A framework to evaluate the impact of infectious disease outbreak response measures on delivery of routine health services

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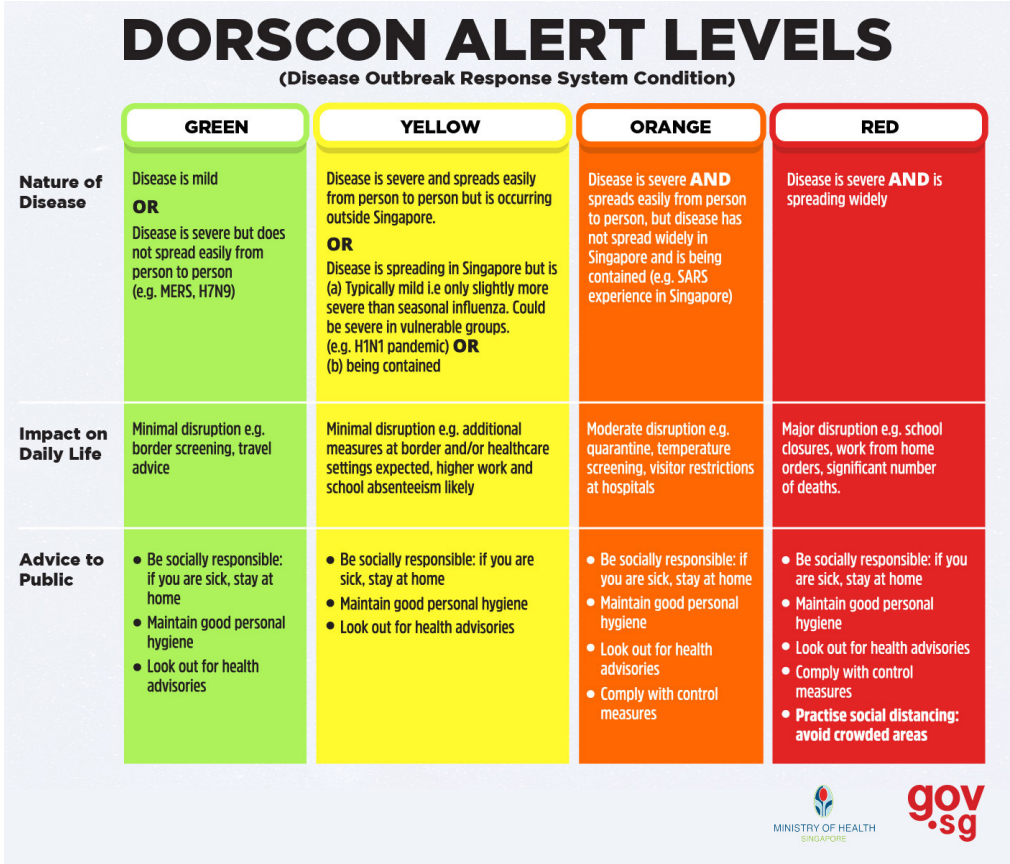
Background

- 23 Jan 2020: First confirmed case of COVID-19 in Singapore
- Clinical services were being curtailed in preparation for escalation to DORSCON Orange
- 07 Feb 2020: DORSCON Orange (15 days after first confirmed case)



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Pandemic preparedness

All publications and related documents

Essential steps for developing or updating a national pandemic influenza preparedness plan
March 2018

A checklist for pandemic influenza risk and impact management
January 2018

Pandemic influenza risk management - A WHO guide to inform & harmonize national & international pandemic preparedness and
May 2017

July 2016

GIP: comparative_analysis_pip_2011
January 2011

WHO pandemic influenza preparedness and response guidance
2009

WHO checklist for influenza pandemic preparedness planning
2005

Pandemic Influenza Preparedness Framework
2011

No framework to study the impact of a pandemic on non-communicable diseases

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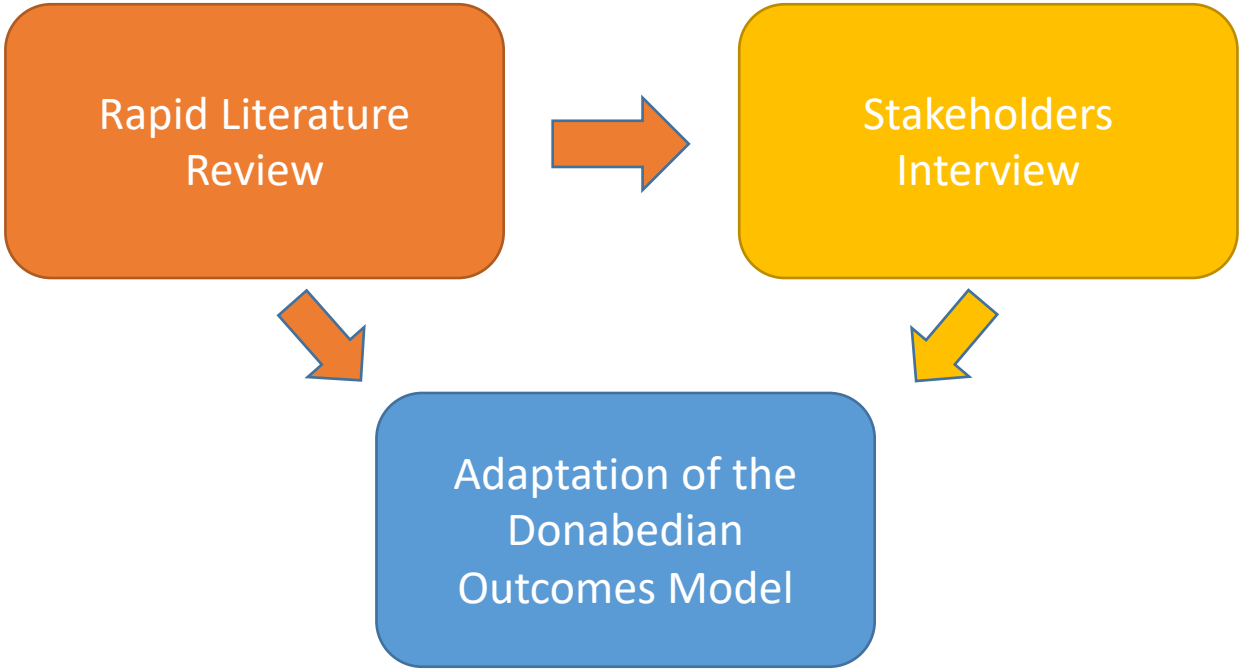
Methods



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Methods – Rapid Literature Review

- Goal: To examine indirect effects of past disease outbreaks to extract common themes
- The review was limited to studies that assessed or described the effects of epidemics, pandemics, or disease outbreaks on other health services, and not the direct impact of the infectious disease itself
- Studies that evaluated the impact on patient outcomes (e.g. clinical presentation of cancer patients with COVID-19), mental health, medical education and training, and health care workers' welfare were excluded

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Methods – Rapid Literature Review

- Early studies on the COVID-19 pandemic published before May 2020 were included (1 January 2000 - 7 May 2020)
- The search was done on one database (PubMed) and title and abstract reviews were done by a single researcher (DB)
- Recurring themes from the studies and evaluation parameters that were most commonly used were extracted

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Methods – Stakeholders Interviews

- What aspect of your work has changed as a result of COVID-19?
- What is the intermediate impact on health services and patients?
- What is the likely longer-term impact on patient outcomes?
- Collated responses were used to identify the indicators for each of the three components of structure, process and outcomes.

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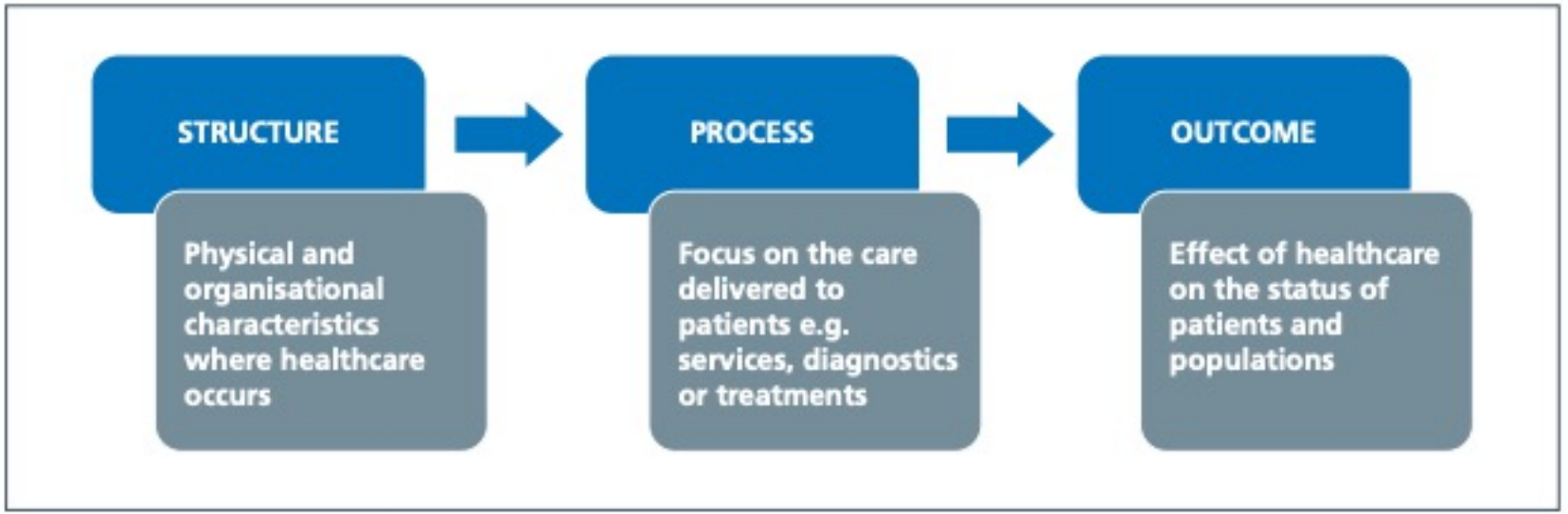
Methods – Adapting the Donabedian's Outcome Model

Figure 1: The Donabedian model for quality of care



Ref. https://improvement.nhs.uk/documents/2135/measuring-quality-care-model.pdf

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Results – Rapid Literature Review

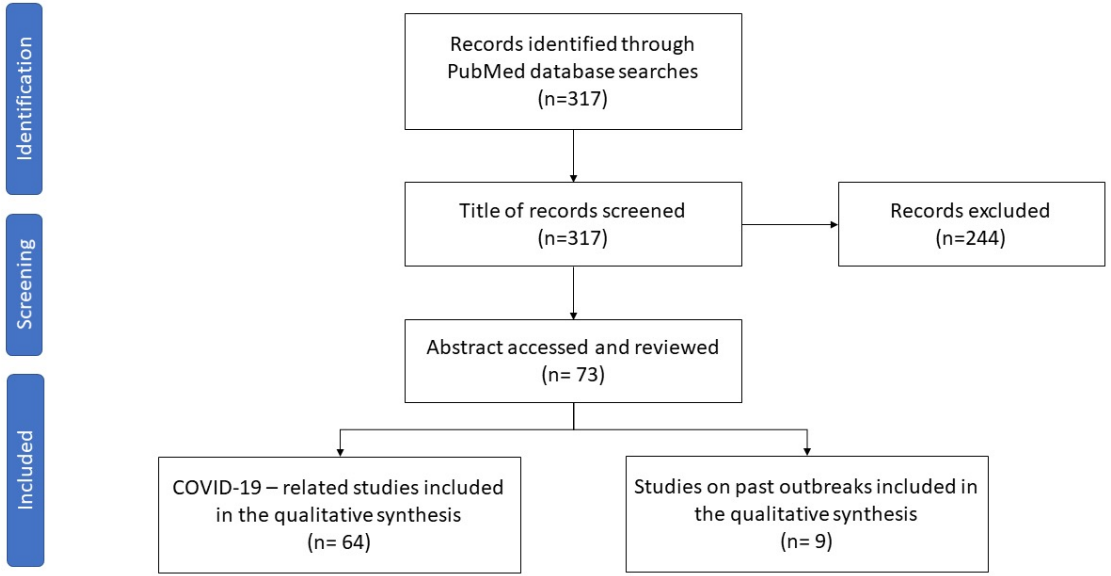

Figure 1. PRISMA flow diagram of the rapid review

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Results – Rapid Literature Review

Table. Most common themes and parameters in studies evaluating indirect effects of disease outbreaks

1. Decreased utilization of healthcare services
2. Delay in pre-hospital care due to infection control measures
3. Decrease in delivery of non-urgent care
4. Delay or postponement of elective procedures
5. Organizational changes (e.g. shift to telemedicine, shift to primary care instead of hospital, triaging and separating of suspect cases, use of personal protective equipment, redeployment, and implementation of split team arrangements)
6. Emergence of new clinical guidelines (e.g. medical specialty or facility specific)
7. Disruption to research and education activities (e.g. medical specialty or facility specific)

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Results

- Clinicians from five major medical and surgical disciplines (cardiology, nephrology, oncology, neurology and other infectious disease), as well as primary care, participated in Zoom interviews
- List of discipline-specific indicators were captured
- Clinicians suggested to think of the impact of the pandemic in different phases/ waves

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List of indicators for acute myocardial infarction and heart failure management

Category	Indicator	Description	Data source
Acute myocardial infarction & heart failure management			
Process	Door-to-balloon time for acute myocardial infarction patients	Time from the patient's arrival at the recipient hospital to the time of deployment of first device, defined as balloon inflation, manual thrombectomy or direct stenting, during PCI in patients with ST elevation	Hospital record on case diagnosis and case movement
Process	Mean length of stay	Number of inpatient days spent	Hospital record on case diagnosis and case movement
Outcome	In-Hospital mortality	Death between admission and discharge among AMI and HF patients	Hospital record on case diagnosis and case movement
Outcome	Readmission and readmission mortality	Crude cardiac readmission rates or mortality rates of AMI patients at 30-day, 6-month, and 12-month from index admission	Hospital record on case diagnosis and case movement
Outcome	Complication rate	Patients experiencing any complication within 30 days after each discharge	Hospital record on case diagnosis and case movement

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List of indicators for post-stroke management

Category	Indicator	Description	Data source
Post-stroke management			
Process	Outpatient visits	Number of outpatient visits with Neurology	Specialist clinic records
Process	Home deliveries	Number of home deliveries by pharmacist	Pharmacy services records
Process	Teleconsultations	Number of teleconsultations conducted	Specialist clinic records
Process	Rate of in-hospital rehabilitation	No. of sessions completed and percent complement (as a proportion of total number of sessions recommended)	Hospital record on case diagnosis and case movement
Process	Rate of community rehabilitation	No. of sessions completed and percent complement (as a proportion of total number of sessions recommended)	Community rehabilitation service provider records
Outcome	Hospital mortality	Death between admission and discharge with stroke as primary cause	Hospital record on case diagnosis and case movement

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List of indicators for cancer management

Category	Indicator	Description	Data source
Cancer management			
Process	Number of active treatments	Number of patients ongoing treatment (chemotherapy and radiotherapy)	Hospital record on case diagnosis and case movement
Process	Number of inpatient and outpatient visits	Any planned or unplanned inpatient or specialist outpatient clinic visit for chemotherapy or adverse drug reactions due to chemotherapy	Hospital record on case diagnosis and case movement, specialist clinic records
Process	Patients who received chemotherapy prior to death	Received chemotherapy in the last 14 days of life [Yes/ No]	Hospital record on case diagnosis and case movement
Outcome	Overall survival	Time from initiation of first treatment to death from any cause. Derivation: Date of death or date of last follow-up minus date of initiation of first treatment	Hospital record on case diagnosis and case movement

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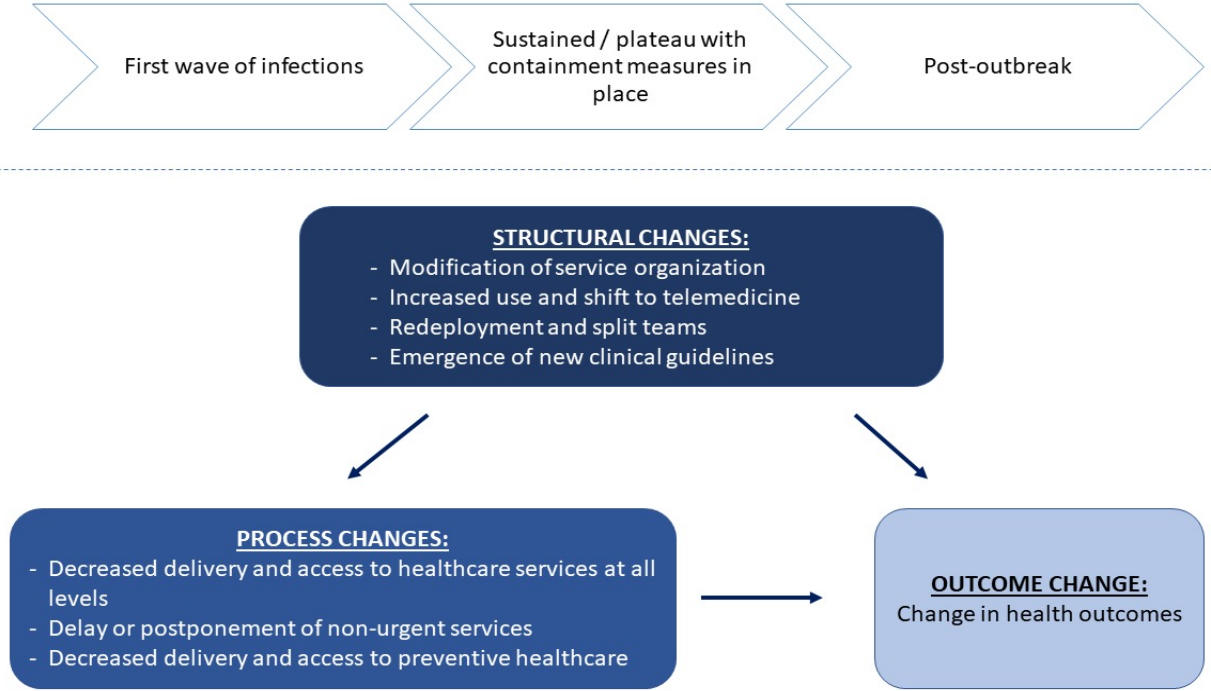
Results – Adapted framework



Modified Donabedian Outcomes Model for the Evaluation of Pandemic Impact on non-communicable diseases

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Results – Adapted framework

- Locally, COVID-18 pandemic responses were rolled out or recoiled in a calibrated manner, in line with pandemic response strategy of containment in the early days of the pandemic, followed by mitigation as the number of cases increased exponentially and then suppression as the numbers began to come down and local transmission is much reduced.
- Our framework attempted to reflect the changes over time to more accurately characterize the impact of the pandemic on the health system.

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Discussion

- The framework provides a guidance for healthcare providers, researchers, health service planners and governments to objectively evaluate the impact of not just for COVID-19 but any infectious disease outbreak.
- It can be applied to different contexts, regardless of the scope, scale, and time horizon, and whether for short, medium, or long-term.

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Discussion

- The interviews with stakeholders were essential
- The study team's assumptions were inaccurate
  - We assumed that the number of patients undergoing active treatment (including those with cancer) will be affected by COVID-19. However, as there was sufficient capacity in the Singapore health system, the care of patients with cancer were prioritized and most cancer patients were able to receive the care that they need unless they choose not to go to the hospital.

