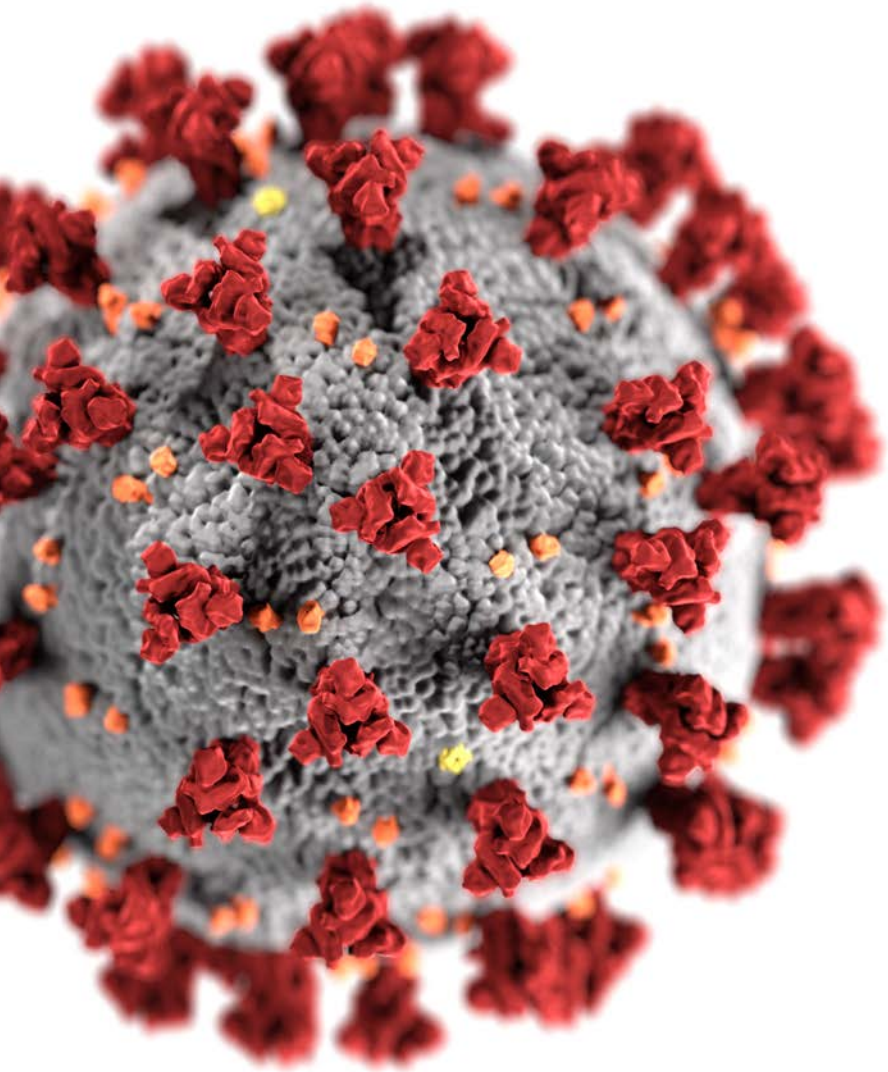
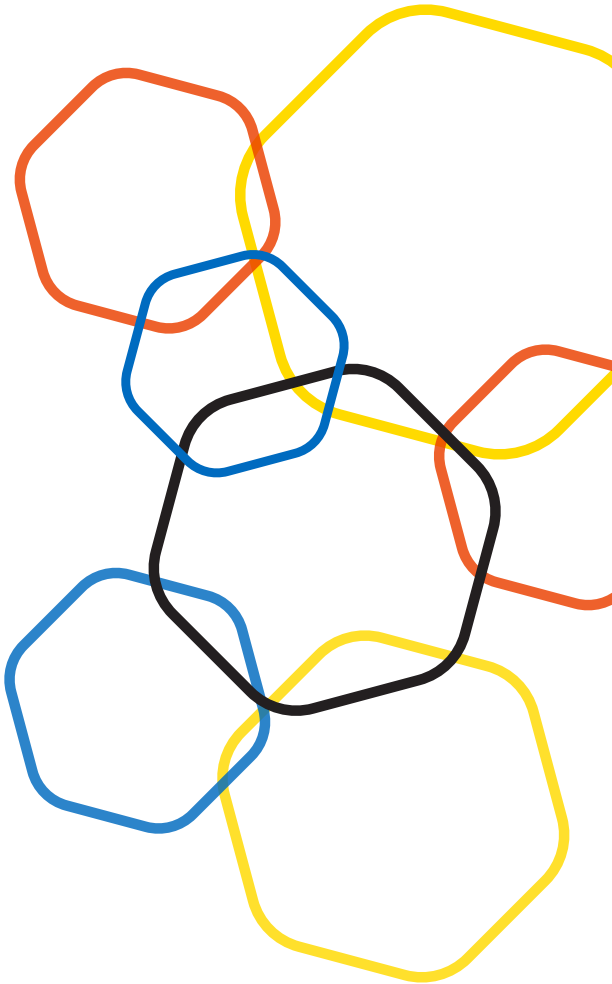
Responding to non-communicable diseases during and beyond the COVID-19 pandemic

