The Exercise Prescription in Primary Care

How To Maximize the Medicine of Movement for Our Patients and Ourselves

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Hospital for Special Surgery

- I have no conflicts of interest to disclose

Where Do We Treat Disease?

The Cost of Chronic Disease

Hajat C et al, Front Public Health 2021. https://doi.org/10.3389/fpubh.2020.607528

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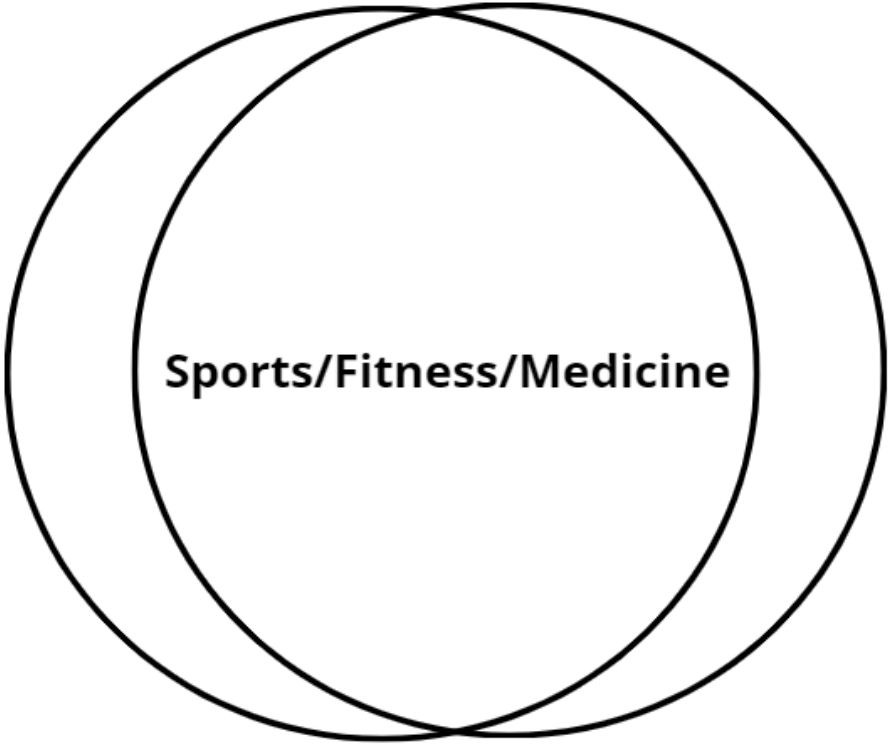
CDC and Chronic Disease Messaging

A Progression of Thought



Move Better. Feel Better.

Hospital of the New York Society for the Relief of the Ruptured and Crippled

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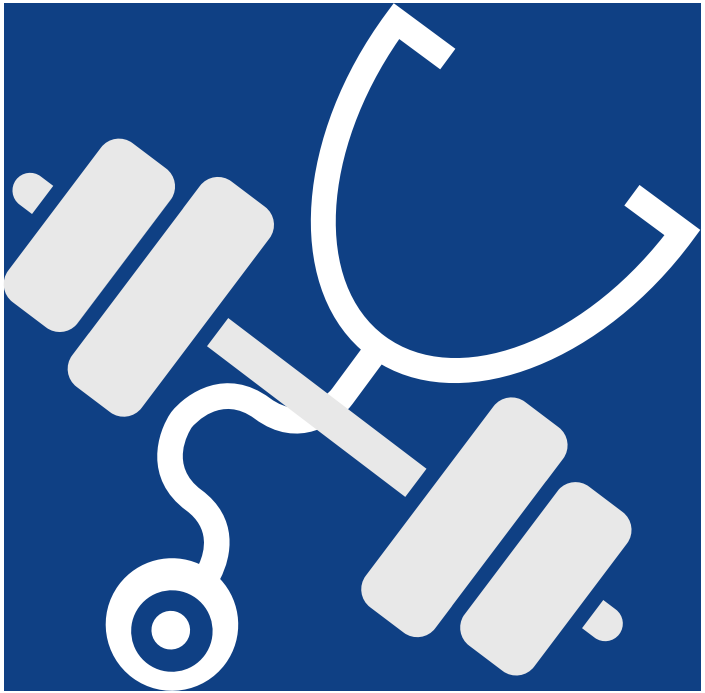

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EXERCISE PRESCRIPTION & REFERRAL FORM

Your Prescription for Health
Exercise is Medicine™
www.ExerciseIsMedicine.org

PATIENT'S NAME: _____ DOB: _____ DATE: _____

HEALTH CARE PROVIDER'S NAME: _____ SIGNATURE: _____

PHYSICAL ACTIVITY RECOMMENDATIONS

Type of physical activity:	Aerobic	Strength
Number of days per week:		
Minutes per day:		
Total minutes per week*:		

***PHYSICAL ACTIVITY GUIDELINES**

Adults aged 18-64 with no chronic conditions: Minimum of 150 minutes of moderate physical activity a week (for example, 30 minutes per day, five days a week) ***and*** muscle-strengthening activities on two or more days a week (2008 Physical Activity Guidelines for Americans).
For more information, visit www.acsm.org/physicalactivity.

