Public Health and Epidemiology of COVID-19 for Doctors of Optometry

Updated October 5, 2020

The American Optometric Association (AOA) Health Policy Institute (HPI) is providing information relevant to the eye health and vision care community regarding the novel coronavirus (SARS-CoV-2) and COVID-19.[i] Every doctor of optometry should understand the risks associated with this outbreak to ensure continued ability to care for patients.

Historical Background:

On Jan. 30, 2020, the World Health Organization (WHO) declared COVID-19 (then known as 2019 nCoV) as a global health emergency. The U.S. Secretary of Health and Human Services (HHS) declared a public health emergency on Jan. 31, 2020, under section 319 of the Public Health Service Act (42 U.S.C. 247d), in response to COVID-19.[ii] [iii]

On March 30, 2020, the WHO reported that the rapidly increasing demand on health facilities and health workers threatens to leave health systems worldwide overstretched and unable to operate effectively. The focused message was that physical distancing measures are necessary to slow the transmission of the virus to aid the health care system and mitigate the risk of systems collapse. Adding, "to suppress and control COVID-19 epidemics, countries must isolate, test, treat and trace. If they don't, transmission chains can continue at a low level, then resurge once physical distancing measures are lifted. Don't assume your community won't be affected. Prepare as if it will be. Don't assume you won't be infected. Prepare as if you will be."[iv]

The U.S. Centers for Disease Control and Prevention (CDC) stresses that COVID-19 can result in severe disease, including hospitalization, admission to an intensive care unit and death, especially among older adults (ages 55 and over) and adults with certain underlying health conditions. Everyone can take actions, such as social distancing and staying home, to help slow the spread of COVID-19 and protect older adults from severe illness.[v]

COVID-19 in the U.S.

According to a October 5, 2020 New York Times data base, 7.4 million+ people across every state, plus Washington, D.C., and three U.S. territories, have tested positive for COVID-19, and at least 209,603 people with the virus have died. Case numbers remain persistently high across the country. Over the past week, there has been an average of 43,586 cases per day, an increase of 6% from the average two weeks earlier. Cases are now rising in 40 states. In California, the state with the most known cases, more than

834,635 people have had COVID-19 and 22,937 of those were in the last seven days. Texas is close behind with the second highest number of confirmed COVID-19 cases at 801,633 and with 31,094 in the last seven days, is trending toward taking the number one spot away from California. Florida, which now has 716,451 COVID-19 cases, has passed New York, which has 469,307 cases. You can find nationally where cases are rising the fastest here.

Disease Transmission:

COVID-19 is of high concern because it is a novel virus, meaning it has never occurred before in humans. It is important to note that the virus is transmitted person-to-person through either direct contact or an exchange of bodily fluids. A study published in the New England Journal of Medicine on March 17, 2020 found that viable virus could be detected up to three hours later in the air, up to four hours on copper, up to 24 hours on cardboard and up to two to three days on plastic and stainless steel. With airborne transmission still not, to date, fully incorporated into public health directives, 239 scientists in 32 countries have outlined the evidence showing that smaller airborne particles can float in the air and infect people, and are calling for the WHO to revise its recommendations which accepted the evidence on July 7, 2020.[vi] This evidence shows that SARS-CoV-2 can stay in the air longer and travel farther in tinier bits, called aerosols, and that these aerosols can be generated by people talking, breathing or singing. This SARS-CoV-2 aerosolization combined with staying indoors in colder months can produce much higher rates of infection in the fall and winter. According to October 5, 2020 projections from the University of Washington's Institute for Health Metrics and Evaluation, COVID-19 could kill more than 2,900 people a day in the U.S. by December 27, 2020.[vii]

On June 3, 2020, it was reported in the Annals of Internal Medicine that asymptomatic persons account for approximately 40% to 45% of SARS-CoV-2 infections.[viii] This highlights the necessity of assuming all people as possibly being carriers. Dr. Thomas Frieden, chief executive at Resolve to Save Lives, an initiative of Vital Strategies to prevent epidemics and cardiovascular disease, and former director of the CDC, adds that superspreading events may involve people with symptoms that linger but who are not sick enough to stay home. The secondary attack rate of transmission of a virus is therefore an important number to monitor. This number (R_0, pronounced R-nought or r-zero) serves as an indicator of how easy the disease spreads from person-to-person, as indicated by its reproductive number, which represents the average number of people who will catch the disease from a single infected person. An outbreak with a reproductive number of below 1.0 will gradually disappear. Early in the pandemic the R0 of COVID-19 has been reported as high as 4.08 while other studies estimating the R0 to be between 1.5 and 3.5.[ix x xi xii] Based on these numbers, on average every case of COVID-19 would create three to four new cases. Recent reports now present state-by-state estimates of R0 and confirm in New York State the R0 = 6.4, explaining what is known about COVID-19, that it has the potential to spread rapidly, especially in urban areas. Estimates of R0 reveal potential challenges for vaccination campaigns: using the rule of thumb that a proportion 1 – 1/R0 of a population needs to be vaccinated, vaccination coverage will have to be roughly 60% on average among the states. However, when the RO variation among states is considered, the R0 = 6.4 for New York state suggests a vaccination coverage rate of 85%.[xiii]