State of the evidence on COVID-19 and non-communicable diseases: a rapid review





UN INTERAGENCY TASK FORCE ON NCDs
#beatNCDs
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World Health Organization

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WHO/2019-nCoV/Non-communicable_diseases/Evidence/2020.1

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Summary

This document provides an initial review of emerging information (as of 2 July 2020) on the relations among COVID-19, NCDs and NCD risk factors. Peer-reviewed articles were retrieved from the NCBI PubMed, PMC and Google Scholar databases. The review demonstrates that people living with NCDs are at higher risk of severe COVID-19-related illness and death and that there are limited data for estimating risk. We also summarize the results of two WHO surveys that indicate that services for the prevention and treatment of NCDs have been severely disrupted since the pandemic began.

Aims and objectives

To undertake an initial review of studies on the relations among COVID-19, NCDs and NCD risk factors.

Methods

Search. A search for articles in NCBI PubMed, PMC and Google Scholar was undertaken between 18 May and 1 July 2020 with the keywords "COVID-19", "coronavirus" and "SARS-CoV-2" in combination with any of the following: "(air) pollution", "asthma", "cancer", "cardiovascular disease", "chronic obstructive pulmonary disease", "chronic respiratory disease", "diabetes", "diet", "heart disease", "hypertension", "NCDs", "noncommunicable disease", "non-communicable diseases", "obesity", "overweight", "physical activity", "physical inactivity", "smoking", "smokers", "tobacco" and "vaping". No language filter was applied in the search. The references in the included articles were reviewed to establish accurate reporting.

Study selection. Publications of studies that assessed risk for hospitalization, severe or critical illness or death associated with NCDs or NCD risk factors and COVID-19 were included. Only peer-reviewed publications were used. The publications reported case-control, cross-sectional and descriptive studies, randomized and nonrandomized controlled trials, systematic reviews and meta-analyses.

Information on the continuity of health services during the COVID-19 pandemic (see below) was obtained from two surveys conducted by WHO during 2020.

Limitations

This document is not a systematic review but rather an initial synthesis of emerging evidence, which continues to appear.[1] Meaningful risk estimates are still not available for many NCDs and NCD risk factors. Most of the peer-reviewed publications are from high- or upper-middle-income countries, and care must be taken in extrapolating the results to low- and middle-income countries. Factors that may influence COVID-19 outcomes other than NCDs (age, gender, ethnicity, mental health) are not addressed in this review.

1 WHO is gathering the latest international scientific findings and knowledge on COVID-19 (1). The database, with other resources on COVID-19, represents a comprehensive multilingual source of current literature on the topic.

Risk factors

1. Tobacco use

1.1 Tobacco is one of the main causes of premature mortality, killing more than eight million people a year globally; seven million deaths are due to direct tobacco use and 1.2 million to exposure to second-hand smoke *(2)*. Tobacco use increases the risk of developing several NCDs, such as cardiovascular disease, chronic respiratory disease, diabetes and cancer *(3)*. People living with pre-existing NCDs, including those caused by tobacco use, are more vulnerable to severe illness with COVID-19 *(4)*.