REFERRAL TO HEALTH & FITNESS PROFESSIONAL

Name: _____

Phone: _____

Address: _____

_____

Web Site: _____

Follow-up Appointment Date: _____

Notes: _____

_____

_____

_____

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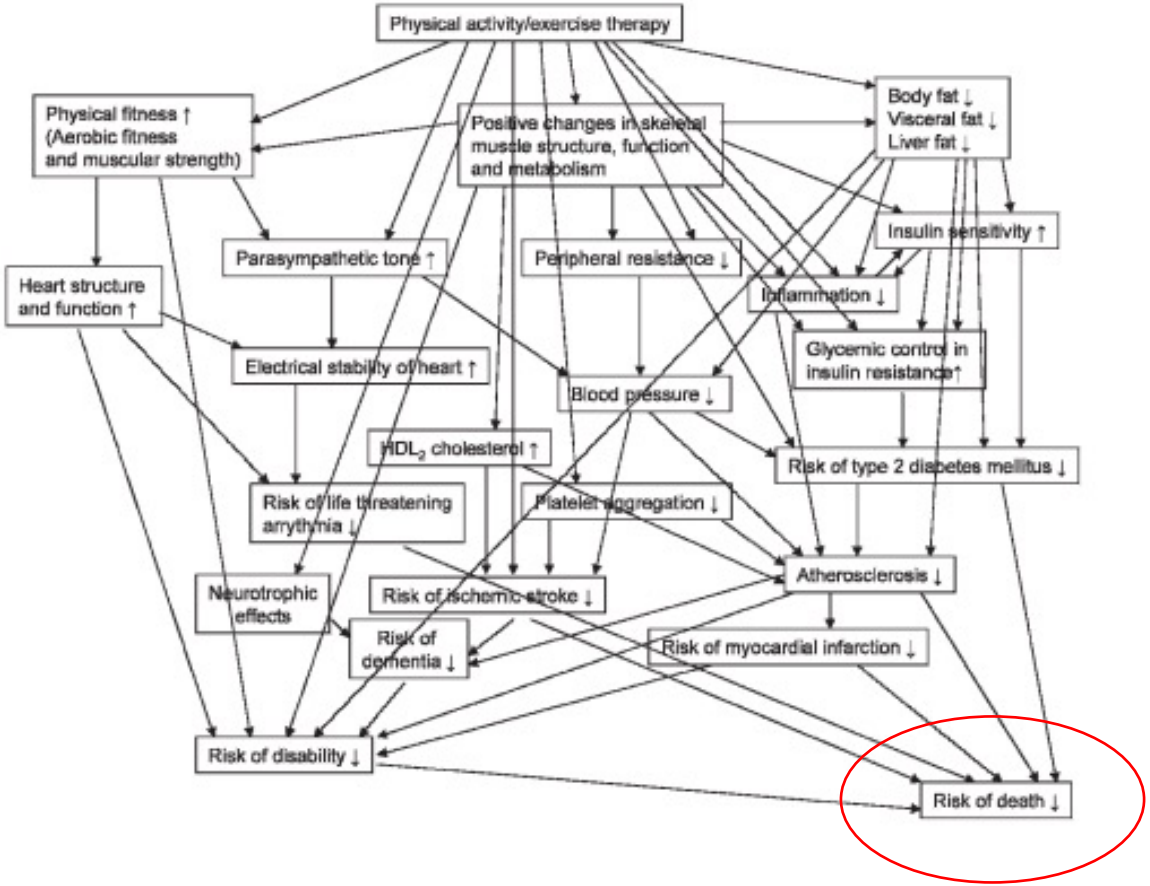
Physical activity/exercise therapy
Physical fitness ↑ (Aerobic fitness and muscular strength)
Positive changes in skeletal muscle structure, function and metabolism
Body fat ↓ Visceral fat ↓ Liver fat ↓
Insulin sensitivity ↑
Parasympathetic tone ↑
Peripheral resistance ↓
Heart structure and function ↑
Inflammation ↓
Glycemic control in insulin resistance↑
Electrical stability of heart ↑
Blood pressure ↓
HDL2 cholesterol ↑
Risk of type 2 diabetes mellitus ↓
Risk of life threatening arrythmia ↓
Platelet aggregation ↓
Atherosclerosis ↓
Neurotrophic effects
Risk of ischemic stroke ↓
Risk of dementia ↓
Risk of myocardial infarction ↓
Risk of disability ↓
Risk of death ↓

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Today's Lecture

- Overview
- A Glance at the Evolution of Fitness
- Lifespan vs. Healthspan
- The Medicine of Exercise
- The Exercise Prescription
- Thoughts on Exercise Intensity
  Conclusions/Recommendations

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We've Been Talking About Exercise for A Long Time.....

2020 A.D.

2020 B.C.

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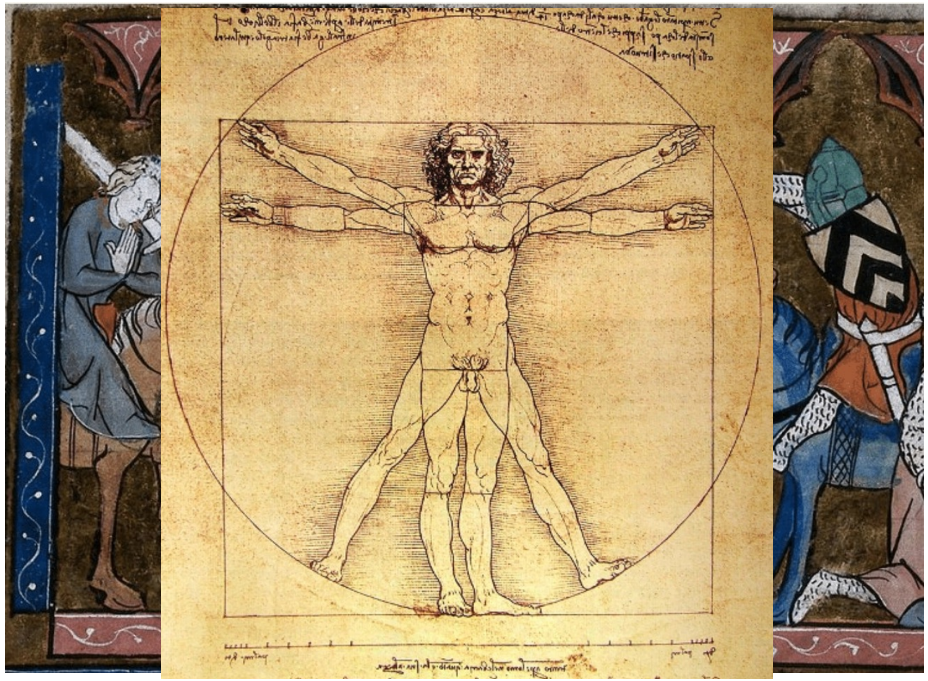
An Evolving Concept of Movement



