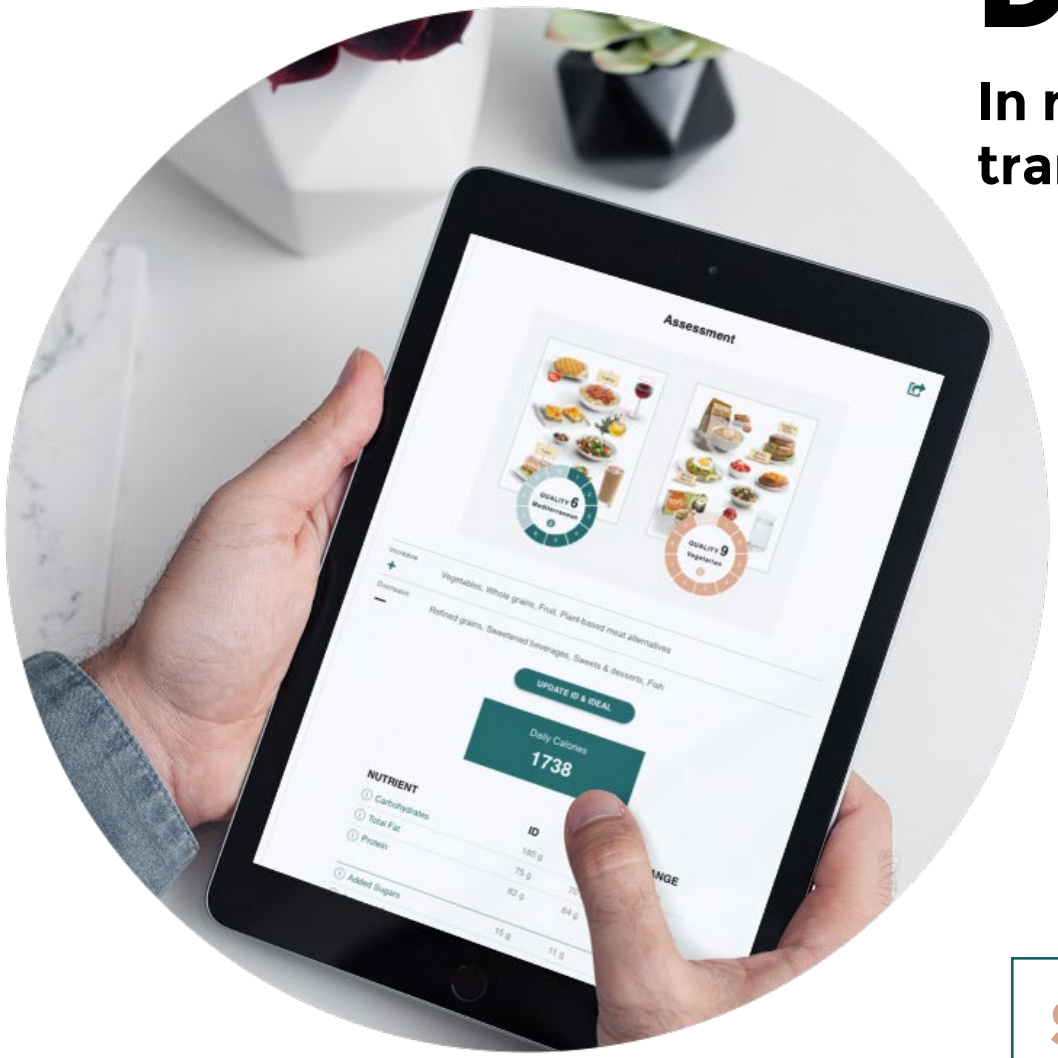
Thank you for joining!

We will begin in just a few minutes

Diet ID – FREE ACCESS

In response to the impact of Covid-19 and the transition to digital care



- Digital Dietary Assessment + Goal Setting
- Completed in 2 minutes
- Real-time results
- Data include nutrient intake, food group intake, HEI score, sample meal plans, and more
- Your own branded web app **in 24 hours**

