-19 cases but was on alert far earlier than the other cities examined here due to the Diamond Princess cruise ship situation. Tokyo was never locked down by government order but declared a state of emergency, with voluntary stay-at-home orders [10]. The UK was hoping to achieve herd immunity initially without lockdown but quickly changed course and resorted to lockdown measures [11, 12]. Table 1 is summary of each city's approach and lockdown duration.

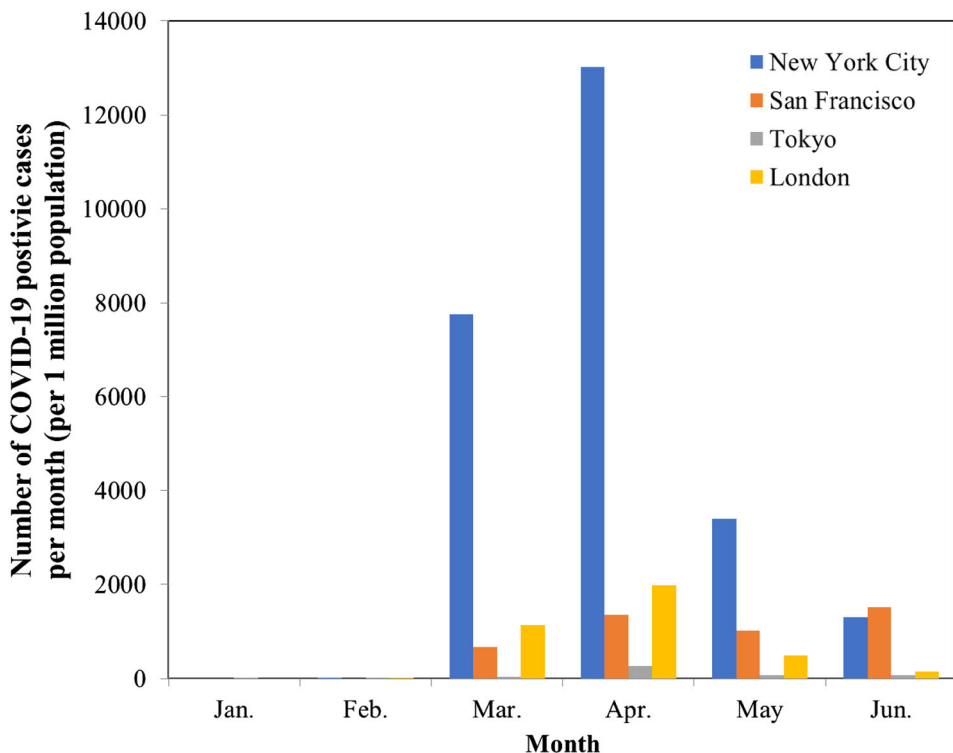


Figure 1. Number of COVID-19 positive cases per month (per 1 million population) calculated based on open data source [13–16].

2.2. Data Collection

The fire incident data was obtained from open database sites [17–21]. All of these data across four cities were “reported” data, and not corrected for analysis, as the purpose of this study is to grasp the overall effects across the different cities.

3. Analysis

Comparing fire statistics among different countries needs attention as definitions may differ. As a baseline, the fire statistics of each city from the past 5 years was compared first. Some of analysis on the fire trend has already been published elsewhere [20–22]. Attention was paid as terminology or categories may be different among countries. This is an issue discussed also elsewhere when comparing the fire statistics among countries [23]. It is important to mention that the data were “reported fires”, thus unreported fires—most of smaller fires, are not included [24].

The number of residential fires, and the number of cooking fires in the first 6 months of 2020 were compared with those in the first 6 months of 2015 to 2019

Table 1
Approach and Lockdown/Stay-at-Home Duration of Each City

	New York City	San Francisco	Tokyo	London
Contents of lockdown/stay-at-home measures	Stay-at-home (All non-essential business closed. Residents are allowed only “essential” purpose. Order is mandatory, while it was indicated no individual would be fined.)	Shelter in place or stay-home (all non-essential business closed. Residents are allowed to go outside for only “essential” purpose. Order is mandatory.)	Declaration of State of Emergency. (all non-essential business closed. Residents are allowed to go outside for only “essential” purpose. Order is not mandatory.)	Lockdown. (All non-essential business closed. Residents are allowed only “essential” purpose. Order is mandatory. Limitation on outside activities.)
Lockdown duration or emergency declaration	March 22nd to June 7th	March 19th to May 7th	April 8th to May 26th	March 26th to July 4th

(average value). In this study, a comparison of past 5 years data was selected for comparison. The use of 5-year average data has been presented elsewhere [20, 21]. In addition, the purpose of this study is to see the ‘big picture’ of how stay-at-home measures influenced fires in four cities.

The average data of 2015 to 2019 was used for comparison. The data in London needs an attention, as there were decreases in the total number of fires, and residential fires in last 5 years [22]. For London, the data [19] does not contain information on cooking fires, and no comparison with that in London was performed. Table 2 provides “categories” used to count the number of each fire.