The Dark Ages: 5th-15th Century

The Renaissance: 16th-18th Century

Heading Towards a Modern Fitness Concept

Source: USA 1880

The 1970's Fitness Boom

Today's Fitness World

Global Wellness Initiative, 2022

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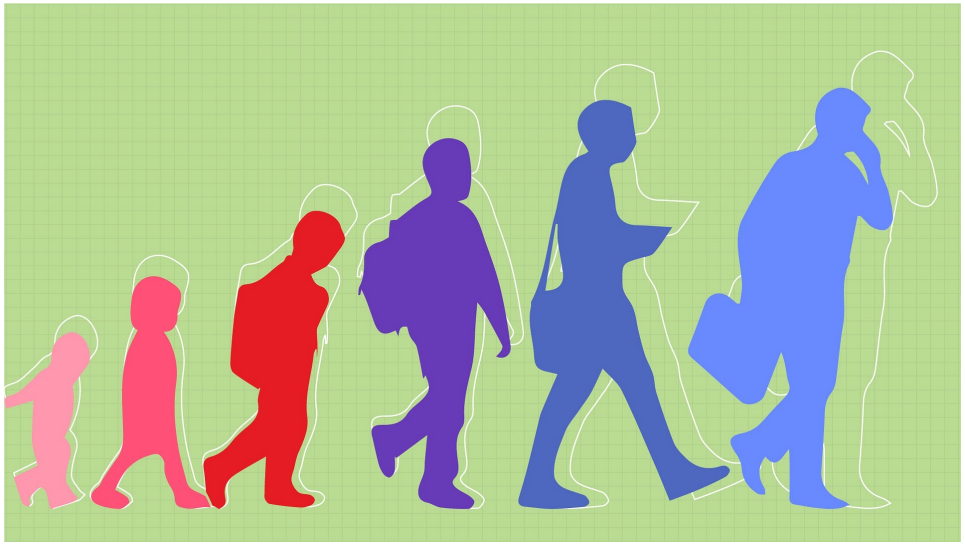
To Consider

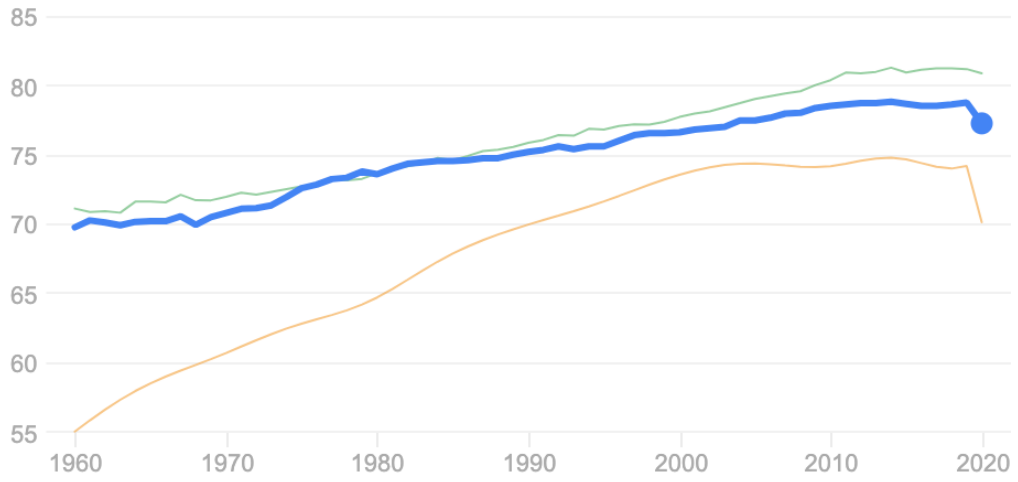
LIFESPAN



HEALTHSPAN

Lifespan Changes

77.28 years (2020)