1.2 The conclusion of a review of the evidence conducted by WHO up to 12 May 2020 suggested that smoking is associated with greater severity of disease and death in hospitalized COVID-19 patients. Although this is probably related to severity *(5–7)*, evidence is now emerging that smokers may be at higher risk of hospitalization with COVID-19 *(8–10)*. More generally, tobacco smoking is detrimental to the respiratory immune system and increases vulnerability to respiratory infectious diseases, including Middle East respiratory syndrome *(11–13)*. Well-designed population-based studies are, however, necessary to address questions about hospitalization, COVID-19 severity, and the risk of infection by SARS-CoV-2[2] among smokers *(14)*.

1.3 Cigarettes and other forms of tobacco use like water-pipes and smokeless tobacco, as well as e-cigarettes, may increase the risk of COVID-19, for example through hand-to-mouth contact *(14)*.

2 'SARS-CoV-2' refers to the novel coronavirus, 'COVID-19' refers to SARS-CoV-2-associated disease.

2. Harmful use of alcohol

2.1 Harmful use of alcohol has negative effects on physical and mental health and is one of the leading risk factors for disease, disability and death globally. It is causally linked to more than 200 codes for diseases and injury in the International Classification of Diseases (10th revision), including NCDs such as cancer, stroke and hypertension *(15)*.

2.2 To date, few studies have been performed to quantify the effect of alcohol consumption on vulnerability to COVID-19. Use of alcohol is nevertheless associated with significant health risks and can lead to the development of substance use disorders and other health conditions due to intoxication, toxicity or other long-lasting effects. Harmful use of alcohol and other psychoactive substances has a number of negative effects, which include undermining immune function, thus weakening the body's ability to fight SARS-CoV-2 infection. Even a single session of heavy alcohol use can have measurable negative effects on both adaptive and innate immune responses *(16)*. Harmful use of alcohol also increases the risk of diseases associated with severe COVID-19 *(16–19)*. Scientific evidence refutes the suggestion that alcohol can protect against COVID-19 *(20)*.

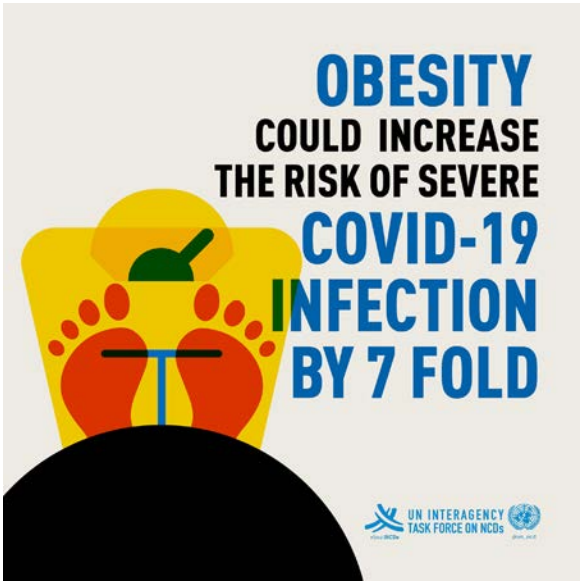
2.3 Alcohol use not only impairs overall physiological and immune function but can have other negative effects during the COVID-19 pandemic *(21)*. Unhealthy behaviour such as harmful use of alcohol may increase during challenging times as a coping strategy to relieve stress or anxiety or to pass time when self-isolating *(22)*. Harmful alcohol use affects psychological well-being and can impair judgement, self-regulation, motor coordination and reaction time. This in turn increases the risks of injuries and violence, including intimate partner violence, which is being exacerbated by the pandemic *(23, 24)*. Moreover, harmful use of alcohol interferes with people's ability to take precautions to protect themselves against infection, such as compliance with hand hygiene, and can decrease the effectiveness of COVID-19 protective measures by interfering with compliance with regulatory and treatment regimens *(25)*.

