

SHORT COMMUNICATION

A Study on the Effectiveness and Adherence to Mask Mandates in Stores in Greensboro, North Carolina, USA

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Abstract:

The Governor of North Carolina requires people to wear face coverings in most public settings to curb the spread of COVID-19. Stores in Greensboro, North Carolina responded to the new executive order which strengthened the mask mandate. Every store in North Carolina requires customers to wear face masks while shopping to protect the health and safety of the public. However, the extent to which shoppers adopted this recommendation was uncertain. The objective of this study was to determine if Greensboro shoppers adhered to the mask mandate signs in local stores. In June and July 2020, investigators used direct observations of shoppers (n=2,520) in stores to assess face-covering use. Over 25% of shoppers were seen without face masks and the odds of shoppers not wearing face masks increased significantly ($P < 0.05$) in the evenings. A significantly ($P < 0.05$) greater number of males (58.3%) were seen not wearing face masks than females (41.6%). The findings suggest that not all shoppers adhered to Greensboro's Mayor Nancy Vaughan's emergency proclamation that was released to reinforce Governor Cooper's Executive Order. This is the first direct observational study evaluating the effectiveness and the adherence to mask mandates in Greensboro, North Carolina. North Carolina is probably rated as a high risk for COVID-19 infection because there is not full compliance with the mask mandates. Future directions from this study include visiting more stores during the Spring, Summer, and Fall and examining the reasons why some individuals choose not to wear face masks in public places.

Keywords: Face masks, COVID-19, Greensboro, Stores, Males, Females.

Introduction

In December 2019, an outbreak of a mysterious pneumonia known as coronavirus disease 2019 (COVID-19), caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first occurred in Wuhan, China, rapidly grew into a global pandemic (1). As of August 16, 2020, 21.6 million people in the world contracted the virus with over 773,000 deaths (2). According to the official report from the Department of Health and Human Services, the United States of America recorded 5.37 million cases of COVID-19 and 169,000 deaths. In North Carolina, approximately 144,000 confirmed cases of COVID-19 with 2,370 deaths were recorded. Guilford County reported 5,911 total confirmed COVID-19 cases with 158 related deaths (2).

The use of vaccines is one of the most significant preventive measures to contain COVID-19 and is a major step in fighting the disease (3, 4). Other safety and preventive measures have been introduced to mitigate the spread of COVID-19 (5). Everyone is encouraged to avoid or minimize the risk of exposure by adhering to the following Centers for Disease Control and Prevention (CDC) basic measures: wash hands frequently with soap and water for at least 20 seconds; clean and disinfect frequently touched surfaces daily; stay at least 6 feet away from other people; wear gloves, face shield/goggles and wear a face mask (6, 7).

The use of face masks is ubiquitous in the United States of America (8). Masks act as barriers to help prevent respiratory droplets from being inhaled by the wearer and reduce the spread of the droplets to others (9-12). The US Centers for Disease Control and Prevention (CDC) strongly admonishes wearing of face masks in public places to mitigate the risk and impact of COVID-19 (6). Nonetheless, no federal mandate requiring people to wear face masks has been made in the United States, and this has left all states and cities to decide if people are required to wear face masks (13). In July 2020, North Carolina Governor, Roy Cooper encouraged local law enforcement officers to increase enforcement of the state mask mandate. A study conducted in North Carolina showed that not everyone was willing to wear a face mask for coronavirus protection (14).

In May and June 2020, there was a record surge in new cases and hospitalization in Greensboro, North Carolina. Greensboro is the third and 66th largest city in North Carolina and the USA respectively, with a population of 299,946 inhabitants (15). As the number of COVID-19 cases spikes in communities in North Carolina, Guilford County, and Greensboro, public places such as pharmacies, clothing stores, convenience stores, and gas stations have bright and bold signs at the entrances reminding customers, visitors, and employees that face masks are required. On June 23, 2020, Greensboro Mayor, Nancy Vaughan, issued an emergency proclamation to reinforce Governor Cooper's Executive Order requiring face coverings to be worn anytime a person in public places. To reinforce these guidelines business owners were cited and fined \$100 for each person found on the premises without a mask (16). To facilitate greater insight into experimental data on whether the presence of mask mandates influences the use of face masks in Greensboro, North Carolina, the authors conducted a direct observational study at retail stores in Greensboro, North Carolina. The study hypothesizes that not all shoppers will adhere to the face masks mandate.