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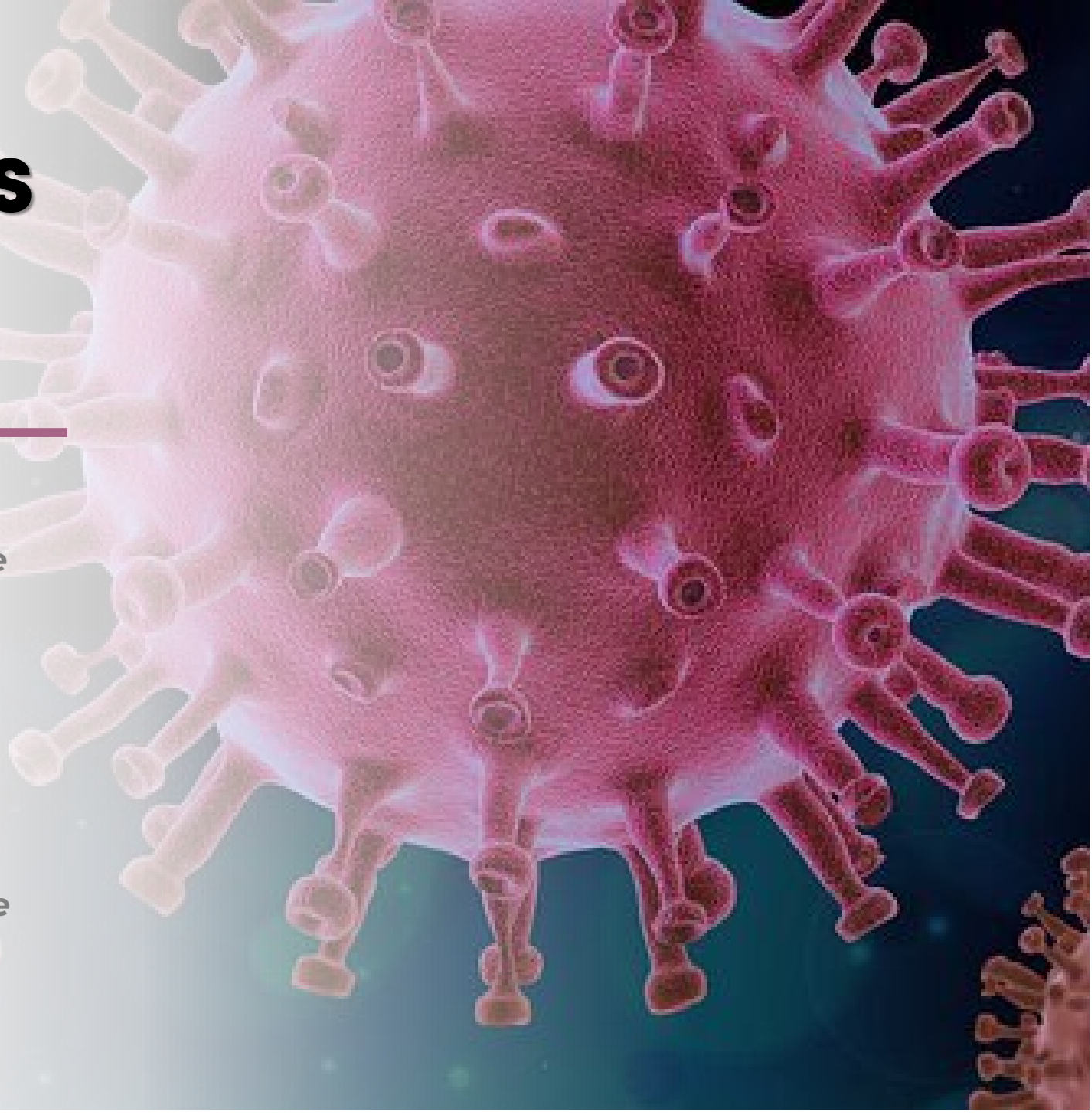
HOW DO LIFESTYLE-RELATED CONDITIONS AFFECT COVID-19 OUTCOMES?

David L. Katz, MD, MPH
CEO, Diet ID; President, True Health Initiative

Candace D. McNaughton, MD, PhD, MPH
Associate Professor, Emergency Medicine, Vanderbilt University Medical Center

Robert J. Ostfeld, MD, MSc, FACC
Director of Preventive Cardiology, Montefiore Health System

May 20, 2020



CDC's National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP)

CHRONIC DISEASES IN AMERICA

6 IN 10

Adults in the US have a **chronic disease**

4 IN 10

Adults in the US have **two or more**

THE LEADING CAUSES OF DEATH AND DISABILITY
and Leading Drivers of the Nation's **$3.5 Trillion** in Annual Health Care Costs

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https://www.cdc.gov/chronicdisease/resources/infographic/chronic-diseases.htm

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Prevalence in the US (Adults)

- Obesity: 43% (Severe obesity: 9%)
- Diabetes: 11% of the population; 27% of seniors (>65)
- CVD: 48%
- Hypertension: 45%
- Metabolic syndrome: 24%; 44% in those over 50

https://cdc.gov

Main Determinants of Mortality Risk

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Statistics

- 94% of deaths from COVID-19 are in those with an underlying age-related chronic disease
- Adjusting for other risk factors, Americans with obesity (BMI>30) have a more than four times higher risk of hospitalization due to coronavirus, while those with severe obesity (BMI>40) have a more than six times higher risk
- Experts warn that healthy people have had severe infection (viral dose? genetics?) – avoid being overly reassured

Hyman M, Mozaffarian D. The link between coronavirus deaths and those french fries. Opinion: The Boston Globe. May 7, 2020. https://www.bostonglobe.com/2020/05/07/opinion/link-between-coronavirus-deaths-those-french-fries/
Docherty AB, Harrison EM, Green CA, et al. Features of 16,749 hospitalised UK patients with COVID-19 using the ISARIC WHO Clinical Characterisation Protocol. medRxiv 2020.04.23.20076042; doi: https://doi.org/10.1101/2020.04.23.20076042