2.4 People with alcohol use disorder may be more vulnerable to COVID-19 *(26)* and may be at particular risk of acquiring a range of infections due to risk factors associated with alcohol use, such as sharing objects (bottles and other containers, tableware), gathering in groups, poverty, unemployment, worse physical health and a greater likelihood of arrest and incarceration. In global humanitarian settings, people with substance use disorders are often already marginalized and may not have appropriate treatment options. During a pandemic, these populations may be particularly vulnerable and neglected and should therefore be considered in mental health and psychosocial support responses.

3. Physical inactivity

3.1 Physical inactivity is one of the main risk factors for developing NCDs, while regular physical activity helps to prevent risk factors such as hypertension, overweight and obesity, protects against NCDs and contributes importantly to improving mental health *(27, 28)*.

3.2 Physical inactivity may indirectly influence the progression of COVID-19 disease. A large-scale study of behavioural risk factors for COVID-19 suggests that physical inactivity is a risk factor for hospitalization related to the disease *(9)*. Physical inactivity is associated with obesity, a metabolic risk factor for severe COVID-19 disease *(29, 30)*. In contrast, physical activity can stimulate immune function and reduce inflammation and also has various physiological and psychological benefits, including reducing stress and anxiety *(28, 31, 32)*. Insufficient physical activity and sedentary behaviour, including a sedentary work culture, are exacerbated by pandemic-related lockdowns and travel restrictions, increasing the associated risk for obesity or NCDs *(33, 34)*. Therefore, maintaining regular physical activity is especially important during the pandemic and extended time at home *(35)*.



4. Malnutrition and unhealthy diets

4.1 Globally, malnutrition in all its forms (including undernutrition, micronutrient deficiencies, overweight and obesity) is a leading cause of disease and NCD-related mortality *(36)*. Malnutrition throughout the life course exacerbates the risk of NCDs: both childhood undernutrition and obesity are associated with increased likelihoods of adult obesity and NCD onset *(37)*.

4.2 Overweight and obesity are among the most common comorbid conditions in hospitalized COVID-19 patients and have been associated with higher risks of adverse outcomes *(30, 38)*. A higher likelihood of severe COVID-19 is in accordance with previous findings that obesity is pro-inflammatory, impairs immune responses to viral infection, induces diabetes and oxidant stress and restricts both cardiovascular and respiratory function (*39, 40)*. While it is clear that obese patients are more vulnerable to COVID-19 *(41)*, limitations in study size and lack of comprehensive documentation of patients' body mass indices currently obviate statistically powerful analyses to estimate relative risks accurately *(42–45)*.

4.3 Obesity has been highlighted as a risk factor for severe COVID-19 in several studies *(44, 46)*. First, obesity is one of the most prevalent pre-existing medical conditions in hospitalized patients in the USA *(38, 47)*. Secondly, obese males were more likely to develop severe pneumonia than patients of normal weight (odds ratio [OR], 5.7; 95% confidence interval [CI], 1.8;17.8) *(29)*. Thirdly, in a study involving 124 patients admitted to intensive care units, disease severity increased with body mass index even after adjustment for potential confounding factors such as age, diabetes and hypertension. The risk of severe COVID-19 was markedly increased in the severely obese group (body mass index > 35) (OR, 7.36; 95% CI, 1.63;33.14) *(30)*.

A nationwide study of 177,000 people in Mexico found that obesity was a risk factor for both admission to intensive care and mortality from COVID-19 (hazard ratio, 1.25; 95% CI, 1.17;1.34) *(48)*. Overweight has also been associated with adverse outcomes from COVID-19. A study of 112 intensive care patients found that the percentage of overweight patients (body mass index ≥ 25) was much higher among non-survivors (88% overweight) than among survivors (19% overweight) *(49)*.