Methods

To address the primary aim of this study several stores were visited three times (the best times people shopped in Greensboro) daily at 9:00-11 AM (morning), 4:00-6:00 PM (afternoon), and 9:00-10:00 PM (evening), within a specific zip code in Greensboro, North Carolina. The zip code was selected because it recorded the highest number of COVID-19 cases in Greensboro in June and July 2020. The stores included a convenience store, a pharmacy, a gas station, a grocery store, and a clothing store. These stores were selected for this study because they provide essential services and were frequently visited by the public. On average 360 customers visited each store daily. The entrance to each store had signs stating, "Masks are required for entry." Direct observation of shoppers (n=2,520) was used to access face coverings within the stores at regular intervals. In each store, during every visit, the 2nd male or female (i.e., 2, 4, 6, 8, etc.) shopper was observed and the use of a face mask (present or absent) was recorded. A total of 10 males and 10 females were observed in each store during every visit. The percent of those without face masks was calculated using this formula: $\% \text{ without face mask} = \frac{\text{Number of individuals without face mask}}{\text{total number of people counted}} \times 100$.

Statistical Analysis

All statistical analyses were performed using Graph Pad Prism version 8.1. Data are shown as means \pm standard error (SE). The significance of difference was determined by using a t-test to compare means of values between groups. Values of $P < 0.05$ were considered statistically significant.

Results

Over the course of 450 visits, the highest spikes of men and women not wearing masks were in the evening as illustrated in this order: evening (40.9%) > morning (34.1%) > afternoon (24.8%). A significantly ($P < 0.05$) higher percentage of males (58.3%) were seen without masks than females (41.6%) (Fig 1).

In the morning, on average a significantly high ($P < 0.05$) number of males (51.1%) were seen without face masks in convenience stores and pharmacies compared to the females (15.1%). In comparison, the number of males and females without masks were similar but much lower in the grocery and clothing store (Fig 2). A significantly higher percentage of female shoppers (50.1%) than male shoppers (10%) were seen in the gas station.

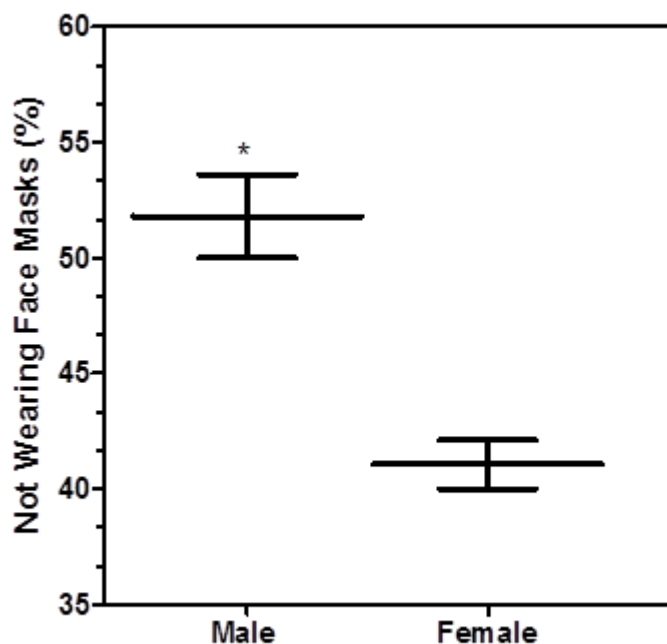


Figure 1: Shopper seen without face masks in stores across gender in the morning in Greensboro, North Carolina, in summer 2020