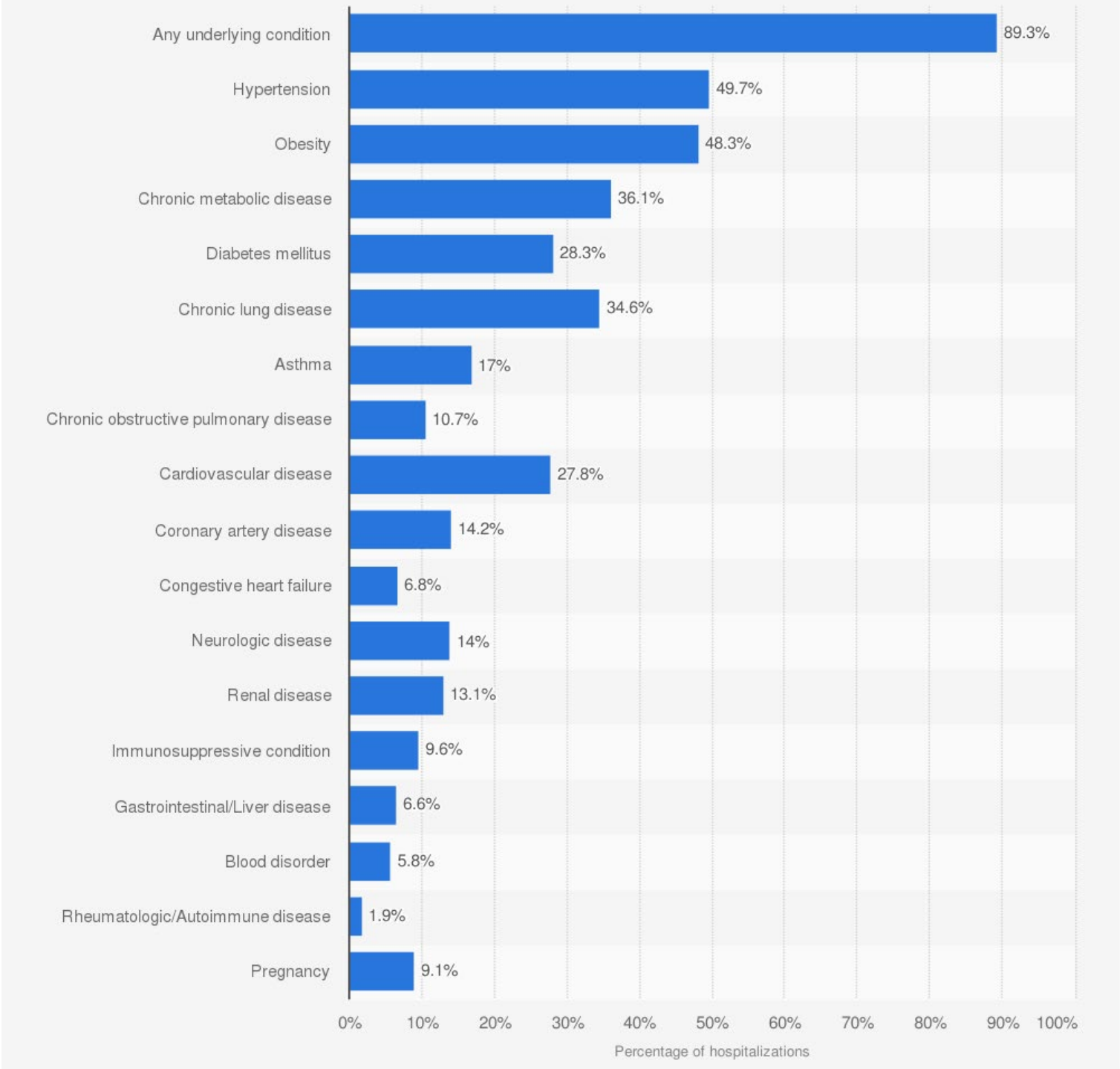
Underlying Conditions in COVID-19

- In general, “comorbidity” refers to the simultaneous presence of >1 chronic disease or condition in a patient.
- In COVID-19, the most common comorbidities related to poor outcomes (hospitalizations, morbidity) are:
  - Hypertension
  - Diabetes
  - Cardiovascular disease
  - Respiratory system disease
  - Obesity

Percentage of COVID-19-associated hospitalizations in the U.S. from March 1 to 30, 2020 with select with underlying conditions

Sources
MMWR; CDC; US Department of Health and Human Services
© Statista 2020

Additional Information:
United States; MMWR; CDC; March 1 to 30, 2020; 18 years and older



https://www.statista.com/statistics/1111428/covid-hospitalization-underlying-conditions-us/

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Defining Comorbidities in COVID-19

"We estimate 56.0% of US adults are at risk of needing hospitalization for COVID-19 due to underlying conditions. Such estimates will vary depending on exact criteria used to define underlying conditions but represent a substantial fraction of all US adults. These underlying conditions are, in turn, associated with modifiable risk factors including ever smoking, being sedentary and inadequate fruit and vegetable consumption. The three risk factors were estimated to contribute 40.6% of attributable-risk for all adults reporting any of the underlying conditions in this study including 34.2% of attributable-risk among adults ages 18-59 and 59.7% for adults ages 60 and older. These results suggest the potential for policies based on risk-stratification of the population and for possible improvement of risk status through lifestyle change. A national focus on, and support for, a "health promotion" campaign would be timely."