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Limitations

- The indicators were developed based on the inputs of a limited set of stakeholders in a single regional health system
  - Seek funding to set up an international Delphi panel
- There may be limited feasibility of collecting these data in a low resource country
  - An essential list version needs to be developed

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Future Plan - Applying the framework

- Patient-level health services utilization data from a regional health system in Singapore
  - Hospital and primary care
  - Medicines, laboratory tests, procedures, etc
  - Feb 2018 to Aug 2021
- Construct the list of indicators
- Compare pre- and post-COVID-19
  - Stratify the analyses by waves of pandemic development

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THANK YOU

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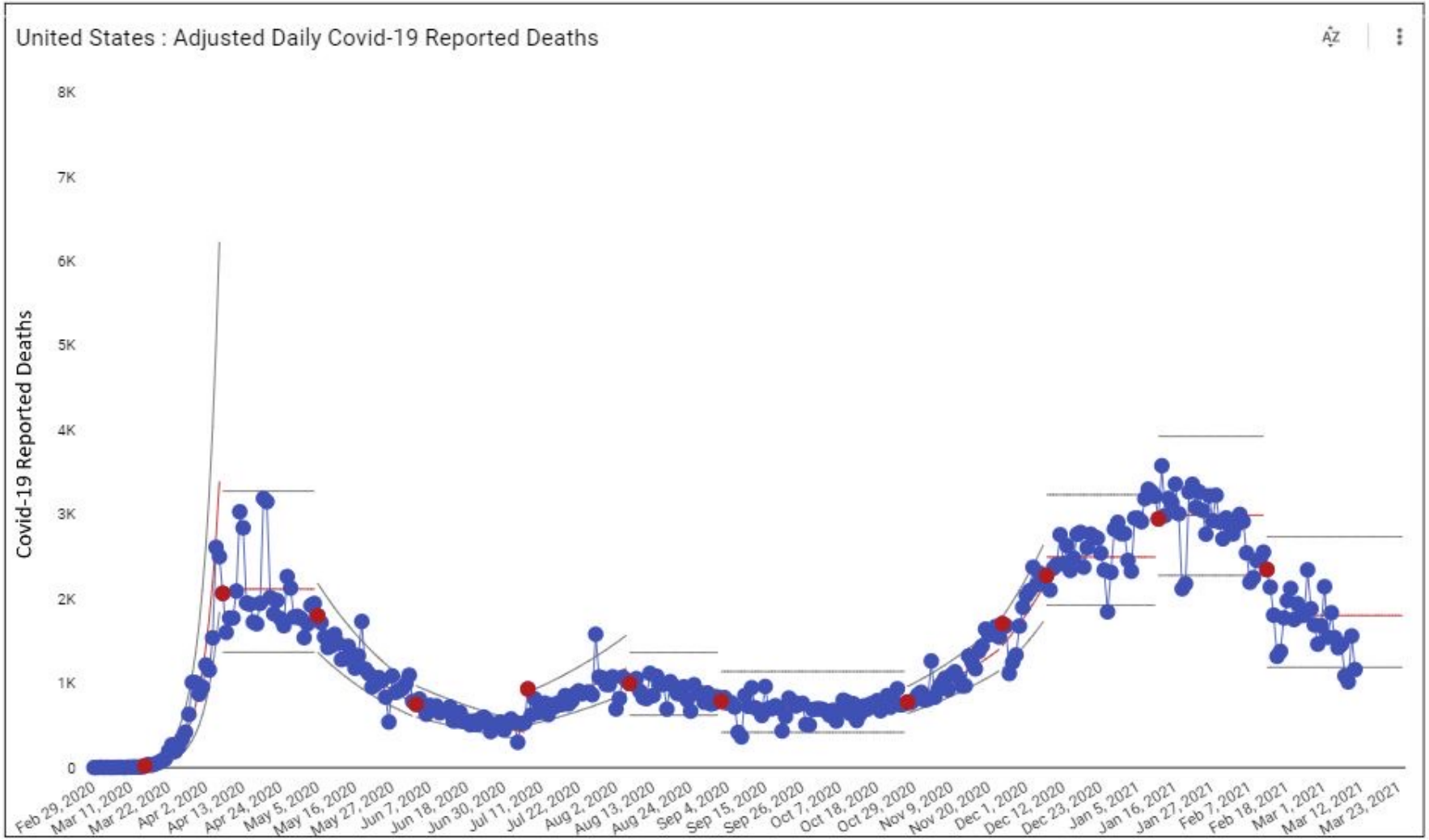
Non-communicable disease prevention and control during the era of COVID-19

The Association of Pacific Rim Universities (APRU) Webinar – Collaboration in Crisis: The Impact of COVID-19 on Non-Communicable Diseases

Wednesday, March 17, 2021

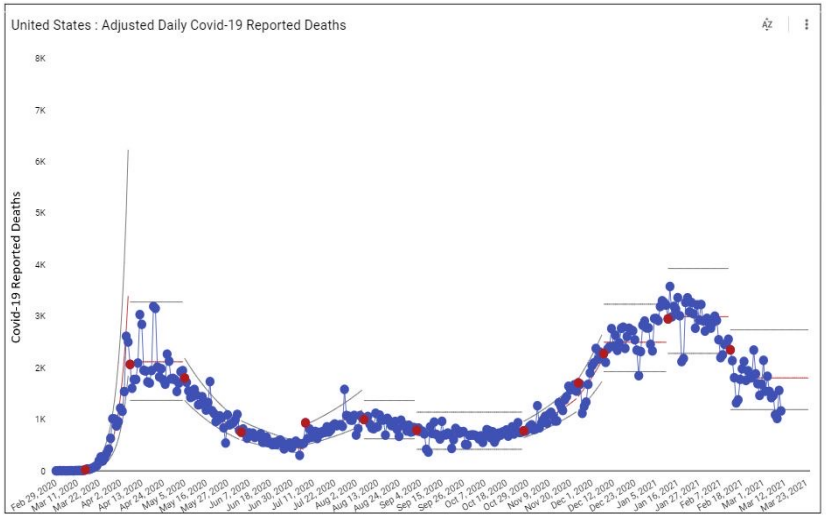
Tony Kuo, M.D., M.S.H.S.
Department of Epidemiology, UCLA Fielding School of Public Health
Department of Family Medicine, UCLA David Geffen School of Medicine
Population Health Program, UCLA Clinical and Translational Science Institute
Chronic Disease and Injury Prevention, Los Angeles County Department of Public Health

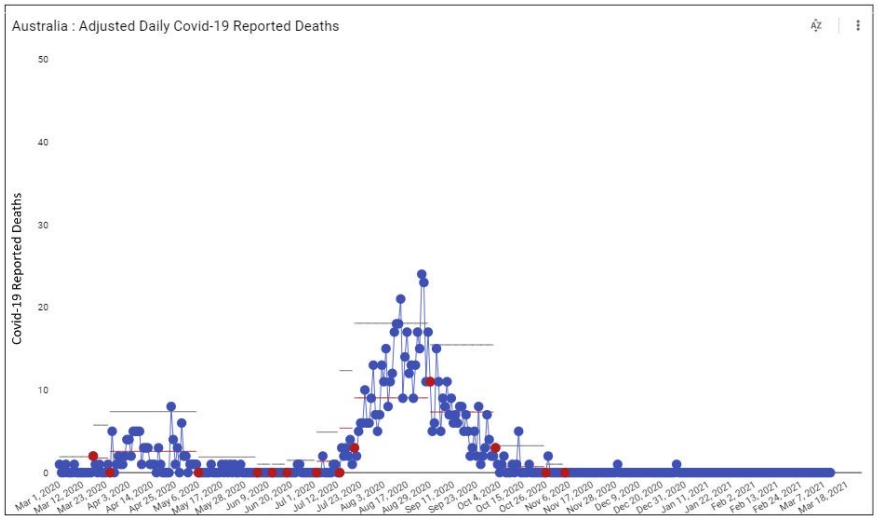
COVID-19 Deaths in the United States

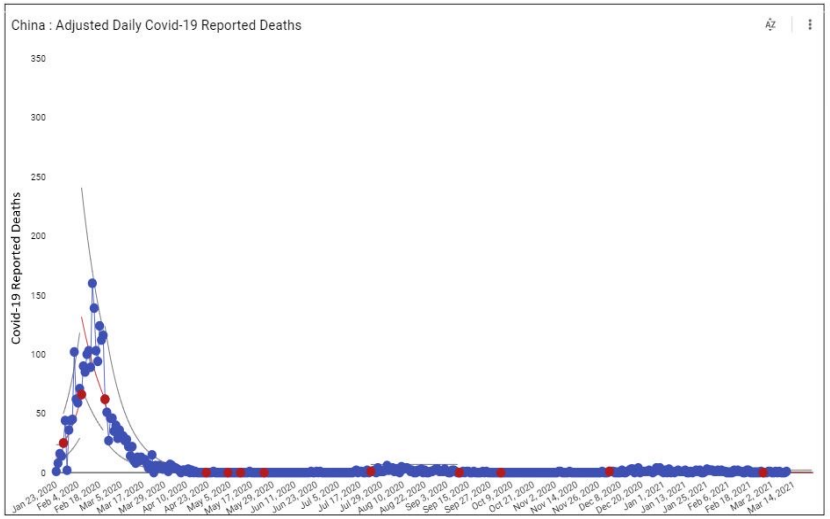


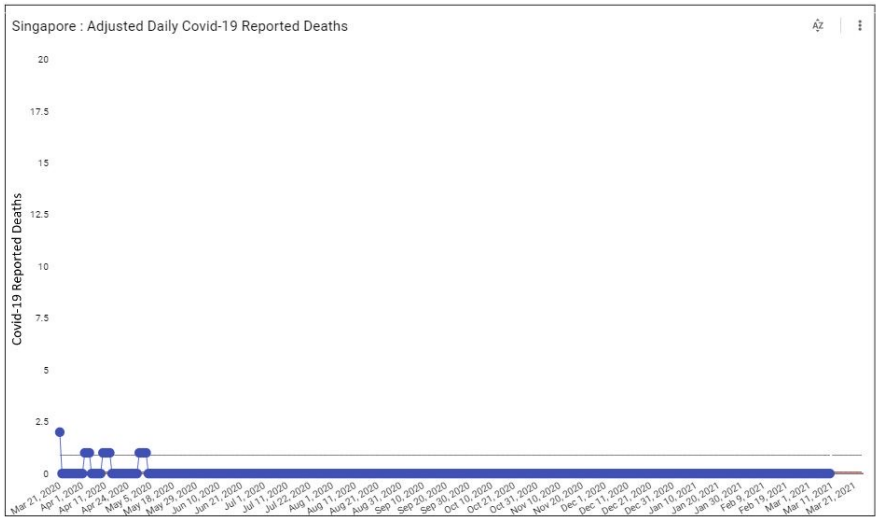
Source: https://isqua.org/covid19-research-page.html

COVID-19 Deaths in Other Countries



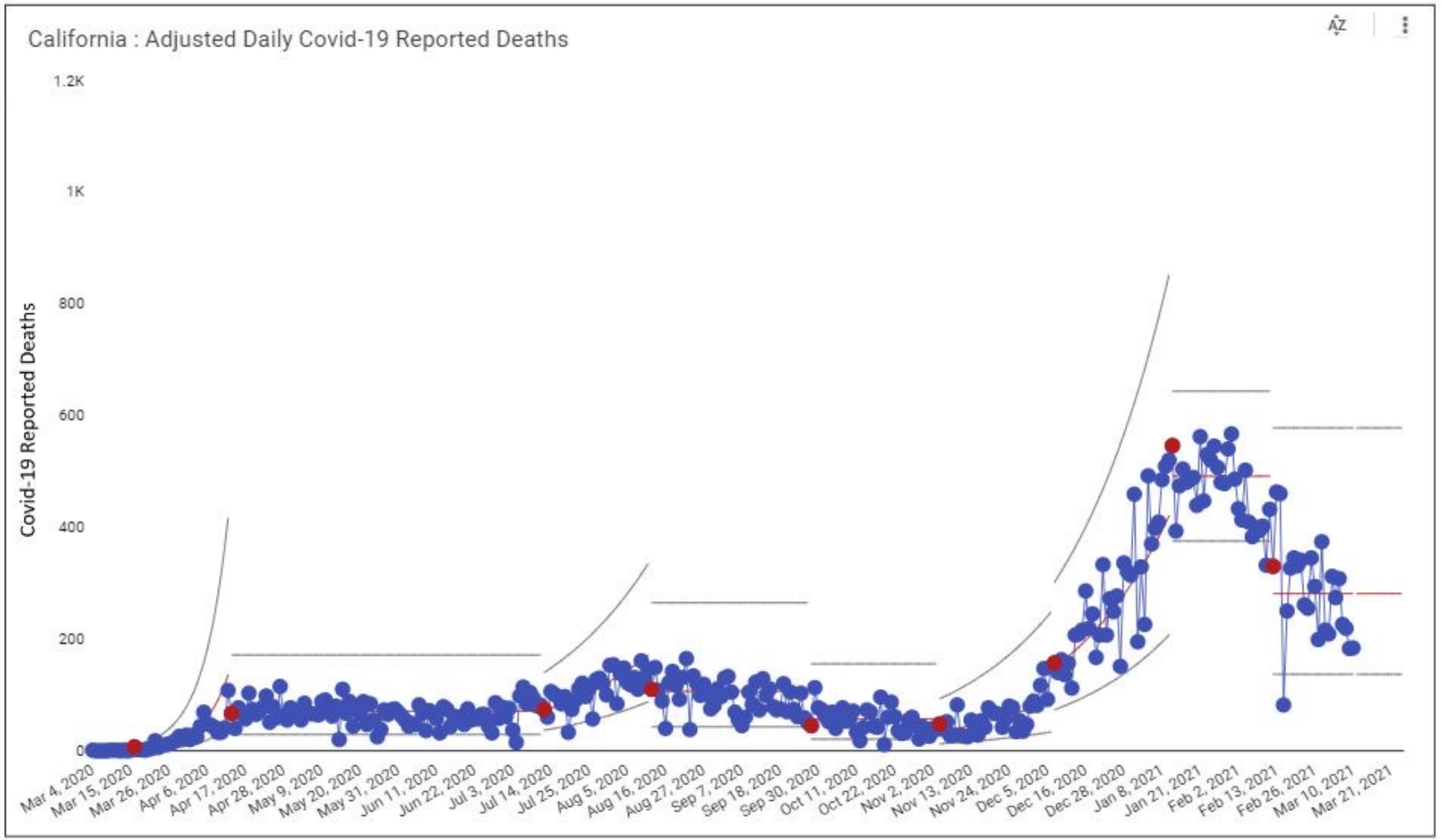






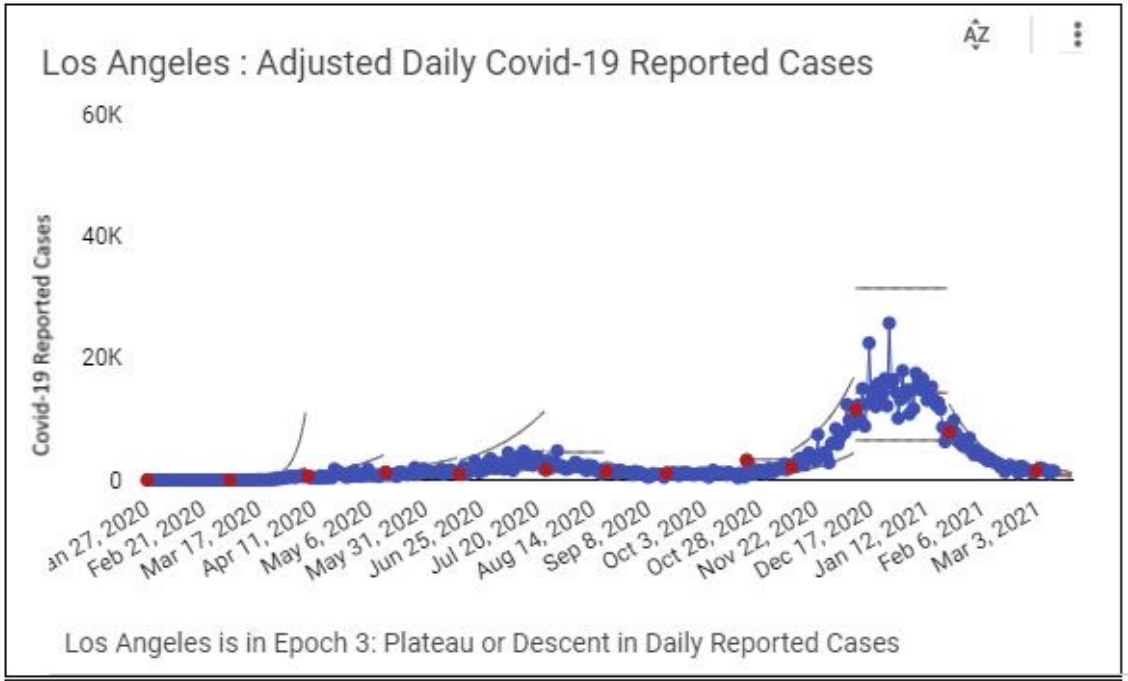
Source: https://isqua.org/covid19-research-page.html

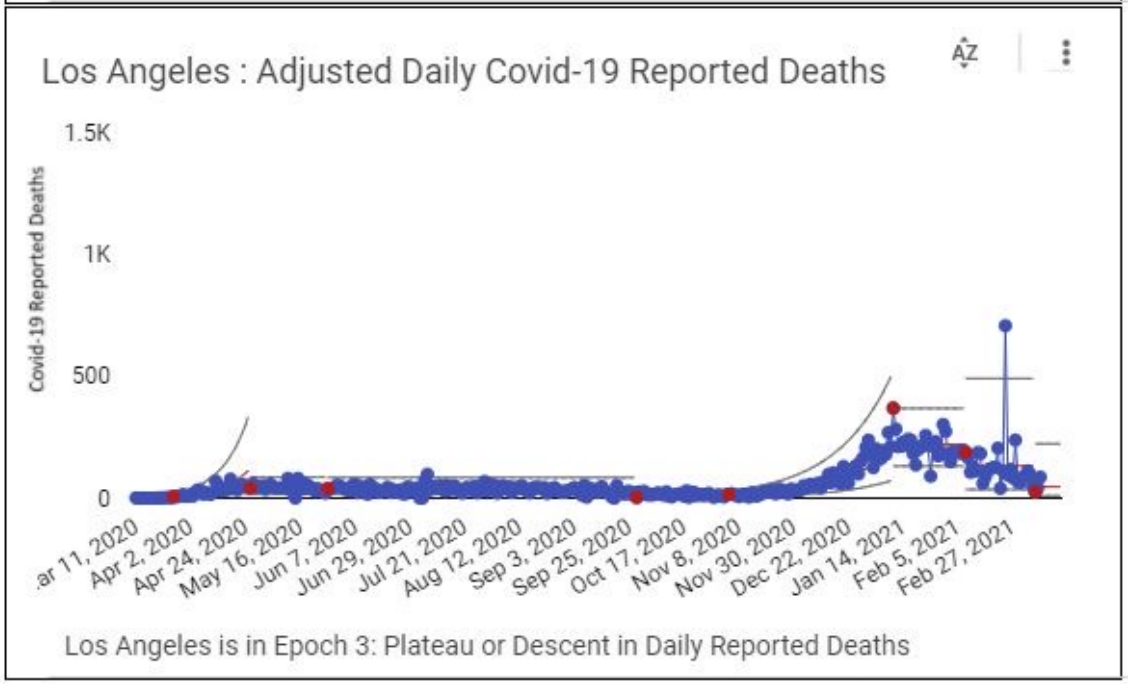
COVID-19 Deaths in California



Source: https://isqua.org/covid19-research-page.html

COVID-19 Cases and Deaths in Los Angeles County

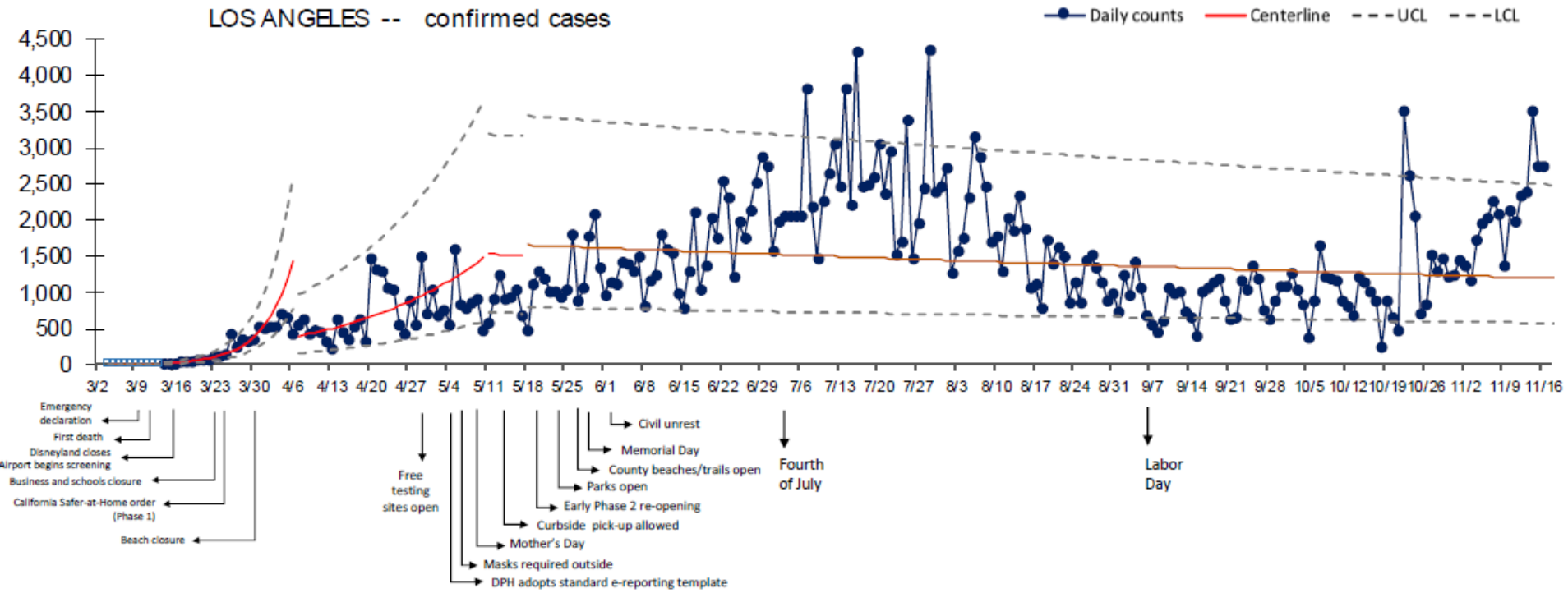




Jan 1, 2020 - Mar 18, 2021

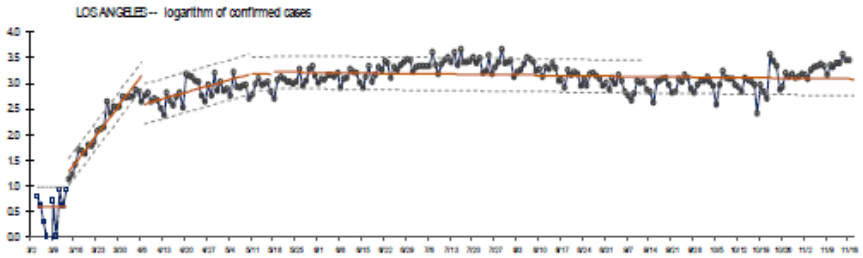
Source:
https://datastudio.google.com/reporting/73d854a3-bc4c-4cbc-b830-bf9da16d54ed/page/brFsB