On September 24, 2020, the CDC reported that from June through August, the incidence of COVID-19 was highest among adults age 20-29 years old with young adults now accounting for more than 20% of all

confirmed cases. The CDC study confirms that these infected young adults seeded waves of new infections among the middle-aged, and then in older Americans.[xiv]

Morbidity and Mortality

The CDC believes that symptoms of COVID-19 may appear in as few as two days or as long as 14 days, with median estimates of five to six days after exposure. American adults of all ages—not just those in their 70s, 80s and 90s—are being seriously sickened by the coronavirus. On April 8, 2020, the CDC released Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States, March 1–30, 2020.[xv]

Figure 1. Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019—COVID-NET, 14 States, March 1–30, 2020
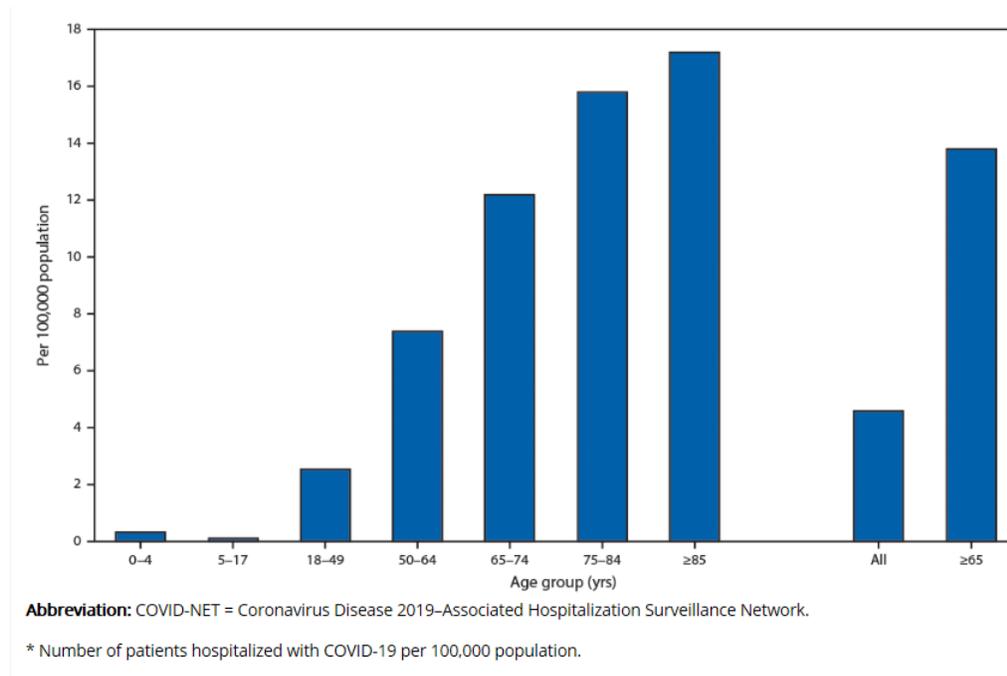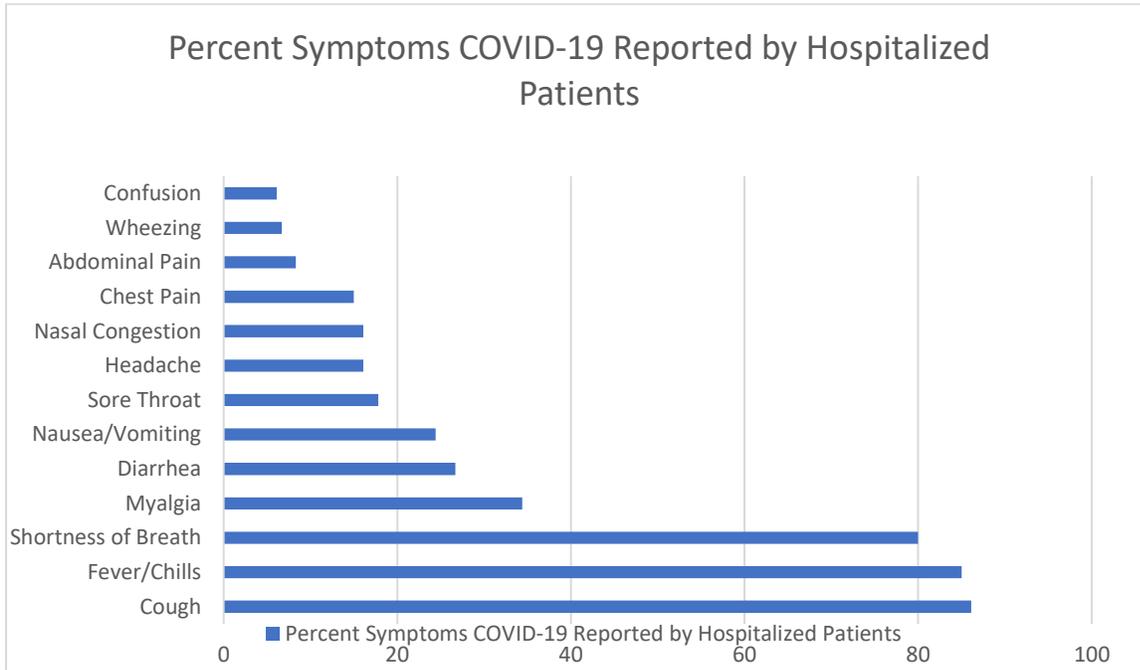