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Adams ML, Grandpre J, Katz DL. Updated estimates of comorbidities associated with risk for COVID-19 complications based on US data. medRxiv 2020.05.02.20088781; doi: https://doi.org/10.1101/2020.05.02.20088781

Sample of 5700 Pts Hospitalized with COVID in NYC

Richardson S, Hirsch JS, Narasimhan M, et a. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. JAMA 2020; April 22; https://jamanetwork.com/journals/jama/fullarticle/2765184

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Table 1. Baseline Characteristics of Patients Hospitalized With COVID-19

	No. (%)
Demographic information	
Total No.	5700
Age, median (IQR) [range], y	63 (52-75) [0-107]
Sex	
Female	2263 (39.7)
Male	3437 (60.3)
Race[a]	
No.	5441
African American	1230 (22.6)
Asian	473 (8.7)
White	2164 (39.8)
Other/multiracial	1574 (28.9)
Ethnicity[a]	
No.	5341
Hispanic	1230 (23)
Non-Hispanic	4111 (77)
Preferred language non-English	1054 (18.5)
Insurance	
Commercial	1885 (33.1)
Medicaid	1210 (21.2)
Medicare	2415 (42.4)
Self-pay	95 (1.7)
Other[b]	95 (1.7)

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Sample of 5700 Pts Hospitalized with COVID in NYC

Richardson S, Hirsch JS, Narasimhan M, et a. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. JAMA 2020; April 22; https://jamanetwork.com/journals/jama/fullarticle/2765184

	No. (%)
Comorbidities	
Total No.	5700
Cancer	320 (6)
Cardiovascular disease	
Hypertension	3026 (56.6)
Coronary artery disease	595 (11.1)
Congestive heart failure	371 (6.9)
Chronic respiratory disease	
Asthma	479 (9)
Chronic obstructive pulmonary disease	287 (5.4)
Obstructive sleep apnea	154 (2.9)
Immunosuppression	
HIV	43 (0.8)
History of solid organ transplant	55 (1)
Kidney disease	
Chronic[c]	268 (5)
End-stage[d]	186 (3.5)
Liver disease	
Cirrhosis	19 (0.4)
Chronic	
Hepatitis B	8 (0.1)
Hepatitis C	3 (0.1)

	No. (%)
Metabolic disease	
Obesity (BMI ≥30)	1737 (41.7)
No.	4170
Morbid obesity (BMI ≥35)	791 (19.0)
No.	4170
Diabetes[e]	1808 (33.8)
Never smoker	3009 (84.4)
No.	3567
Comorbidities[f]	
None	350 (6.1)
1	359 (6.3)
>1	4991 (88)
Total, median (IQR)	4 (2-8)
Charlson Comorbidity Index score, median (IQR)[g]	4 (2-6)

[a] Race and ethnicity data were collected by self-report in prespecified fixed categories.

[b] Other insurance includes military, union, and workers' compensation.

[c] Assessed based on a diagnosis of chronic kidney disease in medical history by *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* (*ICD-10*) coding.

[d] Assessed based on a diagnosis of end-stage kidney disease in medical history by *ICD-10* coding.

[e] Assessed based on a diagnosis of diabetes mellitus and includes diet-controlled and non–insulin-dependent diabetes.

[f] Comorbidities listed here are defined as medical diagnoses included in medical history by *ICD-10* coding. These include, but are not limited to, those presented in the table.

[g] Charlson Comorbidity Index predicts the 10-year mortality for a patient based on age and a number of serious comorbid conditions, such as congestive heart failure or cancer. Scores are summed to provide a total score to predict mortality. The median score of 4 corresponds to a 53% estimated 10-year survival and reflects a significant comorbidity burden for these patients.

Clinical Observations

- What is the “typical patient”?
- How quickly / easily can clinicians predict outcomes risk?
- Are people with uncontrolled T2D or HTN at greater risk than those controlling it with medication?
- Learnings from direct observations
- Thoughts about how healthcare providers should adjust future focus of care

Assessing Risk

- Many models evaluate risk based on available data
- Researchers develop tools to quickly determine at-risk patients and predict lethality, based on age, conditions, age of diagnosis, and other factors
- Enables clinicians to stratify risk and determine best course of management / treatment

Bello-Chavolla OY, Bahena-Lopez JP, Antonio-Villa NE, et al. Predicting mortality due to SARS-CoV-2: A mechanistic score relating obesity and diabetes to COVID-19 outcomes in Mexico. medRxiv 2020.04.20.20072223; doi: https://doi.org/10.1101/2020.04.20.20072223