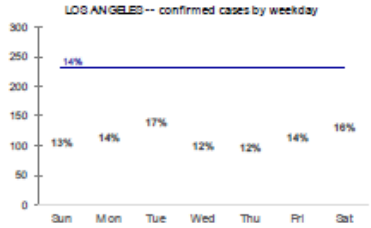
The COVID-19 Pandemic in Los Angeles County



Roles in the Response:

- **Use of data science in outbreak management**
- **Health plans & multi-county entities – efforts underway to address health equity and barriers to vaccine distribution**





Source: LA DPH press release (thru 6/30) and LA Times (7/1 thru 11/16)

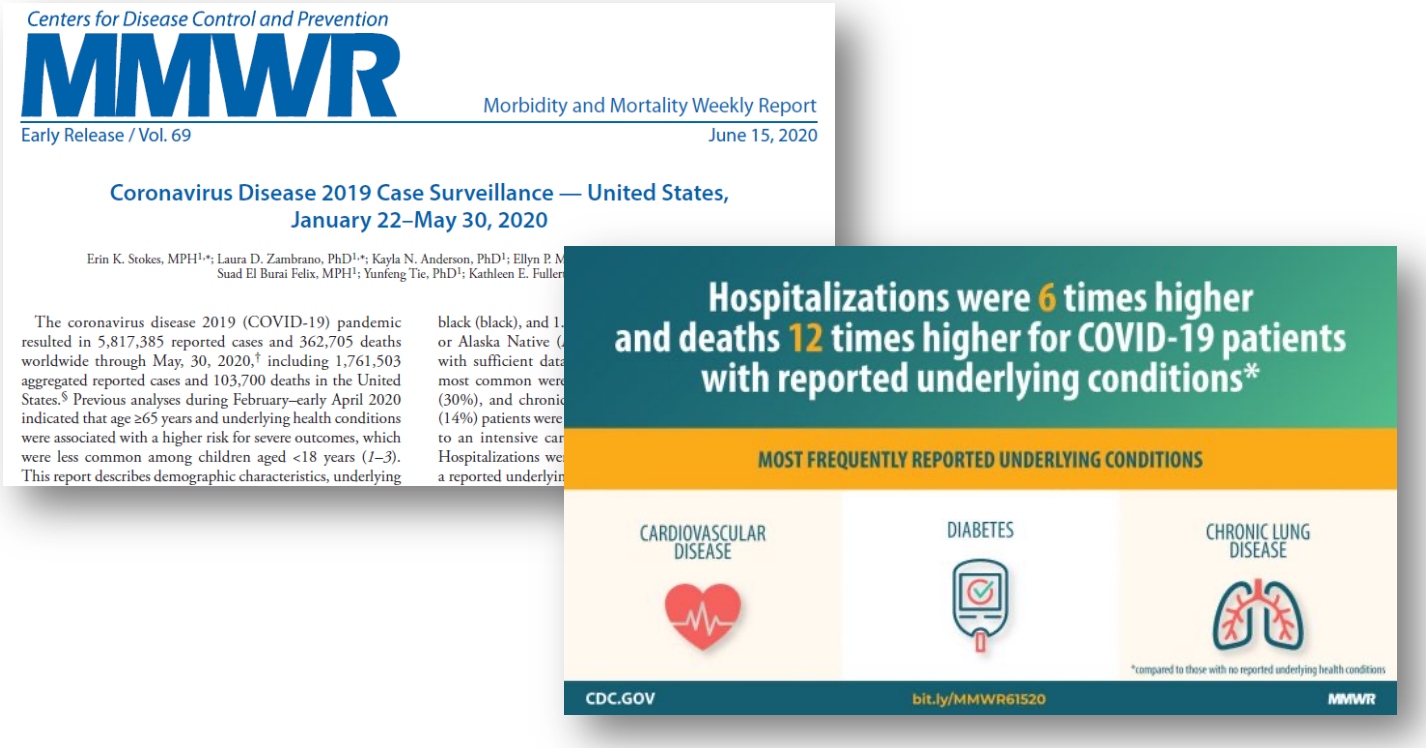
Leading Causes of Death in the United States

Number of deaths (2019)

- Heart disease: 659,041
- Cancer: 599,601
- Accidents (unintentional injuries): 173,040
- Chronic lower respiratory diseases: 156,979
- Stroke (cerebrovascular diseases): 150,005
- Alzheimer's disease: 121,499
- Diabetes: 87,647
- Nephritis, nephrotic syndrome, and nephrosis: 51,565
- Influenza and Pneumonia: 49,783
- Intentional self-harm (suicide): 47,511

Source: Mortality in the United States, 2019, data table for Figure 2

Coronavirus Disease 2019 (COVID-19)



Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Early Release / Vol. 69 June 15, 2020

Coronavirus Disease 2019 Case Surveillance — United States, January 22–May 30, 2020

Erin K. Stokes, MPH[1,*]; Laura D. Zambrano, PhD[1,*]; Kayla N. Anderson, PhD[1]; Ellyn P. M
Suad El Burai Felix, MPH[1]; Yunfeng Tie, PhD[1]; Kathleen E. Fuller

The coronavirus disease 2019 (COVID-19) pandemic resulted in 5,817,385 reported cases and 362,705 deaths worldwide through May, 30, 2020,[†] including 1,761,503 aggregated reported cases and 103,700 deaths in the United States.[§] Previous analyses during February–early April 2020 indicated that age ≥65 years and underlying health conditions were associated with a higher risk for severe outcomes, which were less common among children aged <18 years (*1–3*). This report describes demographic characteristics, underlying

black (black), and 1
or Alaska Native (
with sufficient data
most common were
(30%), and chronic
(14%) patients were
to an intensive car
Hospitalizations we
a reported underlyin

Hospitalizations were 6 times higher and deaths 12 times higher for COVID-19 patients with reported underlying conditions*

MOST FREQUENTLY REPORTED UNDERLYING CONDITIONS

CARDIOVASCULAR DISEASE

DIABETES

CHRONIC LUNG DISEASE

*compared to those with no reported underlying health conditions

CDC.GOV bit.ly/MMWR61520 MMWR

Delays in Care Could Cause Surge in Non-Communicable Disease Conditions

Fear of COVID-19 Exposure Has Resulted in Reduced Healthcare Visits

- 17% worsening symptoms
- 18% delayed diagnosis of a condition
- 23% delayed treatment
- 31% greater stress about a health condition
- More than one-third have no plans to resume visits until better pandemic control or vaccine

Source: Quest Diagnostics, Health Trends™ study of more than 2,000 U.S. Adults

Other Delays and Pandemic Considerations

- Newly identified cancers declined from January 2019-February 2020 to March-April 2020 (e.g., breast cancer, from 132,513 to 9,475; colorectal cancer, from 56,744 to 4,377).[1]
- In the first 8 weeks of March and April 2020, HbA1c testing volume was reduced by as much as 66% compared to baseline weekly test volumes.[2]
- Almost 2/3 (63.5%) of hospitalizations among U.S. adults as of November 2020 were attributable to 4 cardiometabolic conditions: 30% obesity, 26% hypertension, 21% diabetes, 12% heart failure (simulation analysis using data from CDC's COVID-NET, COVID Tracking Project, and 2015-18 NHANES).[3]
- The Cleveland Clinic: Results suggest that cumulative exposure to cigarette smoke is an independent risk factor for hospital admission and death from COVID-19. OR=1.26 (0.75-2.10), adjusted for age, race, gender, medication, and comorbidity.[4]
- Slow to reopen K-12 schools – concerns over child development and mental health. Vaccine distribution and its importance to noncommunicable chronic disease management.

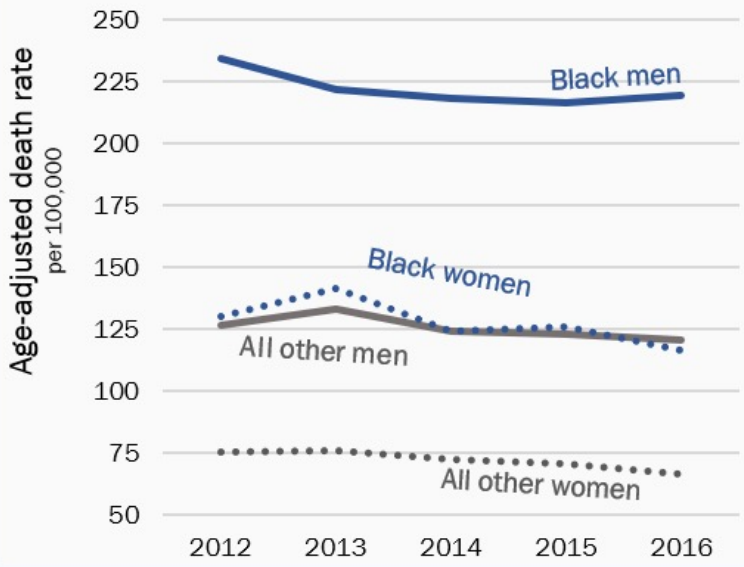
[1] Kaufman et al. JAMA Netw Open. 2020 Aug; 3(8): e2017267.
[2] Fragala et al. Pop Health Managmt. 2021; 24(1): 8-9.
[3] O'Hearn et al. J Am Heart Assoc. 2021; 10:e019259.
[4] Lowe et al. JAMA Intern Med. 2021; Online Jan 25:E1-E3.

Heart Disease and Stroke in Los Angeles County

HEART DISEASE

Heart disease mortality has declined in recent years in Los Angeles County. However, among all groups, **Black men have the highest heart disease mortality rates.**[2]

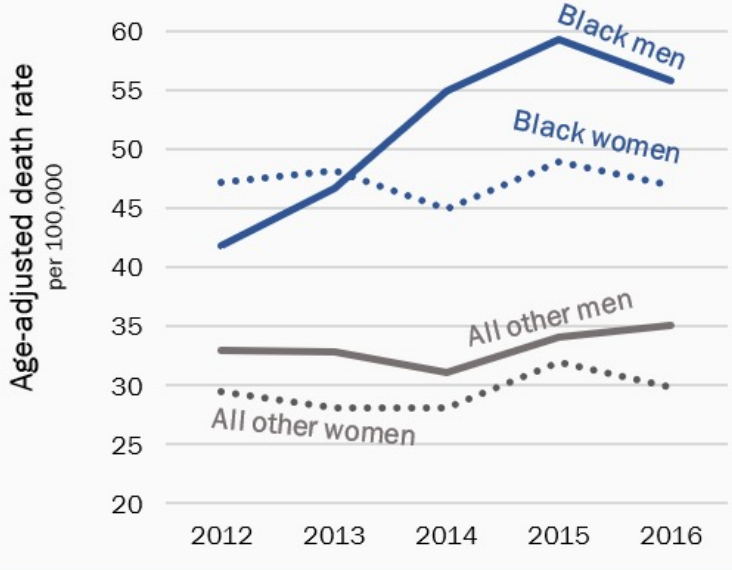
Heart disease mortality rate, Los Angeles County (2012–2016)



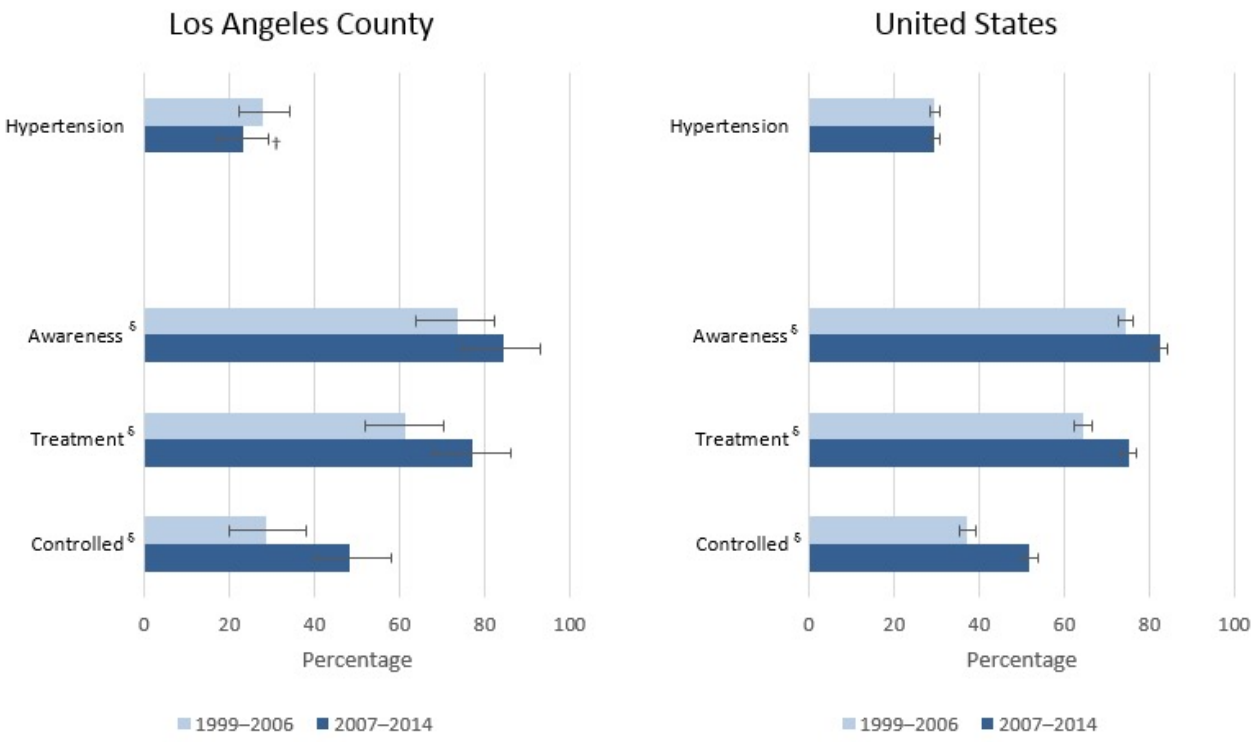
STROKE

Stroke mortality has been relatively stable between 2012 and 2016. However, Black men and Black women have higher stroke mortality rates than other racial or ethnic groups, and despite a recent decrease, **rates for Black men have gotten worse.**[3]

Stroke mortality rate, Los Angeles County (2012–2016)



Age-adjusted prevalence of hypertension, and awareness, treatment, and control of hypertension* among adults aged ≥18 years — Los Angeles County and United States, 1999–2006 and 2007–2014



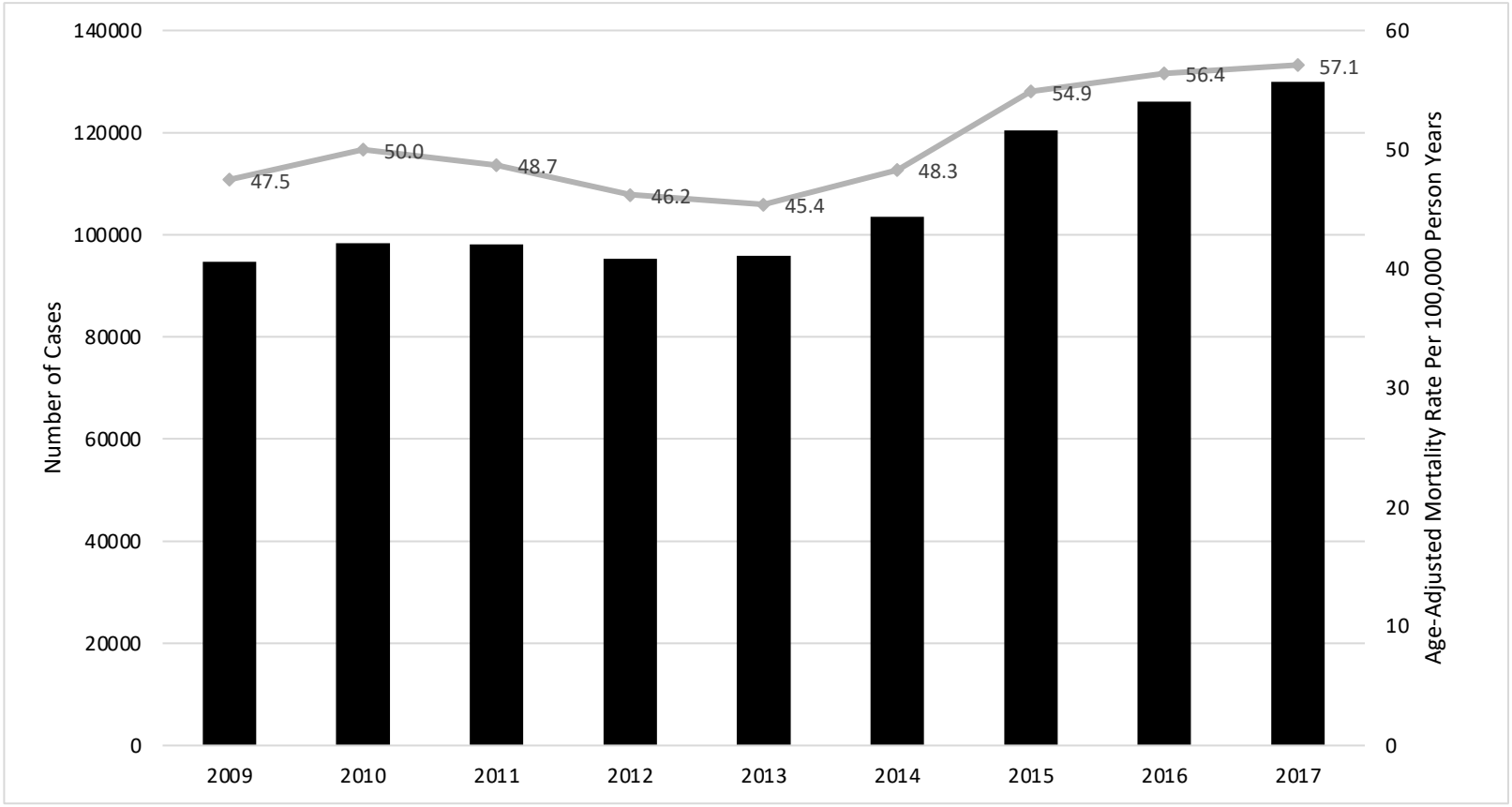
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey

*Hypertension prevalence estimates were age-adjusted by the direct method to the 2000 U.S. census population using the age groups 18–39, 40–59, and ≥60 years. Estimates for awareness, treatment, and control of hypertension were age-adjusted using the subpopulation of persons who have hypertension (age groups of 18–39, 40–59, and ≥60 years) in NHANES 2007–2008.

†Statistically significant at $p<0.05$ level between Los Angeles County and the United States.