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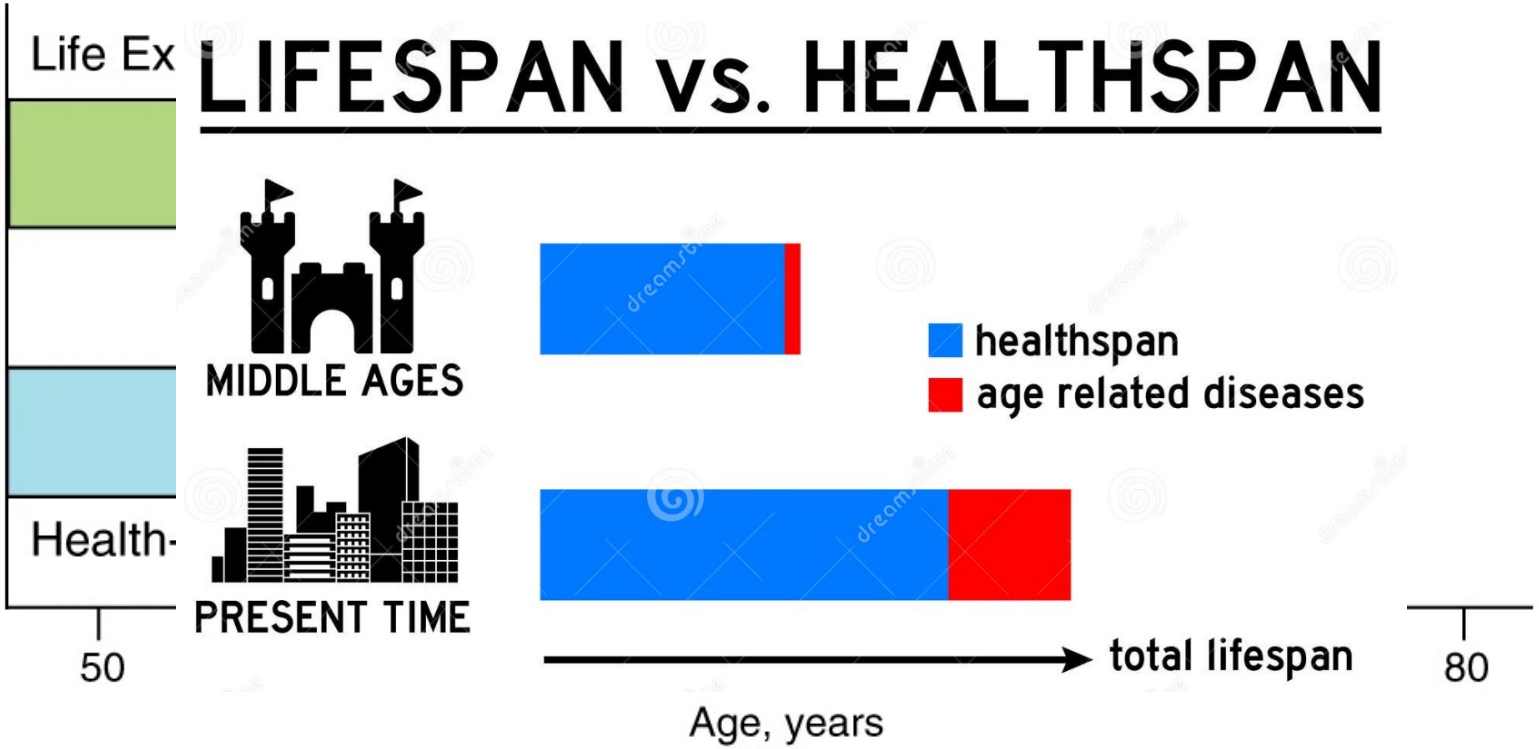
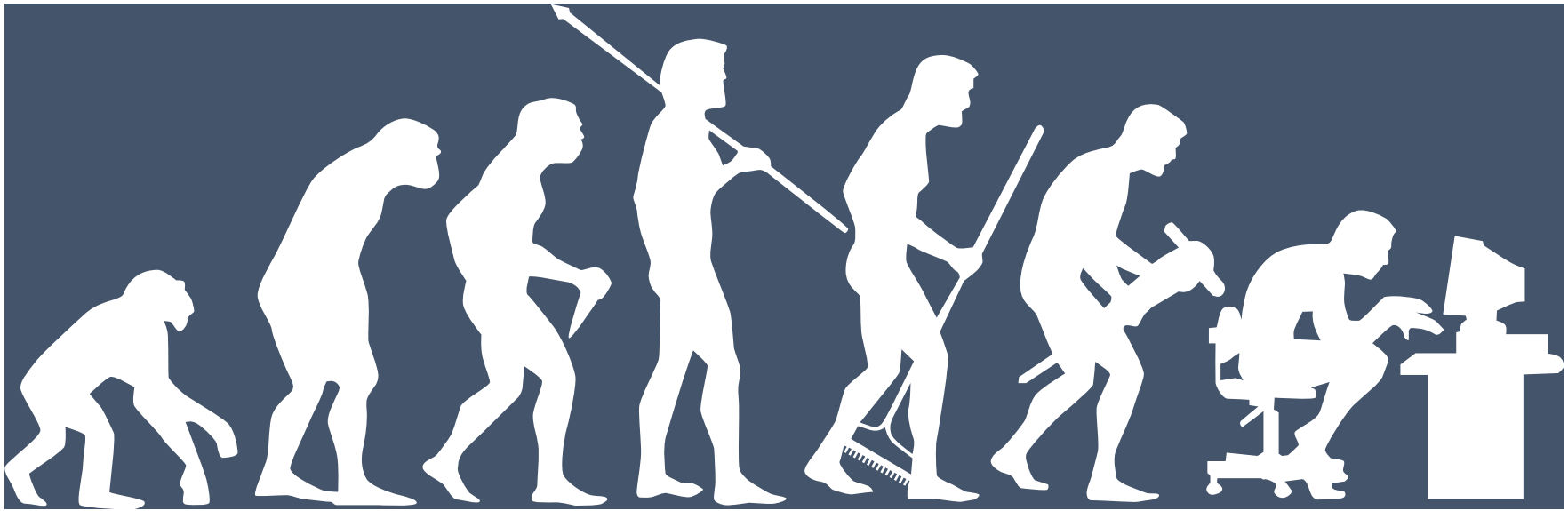
Lifespan vs Healthspan



Nature. 2021 https://doi.org/10.1038/s41536-021-00169-5



Historical Step Counts

GROUP	STEPS / DAY
Paleolithic Stone Agers[1]	24,000
Amish[2]	18,000 (men) 14,00 (women)
Colorado[2]	6,733 (men) 6,384 (women)
Contemporary[4]	Mean = 5,000

Cordain. IntJ Sports Med 19:328

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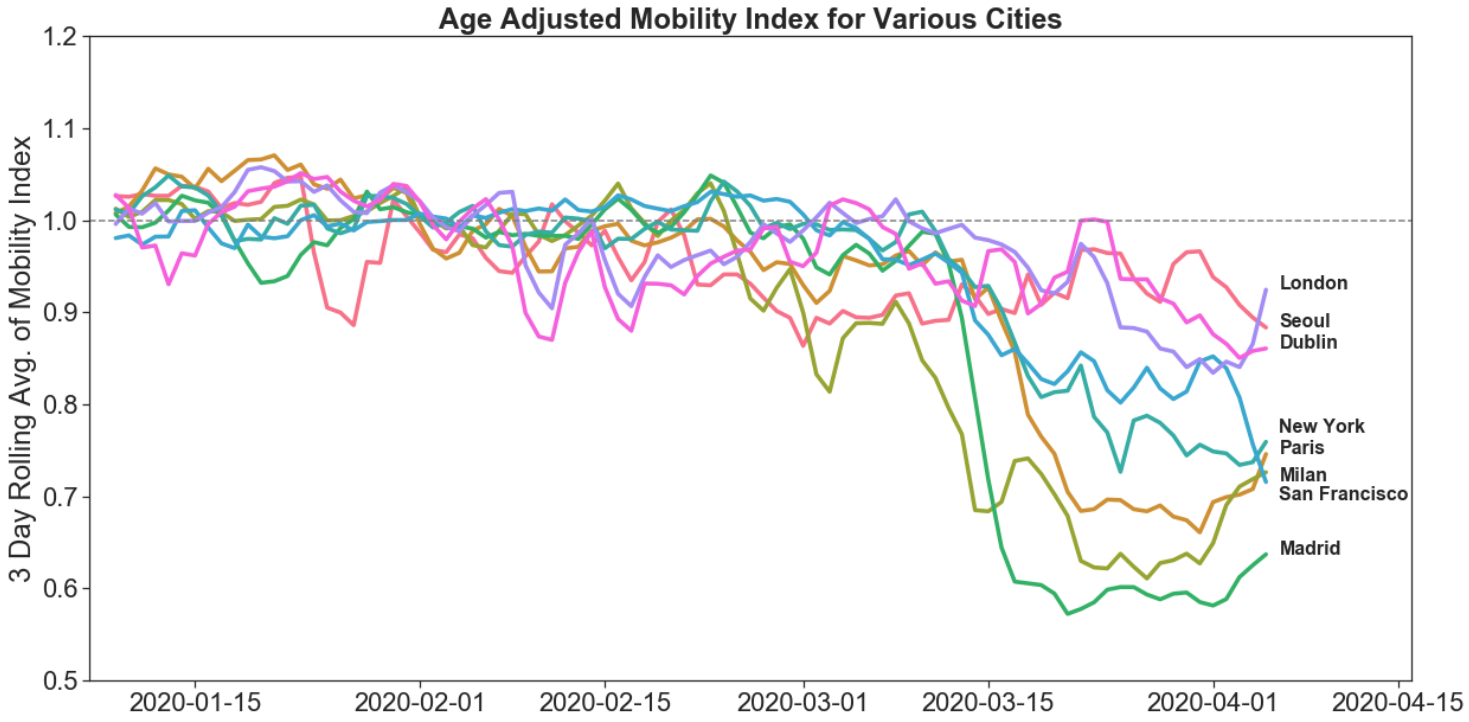