OBESITY

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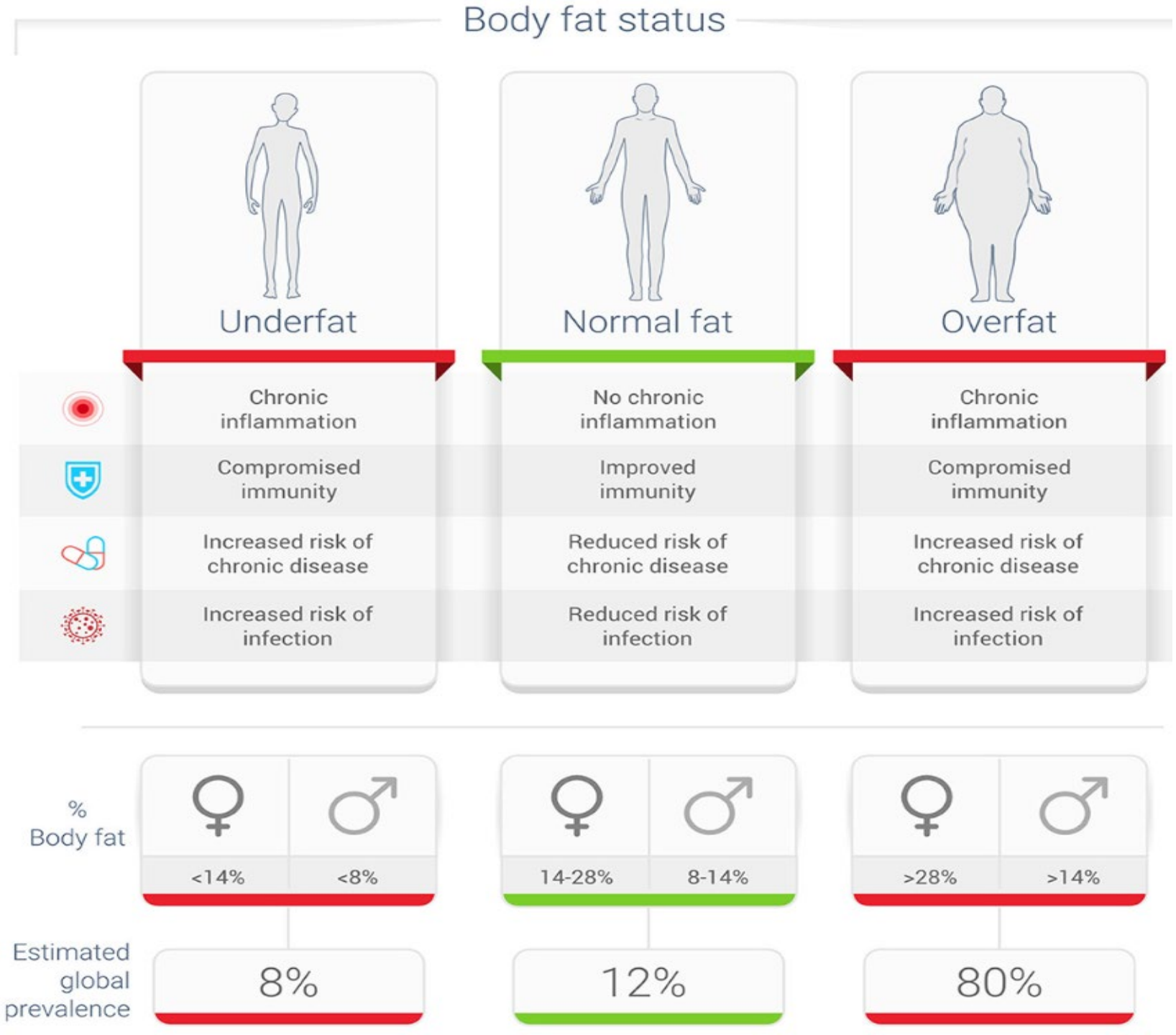

https://www.frontiersin.org/articles/10.3389/fpubh.2020.00135/full

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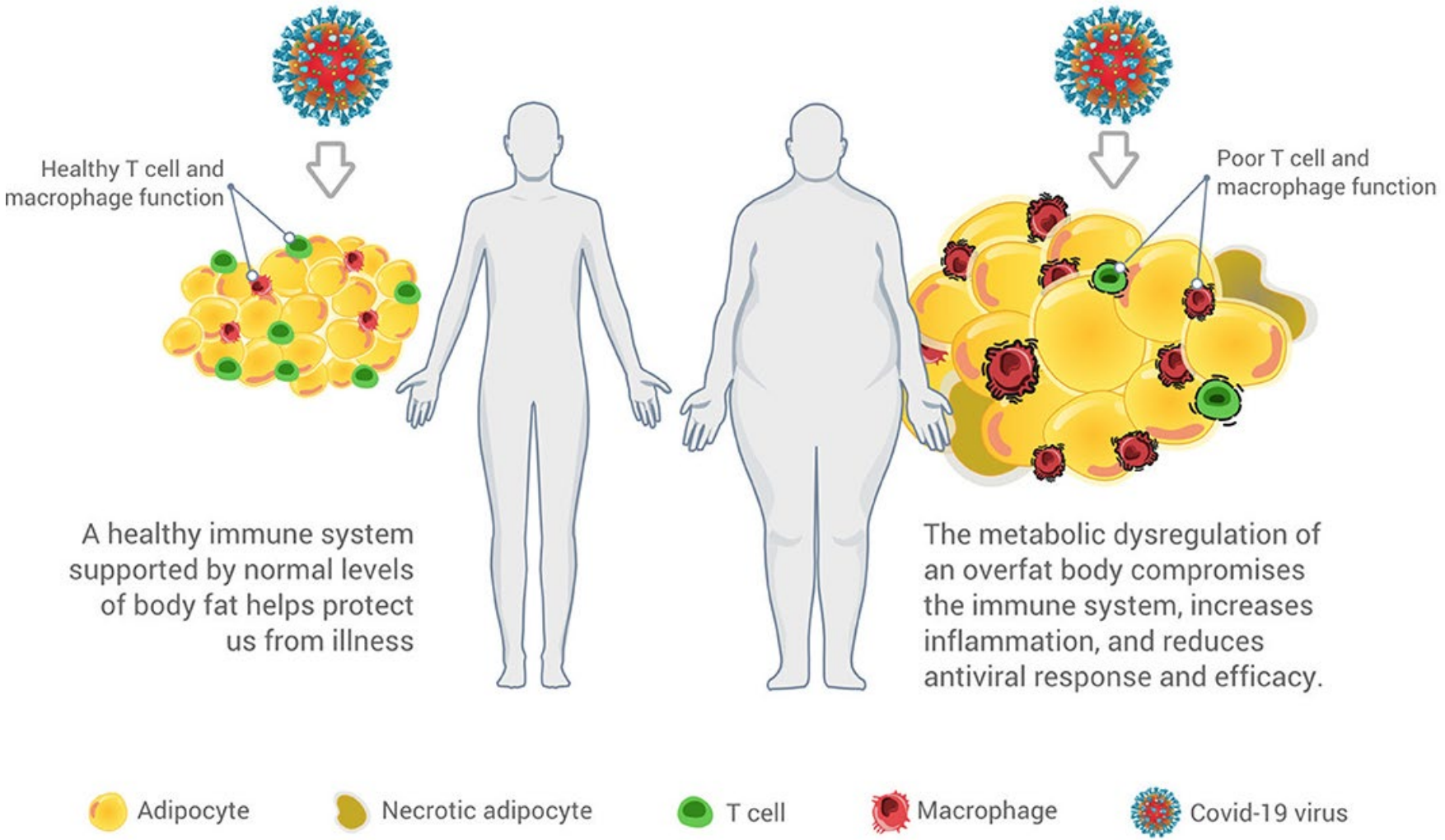
Covid-19: Death through virally-driven hyperinflammation.