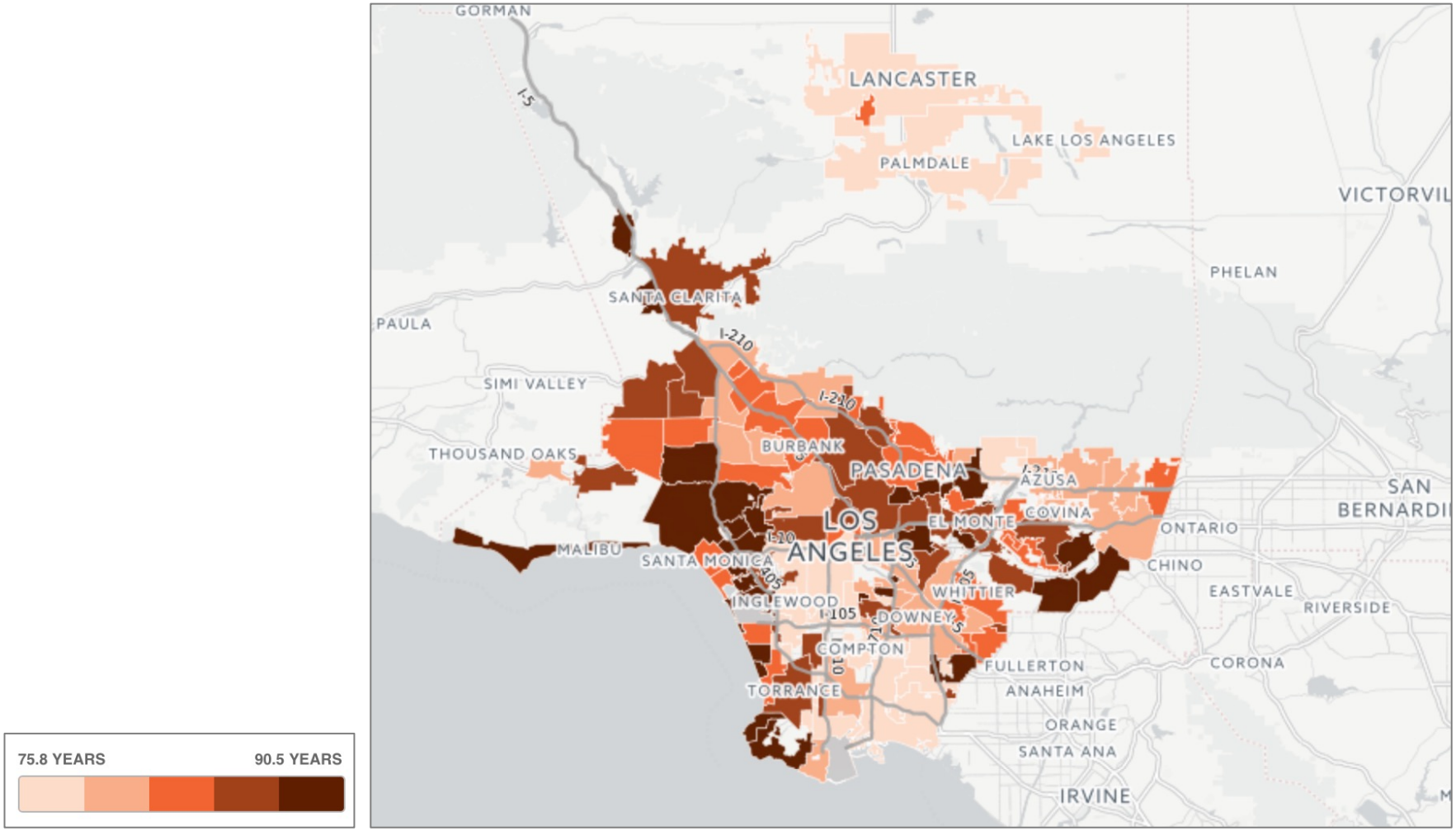
§Statistically significant at $p<0.05$ level between 1999–2006 and 2007–2014

Annual Alzheimer's Disease-Related Deaths and Age-Adjusted Mortality Rates per 100,000 population in the United States, 2009-2017



Source: U.S. multiple causes of death dataset

Life Expectancy in Los Angeles County by City and Unincorporated Communities



Electronic cigarettes and other vape devices are devices that deliver an aerosol to the user through inhalation by heating a liquid that usually contains nicotine, flavorings, and other substances (e.g., marijuana).

4.9 million

middle and high school students in 2018 were current users of tobacco products, up from 3.6 million in 2017.[1]

Over **15,000** **e-juice flavors** are on the market.[2]

Among LA County High School Students[3]...

1 in 10

are current e-cigarette users

56%

Rate of increase among e-cigarette users between 2015-16 to 2017-18.

15%

Rate of current marijuana use– higher than any tobacco products.

VAPING-ASSOCIATED PULMONARY INJURIES (VAPI) ARE LINKED TO E-CIGARETTE USE

Symptoms[1]

Patients with VAPI injuries have experienced the following symptoms:

Respiratory
- Cough
- Hemoptysis (coughing up blood)
- Shortness of breath
- Chest pain

Gastrointestinal
- Nausea
- Vomiting
- Diarrhea
- Abdominal pain

Constitutional
- Fatigue or malaise
- Fever
- Weight loss
- Chills

Compounds/Additives Found in VAPI Cases

Includes, but not limited to:
- Nicotine
- Tetrahydrocannabinol (THC)
- Cannabinoids (CBD)
- Synthetic cannabinoids
- Flavorings and other substances

Ongoing Epidemiologic Investigations

The etiology of VAPI is **undetermined** and current epidemiologic investigations involves:
- Identification of harmful aspects of e-cigarette use
- Understanding the underlining mechanisms and causes

Complications during Hospitalization

Approximately

50%

of Los Angeles County **patients** who were hospitalized for **VAPI** required **mechanical ventilation**.

Nearly **2 in 3**

cases reported in Los Angeles County are **ages 25 and younger.**[2]

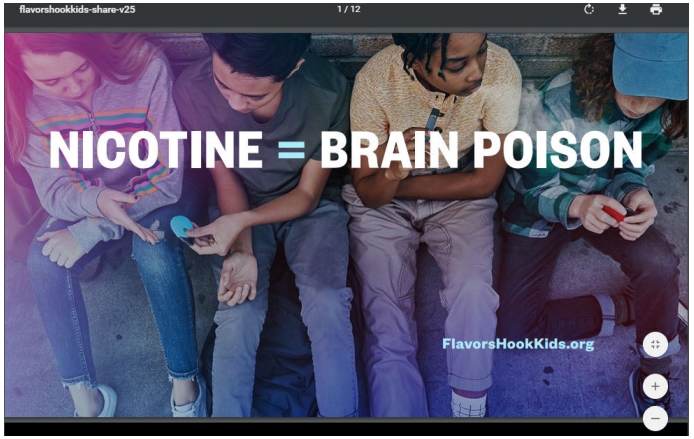
Proposition 56 (2016) and other tobacco product tax

Tobacco Control and Prevention Program (TCPP) Priorities

- Reduce youth access to ALL tobacco products
  - Tobacco retailer licensing (TRL)
  - E-Cigarettes in TRL
  - Healthy Retail Initiative
- Reduce exposure to secondhand smoke
  - Smoke-free multi-unit housing (Housing Authority of City of Los Angeles and Housing Authority of County of Los Angeles)
- Increase access to cessation services (e.g., California Smokers Helpline 1-800-No-BUTTS)
- Media/public education campaigns (LA Quits webpage: https://www.laquits.com/, >44 quit stories (videos

CHANGES TO
COUNTY TOBACCO RETAIL ORDINANCES

- **Require a Tobacco Retail License to sell electronic smoking devices**
  (e.g., electronic cigarettes, vapes and other nicotine containing devices)
- **Prohibit the sale, not use, of flavored tobacco products** *(e.g., watermelon, cherry, mint, gummy bears)* **and those that include menthol**



Rx for Prevention

Addressing the Dangers of Increased E-Cigarette Use Among Youth: A Call to Action for Clinicians

September 2019

Tony Kuo, MD, MSHS, FAAFP

Alice Kuo, MD, PhD, MBA, FAAP, FACP

and the Los Angeles County Medical Societies

Many in the medical and public health communities are increasingly concerned with the use of electronic cigarette products (e-cigarettes) among youth. These electronic products, which are handheld devices designed to "deliver emissions for inhalation by heating a solution that commonly contains nicotine, a humectant, and flavoring chemicals"[1] (i.e., designed for the act of vaping) are becoming all too common in youth sensitive areas such as schools, parks, and libraries. The devices are also often used to deliver other dangerous chemicals such as cannabis/tetrahydrocannabinol (THC). Although research is underway to further study the use of e-cigarettes as a cessation aid for helping adult smokers quit using conventional cigarettes,[2,3] the highly addictive nature of nicotine combined with the heavy promotion of these products to youth through subversive marketing and use of flavorings has caused a public health crisis in younger populations.[4-14]

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HOME

CALIFORNIA SMOKERS' HELPLINE
1-800-NO-BUTTS

MONDAY RX | Clear Lungs, Clear Minds

Jun 24, 2019 0

Smoke-Free Car Legislation and Student Exposure to Smoking

Minal Patel, MPH, PhD,[a,b] Chan L. Thai, MPH, PhD,[c] Ying-Ying Meng, DrPh,[d] Tony Kuo, MD, MSHS,[e] Hong Zheng, MPH,[f] Barbara Dietsch, PhD, RD,[f] William J. McCarthy, PhD[g]

abstract

BACKGROUND: Policies protecting children from exposure to secondhand smoke (SHS) may help prevent SHS-related negative health outcomes in children and discourage them from intending to smoke in the future. In this study, we assess the impact of California's 2007 smoke-free vehicle law on changes in middle and high school students' reported exposure to smoking in cars. Secondary aims included assessing the association of student-reported exposure to smoking in vehicles and lifetime asthma diagnosis and future intentions to smoke.

METHODS: Population-weighted data from the California Student Tobacco Survey and the National Youth Tobacco Survey were used to evaluate California and national trends, respectively. Weighted logistic regression models using California Student Tobacco Survey 2011 data assessed the association between the number of days of exposure to smoking in cars and student-reported lifetime asthma diagnosis as well as intention to smoke in the future.

RESULTS: The proportion of California students reporting exposure to smoking in cars in the last 7 days declined <1% annually from 2001 through 2005, but declined 12% annually from 2007 to 2011. National trends did not show comparable declines after 2006. Students

Patel M, et al. Pediatrics. 2018. PMID: 29292305

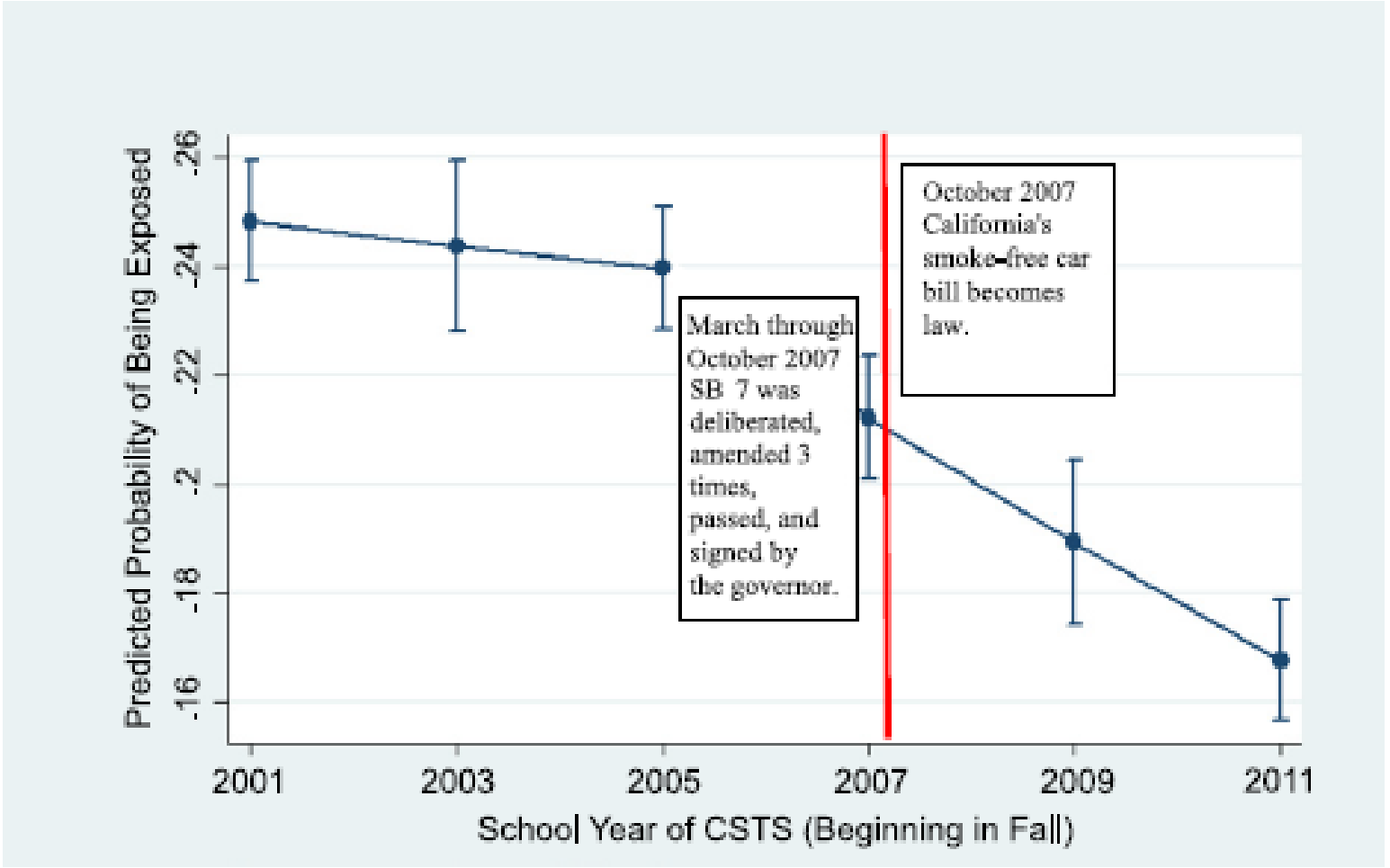


FIGURE 1

Predicted probability of SHS exposure in the car in the last 7 days in California from 2001 to 2011 (n = 148 664). The figure was adjusted for sex, race and/or ethnicity, and grade level (source: CSTS).

Patel M, et al. Pediatrics. 2018. PMID: 29292305

Community Design: Multiple Impacts on Well-being

Photo Credit: David McNew/Getty Images

Obesity & Chronic Disease

access to clean air, free water, public transportation, walkways, healthy foods and opportunities for physical activity

Crime & Violence

access to safe neighborhoods (street lightening, street/building maintenance, recreational spaces)

Social Cohesion

promoting civic engagement

Mental Health

density of alcohol, tobacco and marijuana dispensaries

Healthy Hospital Food Initiative

- Supports improvements in the nutritional quality of food and beverages offered in hospital cafeterias, cafés, and vending machines.

Hospitals and Health Centers

Adventist Health White Memorial
Children's Hospital Los Angeles
City of Hope National Medical Center
Harbor-UCLA Medical Center
High Desert Regional Health Center
LAC +USC Medical Center
Olive View-UCLA Medical Center
Rancho Los Amigos Rehabilitation Center

Supported by CDC Funding: *Sodium Reduction in Communities Program** and 1422 grant, *State and Local Public Health Actions to Prevent Obesity, Diabetes, and Heart Disease and Stroke*

Los Angeles Food Policy Council (LAFPC)
Key Accomplishments

Healthy Neighborhood Market Network (HNMN)

Developed a curriculum with 8 modules focused on promoting and selling healthy food in corner stores

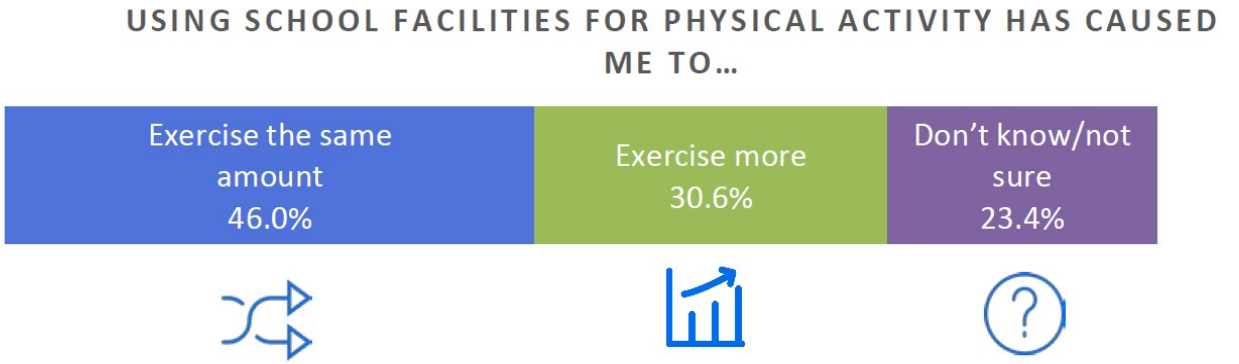
- Modules include marketing, store design and layout, social media
- Stores receive tailored TA based on their needs

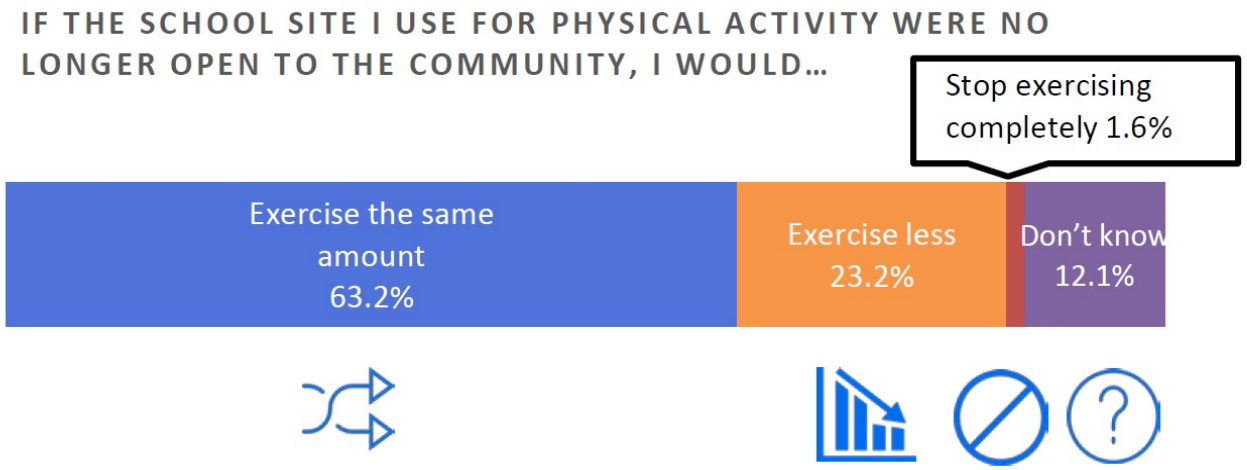
COMPRA, the small store purchasing cooperative has 58 clients

- 49 stores
- 3 nonprofits
- 6 private food enterprises

Promoting Community Physical Activity at School Sites

Internet panel survey results: Self-reported relationship between using a school for physical activity and overall activity level among adults in Los Angeles (n=207).



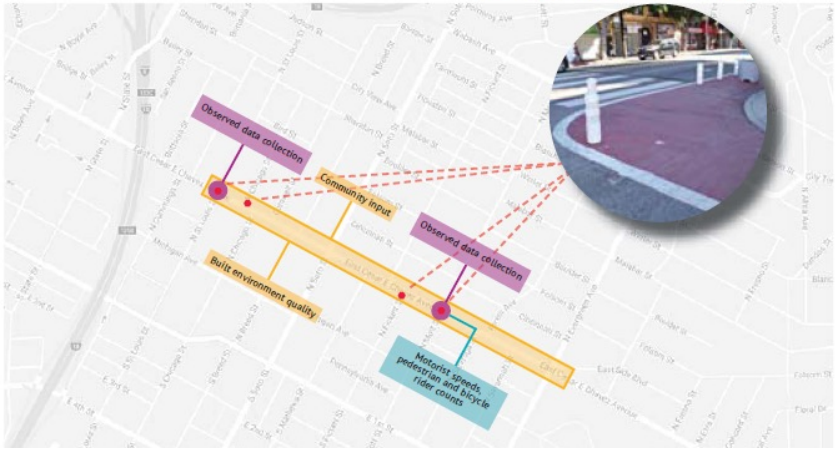


Implement Community Plans to Promote Walking

What is happening on César Chávez?

Nuestra Avenida and the Department of Public Health collected data along César Chávez to understand how recent changes could impact walking along the street.

Street improvements - new crosswalks and painted curb extensions



A need for more street enhancements

Nuestra Avenida heard a need for...

- more **trash cans** and more frequent trash pick-up
- more street furniture, such as **seating**, and more **lighting**
- better **sidewalks** with fewer cracks

DPH found that...

- **100%** of street segments had litter present
- only **29%** of street segments had pedestrian lighting
- **71%** of street segments had broken sidewalks

What did the community and DPH find along the street?

Lots of people are walking

Between Mott St. and Fickett St., we counted **1,689** walking every day

Many benefits to the street improvements so far

89% of people surveyed said...

- They felt safer with the improvements installed.
- They would visit César Chávez more often if the improvements were made permanent
- The improvements made the street more inviting and attractive

Unsafe driver behavior

Nuestra Avenida heard...

- drivers appear to be **running red lights** or speeding
- community members suggested protected left turn phases, leading pedestrian intervals, and other ways to **slow cars down and make it safer** for people walking

DPH found that...