4. Results

4.1. Trend on the Number of Residential Fires

The residential fires in all four cities are shown in Fig. 2. The number of residential fires in both New York City (Fig. 2a) and San Francisco (Fig. 2b) during the first six months of 2020 are within the uncertainties of average (2 standards deviations) with a small increase observed in San Francisco’s May. For Tokyo, the number of residential fires in 2020 remains similar to the average except May, which shows an increase (Fig. 2c). The number of residential fires in 2020 (Fig. 2d) in London is lower than the average of last 5 years, due to the decrease in the number of residential fires in general in London. Overall, the number of residential fires in those four cities was observed to be similar to average, expect that in May in Tokyo.

Table 2
Terminologies and Categories Used to Analyze for Fires, Residential Fires and Cooking Fires

	New York City	San Francisco	London	Tokyo
Residential fires	INCIDENT_CLASSIFICATION_GROUP Structural fires INCIDENT_CLASSIFICATION - “Multiple Dwelling”, “A”, “B” and “Private Dwelling Fire”	Primary Situation-100 s (including 1600 but excluding natural fire, other, brush or brush-and-grass mixture fire, grass fire) Area of Fire Origin - Multifamily dwelling, 1 or 2 family dwelling	Incident Group - Fire Stop Code Description - Primary Fire PropertyCategory-Dwelling	Provided in refer- ence [20]
Cooking fires	INCIDENT_CLASSIFICATION - Multiple Dwelling Fire, Food on the stove fire	Primary Situation - Cooking fire, con- fined to container Area of Fire Origin-Cooking area, kitchen	-	Provided in refer- ence [20]

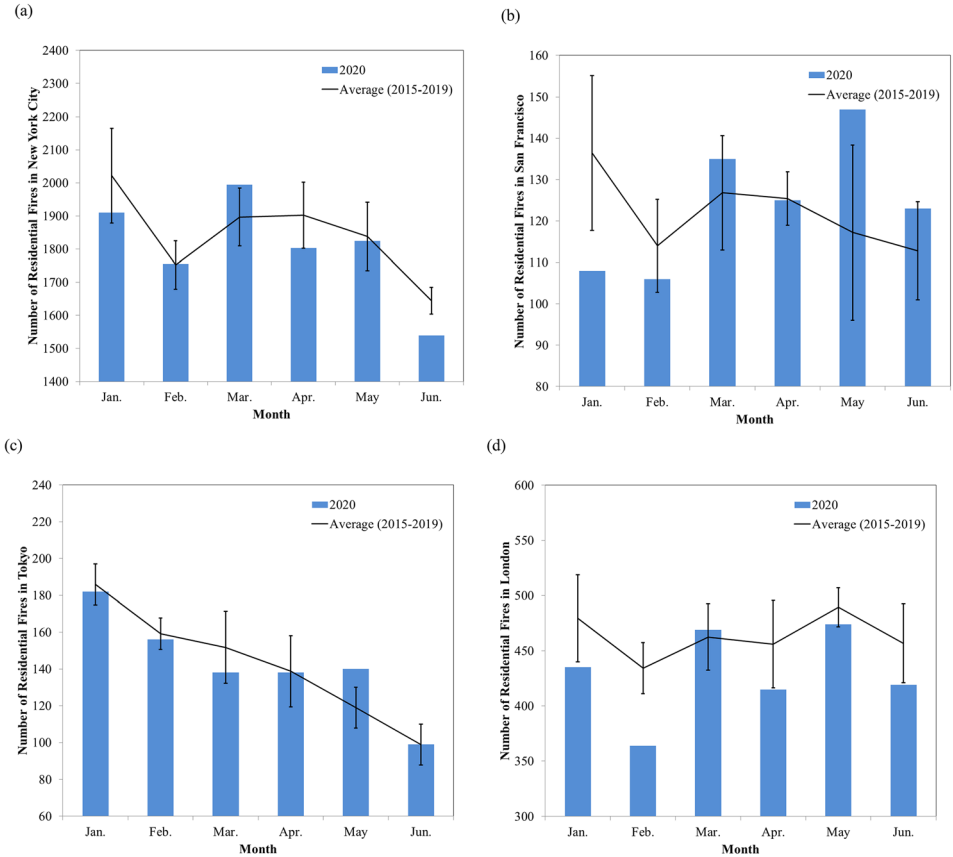


Figure 2. Number of residential fires in the period of January to June a New York b San Francisco c Tokyo d London.

4.2. Trend on the Number of Cooking Fires

The number of cooking fires in New York City, shown in Fig. 3a, started increasing in February, peaked in March, and started decreasing in April. In the case of San Francisco (see Fig. 3b), the number of cooking fires is clearly higher from March to May. In January, February, and June, the number is slightly higher than the average. In the case of Tokyo (see Fig. 3c), the increase in May is more than 50% up from the average. Smaller peak in February is observed. The increase in April and May in Tokyo and San Francisco are similar while a different trend is observed in New York.