Adipose tissue is populated by a number of immune cells including T cells and macrophages.



https://www.frontiersin.org/articles/10.3389/fpubh.2020.00135/full

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Obesity

- How does obesity increase COVID risk?
  - Associated with metabolic syndrome and inflammation
  - Increased weight compresses the lungs
  - Predisposition to pulmonary dysfunction
  - Increases risk of acute respiratory distress syndrome
- In young patients (<50), obesity is the single largest predictor of severe illness and death

HYPERTENSION

Hypertension

- How does hypertension increase COVID risk?
  - Hypertension indicative of other chronic inflammatory conditions
  - Already taxed blood vessels have to work extra hard to circulate oxygen
  - It's been suggested that ACE inhibitors and ARBs may increase susceptibility to infection, but currently the risk/benefit clearly favors using the meds to control blood pressure. RTCs in progress.

https://www.health.harvard.edu/blog/how-does-cardiovascular-disease-increase-the-risk-of-severe-illness-and-death-from-covid-19-2020040219401

Jarcho JA, Ingelfinger JR, Hamel MB. Inhibitors of the Renin–Angiotensin–Aldosterone System and Covid-19. NEJM 2020. https://doi.org/10.1056/NEJMe2012924

DIABETES

www.DietID.com

Diabetes

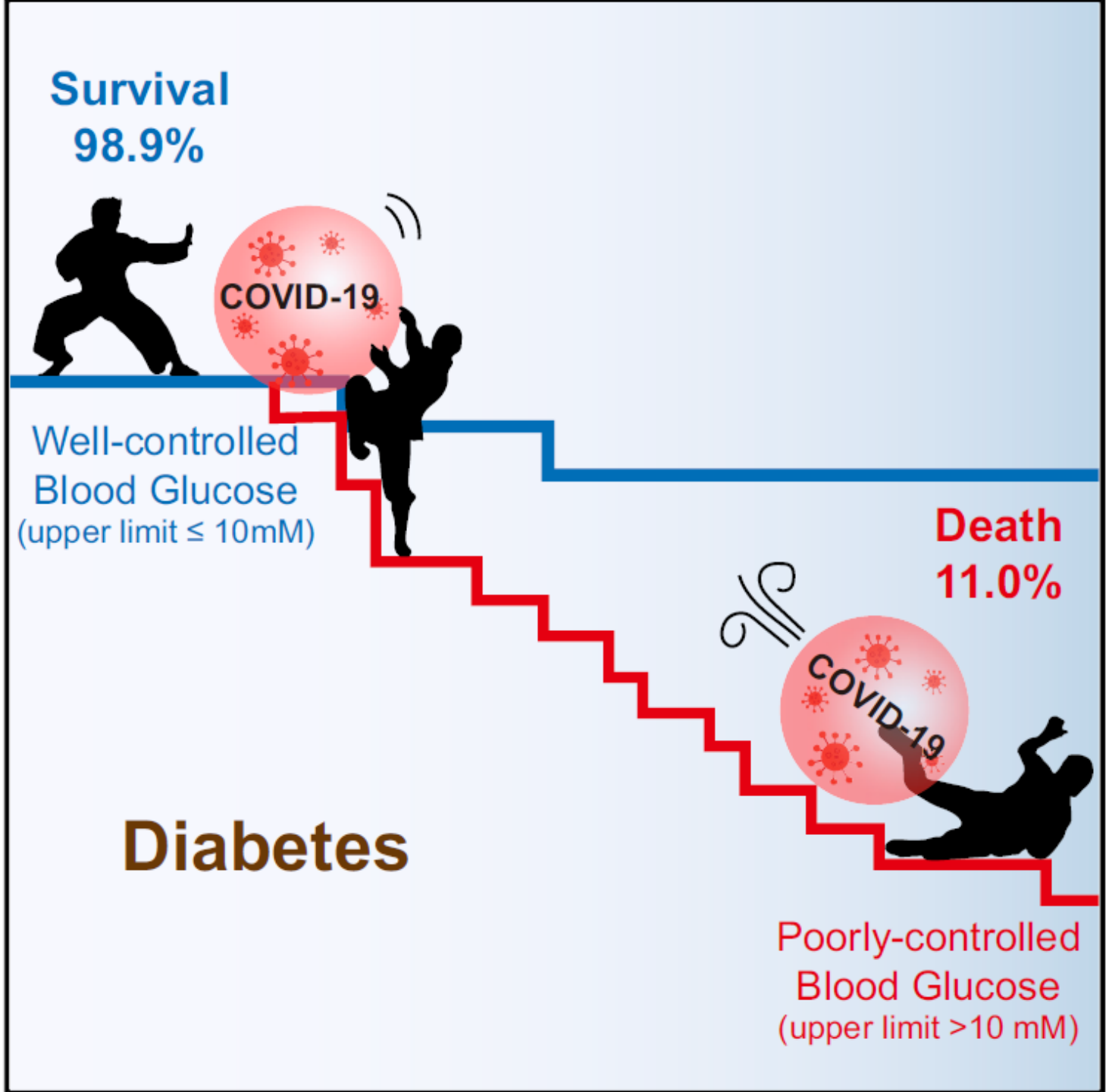
- How does diabetes increase COVID risk?
  - Hyperglycemia causes immune response dysfunction
  - Damaged circulatory system compromises blood flow and oxygen delivery
  - Higher affinity of cellular binding and efficient virus
  - Decreased viral clearance in the blood stream
  - Diminished T cell function
  - Increased susceptibility to hyper-inflammation and cytokine storm syndrome