Fitbit 2020

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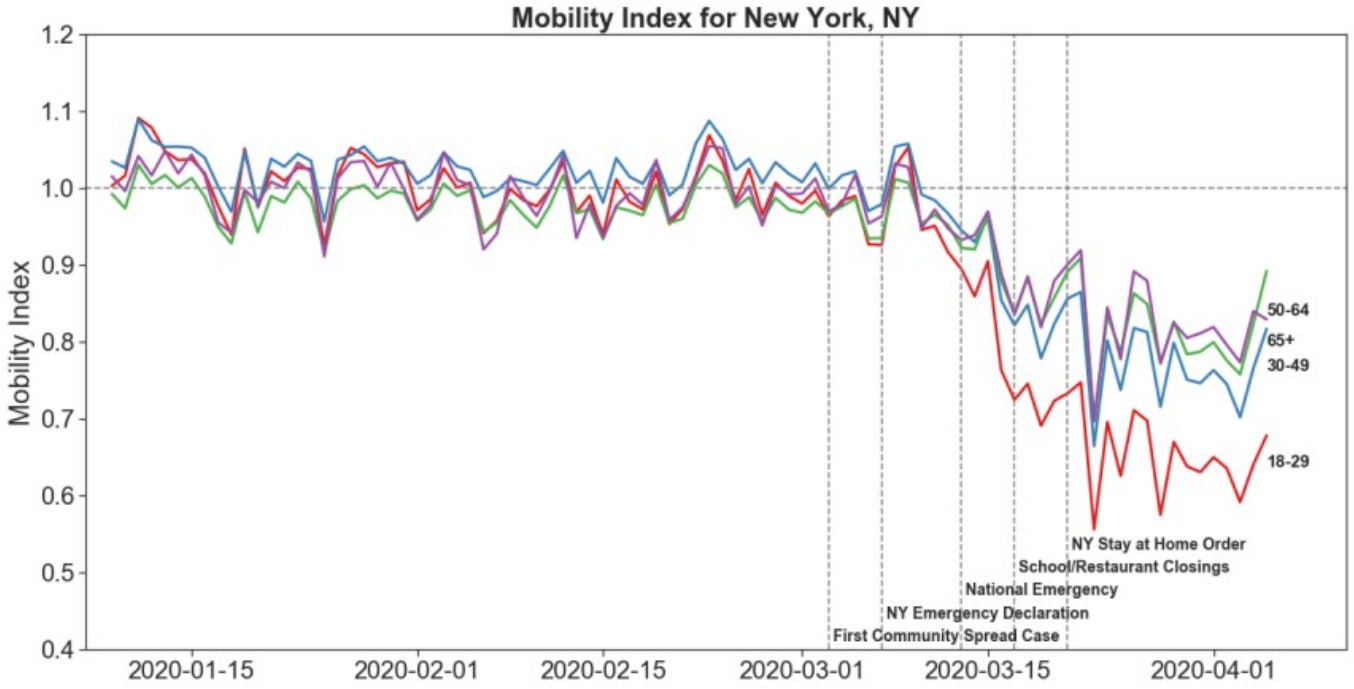

Fitbit 2020

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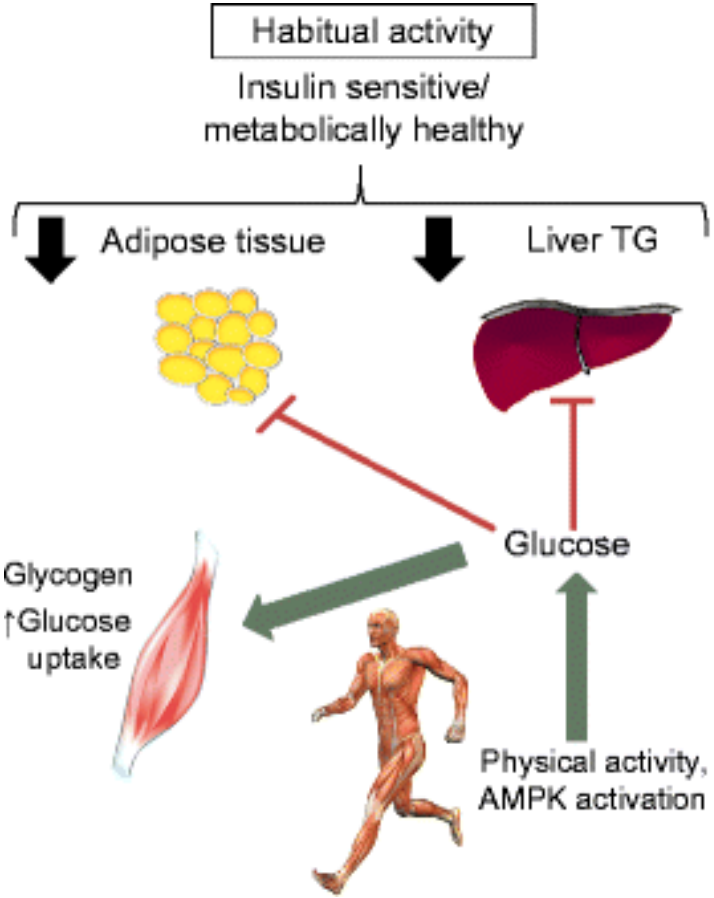
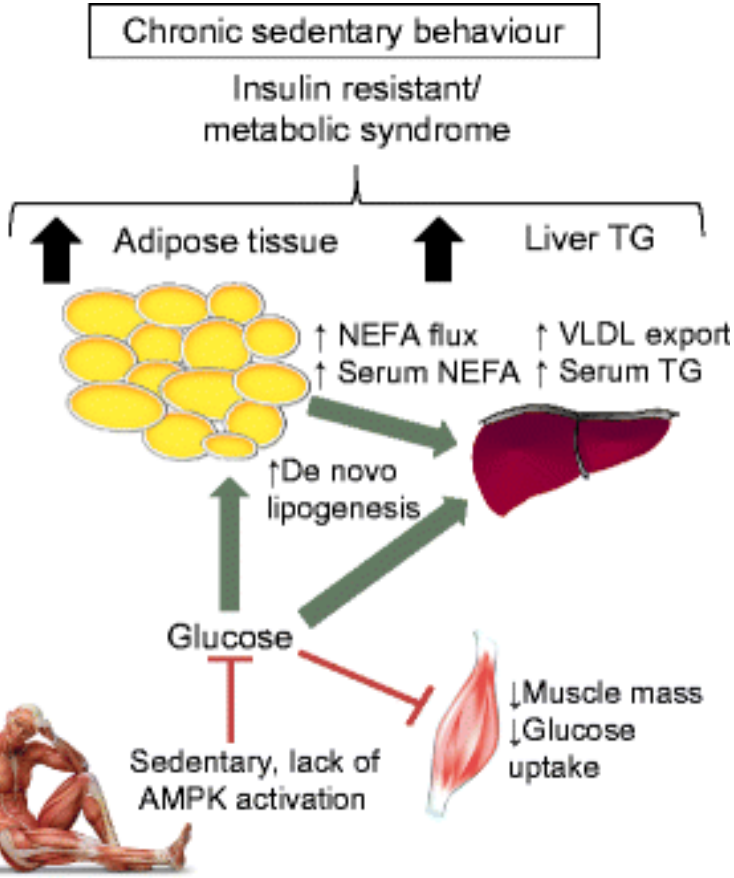
Changes During COVID