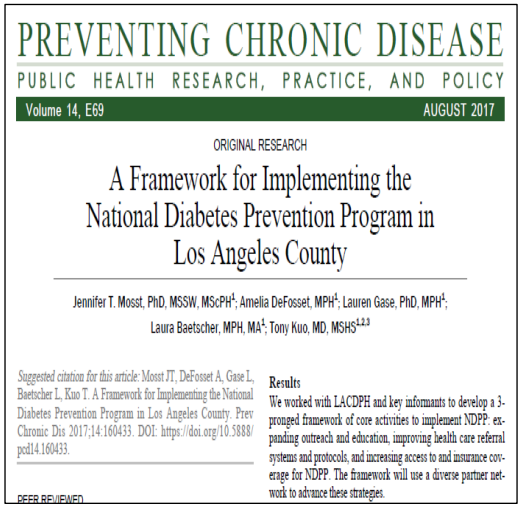
- drivers entered crosswalks during red lights **19%** of the time
- **42%** of drivers exceeded the speed limit
- drivers failed to yield to pedestrians in the crosswalk **10%** of the time

Growing Choose Health LA

PICK YOUR PORTION
CHOOSE HEALTH LA
CHOOSEHEALTHLA.COM

Choose HealthLA

National Diabetes Prevention Program Resources



PREVENTING CHRONIC DISEASE

PUBLIC HEALTH RESEARCH, PRACTICE, AND POLICY

Volume 14, E69 AUGUST 2017

ORIGINAL RESEARCH

A Framework for Implementing the National Diabetes Prevention Program in Los Angeles County

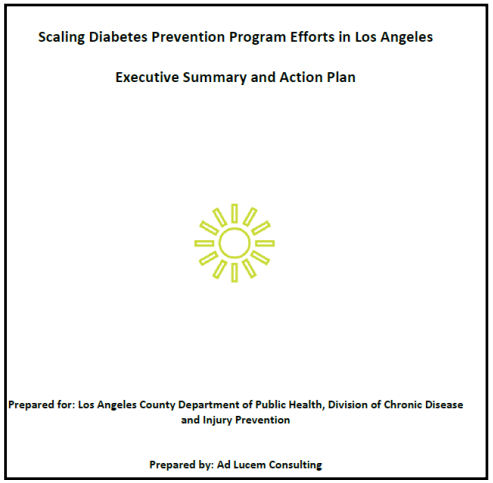
Jennifer T. Mosst, PhD, MSSW, MScPH[1]; Amelia DeFosset, MPH[1]; Lauren Gase, PhD, MPH[1]; Laura Baetscher, MPH, MA[1]; Tony Kuo, MD, MSHS[1,2,3]

Suggested citation for this article: Mosst JT, DeFosset A, Gase L, Baetscher L, Kuo T. A Framework for Implementing the National Diabetes Prevention Program in Los Angeles County. Prev Chronic Dis 2017;14:160433. DOI: https://doi.org/10.5888/pcd14.160433.

PEER REVIEWED

Results

We worked with LACDPH and key informants to develop a 3-pronged framework of core activities to implement NDPP: expanding outreach and education, improving health care referral systems and protocols, and increasing access to and insurance coverage for NDPP. The framework will use a diverse partner network to advance these strategies.

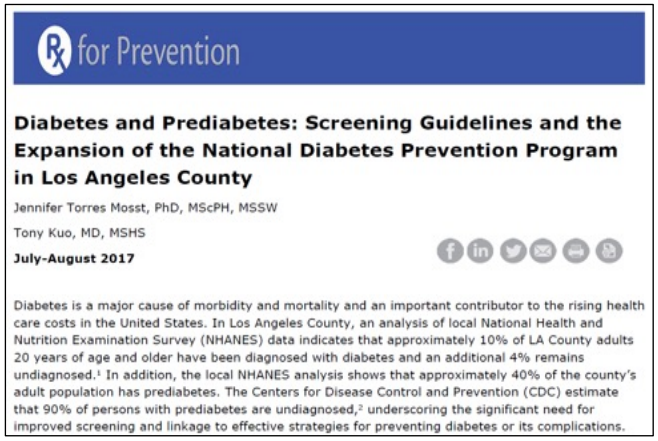


Scaling Diabetes Prevention Program Efforts in Los Angeles

Executive Summary and Action Plan

Prepared for: Los Angeles County Department of Public Health, Division of Chronic Disease and Injury Prevention

Prepared by: Ad Lucem Consulting



Rx for Prevention

Diabetes and Prediabetes: Screening Guidelines and the Expansion of the National Diabetes Prevention Program in Los Angeles County

Jennifer Torres Mosst, PhD, MScPH, MSSW

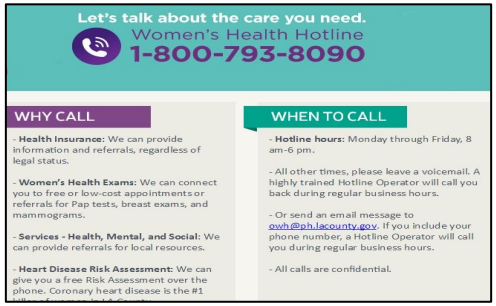
Tony Kuo, MD, MSHS

July-August 2017

Diabetes is a major cause of morbidity and mortality and an important contributor to the rising health care costs in the United States. In Los Angeles County, an analysis of local National Health and Nutrition Examination Survey (NHANES) data indicates that approximately 10% of LA County adults 20 years of age and older have been diagnosed with diabetes and an additional 4% remains undiagnosed.[1] In addition, the local NHANES analysis shows that approximately 40% of the county's adult population has prediabetes. The Centers for Disease Control and Prevention (CDC) estimate that 90% of persons with prediabetes are undiagnosed,[2] underscoring the significant need for improved screening and linkage to effective strategies for preventing diabetes or its complications.

Expanding Health Insurance Coverage in California for the National Diabetes Prevention Program

May 2016



Let's talk about the care you need.

Women's Health Hotline

1-800-793-8090

WHY CALL

- **Health Insurance:** We can provide information and referrals, regardless of legal status.

- **Women's Health Exams:** We can connect you to free or low-cost appointments or referrals for Pap tests, breast exams, and mammograms.

- **Services - Health, Mental, and Social:** We can provide referrals for local resources.

- **Heart Disease Risk Assessment:** We can give you a free Risk Assessment over the phone. Coronary heart disease is the #1

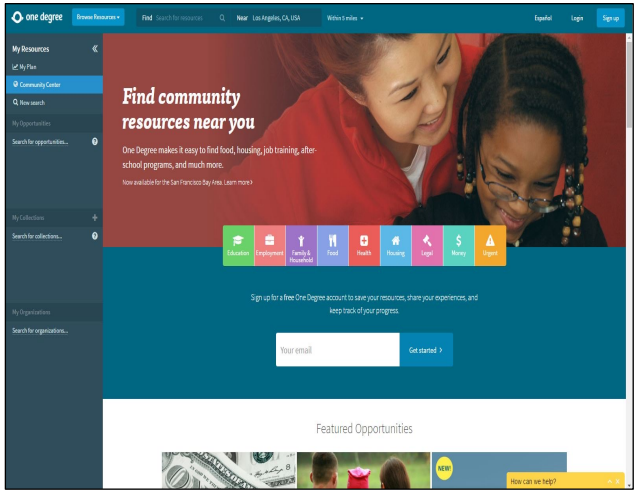
WHEN TO CALL

- **Hotline hours:** Monday through Friday, 8 am-6 pm.

- All other times, please leave a voicemail. A highly trained Hotline Operator will call you back during regular business hours.

- Or send an email message to owh@ph.lacounty.gov. If you include your phone number, a Hotline Operator will call you during regular business hours.

- All calls are confidential.



one degree

Find community resources near you

One Degree makes it easy to find food, housing, job training, after-school programs, and much more.

Sign up for a free One Degree account to save your resources, share your experiences, and keep track of your progress.

Get started

Featured Opportunities

Produce Prescription Project

- Patient eligibility:
  - Enrolled in Medicaid; and
  - Screened positive for food insecurity; and
  - Enrolled in the National Diabetes Prevention Program (DPP) **OR** with type 2 diabetes diagnosis

- Intended outcomes:
  - Increase PPR participants' daily fruit and vegetable intake
  - Improve PPR participants' household food security
  - Develop and implement a standardized program infrastructure to monitor PPR participants' blood pressure and HgbA1c changes

Fresca y Saludable/Fresh & Healthy

Screen

- NEVHC Family Medicine Care Coordinators and DPP Lifestyle Coaches screen patients for eligibility

Refer

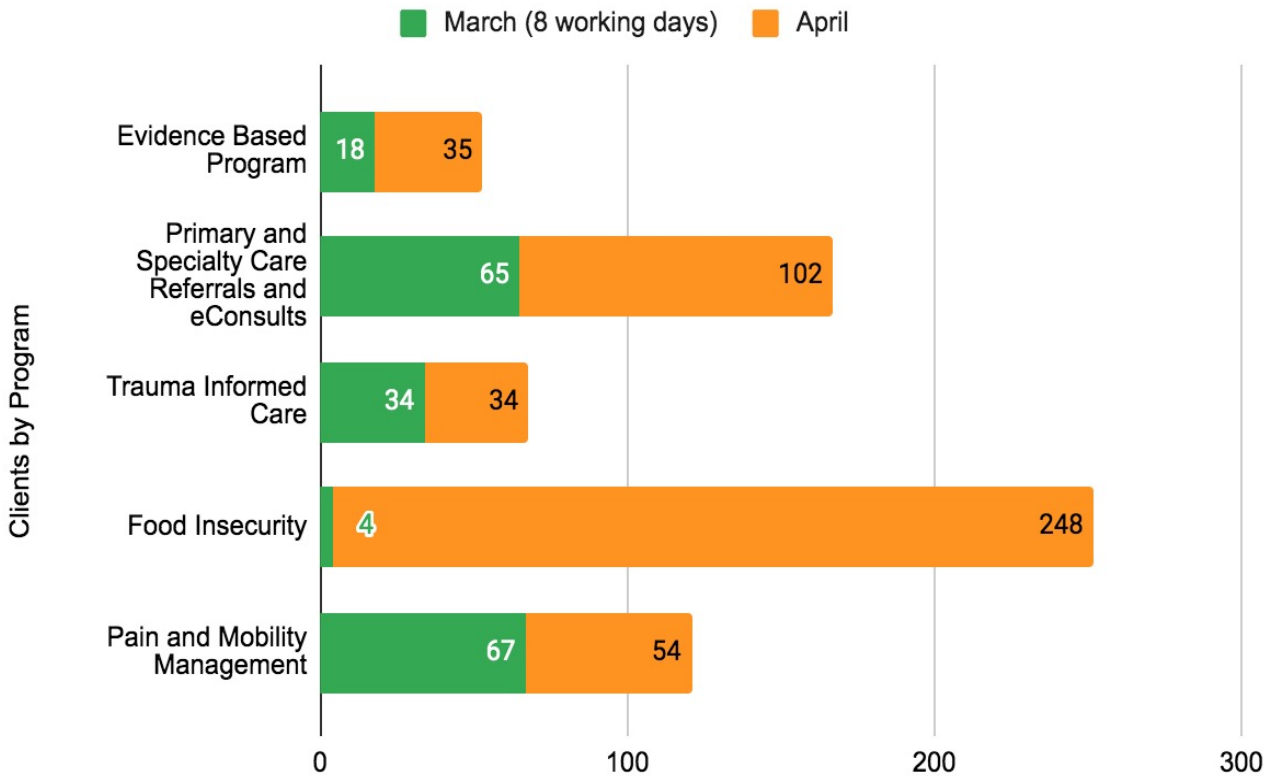
- Eligible patients will receive $40 debit card (6-month program)
- Referred to SNAP-Ed classes and grocery store tours

Access

- Patients use card to buy fresh fruits and vegetables at participating grocery stores

The Wellness Center at Historic General Hospital

Phone-based Client Wellness Checks



Wellness Navigators conducted wellness checks on TWC clients to ensure they have access to available resources while stay at home orders are in place. Wellness checks are tracked by class or program.

The Wellness Center: Client navigation referrals before versus after COVID-19 pandemic started

Top referrals January through March 2020

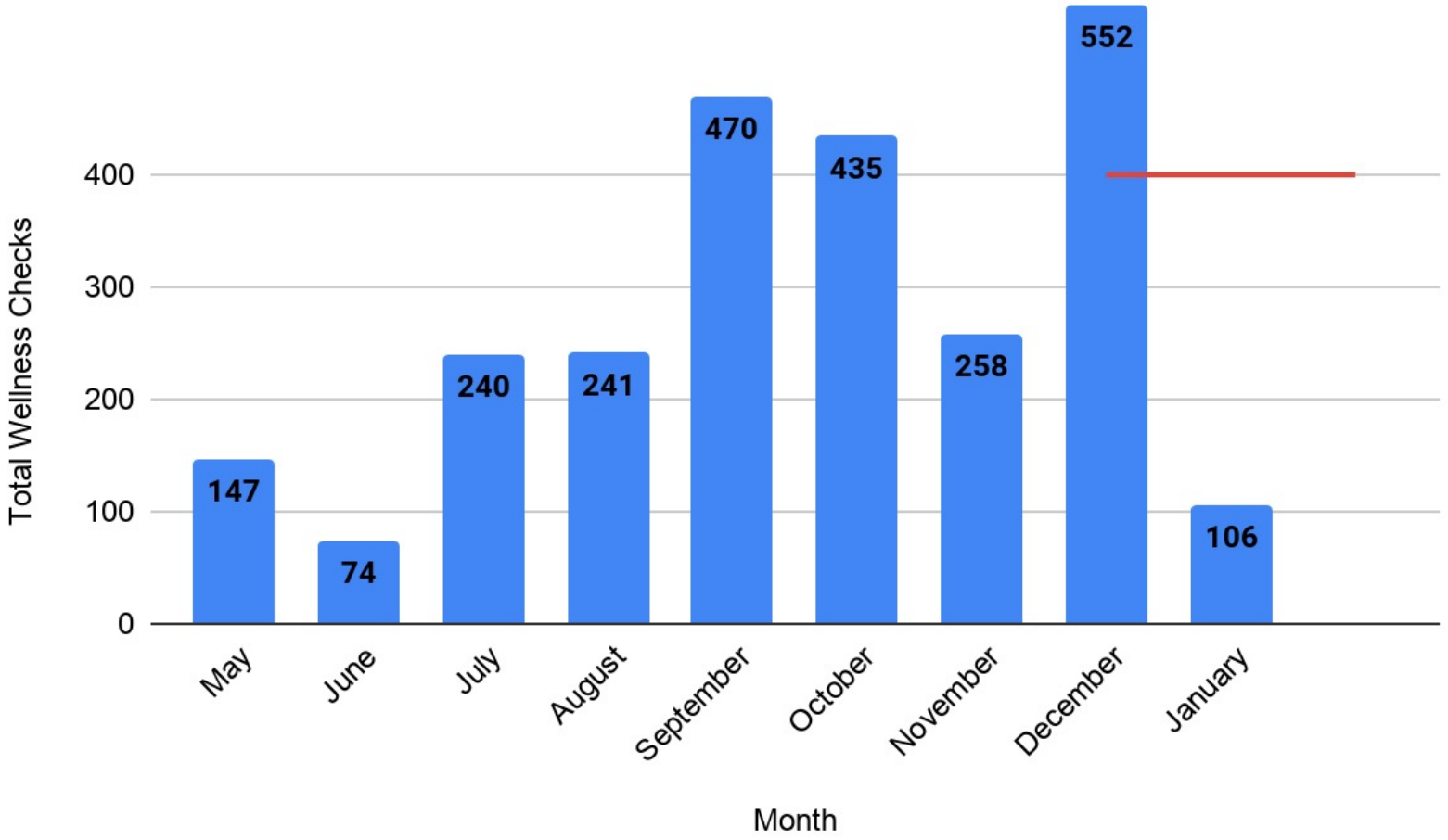
1. Healthy Cooking/Phys. Act. (43%)
2. Health Insurance Enrollment (34%)
3. Trauma Informed Care (10%)
4. Legal Aid (10%)

Top referrals after "Safer at Home" Health Order

1. Food Insecurity (53%)
2. Health Insurance Enrollment (44%)
3. Trauma Informed Care (26%)
4. Legal Aid (23%)

Overall, by December 2020 >4,700 clients received health navigation and related services.

Volume of Phone-based Client Wellness Checks through January 2021



UCLA Clinical and Translational Science Institute

Source: https://ctsi.ucla.edu/overview/pages/pophealth-team

Research

Garcia et al. Acad Med 93(1);82-89, 2018.pdf

Research Report

Factors Associated With Medical School Graduates' Intention to Work With Underserved Populations: Policy Implications for Advancing Workforce Diversity

Andrea N. Garcia, MD, MS, Tony Kuo, MD, MSHS, Lisa Arangua, MPP, and Eliseo J. Pérez-Stable, MD

Abstract

Purpose

Given projected U.S. physician shortages across all specialties that will likely impact underserved areas disproportionately, the authors sought to explore factors most correlated with medical school graduates' intention to work with underserved populations (IWUP).

Method

Data from the 2010–2012 Association of American Medical Colleges Medical School Graduation Questionnaire (n = 40,846) were analyzed. Variables (demographics, career preference, debt burden, intention to enter loan forgiveness programs) were examined using chi-square tests and logistic regression models.

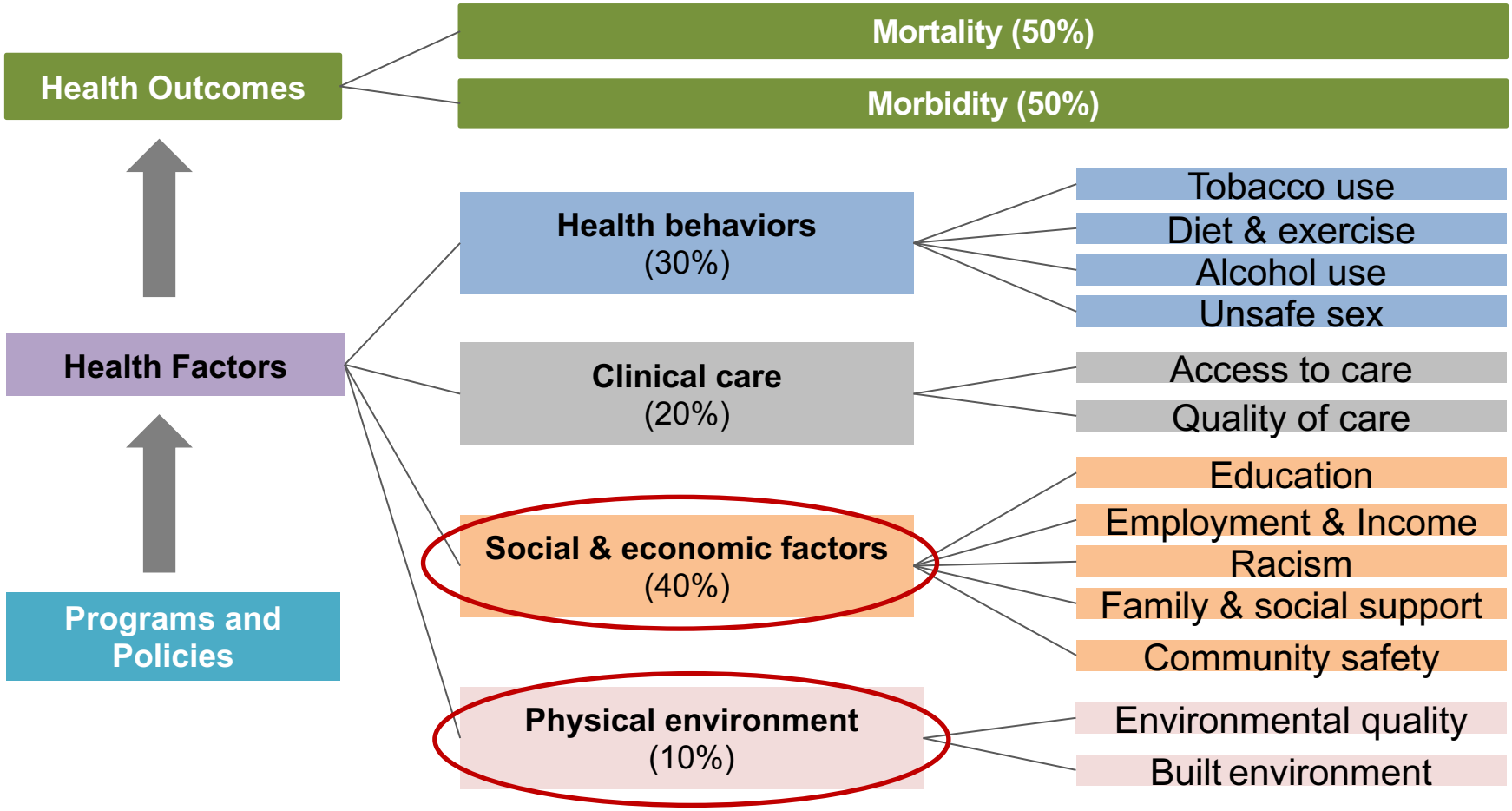
Results

Respondents included 49.5% (20,228/40,846) women, 16.6% (6,771/40,837) underrepresented minorities (URMs), and 32.4% (13,034/37,342) with primary care intent. The median educational debt was $160,000. Respondents who were women (adjusted odds ratio [aOR] 1.59, 95% confidence interval [CI] 1.49, 1.70), URMs (aOR 2.50, 95% CI 2.30, 2.72), intended to enter loan forgiveness programs (aOR 2.44, 95% CI 2.26, 2.63), intended to practice primary care (aOR 1.65, 95% CI 1.54, 1.76), and intended to emphasize nonclinical careers (aOR 1.23, 95% CI 1.11, 1.37) had greater odds of reporting IWUP. Among those who chose specialties and careers with a nonclinical emphasis, and among those with greater burdens of educational and consumer debt, URMs were nearly twice as likely as other minorities and whites to report IWUP.