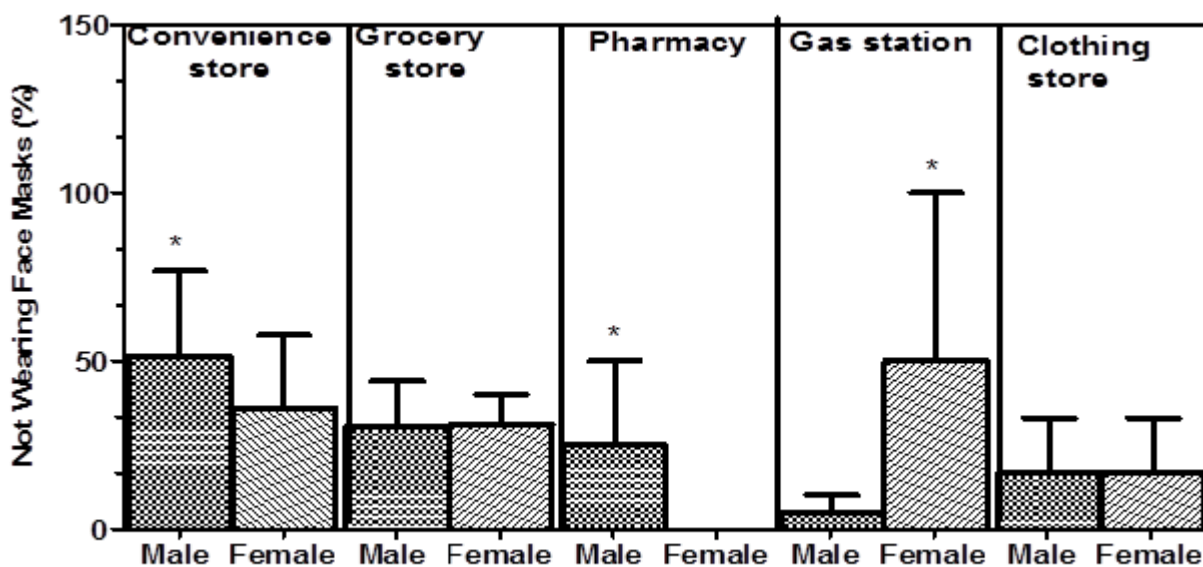


Figure 2: Customers without facemasks across gender in stores in the morning. Data shown indicates the percentage of individuals without facemasks in summer 2020 in stores in Greensboro, North Carolina .

In the afternoon, on average a significantly ($P < 0.05$) higher number of male shoppers were seen without facemasks in convenience, grocery, gas station, and

clothing stores (42.1%) compared to the female shoppers (15.3%) (Fig 3). In contrast, a significantly higher number of female shoppers (26.3%) than male shoppers (0%) were seen without face masks in the pharmacy (Fig 3).