https://www.clinicalomics.com/news-and-features/diabetic-patients-at-higher-risk-for-covid-19-mortality/

Diabetes Outcomes Study (Hubei, China)

Zhu L, She ZG, Cheng X et al. Association of Blood Glucose Control and Outcomes in Patients with COVID-19 and Pre-existing Type 2 Diabetes. Cell Metabolism 2020; https://doi.org/10.1016/j.cmet.2020.04.021

www.DietID.com



Diabetes Outcomes Study (Hubei)

- 7337 cases, 952 with pre-existing T2D
- T2D pts mortality rate 7.8% vs 2.7%
- T2D pts more at risk for multiple organ injury
- Among T2D pts, risk largely dependent upon blood glucose control
- Diabetes status predicts need for medical interventions as well as mortality

Zhu L, She ZG, Cheng X et al. Association of Blood Glucose Control and Outcomes in Patients with COVID-19 and Pre-existing Type 2 Diabetes. Cell Metabolism 2020; https://doi.org/10.1016/j.cmet.2020.04.021

Diabetes Outcomes Study (USA)

- 451 pts with diabetes (among a sample of 1122)
- T2D patients had a 4x higher death rate from COVID-19
- Mortality rate for T2D patients was 28.8% (compared to 6.2% without diabetes in the sample)
- Those with uncontrolled hyperglycemia had highest mortality rate (41.7%)

Bode B, Garrett V, Messler J, et al. Glycemic Characteristics and Clinical Outcomes of COVID-19 Patients Hospitalized in the United States. Journal of Diabetes Science and Technology 2020. https://glytecsystems.com/wp-content/uploads/JDST-Glytec-Covid-Research.pdf

CARDIOVASCULAR DISEASE

Cardiovascular disease

- How does CVD increase COVID risk?
  - Viral illness increases demand on the heart (e.g. fever, rapid heart rate)
  - Compromised oxygen distribution
  - Inflammation of the already damaged heart (myocarditis)
  - CVD pts more susceptible to clots, heart attack, stroke caused by viral-induced inflammation

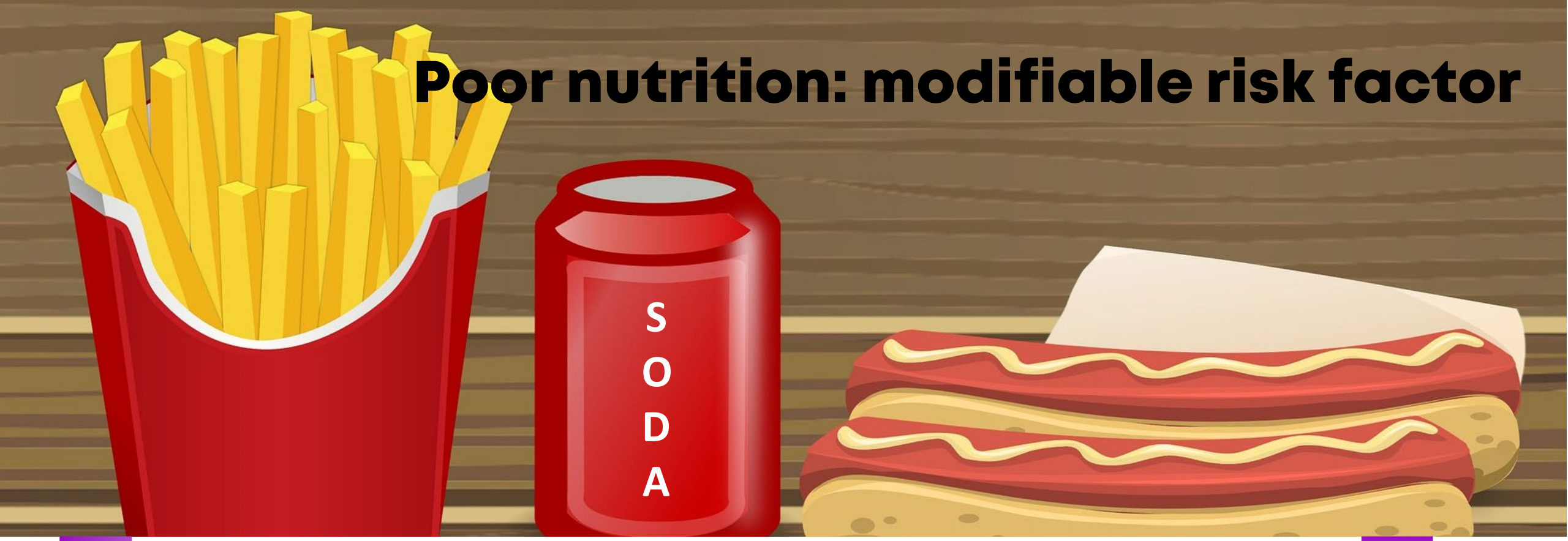
- CVD patients have a 10x greater risk of death from COVID-19 than healthy patients