Conclusions

Findings suggest physician characteristics that may be associated with filling workforce gaps in underserved areas. Restructuring financial incentive programs to support physician leaders and specialists with characteristics associated with IWUP may complement similar policies in primary care and could have key impacts on health equity in underserved areas.

Factors that impact health outcomes



Source: http://www.countyhealthrankings.org/our-approach

QUESTIONS?

The impact of COVID-19 on physical activity

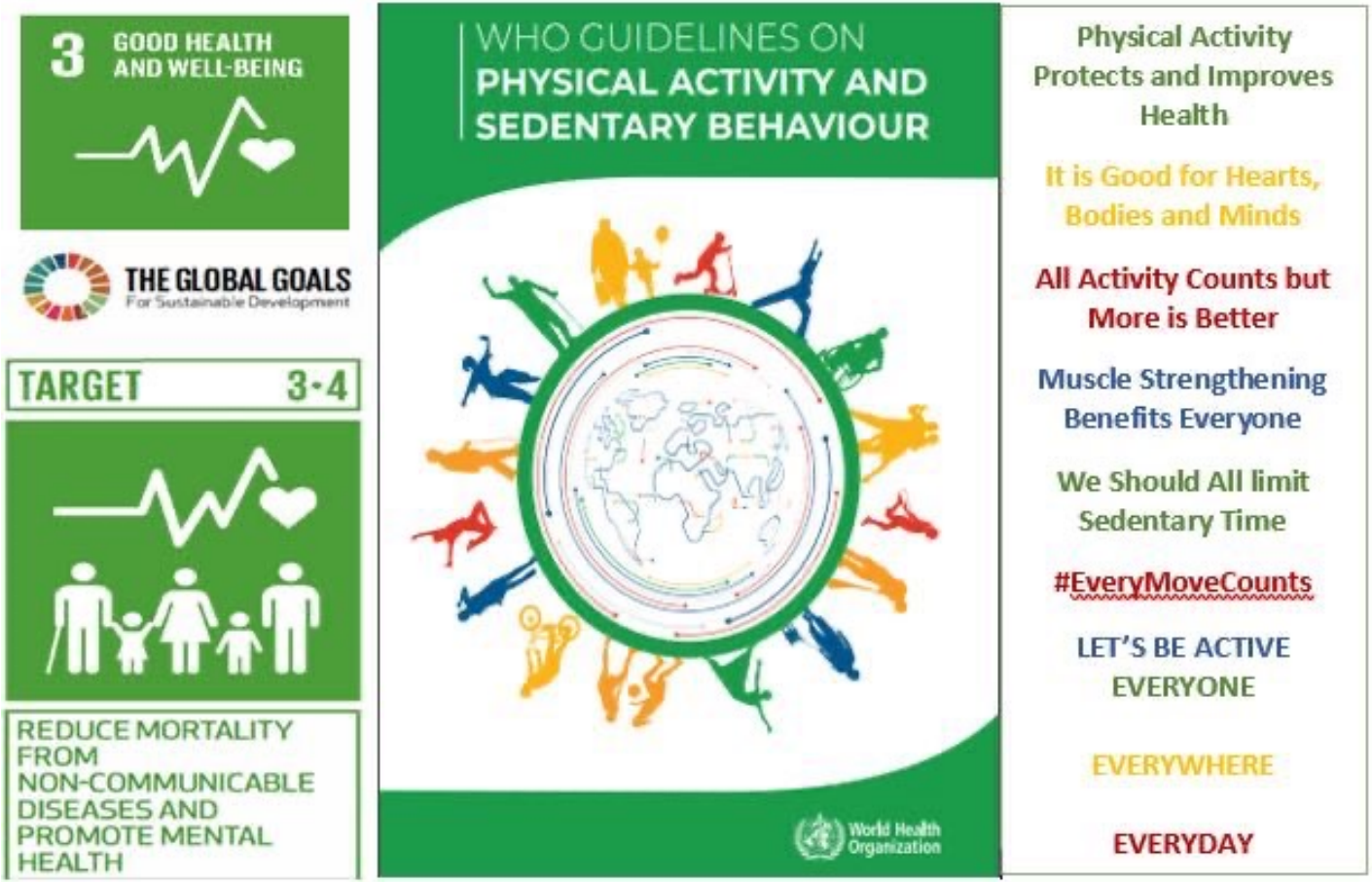
A/Prof Melody Ding, Sydney School of Public Health, FMH
Melody.ding@sydney.edu.au
@DrMelodyDing

THE UNIVERSITY OF SYDNEY

For: APRU Crisis Management Webinar

We acknowledge the tradition of custodianship and law of the Country on which the University of Sydney campuses stand. We pay our respects to those who have cared and continue to care for Country.

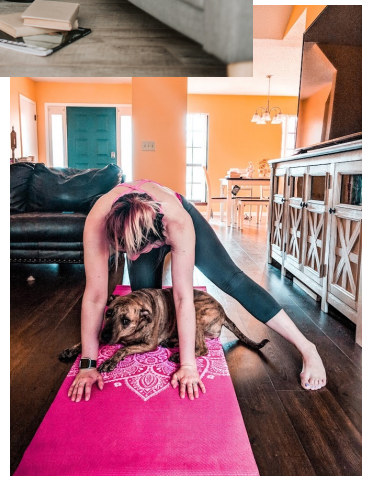
THE UNIVERSITY OF SYDNEY


3 GOOD HEALTH AND WELL-BEING
THE GLOBAL GOALS
For Sustainable Development
TARGET 3·4
REDUCE MORTALITY FROM NON-COMMUNICABLE DISEASES AND PROMOTE MENTAL HEALTH
WHO GUIDELINES ON
PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR
World Health Organization
Physical Activity Protects and Improves Health
It is Good for Hearts, Bodies and Minds
All Activity Counts but More is Better
Muscle Strengthening Benefits Everyone
We Should All limit Sedentary Time
#EveryMoveCounts
LET'S BE ACTIVE EVERYONE
EVERYWHERE
EVERYDAY

What will happen if our living environment changes

From this

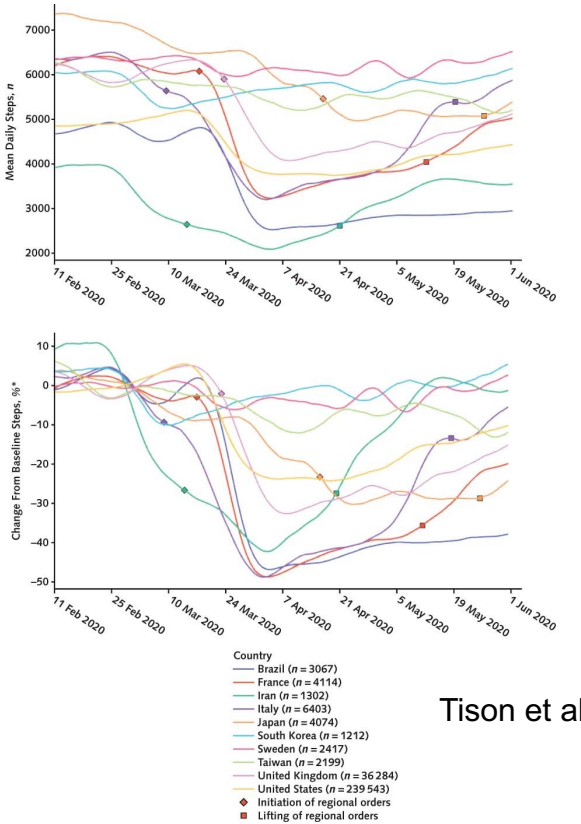
to this?



What does the evidence say?

- Increase?
- Decrease?
- Stayed the same
- Mixed?

Why is the evidence so heterogenous?

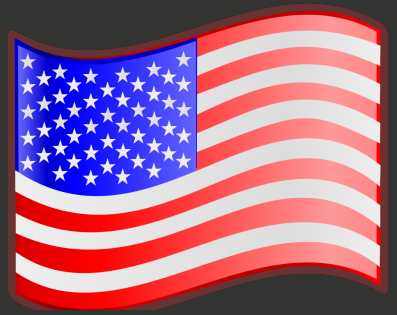
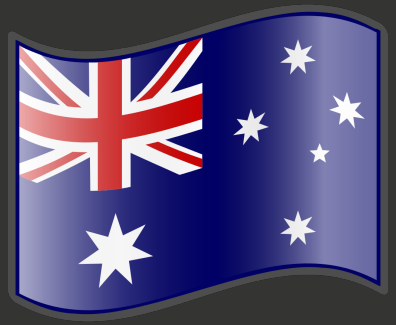
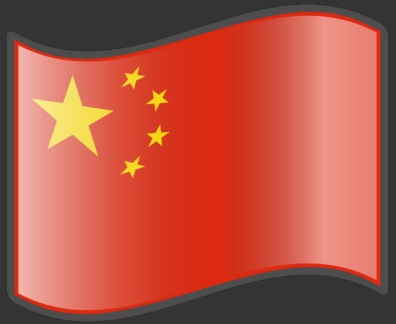


Tison et al. 2020

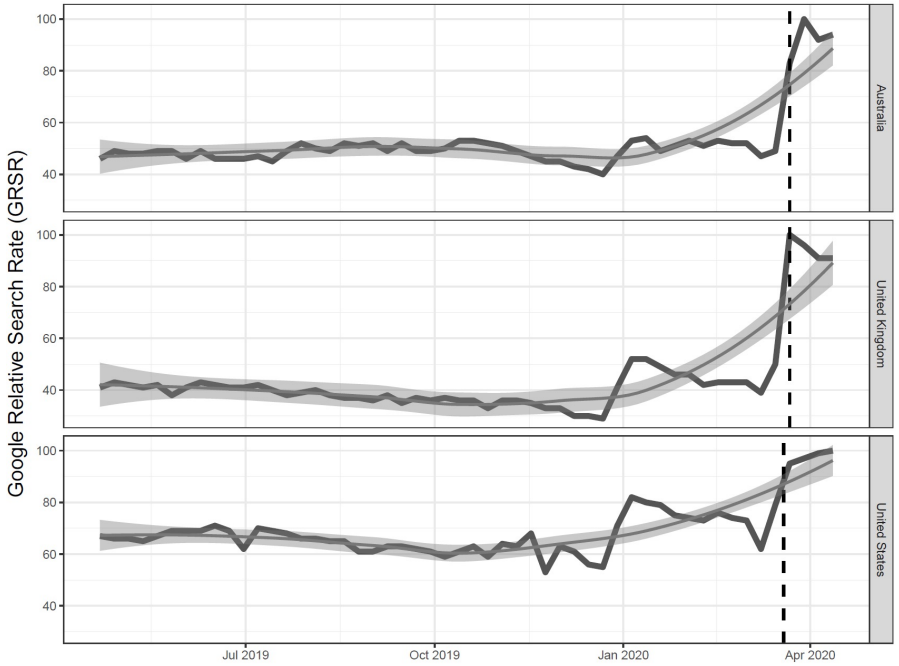
The conclusions depend on:

- Setting/policy/restrictions
- Physical activity vs exercise
- Context of physical activity
- Study design (e.g., retrospective)
- Sample characteristics
- Measurement of physical activity

Three case studies:

Study 1: Covid-19 and online inquiry



Editorial

Is the COVID-19 lockdown nudging people to be more active: a big data analysis

Ding Ding [1,2] Borja del Pozo Cruz [3] Mark A Green,[4] Adrian E Bauman[1,2]

The COVID-19 pandemic has brought unparalleled destruction to global health, social and economic systems. To control the spread of COVID-19, most countries have enforced a societal-level lockdown. This mass disruption of civil life provides opportunities for observational 'natural experiments', mandating lifestyle changes overnight. Big data, such as Google Trends (GT), have been used to identify outbreaks[1] and monitor risk communication strategies within a defined time frame and geography on a scale of 0–100, based on a topic's search proportion out of all searches, representing population-level interest in selected topics (Google Relative Search Rate (GRSR)). To contextualise the trend in exercise, we contrasted the GRSR of 'exercise' with 'television show' as a proxy for population-level interest in television viewing, a common sedentary activity expected to increase during the lockdown. In fact, population-level interest in exercise in April 2020 was at an all-time high since GT records began in January 2004. As expected, community interest in television also increased since the COVID-19 lockdown. Despite 'television show' remained an overall more searched topic than 'exercise', the increase in 'exercise' was so large that it surpassed 'television show' for the first 2 weeks following the lockdown in Australia and the UK. In Australia, the UK and the USA, respectively, the mean (SD) GRSR for 'exercise' accounting for 'television show' was 47.1 (3.2), 36.6 (4.8) and 50.5 (5.2) before, and 77.3 (11.0), 78.9 (9.4) and 71.1 (4.1) after the lockdown, suggesting significant (all $p<0.01$) proportionate increases in 'exercise' interest when accounting for the rise in 'television show'.

These data suggest that despite challenges to an active lifestyle, the COVID-19 lockdown may have led to increases in

Ding D, del Pozo Cruz B, Green MA, et al. Is the COVID-19 lockdown nudging people to be more active: a big data analysis. British Journal of Sports Medicine 2020;54:1183-1184.

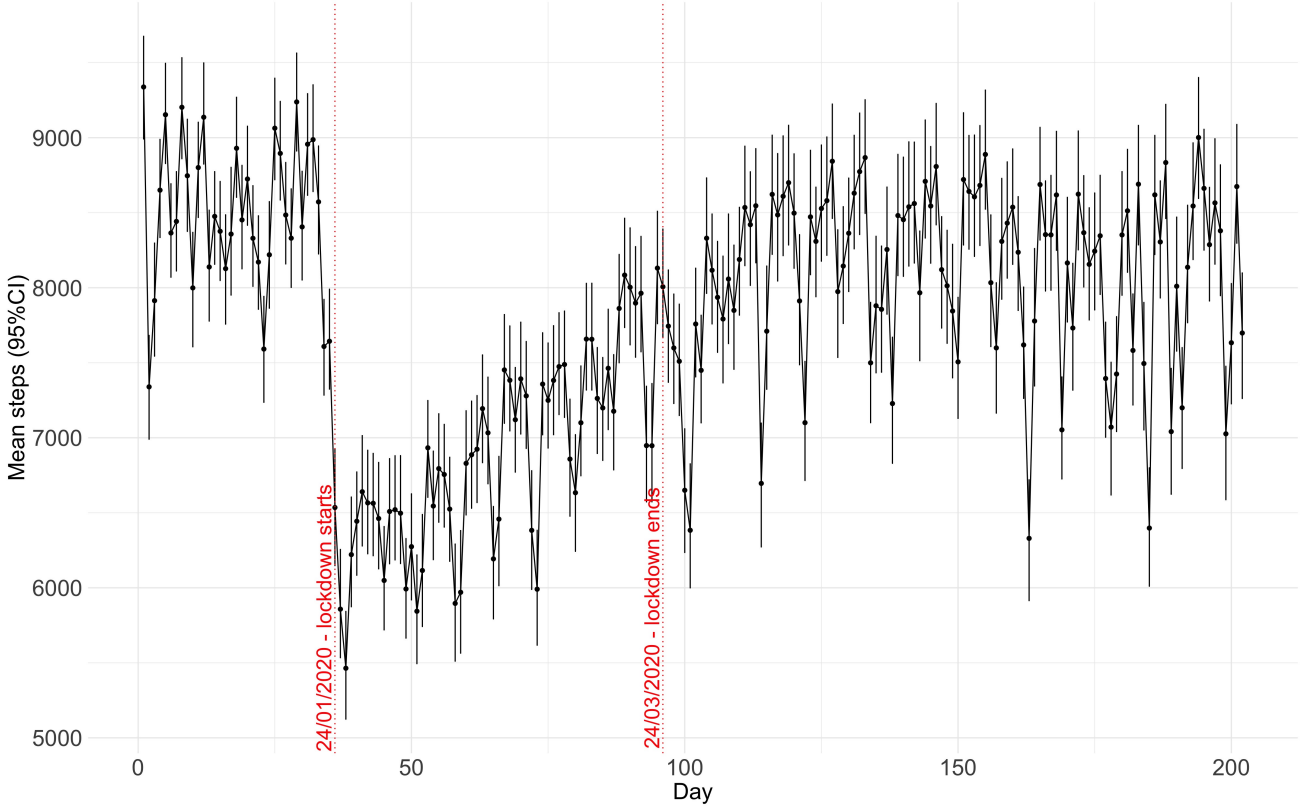
The New York Times

PHYS ED

How the Pandemic Is Changing Our Exercise Habits

Many of us have been moving less since the pandemic began. But some, including many older men and women, seem to be moving more.

Study 2: Covid-19 and Step Counts in China



- Shanghai residents
- n=815 (202 days)
- Step counts through Wechat
- Opportunistic evaluation

Who were slower at recovering step counts

During the lockdown

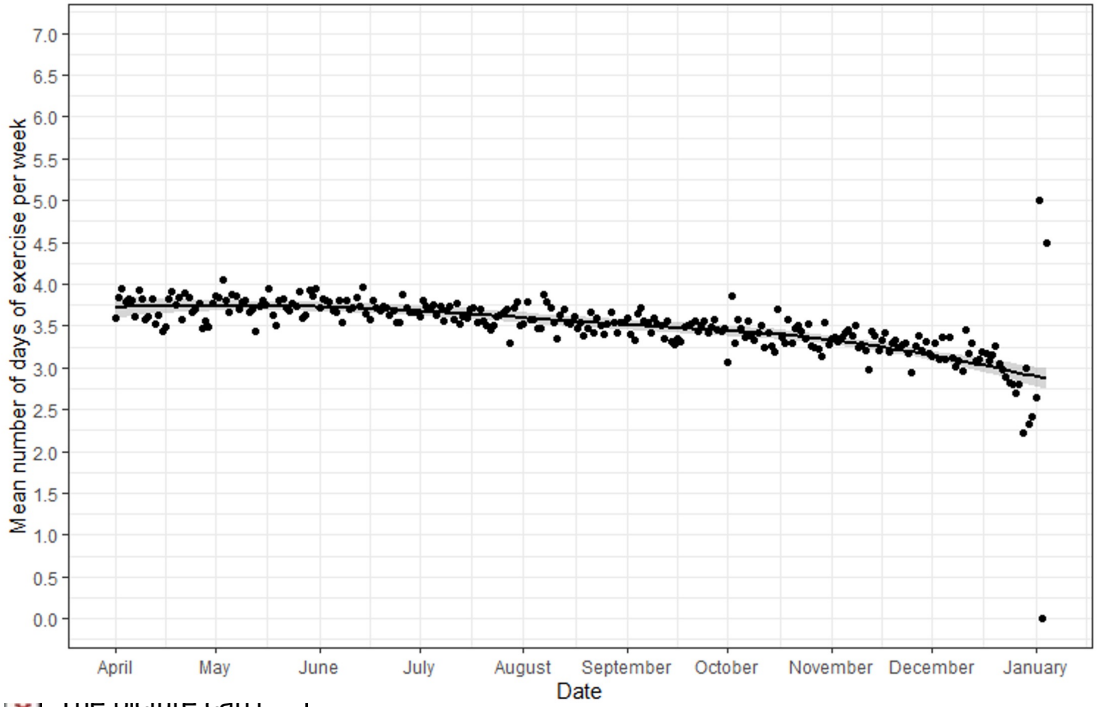
- Older
- Married
- University educated
- Less active pre-COVID
- ‘At risk’ adiposity

After the lockdown

- Older
- Married
- Not University educated
- ‘At risk’ adiposity

Ding et al. Int J Behav Nutri Phys Act, in press

Study 3: Leisure-time physical activity in the USA



The picture can't be displayed.

- Understanding America Study (UAS)
- Population representative
- n=4879 over 279 days
- Days of exercise/week

Who were less active during COVID-19

Sociodemographic

- Younger
- Female
- Non-White
- No university education

Pre-COVID health characteristics

- Less active
- Obese
- High blood pressure

Environment

Living in states with stringent containment policies (Oxford COVID-19 Government Response Tracker)

The impact of COVID-19 on physical activity

What we do not know?