Abbreviation: COVID-NET = Coronavirus Disease 2019–Associated Hospitalization Surveillance Network.

* Number of patients hospitalized with COVID-19 per 100,000 population.

Figure 2. Underlying symptoms among adults aged ≥18 years with coronavirus disease 2019 (COVID-19)–associated hospitalizations—COVID-NET, 14 states,* March 1–30, 2020. (Adapted by HPI)

Percent Symptoms COVID-19 Reported by Hospitalized Patients

Symptom	Percent
Confusion	~6
Wheezing	~7
Abdominal Pain	~8
Chest Pain	~14
Nasal Congestion	~15
Headache	~15
Sore Throat	~18
Nausea/Vomiting	~24
Diarrhea	~26
Myalgia	~34
Shortness of Breath	~80
Fever/Chills	~85
Cough	~86

Legend: ■ Percent Symptoms COVID-19 Reported by Hospitalized Patients

COVID-19–associated hospitalizations in the United States are highest among older adults, and nearly 90% of persons hospitalized have one or more underlying medical conditions. Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States, March 1–30, 2020 [xvi]

Figure 3. Underlying conditions among adults aged ≥18 years with coronavirus disease 2019 (COVID-19)–associated hospitalizations—COVID-NET, 14 states,* March 1–30, 2020. (Adapted by HPI)
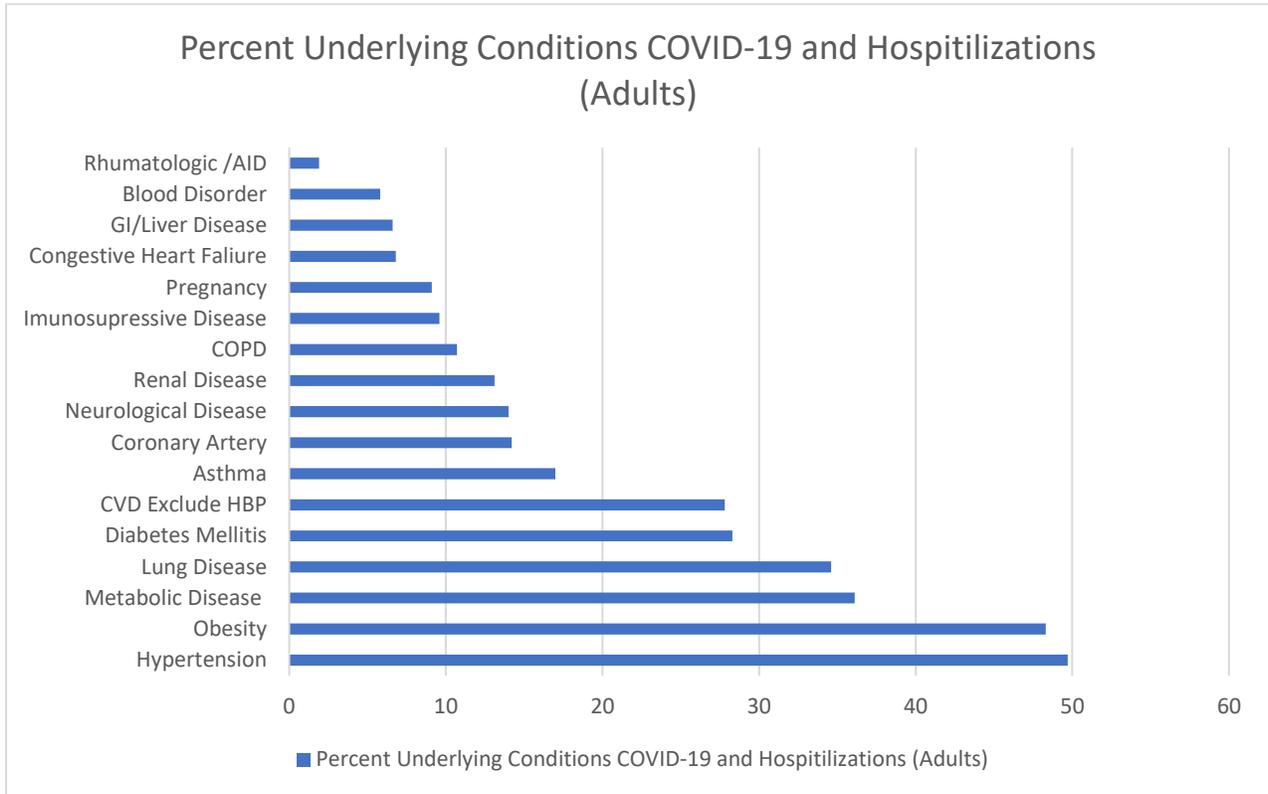
From the beginning of the spread of the coronavirus, public health officials have repeatedly warned that health complications of COVID-19 are more severe among people with underlying health conditions, of which diabetes, cardiovascular disease and obesity are prominent. New data from CDC researchers showed that people with underlying health conditions were 6 times more likely to be hospitalized than those with no such conditions (45.4% versus 7.6%) and deaths were 12 times higher (19.5% versus 1.6%).[xvii]