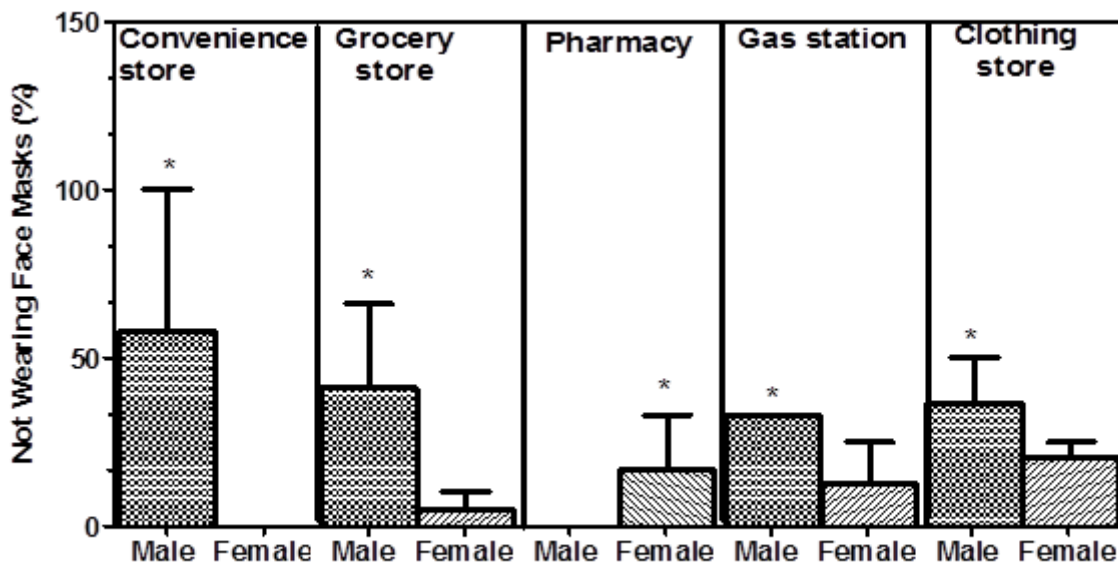


Figure 3: Customers without facemasks across gender in stores in the afternoon. Data shown indicates the percentage of individuals without facemasks in summer 2020 in stores in Greensboro, North Carolina.

In the evenings, on average, a significantly higher number of males (53.3%) than female shoppers (27.6%) were seen without face masks in the grocery store, pharmacy, and gas station (Fig 4) while a greater number of females (35.6%) than males (22.3%) were seen without face masks in the clothing store and pharmacy (35.6%) (Fig 4).

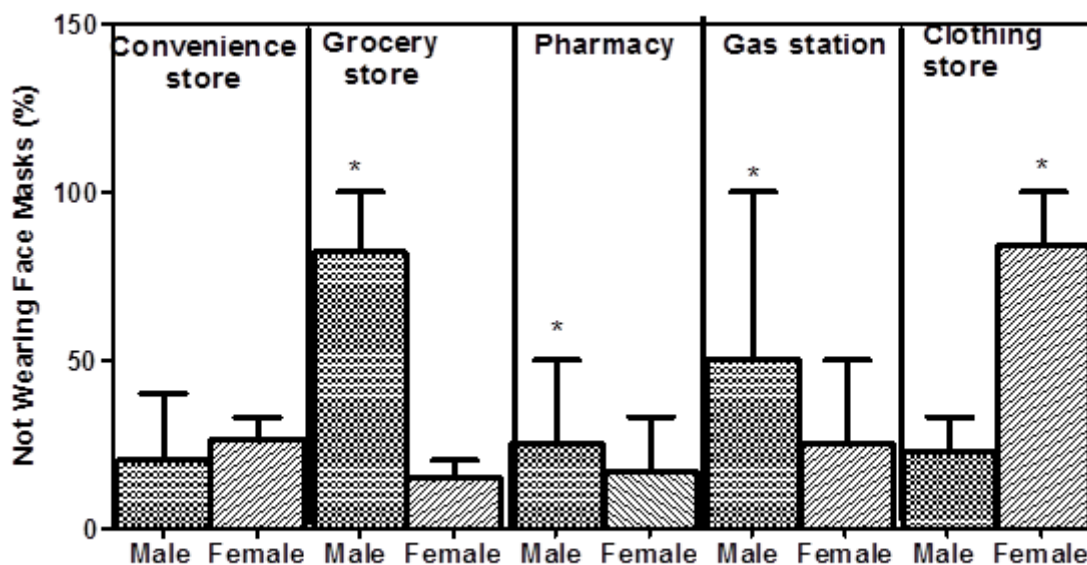


Figure 4: Customers without facemasks across gender in stores in the evening. Data shown indicates the percentage of individuals without facemasks in summer 2020 in stores in Greensboro, North Carolina.