4.4 Unhealthy diets, including those low in fruits and vegetables, high in sodium and sugar, low in nuts and seeds, low in whole grains, and low in seafood-derived omega-3 fatty acids, cause NCDs *(50)*. While empirical evidence remains limited, many indicators suggest a negative impact of the COVID-19 pandemic on dietary patterns, subsequently increasing long-term NCD risk. Examples include the early trend of stockpiling processed shelf-stable food, which may lead to overconsumption; widespread job losses and financial hardship, limiting the affordability of the safe, diverse, nutritious foods that contribute to healthy diets; and supply chain disruptions or containment measures that affect the accessibility of nutritious perishable foods (including fruit, vegetables and fresh fish) *(51)*. A survey of Italian adults under lockdown restrictions found that consumption of nutritious foods increased but so also did intake of sweets, and 49% of respondents reported weight gain since the lockdown *(52)*. An investigation in Portugal indicates that worsening of dietary behaviour during COVID-19 is most prevalent in low socioeconomic communities, with an increase in the intake of snack foods, ready meals, sugar-sweetened beverages and takeaways *(53)*, whereas high socioeconomic groups improved their dietary intake, with increased intake of fruits, vegetables and other nutrient-dense foods. This suggests that COVID-19 is likely to widen socioeconomic inequalities in dietary quality.

4.5 Good nutrition supports a strong immune system. For instance, fruit and vegetables provide vitamins and minerals, and healthy fats in olives or seeds are rich in unsaturated fatty acids, which are necessary for a functioning immune response *(54)*. In contrast, a diet rich in saturated fats, sugar and salt predisposes to obesity, diabetes, hypertension and cancer, which have been linked to more severe COVID-19 infection (see following sections) *(55, 56)*. Furthermore, the so-called "western" diet (high in fats, sugar and carbohydrates) leads to chronic inflammation and impaired immune response to viral infections *(57)*.

5. Environmental risks

5.1 Household and outdoor air pollution are major causes of death from NCDs. Exposure to air pollution in general and especially to high levels of particulate matter have been associated mainly with the development of lung cancer, chronic obstructive pulmonary disease and cardiovascular disease *(58)*.

5.2 Further research is required on the potential links between exposure to higher concentrations of air pollutants, exacerbation of symptoms in people infected with COVID-19 and the potential consequences for those who are treated *(59)*. Fine particles induce an inflammatory response and impair (respiratory) immune function, and long-term exposure to pollution and associated inflammation is known to damage the lungs and heart, potentially leading to comorbid conditions *(60),* which may decrease the ability of exposed individuals to fight SARS-CoV-2.

5.3 Exposure to air pollution probably influences mortality due to COVID-19, but further studies should be conducted. Several studies in which mortality from COVID-19 was associated with levels of air pollution have been published only as non-peer-reviewed preprints and were therefore not included in this review. Nonetheless, the risk of death was suggested to increase with short-term exposure to elevated concentrations of pollutants (NO2 and PM2.5) in a small study in the United Kingdom *(61)*. These findings are corroborated by those of another study, in which the majority of deaths (78% of 4,443 fatalities) investigated in Europe occurred in five regions characterized by high pollution levels and geographical settings that prevent dispersal of airborne pollutants *(62)*. During the SARS epidemic of 2002, air pollution was also correlated with fatality rates *(63)*.

5.4 Household air pollution (e.g. from use of solid fuels and kerosene for cooking) and second-hand tobacco smoke also impair lung and immune functions and probably increase the risk for adverse effects of COVID-19 *(64, 65)*.

Diseases

6. Diabetes

6.1 Diabetes affects over 500 million people worldwide, and its prevalence and the premature mortality it causes are rapidly rising. Diabetes is also a major cause of disability, cardiovascular disease and kidney failure *(66)*.

6.2 People with diabetes are at increased risk for hospitalization and adverse events after SARS-CoV-2 infection *(67–70)*. A systematic review of studies with a total of 1382 patients indicated that people with diabetes were at increased risk of admission to intensive care (OR, 2.79; 95% CI, 1.85;4.22) and mortality (OR, 3.21; 95% CI, 1.82;5.64) *(69)*. Their increased vulnerability may be explained by presence of comorbid conditions, including cardiovascular disease *(67)*, and impaired immune response to infection *(71)*.

6.3 People with uncontrolled diabetes are even more vulnerable to poor outcomes after COVID-19 infection. A large cohort study of 17 million patients in the United Kingdom indicated that those with uncontrolled diabetes had a higher risk of dying from COVID-19 than either non-diabetics or people with controlled diabetes *(72)*. An increased risk was observable even