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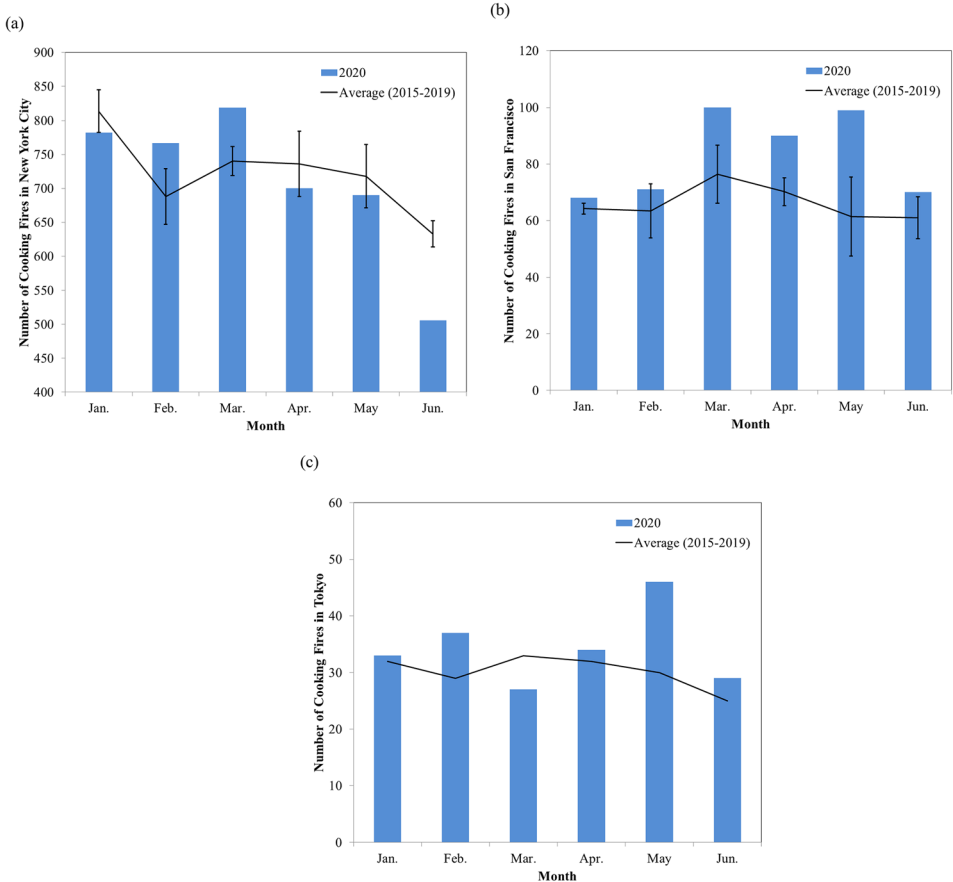


Figure 3. Number of cooking fires in the period of January to June a New York b San Francisco c Tokyo.

5. Discussion

The situation in each city was different—London and New York City had a high number of COVID-19 cases while Tokyo and San Francisco had less during the stay-at-home period shown in Fig. 1. As shown in Table 1, the general approach to lockdown or stay-at-home in New York City, San Francisco and London was similar (mandatory) while people in Tokyo stayed home on more “voluntary” basis. Community mobility reports, such as google or apple, indicate more people stayed home, or less commuted to work in all four cities [25, 26]. This being said, the trend on the number of residential fires and cooking fires in each city, are not clear. For residential fires, the numbers increased in San Francisco and Tokyo, while it did not in London and New York City. For cooking fires, the numbers increased in San Francisco and Tokyo, while it did not in New York City. These

findings are interesting since residents were forced to stay home and spent time in cooking.

The simple comparison did not provide general increases or decreases in the numbers of residential fires or cooking fires. Possible reasons for these findings may be in cultural differences, including cooking habits in those cities, and response to the COVID-19 pandemic. The option for carry-out should be also investigated. Additionally, cooking habits may change when carry-out became available in general.

London and New York City were considered one of the worst hit cities during those stay-at-home period, and high demands for first responders for COVID-19 patients might have prevented people from calling the fire department or people were afraid to let first responders into their home if a fire was small. This needs further investigation, including more data from different countries as well as cultural aspects, including comparison of socioeconomic factors [27, 28]. Furthermore, investigating the number of fire incidents before and after the lockdown periods provide new insights on fire statistics. For example, short-term comparisons on residential fires or cooking fires is also possible from a stay-at-home viewpoint as well as people's approach to fires or reporting fires.

6. Conclusion

The number of fires, especially residential fires and cooking fires, are compared with the previous 5 years for the first 6 months of 2020 (January to June) in New York City, San Francisco, London, and Tokyo in order to investigate the effect of stay-at-home order on the number of fires. No clear trend was observed among the four cities. The number of residential fires increased during the stay-at-home period in San Francisco and Tokyo, while the percentage of residential fires in all fires in New York City increased during the stay-at-home period and both remains similar for London. The number of cooking fires increased in San Francisco and Tokyo, while it did not increase in New York City. One possible explanation for this is the number of COVID-19 cases. The dispatch call number is the same for ambulance and fire, and people hesitated to call fire department if a fire was small due to high demand of first responders or to let first responders into their home. This needs more investigation including more data from different counties and taking into cultural aspects.

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