The New York Times

Working From Home Is Less Healthy Than You Think

March 14, 2023





Davies K et al. *Diabetologia* 2018

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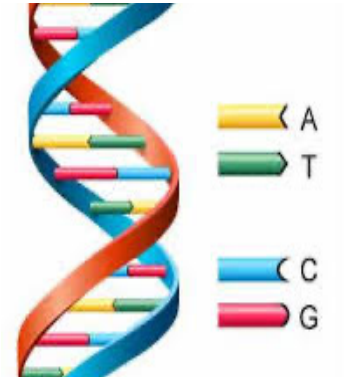
What Determines Health?



20%

20%

60%

Adapted from McGinnis et al, 2002, Health Affairs

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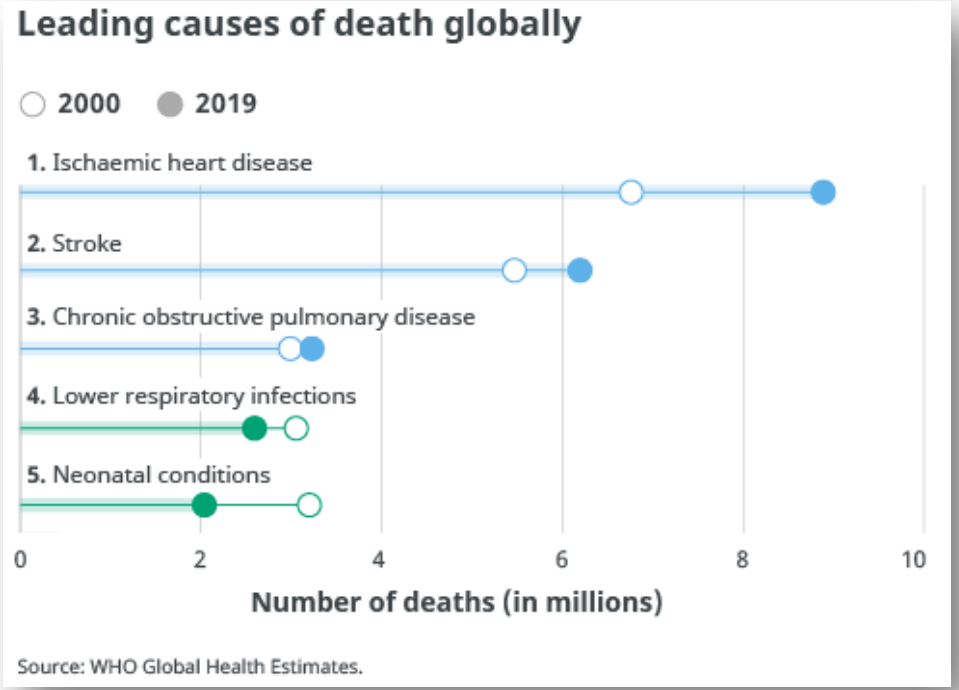
Leading Causes of Death



WHO, 2019

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British Train Conductor Study: Coronary heart-disease and physical activity of work

- Morris et al, *Lancet*, 265(6795):1053-7, 1953
- 1950's study of London Transport and Post Office Employees
- Physically active men (bus conductors and postmen) had lower mortality rates from heart disease than less active workers (bus drivers and switchboard operators)

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Exercise as medicine – evidence for prescribing exercise as therapy in 26 different chronic diseases

- Neurologic
- Metabolic
- Cardiovascular
- Pulmonary
- Musculoskeletal
- Cancer

Pedersen, B, Exercise as medicine – evidence for prescribing exercise as therapy in 26 different chronic diseases. Scand J Med Sci Sports, 25: 1-72. https://doi.org/10.1111/sms.12581, 2015