Analysis of COVID-19 cases by race and ethnicity showed incidence out of proportion to percent of the overall U.S. population for Hispanic (33% COVID-19 vs. 18% population), Black (22% COVID-19 vs. 13% population), and American Indian/Alaskan Native populations (1.3% COVID-19 vs. 0.7% population).[xviii] Among those aged 65 years or older, a population at higher risk for death from COVID-19, 26.8% have DM. Hypertension and severe obesity are present in 68.4% and 15.5% of individuals diagnosed with DM.[xix] Among people with diabetes with COVID-19, it is possible that higher BMI and A1c levels are linked to worse outcomes.[xx] Also, researchers believe that disruptions caused by the pandemic, including increased stress and changes to care, diet and physical activity routines, could contribute to worse outcomes for people with diabetes, and could exacerbate health disparities.[xxi]

New research also suggests that COVID-19 and diabetes may be a two-way street. Not only do people with diabetes and COVID-19 suffer disproportionately higher rates of severe outcomes, it is also possible

that COVID-19 is triggering new cases of type 1 and type 2 diabetes or a new type of diabetes, and among people with existing diabetes, it may be triggering severe metabolic complications, such as diabetic ketoacidosis.[xxii] Other new studies show that nearly half of hospitalized COVID-19 patients without a prior diabetes diagnosis have hyperglycemia, and the latter is an independent predictor of mortality at 28 days.[xxiii]

To help assess this bi-directional hypothesis, a new global registry to track COVID-19-related diabetes, called CoviDiab, has been started by Kings College London and Monash University.[xxiv]

Most recently (August 14, 2020), CMS reported new data on Medicare and dual eligible beneficiaries and COVID-19. Key highlights:

- More than 773,080 Medicare beneficiaries have been diagnosed with COVID-19 this year through August 14, translating to 1,356 cases per 100,000 beneficiaries in urban areas and 641 per 100,000 beneficiaries in rural areas.[xxv]

- The 214,804 Medicare beneficiaries hospitalized with a COVID-19 diagnosis this year through August 14 translates to 384 hospitalizations per 100,000 beneficiaries in urban areas and 157 hospitalizations per 100,000 beneficiaries in rural areas. Among those hospitalized with COVID-19, the five most prevalent chronic conditions for Medicare fee-for-service beneficiaries were: hypertension (80%); hyperlipidemia (62%); chronic kidney disease (52%); anemia (51%); and diabetes (51%).[xxvi]

- Medicare COVID-19 Data Snapshot: Only 29% of hospital discharges of beneficiaries were able to return home unaided; 24% expired at the hospital. The remainder required skilled nursing at a facility (23%) or at home (13%). Average cost of hospitalization (at discharge) per beneficiary was $25,024. Fifty-one percent of hospitalized beneficiaries had diabetes.[xxvii]

- Medicare COVID-19 Data Snapshot: Medicare hospitalization rates for Black beneficiaries were approximately 4X higher than for white beneficiaries. Medicare hospitalization rates for Hispanic beneficiaries were 2X higher than for white beneficiaries.[xxviii]

Conclusion:

Global concern has escalated due to the rapid spread of the disease internationally including alarmingly high numbers of cases identified and presenting in the U.S. Evolving information from the CDC on the outbreak can be found at cdc.gov/coronavirus/2019-ncov/about/index.html.