Precisely how much change in each domain, by how much at the population level

What we do know:

- Very likely a negative impact
- Prolonged low activity levels has long-term health complications
- Affect population subgroup differentially

Lessons learned

The opportunity

- Potentially increased interest and awareness
- Interruption– fast tracked change
- Resilience in some people

The challenges

- Exacerbating gaps
- Competing policy priorities (trade-off)
- Increasing private car use

thank
you

The impact of COVID-19 on diabetes in China

Jue Liu
Assistant Professor
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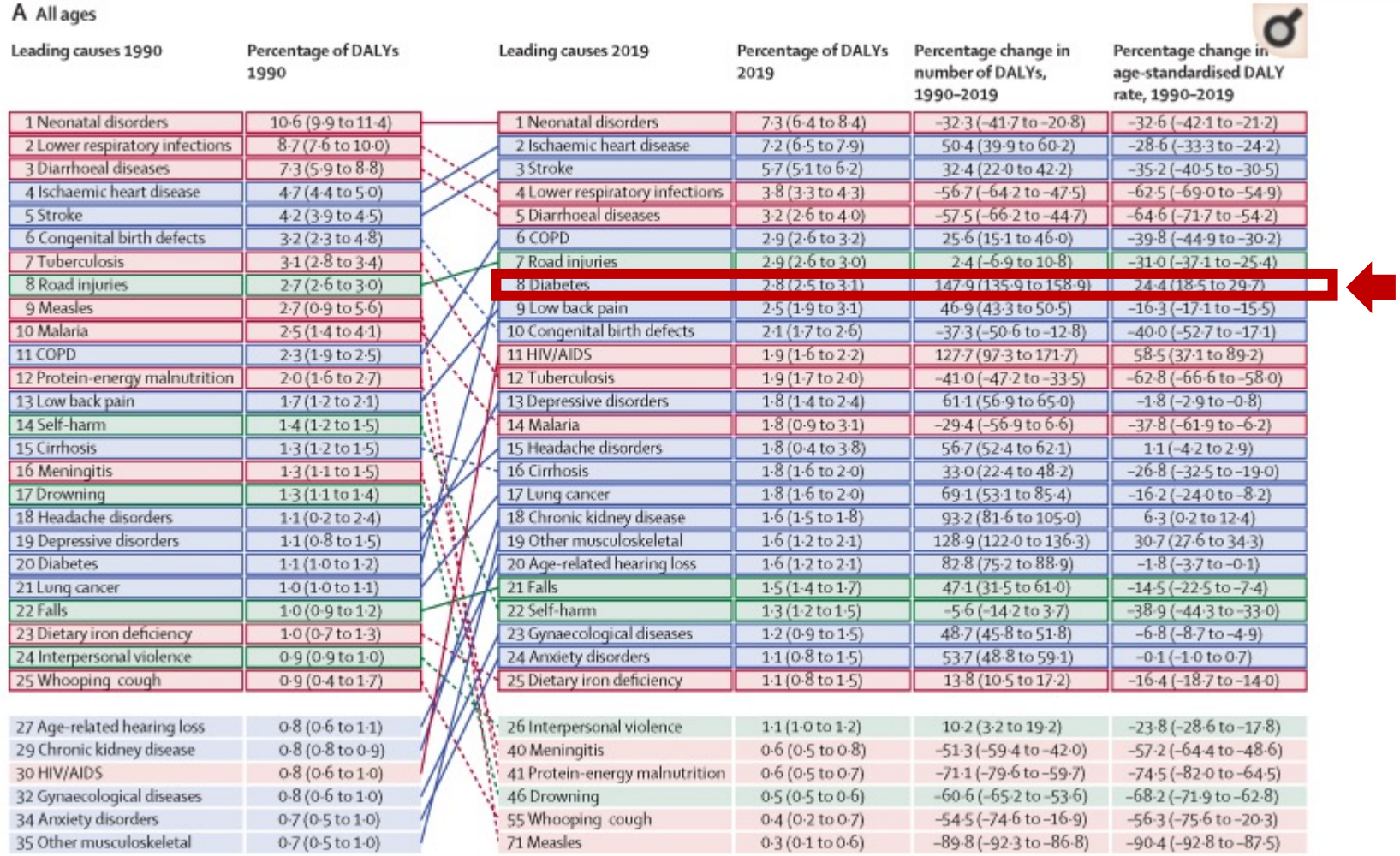
Global burden of diabetes

- A metabolic disorder caused by genetic and environmental factors
- It has become a critical health concern worldwide owing to its high prevalence and related disability and mortality
- Among the top ten causes of DALYs (ranked eight)



A All ages

Leading causes 1990	Percentage of DALYs 1990	Leading causes 2019	Percentage of DALYs 2019	Percentage change in number of DALYs, 1990–2019	Percentage change in age-standardised DALY rate, 1990–2019
1 Neonatal disorders	10·6 (9·9 to 11·4)	1 Neonatal disorders	7·3 (6·4 to 8·4)	−32·3 (−41·7 to −20·8)	−32·6 (−42·1 to −21·2)
2 Lower respiratory infections	8·7 (7·6 to 10·0)	2 Ischaemic heart disease	7·2 (6·5 to 7·9)	50·4 (39·9 to 60·2)	−28·6 (−33·3 to −24·2)
3 Diarrhoeal diseases	7·3 (5·9 to 8·8)	3 Stroke	5·7 (5·1 to 6·2)	32·4 (22·0 to 42·2)	−35·2 (−40·5 to −30·5)
4 Ischaemic heart disease	4·7 (4·4 to 5·0)	4 Lower respiratory infections	3·8 (3·3 to 4·3)	−56·7 (−64·2 to −47·5)	−62·5 (−69·0 to −54·9)
5 Stroke	4·2 (3·9 to 4·5)	5 Diarrhoeal diseases	3·2 (2·6 to 4·0)	−57·5 (−66·2 to −44·7)	−64·6 (−71·7 to −54·2)
6 Congenital birth defects	3·2 (2·3 to 4·8)	6 COPD	2·9 (2·6 to 3·2)	25·6 (15·1 to 46·0)	−39·8 (−44·9 to −30·2)
7 Tuberculosis	3·1 (2·8 to 3·4)	7 Road injuries	2·9 (2·6 to 3·0)	2·4 (−6·9 to 10·8)	−31·0 (−37·1 to −25·4)
8 Road injuries	2·7 (2·6 to 3·0)	8 Diabetes	2·8 (2·5 to 3·1)	147·9 (135·9 to 158·9)	24·4 (18·5 to 29·7)
9 Measles	2·7 (0·9 to 5·6)	9 Low back pain	2·5 (1·9 to 3·1)	46·9 (43·3 to 50·5)	−16·3 (−17·1 to −15·5)
10 Malaria	2·5 (1·4 to 4·1)	10 Congenital birth defects	2·1 (1·7 to 2·6)	−37·3 (−50·6 to −12·8)	−40·0 (−52·7 to −17·1)
11 COPD	2·3 (1·9 to 2·5)	11 HIV/AIDS	1·9 (1·6 to 2·2)	127·7 (97·3 to 171·7)	58·5 (37·1 to 89·2)
12 Protein-energy malnutrition	2·0 (1·6 to 2·7)	12 Tuberculosis	1·9 (1·7 to 2·0)	−41·0 (−47·2 to −33·5)	−62·8 (−66·6 to −58·0)
13 Low back pain	1·7 (1·2 to 2·1)	13 Depressive disorders	1·8 (1·4 to 2·4)	61·1 (56·9 to 65·0)	−1·8 (−2·9 to −0·8)
14 Self-harm	1·4 (1·2 to 1·5)	14 Malaria	1·8 (0·9 to 3·1)	−29·4 (−56·9 to 6·6)	−37·8 (−61·9 to −6·2)
15 Cirrhosis	1·3 (1·2 to 1·5)	15 Headache disorders	1·8 (0·4 to 3·8)	56·7 (52·4 to 62·1)	1·1 (−4·2 to 2·9)
16 Meningitis	1·3 (1·1 to 1·5)	16 Cirrhosis	1·8 (1·6 to 2·0)	33·0 (22·4 to 48·2)	−26·8 (−32·5 to −19·0)
17 Drowning	1·3 (1·1 to 1·4)	17 Lung cancer	1·8 (1·6 to 2·0)	69·1 (53·1 to 85·4)	−16·2 (−24·0 to −8·2)
18 Headache disorders	1·1 (0·2 to 2·4)	18 Chronic kidney disease	1·6 (1·5 to 1·8)	93·2 (81·6 to 105·0)	6·3 (0·2 to 12·4)
19 Depressive disorders	1·1 (0·8 to 1·5)	19 Other musculoskeletal	1·6 (1·2 to 2·1)	128·9 (122·0 to 136·3)	30·7 (27·6 to 34·3)
20 Diabetes	1·1 (1·0 to 1·2)	20 Age-related hearing loss	1·6 (1·2 to 2·1)	82·8 (75·2 to 88·9)	−1·8 (−3·7 to −0·1)
21 Lung cancer	1·0 (1·0 to 1·1)	21 Falls	1·5 (1·4 to 1·7)	47·1 (31·5 to 61·0)	−14·5 (−22·5 to −7·4)
22 Falls	1·0 (0·9 to 1·2)	22 Self-harm	1·3 (1·2 to 1·5)	−5·6 (−14·2 to 3·7)	−38·9 (−44·3 to −33·0)
23 Dietary iron deficiency	1·0 (0·7 to 1·3)	23 Gynaecological diseases	1·2 (0·9 to 1·5)	48·7 (45·8 to 51·8)	−6·8 (−8·7 to −4·9)
24 Interpersonal violence	0·9 (0·9 to 1·0)	24 Anxiety disorders	1·1 (0·8 to 1·5)	53·7 (48·8 to 59·1)	−0·1 (−1·0 to 0·7)
25 Whooping cough	0·9 (0·4 to 1·7)	25 Dietary iron deficiency	1·1 (0·8 to 1·5)	13·8 (10·5 to 17·2)	−16·4 (−18·7 to −14·0)
27 Age-related hearing loss	0·8 (0·6 to 1·1)	26 Interpersonal violence	1·1 (1·0 to 1·2)	10·2 (3·2 to 19·2)	−23·8 (−28·6 to −17·8)
29 Chronic kidney disease	0·8 (0·8 to 0·9)	40 Meningitis	0·6 (0·5 to 0·8)	−51·3 (−59·4 to −42·0)	−57·2 (−64·4 to −48·6)
30 HIV/AIDS	0·8 (0·6 to 1·0)	41 Protein-energy malnutrition	0·6 (0·5 to 0·7)	−71·1 (−79·6 to −59·7)	−74·5 (−82·0 to −64·5)
32 Gynaecological diseases	0·8 (0·6 to 1·0)	46 Drowning	0·5 (0·5 to 0·6)	−60·6 (−65·2 to −53·6)	−68·2 (−71·9 to −62·8)
34 Anxiety disorders	0·7 (0·5 to 1·0)	55 Whooping cough	0·4 (0·2 to 0·7)	−54·5 (−74·6 to −16·9)	−56·3 (−75·6 to −20·3)
35 Other musculoskeletal	0·7 (0·5 to 1·0)	71 Measles	0·3 (0·1 to 0·6)	−89·8 (−92·3 to −86·8)	−90·4 (−92·8 to −87·5)

Leading causes of global DALYs and percentage of total DALYs (1990 and 2019)

Lancet 2020;396(10258):1204-1222.
BMJ 2020;369:m997

Burden of diabetes in China

Prevalence **Number** **Health care cost**

0.67% in 1980 ➡ **12.8% in 2017**

BMJ 2020;369:m997

Burden of diabetes in China

Overview of the four national surveys of diabetes in mainland China

	2007 Survey	2010 Survey	2013 Survey	2017 Survey
Authors	Wenying Yang, et al.	Yu Xu, et al.	Limin Wang, et al.	Yongze Li, et al.
Study objective	"To estimate the prevalence of diabetes among Chinese adults."	"To investigate the prevalence of diabetes and glycemic control in the Chinese adult population."	"To estimate the recent prevalence and to investigate the ethnic variation of diabetes and prediabetes in the Chinese adult population."	"To assess the current prevalence of diabetes and risk factors in mainland China, as well as the national trend in diabetes prevalence."
Geographical range	14 provinces	31 provinces	31 provinces	31 provinces
Participants	46239 participants aged 20 or older	98658 participants aged 18 or older	170287 participants aged 18 or older	75880 participants aged 18 or older
Study design	Cross-sectional study	Cross-sectional study	Cross-sectional study	Cross-sectional study
Study resource	The China National Diabetes and Metabolic Disorders Study	The China Noncommunicable Disease Surveillance 2010	The China Chronic Disease and Risk Factors Surveillance study	Thyroid disorders, iodine status and diabetes epidemiological survey
Sampling design	Multistage, stratified sampling method	Multistage, stratified, probability sampling method	Multistage, stratified sampling method	Multistage, stratified sampling method

BMJ 2020;369:m997

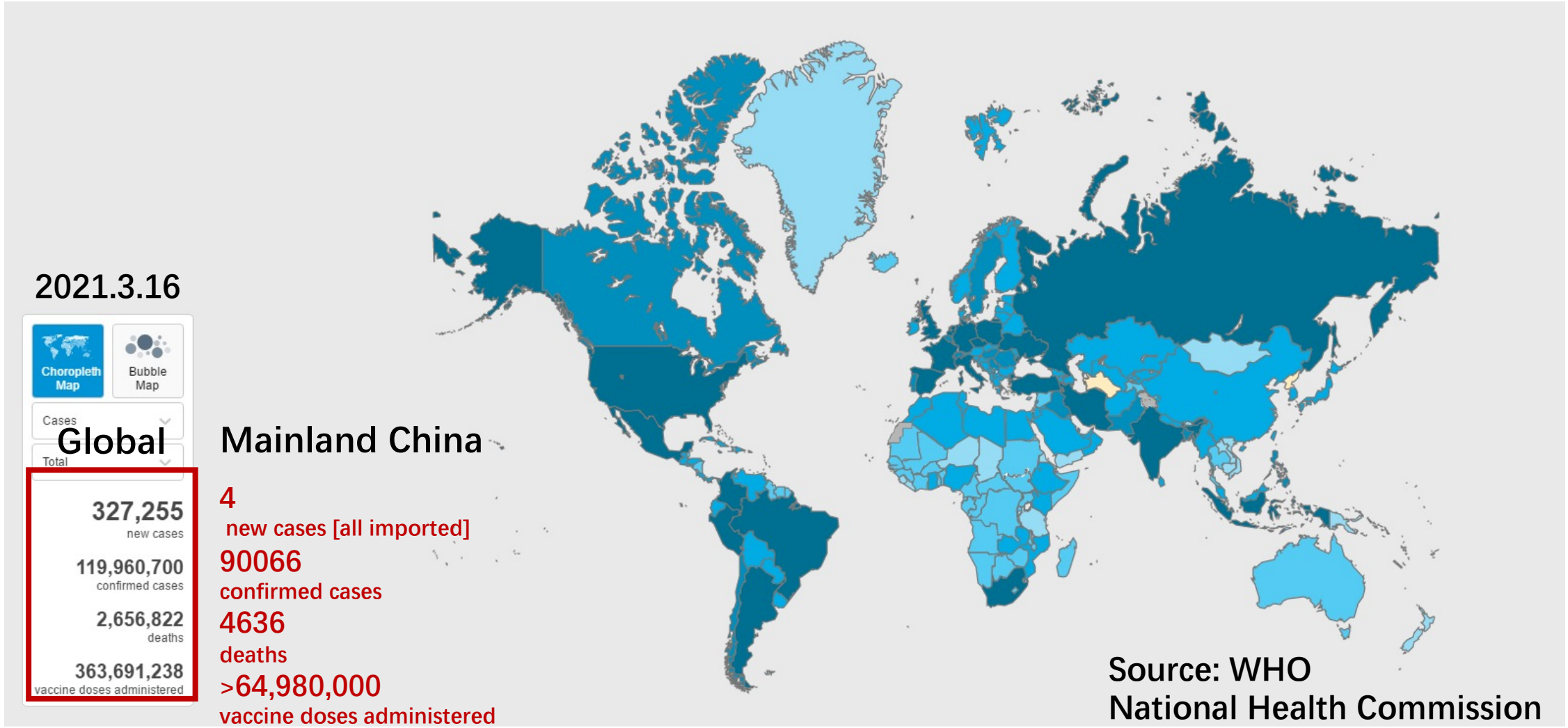
Burden of diabetes in China

Overview of the four national surveys of diabetes in mainland China

Weighted prevalence	2007 survey	2010 Survey	2013 Survey	2017 Survey
Total diabetes, %	9.7	11.6	10.9	12.8
Diagnosed diabetes, %	N/A	3.5	4.0	6.0
Undiagnosed diabetes, %	N/A	8.1	6.9	6.8
Prediabetes , %	15.5	50.1	35.7	35.2
Awareness of diabetes, %	N/A	30.1	36.5	43.3
Treatment of diabetes, %	N/A	25.8	32.3	49.0
Control of diabetes, %	N/A	39.7	49.2	49.4

BMJ 2020;369:m997

Global burden of COVID-19



COVID-19 & Diabetes

- A bidirectional relationship between COVID-19 and diabetes

- Diabetes is associated with an increased risk of severe COVID-19
- New-onset diabetes and severe metabolic complications of preexisting diabetes, including diabetic ketoacidosis and hyperosmolarity for which exceptionally high doses of insulin are warranted, have been observed in patients with COVID-19

N Engl J Med. 2020;383(8):789-790

The impact of diabetes on COVID-19 in China

- Aim: To systematically evaluate the prevalence of diabetes among COVID-19 patients in China and its impact on clinical outcomes (severe cases or death).
- Methods: We searched studies published in PubMed, Web of Science, and EMBASE from December 1, 2019 to March 31, 2020 to identify relevant observational study.

Liu et al. World J Diabetes. 2020;11(10):468-480.

The impact of diabetes on COVID-19 in China

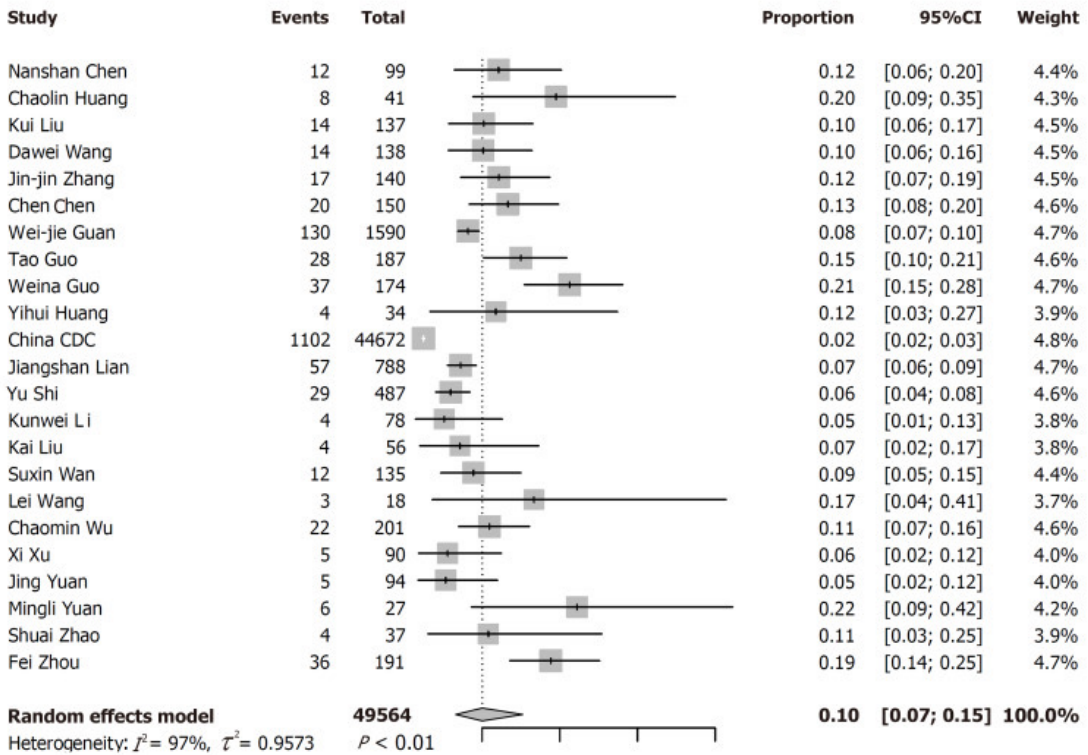
- **Twenty-three eligible articles including 49564 COVID-19 patients (1573 with and 47991 without diabetes) were finally included.**
- **Nearly one in ten COVID-19 patients have diabetes in China.**
- **The pooled prevalence of diabetes was 10% (95%CI: 7%-15%) in COVID-19 patients.**

Liu et al. World J Diabetes. 2020;11(10):468-480.

The impact of diabetes on COVID-19 in China

☐ The pooled prevalence of diabetes:

- patients aged > 50 years (13%; 95%CI: 11%-16%)
- patients aged ≤ 50 years (7%; 95%CI: 6%-8%)
- severe patients (17%; 95%CI: 14%-20%)
- non-severe patients (6%; 95%CI: 5%-8%)
- dead patients (30%; 95%CI: 13%-46%)
- survivors (8%; 95%CI: 2%-15%)



Liu et al. World J Diabetes. 2020;11(10):468-480.

The impact of diabetes on COVID-19 in China

Diabetes is associated with a higher risk of severe illness and death in patients with COVID-19.