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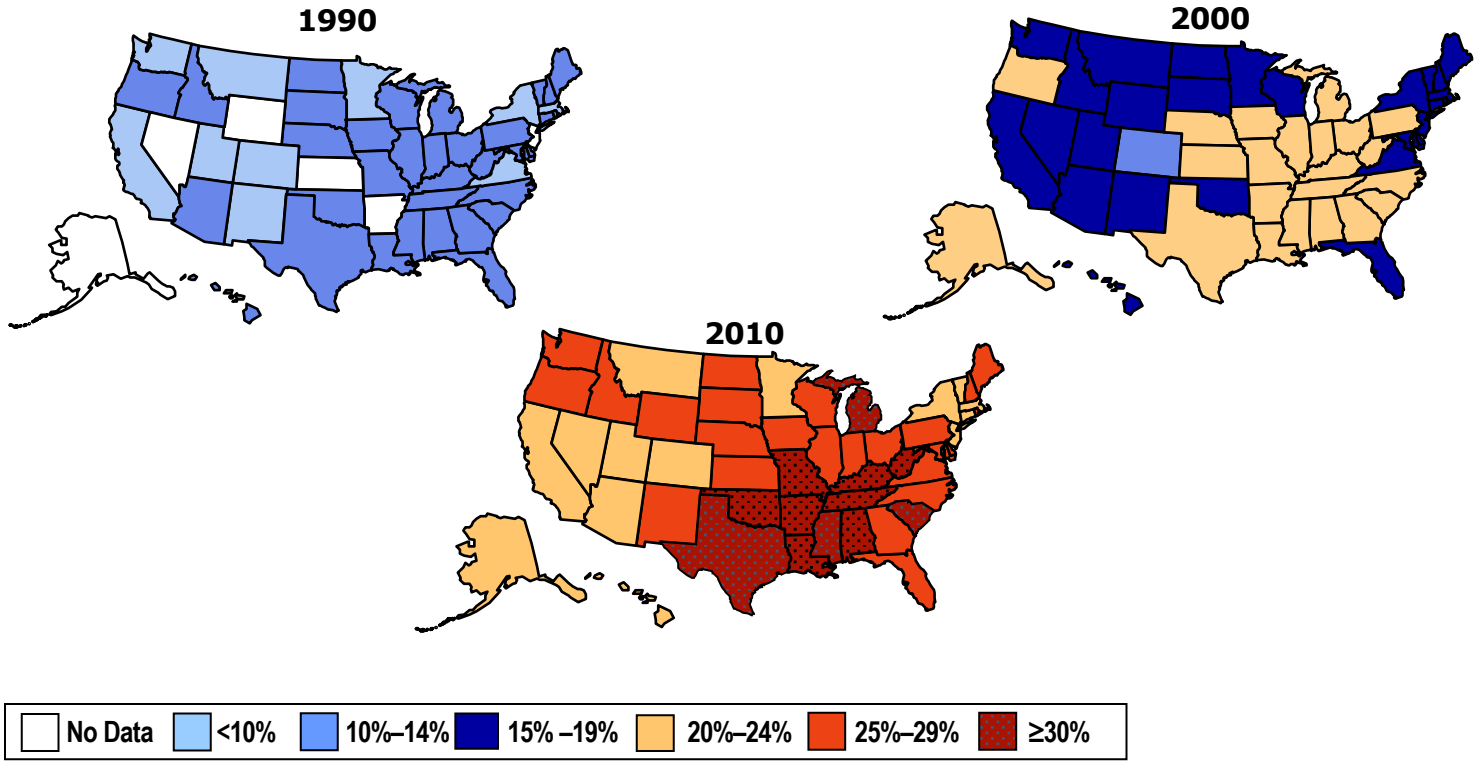
Obesity Trends* Among U.S. Adults

BRFSS, 1990, 2000, 2010

(*BMI ≥30, or about 30 lbs. overweight for 5'4" person)