https://www.health.harvard.edu/blog/how-does-cardiovascular-disease-increase-the-risk-of-severe-illness-and-death-from-covid-19-2020040219401

Putting it all together: INFLAMMATION

- Inflammation is the underlying consequence and driver of essentially all chronic disease
- Increases risk of cytokine storm, leading to poor outcomes
- Obesity and poor metabolic health cause increased inflammation and immune suppression
- SAD diet contributes to chronic inflammation

Poor nutrition: modifiable risk factor



Obesity
Insulin Resistance
Diabetes
Hypertension
Heart Disease

Metabolic Impairment

Compromised Immune Function

HIGH RISK / POOR OUTCOMES

From Slow Motion To Acute Worry

- Most lifestyle-related diseases happen over decades
- The risk is there, but not addressed because most can “buy time”
- COVID-19 era: The risk is still there, but it’s scarier
- People are motivated to decrease risk of severe infection
- DIET and LIFESTYLE adjustments can reduce risk AND improve health over time, by doing the same things.

What about children?

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NYC Data

NYC COVID-19 Deaths Among Confirmed Cases

	Underlying Conditions[1]	No Underlying Conditions	Underlying Conditions Unknown	Total
Age Group				
- 0 to 17	8	1	1	10
- 18 to 44	495	19	111	625
- 45 to 64	3011	71	474	3556
- 65 to 74	3143	3	817	3963
- 75 and over	5913	2	1816	7731
- Unknown	1	0	2	3
Sex				
- Female	4985	11	1227	6223
- Male	7563	85	1986	9634
- Unknown	23	0	8	31

$\Sigma = 15{,}888$

https://www1.nyc.gov/assets/doh/downloads/pdf/imm/covid-19-daily-data-summary-deaths-05172020-1.pdf Available data as of May 20, 2020

Risk in Children

- Infection/recovery rate unknown (asymptomatic children generally not tested)
- Report summary from China 72,314 cases, 1% under 10 years old, 1% aged 10-19.
- Italy data – 2 of the 30k deaths were those under age 19 (0.0067% of total deaths)
- JAMA study: 48 children ≤21y in PICU (US + Canada)
  - 40 had underlying medical conditions (15% obese, 8% diabetes, 23% immune suppression or malignancy)
  - 4.2% mortality rate

Zunyou W, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. JAMA 2020;323(13):1239-1242. 10.1001/jama.2020.2648

Shekerdemian LS et al. Characteristics and Outcomes of Children With Coronavirus Disease 2019 (COVID-19) Infection Admitted to US and Canadian Pediatric Intensive Care Units. JAMA Pediatrics 2020. May 11.

Risk in Children

- Rare Kawasaki-like condition (pediatric multi-system inflammatory syndrome) but not the same
  - Sx=fever, rash, red eyes, swollen lymph nodes, abdominal pain
  - Risk=toxic shock, low BP, poor circulation
  - May be a post-infection process
- NY state: 3 died from the syndrome
  - NYC Study-147 cases of PMIS, 69 with COVID infection or antibodies
- No other deaths reported in the US outside of NY as of 5/17/20

https://doi.org/10.1001/jamapediatrics.2020.1948
https://www.nytimes.com/article/kawasaki-disease-coronavirus-children.html
https://www.nytimes.com/2020/05/12/well/family/coronavirus-children-covid-19.html
https://www.cdc.gov/mmwr/volumes/69/wr/mm6914e4.htm
https://www.who.int/news-room/commentaries/detail/multisystem-inflammatory-syndrome-in-children-and-adolescents-with-covid-19

Risk in Children

- Infected children are likely less contagious to others than adults (transmission from children to adults appears rare), and may be less likely to become infected upon exposure
- Pedi ER visits are down; may delay critical treatment
- Immunizations are down, leading to other risks of infectious disease

Gudbjartsson DF, Helgason A, Jonsson H, et al. Spread of SARS-CoV-2 in the Icelandic Population. NEJM 2020. https://doi.org/10.1056/NEJMoa2006100https://www.nytimes.com/2020/05/12/well/family/coronavirus-children-covid-19.html https://www.nytimes.com/2020/05/05/nyregion/children-Kawasaki-syndrome-coronavirus.html

Clinical Implications

- Do patients with lifestyle-related comorbidities have a different treatment plan than those without?
- What do we know, if anything, about long-term effects among survivors with comorbidities?

Conclusions

- Candace McNaughton
- Robert Ostfeld
- David Katz

QUESTION & ANSWER

Please submit questions via Q/A feature

Thank you for attending!

We'll send out an announcement about our next webinar.
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