Discussion

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. COVID-19 is an ongoing pandemic with 149,216,984 confirmed cases including 3,144,028 deaths (17). In the United States an average of 118,991 new cases are reported daily with at least 3,843 deaths. At least 27,793 people in North Carolina have tested positive for coronavirus, and 12,631 have died, according to state and county health departments (17). In Guilford County, where the city Greensboro is located, 43,477 cases have been confirmed and 642 deaths. Guilford County, North Carolina is rated as a high risk for COVID-19 infection (17).

The use of facemasks in stores is one of the most contentious issues being debated worldwide in the response to the coronavirus (COVID-19) pandemic. The value of wearing masks or face coverings in public settings is critical in combating the virus. In summer 2020, the Governor of North Carolina issued an order requiring face masks or cloth face coverings in all public places. In addition, Greensboro's Mayor Nancy Vaughan stated that all Greensboro stores must have signs on their doors that face coverings, worn over the mouth and nose, is a requirement to enter the store. All public places including stores have signs that clearly stated, Face Masks are required.

Public mask-wearing is most effective at reducing the spread of COVID-19 (18-20). The objective of this study was to determine if Greensboro citizens adhered to the mask mandate signs in stores, gas stations, and pharmacies in the city. The two-week data set that was collected in summer 2020 provided us with a variety of results. The findings indicated that not all the shoppers were seen wearing face masks despite the presence of the sign on the entrance that clearly stated, Face Masks are required before entry. A previous study in Wisconsin found that only 41.2% used face coverings in public places (21). Our studies revealed that a

significantly higher percentage of males were seen without masks than females which correlates with the number of COVID-19 cases among males (52.3%) and females (47.7%) (22). Also, it has been documented that males are more at risk for worse outcomes and death with COVID-19 (23; 24; 25). The reluctance for males to wear personal protective equipment has also been seen in other outbreaks for example influenza and other respiratory infections in Asia (26, 27, 28, 29). This explains why males are more susceptible than females to respiratory infections (30). Also, males are known to engage more in risky active health behaviors than women, such as smoking, drinking, and drug use (31,32). Men are less inclined to wear a face covering because of their ego. Most men are more likely to believe that they will be relatively unaffected by the disease compared to women, Although other biological factors could be driving the difference and social factors may play the largest role (33).

One of the most interesting findings of the current study is the evidence of different mask-wearing behavior at different times of the day in shops. Our study revealed that a significantly high percentage of individuals were seen without facemasks in the evening compared to those seen in the morning and afternoon probably because this is the time most people are free to shop. In the evenings, shoppers feel obliged to smile at other customers and store managers which helps neutralize the stress of emotional labor. Also, some medical conditions such as skin or respiratory problems could impede the ability to wear a face mask. After a long period of mask-wearing, it can become very uncomfortable, hot, and stuffy. People at this point have been wearing masks all day if they go to work in person and some individuals think prolonged use of facemasks may cause carbon dioxide toxicity or lack of adequate. However, clinical implications of elevated CO₂ with prolonged use of facemasks requires further studies (34) Face masks may cause sociological inconveniences and may hinder verbal and nonverbal communication (35).

There are many reasons why people oppose masks. Facemasks are also associated with marked sociological inconveniences, obstructing verbal communication and hindering non-verbal communication by making facial expressions hard to read. Facemasks can also be uncomfortable to wear. Primarily, being slightly resistive to airflow and a possible source of carbon dioxide rebreathing, they change our relationship with our own breathing. Others refuse to wear a mask for political reasons. People who lean Democrat tend to favor the wearing of masks much more so than those who lean Republican. Men generally more often than women felt negative emotions while wearing a face covering, like feeling weak or not cool. Others would think that masks impair breathing (36). These reasons may account for a spike in the number of confirmed Covid-19 cases in Greensboro, North Carolina.

Conclusion

Overall, this study suggests that staff and customers are required to wear face masks in stores. However, some customers chose not to wear masks even though there is abundant evidence that wearing face masks helps slow down the spread of COVID-19. Males are less likely to wear masks when compared to their female counterparts. Future directions from this study include examining the reasons why some individuals choose not to wear face masks in public places such as stores.

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