☐ **Compared with patients without diabetes:**

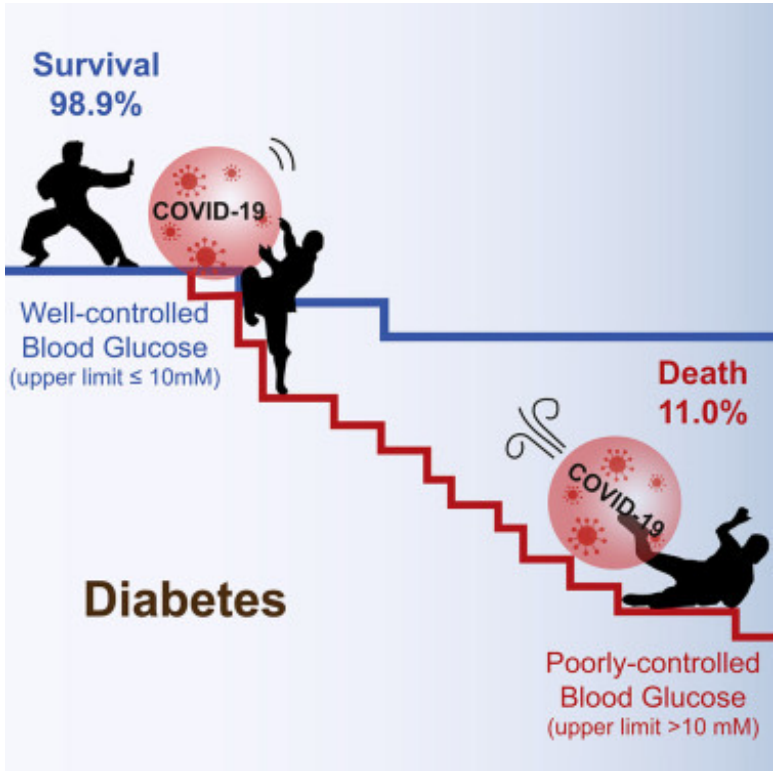
- **the risk of severe cases was higher (RR = 2.13, 95%CI: 1.76-2.56, I^2 = 49%) in COVID-19 patients with diabetes**
- **the risk of death was higher (RR = 3.16, 95%CI: 2.64-3.78, I^2 = 34%) in COVID-19 patients with diabetes**

Liu et al. World J Diabetes. 2020;11(10):468-480.

The impact of COVID-19 on diabetes in China

- **Impact of the COVID-19 lockdown on diabetes patients**
- **Lifestyles?**
- **Glycemic control?**
- **Diabetes management?**
- **Severe metabolic complications of preexisting diabetes ?**
- **COVID-19–related new-onset diabetes ?**
- **……**

Association of Blood Glucose Control and Outcomes n Patients with COVID-19 and Pre-existing Type 2 Diabetes



- A cohort of 7,337 COVID-19 patients with or without diabetes was retrospectively studied (952 had T2D) in Hubei Province, China
- Subjects with T2D required more medical interventions and had a significantly higher mortality (7.8% versus 2.7%; adjusted HR, 1.49).
- Diabetes status increased the mortality risk of patients with COVID-19. Well-controlled blood glucose correlated with improved outcomes in infected patients (adjusted HR, 0.14)
- These findings provide clinical evidence correlating more proper blood glucose control with improved outcomes in patients with COVID-19.

Zhu et al. Cell Metab. 2020;31(6):1068-1077.e3.

Glycemic control and lifestyles in children with type 1 Diabetes

- **Aimed to investigated the impact of COVID-19 lockdown on glycemic control in children with type 1 diabetes**
- **Continuous glucose monitoring data during and after lockdown**
- **Demographics and lifestyle change-related information were collected**

Wu et al. J Diabetes Investig. 2021.

Table 3 | Questionnaire-derived lifestyle and medical data around lockdown in the study participants

Lifestyle changes compared with pre-lockdown (n = 34)	During lockdown			After lockdown			P-value[†]
	More	Same	Less	More	Same	Less	
Total physical activity[‡]	4 (11.8%)	15 (44.1%)	15 (44.1%)	4 (11.8%)	28 (82.4%)	2 (5.9%)	0.004
Food amount	6 (17.6%)	25 (73.5%)	3 (8.8%)	1 (2.9%)	31 (91.2%)	2 (5.9%)	0.142
Regularity of mealtimes	0	26 (76.5%)	8 (23.5%)	3 (8.8%)	31 (91.2%)	0	0.029
No. snacks	11 (32.4%)	22 (64.7%)	1 (2.9%)	3 (8.8%)	30 (88.2%)	1 (2.9%)	0.018
No. midnight snacks	3 (8.8%)	31 (91.2%)	0	0	34 (100.0%)	0	0.317
Sleep duration	14 (41.2%)	19 (55.9%)	1 (2.3%)	4 (11.8%)	27 (79.4%)	3 (8.8%)	0.024
Bedtime[§]	19 (55.9%)	13 (38.2%)	2 (5.9%)	5 (14.7%)	26 (76.5%)	3 (8.8%)	0.003
Waking time[§]	20 (58.8%)	13 (38.2%)	1 (2.9%)	3 (8.8%)	28 (82.4%)	3 (8.8%)	<0.001
Study time	5 (14.7%)	11 (32.4%)	18 (52.9%)	6 (17.6%)	26 (76.5%)	2 (5.9%)	<0.001
Stress	1 (2.9%)	33 (97.1%)	0	2 (5.9%)	32 (94.1%)	0	0.317
Anxiety	1 (2.9%)	33 (97.1%)	0	2 (5.9%)	32 (94.1%)	0	0.317
Self-perceived hypoglycemia	1 (2.9%)	9 (26.5%)	24 (70.6%)	5 (14.7%)	29 (85.3%)	0	<0.001
Time in glycemic management	23 (67.6%)	11 (32.4%)	0	0	34 (100.0%)	0	<0.001
Access to outpatient clinics	0	12 (35.3%)	22 (64.7%)	1 (2.9%)	22 (64.7%)	11 (32.4%)	0.002
Use of online medical service	10 (29.4%)	23 (67.6%)	1 (2.9%)	1 (2.9%)	30 (88.2%)	3 (8.8%)	0.011
Insulin purchase	2 (6.1%)	26 (78.8%)	5 (15.2%)	3 (9.1%)	29 (87.9%)	1 (3%)	0.172
	Yes	No		Yes	No		
Hyperglycemic coma	0	34 (100.0%)		0	34 (100.0%)		>1.000
Hypoglycemic coma	0	34 (100.0%)		0	34 (100.0%)		>1.000
Shortage of insulin	3 (8.8%)	31 (91.2%)		0	34 (100.0%)		0.002
Online shopping for insulin	5 (14.7%)	29 (85.3%)		5 (14.7%)	29 (85.3%)		1.000

Data are expressed as the number of participants (%). [†]McNemar's χ^2-test. [‡]Based on the frequency and duration of physical activity. [§]In bedtime and waking time, 'more' and 'less' referred to 'later' and 'earlier'.

During lockdown, individuals:

- reduced their physical activity
- received longer sleep duration
- spent more time on diabetes management.

Wu et al. J Diabetes Investig. 2021.

Table 2 | Continuous glucose monitoring metrics

	Before lockdown	During lockdown	After lockdown	*P*-value†
Time in range 3.9–7.8 mmol/L (%)	52.57 ± 14.42	52.18 ± 15.40	51.16 ± 15.29	0.614
Time in range 3.9–10.0 mmol/L (%)	74.28 ± 12.13	75.35 ± 12.66	73.60 ± 12.83	0.081
Mean glucose (mmol/L)	7.74 ± 1.19	7.85 ± 1.14	7.70 ± 1.20	0.368
Estimated HbA1c (%)	6.47 ± 0.75	6.54 ± 0.72	6.54 ± 0.72	0.368
Hyperglycemia				
Time >13.9 mmol/L (%)	2.95 (0.42, 5.91)	1.58 (0.69, 7.29)	1.80 (0.71, 3.86)	0.862
Time >10.0 mmol/L (%)	18.68 (12.05, 27.92)	15.39 (12.16, 27.67)	15.84 (11.78, 26.71)	0.404
High blood glucose index	41.54 (31.27, 54.69)	41.20 (33.49, 57.78)	40.74 (31.23, 52.61)	0.298
Hypoglycemia				
Time <3.9 mmol/L (%)	3.70 (2.25, 9.53)	2.91 (1.43, 5.95)	4.95 (2.11, 9.42)	0.004
Time <3.0 mmol/L (%)	0.59 (0.14, 2.21)	0.38 (0.05, 1.35)	0.82 (0.22, 1.69)	0.008
Low blood glucose index	1.15 (0.73, 2.60)	1.03 (0.58, 1.68)	1.40 (0.81, 2.36)	0.020
Hypoglycemic events (per week)	1.50 (0, 3.50)	0.50 (0, 2.00)	1.27 (0.50, 4.00)	0.020
Prolong hypoglycemia (per week)	0 (0, 0.50)	0 (0, 0)	0 (0, 0.50)	0.039
Glucose variability				
CV (%)	35.48 ± 7.17	34.06 ± 6.51	35.20 ± 6.38	0.242
SD (mmol/L)	2.77 ± 0.81	2.70 ± 0.75	2.72 ± 0.69	0.911
MAGE (mmol/L)	7.17 ± 2.04	7.01 ± 1.85	6.99 ± 1.76	0.975
MODD (mmol/L)	3.02 ± 1.00	2.89 ± 0.87	2.87 ± 0.99	0.086

- **Glycemic control did not deteriorate in children with type 1 diabetes around the COVID-19 pandemic.**

Wu et al. J Diabetes Investig. 2021.

Excess mortality in Wuhan city and other parts of China during the three months of the COVID-19 outbreak: findings from nationwide mortality registries

- Setting: 605 urban districts and rural counties in China' s nationally representative Disease Surveillance Point (DSP) system.
- The DSP system recorded 0.58 million deaths from January to March 2020
- Findings: Except in Wuhan, no increase in overall mortality was found during the three months of the covid-19 outbreak in other parts of China. The lower death rates from certain non-covid-19 related diseases might be attributable to the associated behaviour changes during lockdown.
- The findings highlight the need for rapid and coordinated actions during major outbreaks of infectious diseases to contain, suppress, and eradicate transmission and minimise the impact on human health and societal and economic activities.

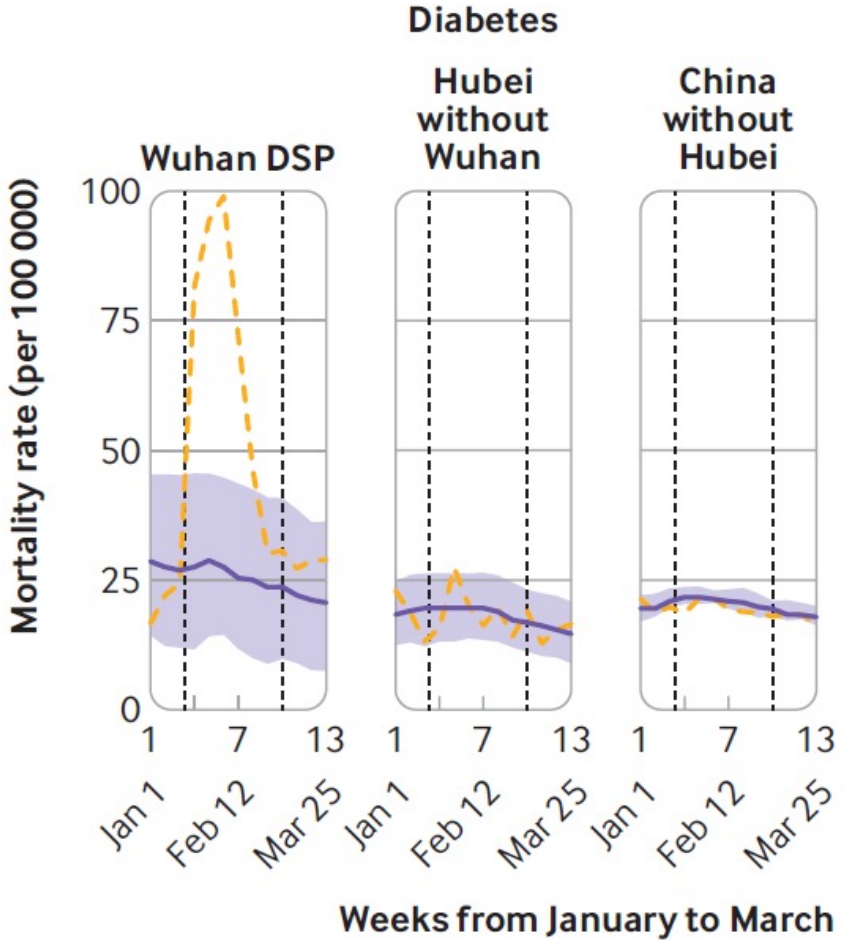


Fig. Trends in weekly observed (dashed orange lines) versus predicted (blue solid lines) mortality rates for selected major diseases between 1 January and 31 March 2020 in China across different DSP areas.

Liu et al. BMJ. 2021;372:n415

Table 1 | Observed and predicted 2020 mortality rates from selected major diseases across different Disease Surveillance Point (DSP) areas

	Wuhan			Hubei without Wuhan			China without Hubei		
Causes of death	Observed per 100 000	Predicted per 100 000*	Rate ratio (95% CI)	Observed per 100 000	Predicted per 100 000*	Rate ratio (95% CI)	Observed per 100 000	Predicted per 100 000*	Rate ratio (95% CI)
All causes	1147.2	734.7	1.56 (1.33 to 1.87)	867.3	871.2	1.00 (0.86 to 1.16)	675.4	715.4	0.94 (0.86 to 1.04)
Infectious diseases†	290.1	47.8	6.07 (4.02 to 10.98)	27.6	31.3	0.88 (0.68 to 1.22)	20.3	29.0	0.70 (0.61 to 0.81)
Pneumonia:	275.2	33.1	8.32 (5.19 to 17.02)	11.4	15.8	0.72 (0.50 to 1.16)	9.5	17.8	0.53 (0.46 to 0.63)
Unspecified viral	34.6	0.6	56.39 (9.95 to ∞)‡	1.8	0.5	3.34 (0.96 to ∞)‡	0.4	0.9	0.43 (0.32 to 0.62)
Other	48.0	32.5	1.48 (0.92 to 3.10)	5.0	15.3	0.33 (0.23 to 0.53)	9.0	16.9	0.53 (0.46 to 0.63)
Covid-19	192.6	0.0	–	4.6	0.0	–	0.0	0.0	–
Other	14.9	16.1	0.92 (0.51 to 2.85)	16.2	15.3	1.06 (0.77 to 1.63)	10.8	11.3	0.95 (0.84 to 1.08)
Non-communicable diseases	757.6	625.5	1.21 (1.03 to 1.46)	744.1	760.1	0.98 (0.85 to 1.14)	606.7	635.7	0.95 (0.87 to 1.05)
Cancer	186.4	182.7	1.02 (0.81 to 1.33)	179.1	166.3	1.08 (0.94 to 1.25)	153.9	155.1	0.99 (0.93 to 1.06)
Cardiovascular disease:	408.1	316.0	1.29 (1.05 to 1.65)	416.1	424.8	0.98 (0.83 to 1.18)	334.0	349.8	0.95 (0.86 to 1.07)
Myocardial infarction	139.9	114.0	1.23 (0.93 to 1.73)	150.4	157.6	0.95 (0.78 to 1.20)	135.9	145.9	0.93 (0.84 to 1.04)
Ischaemic stroke	96.9	77.3	1.24 (0.83 to 2.19)	70.0	64.0	1.03 (0.84 to 1.30)	82.2	85.2	0.96 (0.86 to 1.07)
Haemorrhagic stroke	56.6	45.7	1.25 (0.91 to 1.91)	90.8	88.5	1.09 (0.88 to 1.42)	58.5	61.0	0.96 (0.87 to 1.08)
Hypertensive heart disease	59.9	29.9	2.00 (1.24 to 4.25)	48.3	58.7	0.82 (0.63 to 1.13)	24.4	25.6	0.95 (0.84 to 1.10)
Chronic respiratory disease:	55.6	51.8	1.07 (0.72 to 1.87)	73.4	94.9	0.77 (0.60 to 1.04)	55.2	67.2	0.82 (0.71 to 0.96)
Chronic obstructive pulmonary disease	45.5	40.5	1.13 (0.73 to 2.15)	64.9	86.8	0.75 (0.58 to 1.01)	50.2	61.6	0.82 (0.71 to 0.95)
Diabetes	45.6	24.9	1.83 (1.08 to 4.37)	17.5	17.7	0.99 (0.72 to 1.49)	18.5	19.6	0.94 (0.84 to 1.07)
Chronic kidney disease	7.2	4.8	1.51 (0.60 to ∞)‡	8.5	7.8	1.10 (0.70 to 2.16)	4.3	4.8	0.89 (0.76 to 1.07)
Other	54.6	49.3	1.11 (0.77 to 1.84)	49.5	48.6	1.02 (0.84 to 1.28)	40.8	39.1	1.04 (0.95 to 1.15)
Injury	53.7	46.2	1.16 (0.77 to 2.03)	83.6	74.8	1.12 (0.88 to 1.47)	37.7	40.9	0.92 (0.84 to 1.02)
Road traffic incident	4.6	7.2	0.63 (0.28 to ∞)‡	9.4	15.0	0.63 (0.44 to 0.99)	8.7	11.3	0.77 (0.68 to 0.88)
Suicide	11.7	7.0	1.66 (0.74 to ∞)†	32.2	19.9	1.62 (1.15 to 2.53)	5.3	4.9	1.09 (0.93 to 1.30)
Fall	24.5	17.1	1.43 (0.81 to 3.92)	22.0	19.0	1.16 (0.83 to 1.77)	12.4	12.8	0.97 (0.87 to 1.09)
Other	13.0	15.1	0.86 (0.45 to 2.87)	20.0	20.8	0.96 (0.64 to 1.64)	11.3	12.3	0.92 (0.77 to 1.11)
All other diseases	45.8	23.8	1.92 (1.17 to 4.32)	11.9	9.0	1.33 (0.86 to 2.48)	10.8	10.9	0.99 (0.86 to 1.15)

*Sum of rates from different diseases might not add up to the category sum or overall total owing to rounding in the models.
†Includes a small number of deaths from maternal, perinatal, and nutritional diseases.
‡For certain less common diseases, the upper limits of the rate ratio become infinitely large because they involved zero predicted cases in certain circumstances.

Liu et al. BMJ. 2021;372:n415

Impact of the COVID-19 lockdown on diabetes patients in other countries

- Among diabetes patients in Brazil (including type 1, type 2, GDM, etc.), compliance with medication use significantly reduced after the lockdown.
- These patients also showed fewer healthy lifestyle habits after the lockdown.
- Among patients with type 2 diabetes, the psychological effect of lockdown was significantly more in women than men.

Table 2 – COVID-19 impact on selected habits and behaviors (*n* = 1701).

Blood Glucose (BG) Impact	n	%	Physical Activity	n	%
People monitoring BG	1557	91,53%	High increase	39	2,29%
Deteriorated BG	925	59,41%	Low increase	79	4,64%
Higher BG	312	20,04%	No change	571	33,57%
Lower BG	128	8,22%	Low reduction	250	14,70%
Greater variation	485	31,15%	High reduction	762	44,80%
No changes	632	40,59%			
No BG measuring	144	8,47%	**TV Time**	**n**	**%**
Number of Meals	**n**	**%**	High increase	499	29,34%
High increase	88	5,17%	Low increase	332	19,52%
Low increase	292	17,17%	No change	656	38,57%
No change	1009	59,32%	Low reduction	141	8,29%
Low reduction	256	15,05%	High reduction	73	4,29%
High reduction	56	3,29%			
			Internet Time	**n**	**%**
Food Intake	**n**	**%**	High increase	616	36,21%
High increase	110	6,47%	Low increase	294	17,28%
Low increase	397	23,34%	No change	632	37,15%
No change	815	47,91%	Low reduction	124	7,29%
Low reduction	319	18,75%	High reduction	35	2,06%
High reduction	60	3,53%			

Barone et al. Diabetes Research and Clinical Practice. 2020.

Impact of the COVID-19 lockdown on diabetes patients in other countries

- Overall Glycemic control got deranged among diabetic patients in India during the lockdown period.
- Lifestyle changes and psychological stress identified as possible factors responsible for derangement of glycemic control.
- The duration of lockdown is directly proportional to the worsening of glycemic control and diabetes-related complications.
- Multidisciplinary approach is required which is patient centric for achieving good glycemic control.

Khare et al. Prim Care Diabetes. 2021.
Khare et al. Diabetes Metab Syndr.2020.

Future research

- **Long term effect of COVID-19 on diabetes**
- **COVID-19–related new-onset diabetes**
  - Epidemiology
  - How it develops
  - The natural history

Gain clues regarding appropriate care for patients with diabetes during and after the course of COVID-19

N Engl J Med. 2020;383(8):789-790.

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Thanks !