As discussed above, this information is evolving as public health organizations track and learn more about the spreading COVID-19 coronavirus. It is important to monitor for changes in information from the CDC and WHO to best protect against infection.

[i] On Feb. 11,2020 the WHO renamed 2019-nCoV to COVID-19.

[ii] ii whitehouse.gov/presidential-actions/proclamation-declaring-national-emergency-concerning-novel-coronavirus-disease-covid-19-outbreak/

[iii] who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the- international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel- coronavirus-(2019-ncov)

[iv] who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---18-march-2020

[v] https://www.cdc.gov/coronavirus/2019-ncov/hcp/ambulatory-care-settings.html

[vi] https://www.nytimes.com/2020/07/04/health/239-experts-with-one-big-claim-the-coronavirus-is-airborne.html

[vii] https://covid19.healthdata.org/global?view=total-deaths&tab=trend

[viii] Oran D: Prevalence of Asymptomatic SARS-CoV-2 Infection, A Narrative Review, Annals of Internal Medicine, June 3, 2020 https://doi.org/10.7326/M20-3012

[ix] Estimating the effective reproduction number of the 2019-nCoV in China - Zhidong Cao et al., Jan. 29, 2020 Mandl, Harvard University - Computational Health Informatics Program - Posted: 24 Jan 2020 Last revised: 27 Jan 2020

[x] Novel coronavirus 2019-nCoV: early estimation of epidemiological parameters and epidemic prediction - Jonathan M. Read et al, Jan. 23,2020.

[xi] Early Transmissibility Assessment of a Novel Coronavirus in Wuhan, China - Maimuna Majumder and Kenneth D.

[xii] Report 3: Transmissibility of 2019-nCoV - 25 January 2020 - Imperial College London

[xiii] https://www.medrxiv.org/content/10.1101/2020.05.17.20104653v3.full.pdf

[xiv] https://www.nytimes.com/2020/09/24/world/covid-19-coronavirus.html#link-7f8a5627

[xv] https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e3.htm?s_cid=mm6915e3_e

[xvi] https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e3.htm?s_cid=mm6915e3_e

[xvii] Stokes EK, Zambrano LD, Anderson KN, et al. Coronavirus disease 2019 case surveillance – United States – January 22—May 30, 2020. MMWR. June 15, 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6924e2.htm.

[xviii] Stokes EK, Zambrano LD, Anderson KN, et al. Coronavirus disease 2019 case surveillance – United States – January 22—May 30, 2020. MMWR. June 15, 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6924e2.htm

[xix] Muniyappa R, Gubbi S; COVID-19 pandemic, coronaviruses, and diabetes mellitus, Am J Physiol Endocrinol Metab. 2020 May 1; 318(5): E736–E741.

[xx] Hartmann-Boyce J, Morris E, Goyder C, et al. Diabetes and COVID-19: risks, management, and learnings from other natural disasters. Diabetes Care. June 16, 2020. https://doi.org/10.2337/dc20-1192.

[xxi] Hartmann-Boyce J, Morris E, Goyder C, et al. Diabetes and COVID-19: risks, management, and learnings from other natural disasters. Diabetes Care. June 16, 2020. https://doi.org/10.2337/dc20-1192.

[xxii] Rubino F, Amiel, SA, Zimmet P, et al. New-onset diabetes in COVID-19. NEJM. June 12, 2020. https://doi.org/10.1056/NEJMc2018688. .

[xxiii] https://link.springer.com/article/10.1007/s00125-020-05209-1

[xxiv] http://covidiab.e-dendrite.com/

[xxv] https://www.cms.gov/files/document/medicare-covid-19-data-snapshot-fact-sheet.pdf

[xxvi] https://www.cms.gov/files/document/medicare-covid-19-data-snapshot-fact-sheet.pdf

[xxvii] https://www.cms.gov/files/document/medicare-covid-19-data-snapshot-fact-sheet.pdf

[xxviii] https://www.cms.gov/files/document/medicare-covid-19-data-snapshot-fact-sheet.pdf