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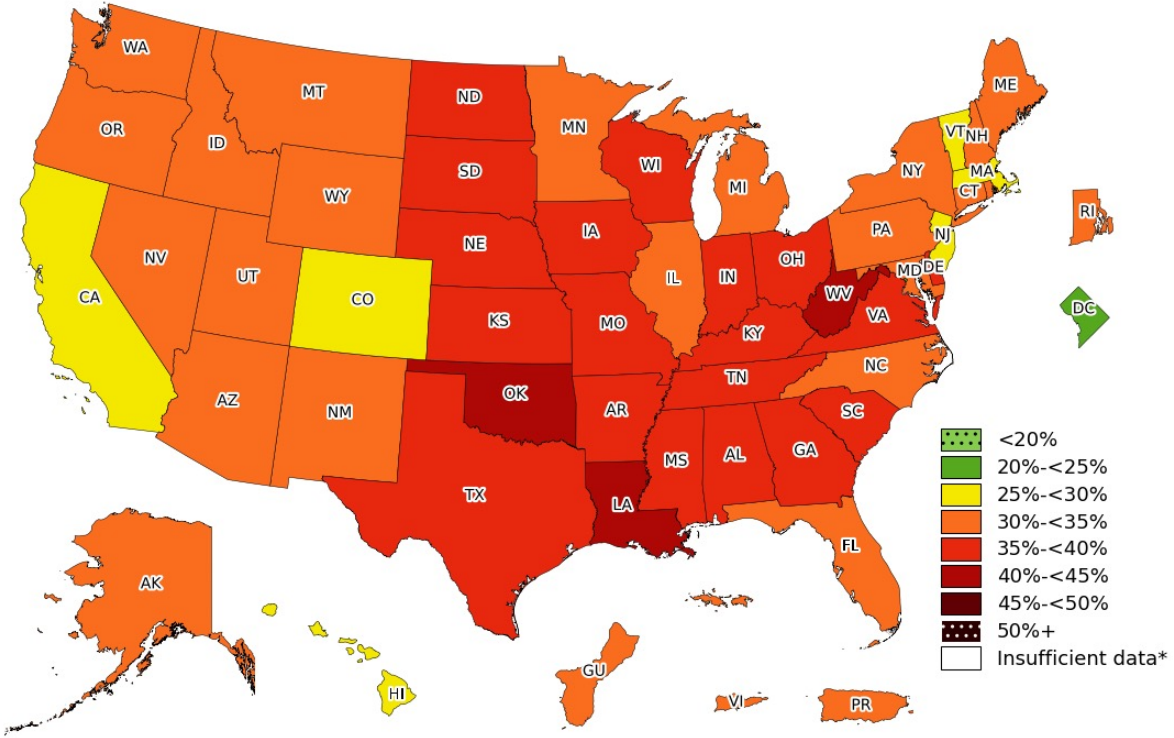
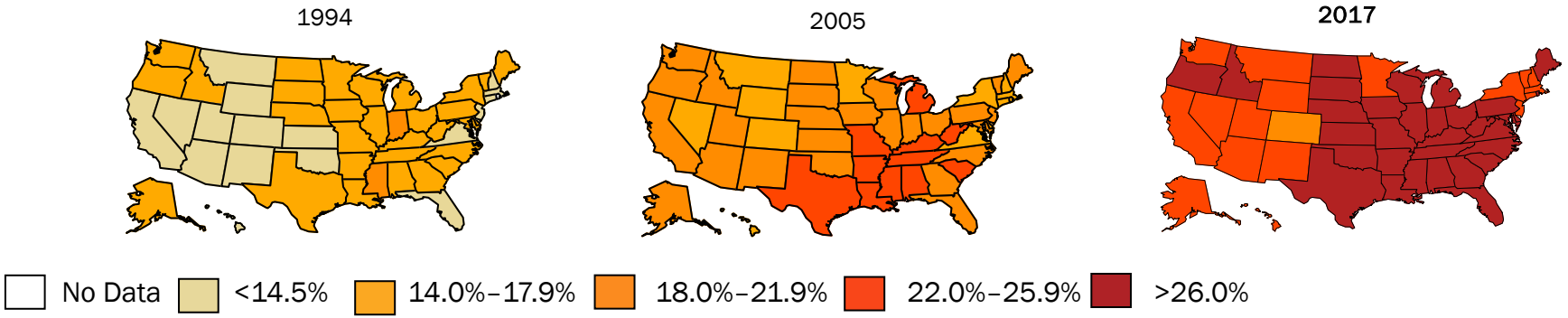
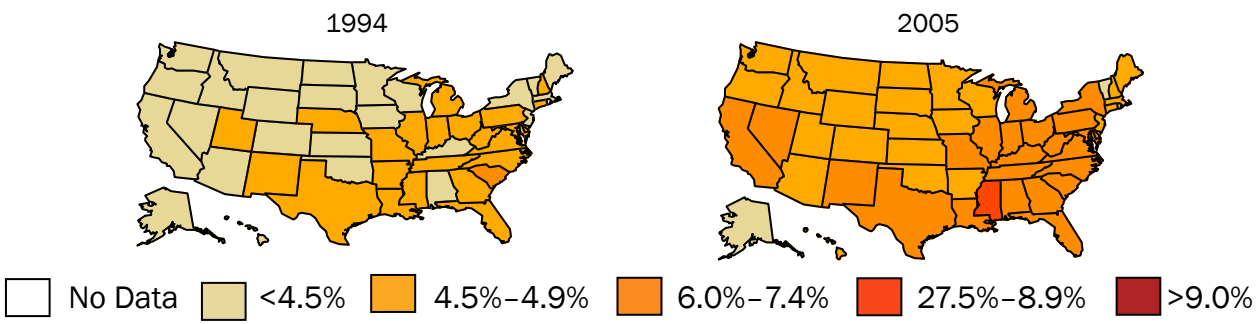
Prevalence¶ of Obesity Based on Self-Reported Weight and Height Among US Adults by State and Territory, BRFSS, 2022

¶ Pr
con



Progression of Obesity and Diabetes





CDC's Division of Diabetes Translation. National Diabetes Surveillance System

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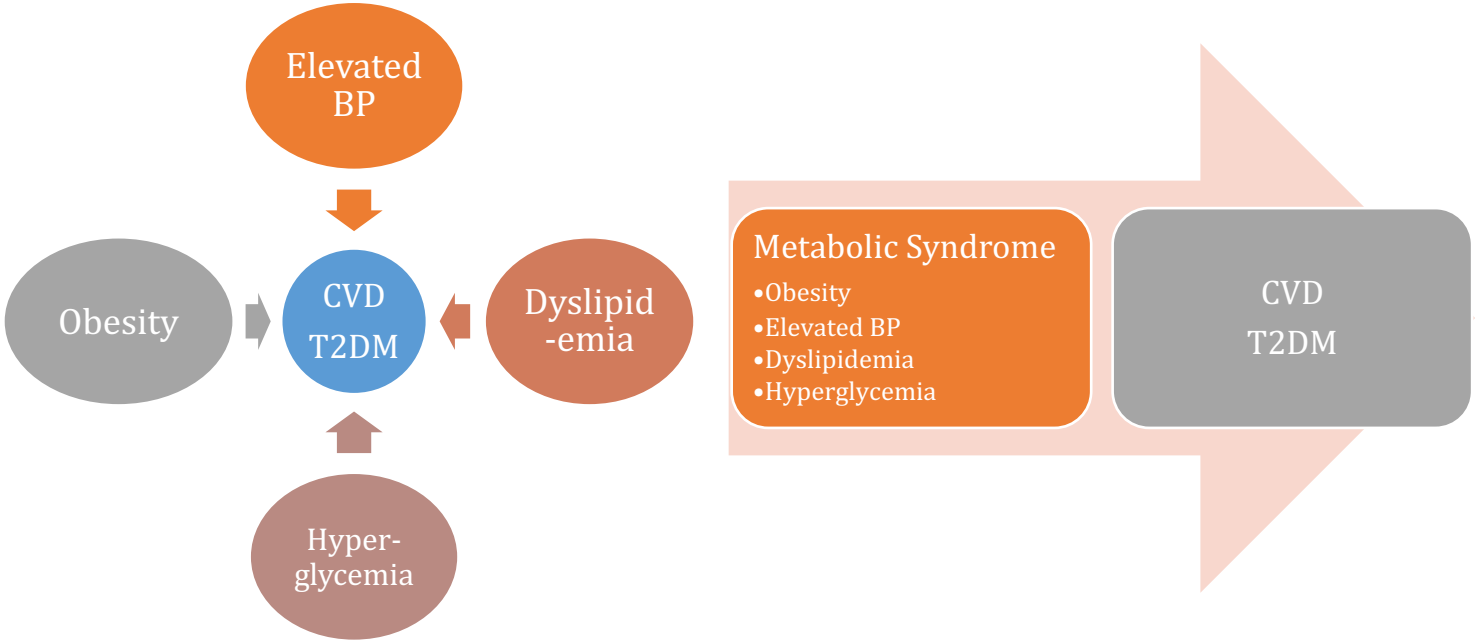
Metabolic Syndrome



Metabolic Syndrome – Definition

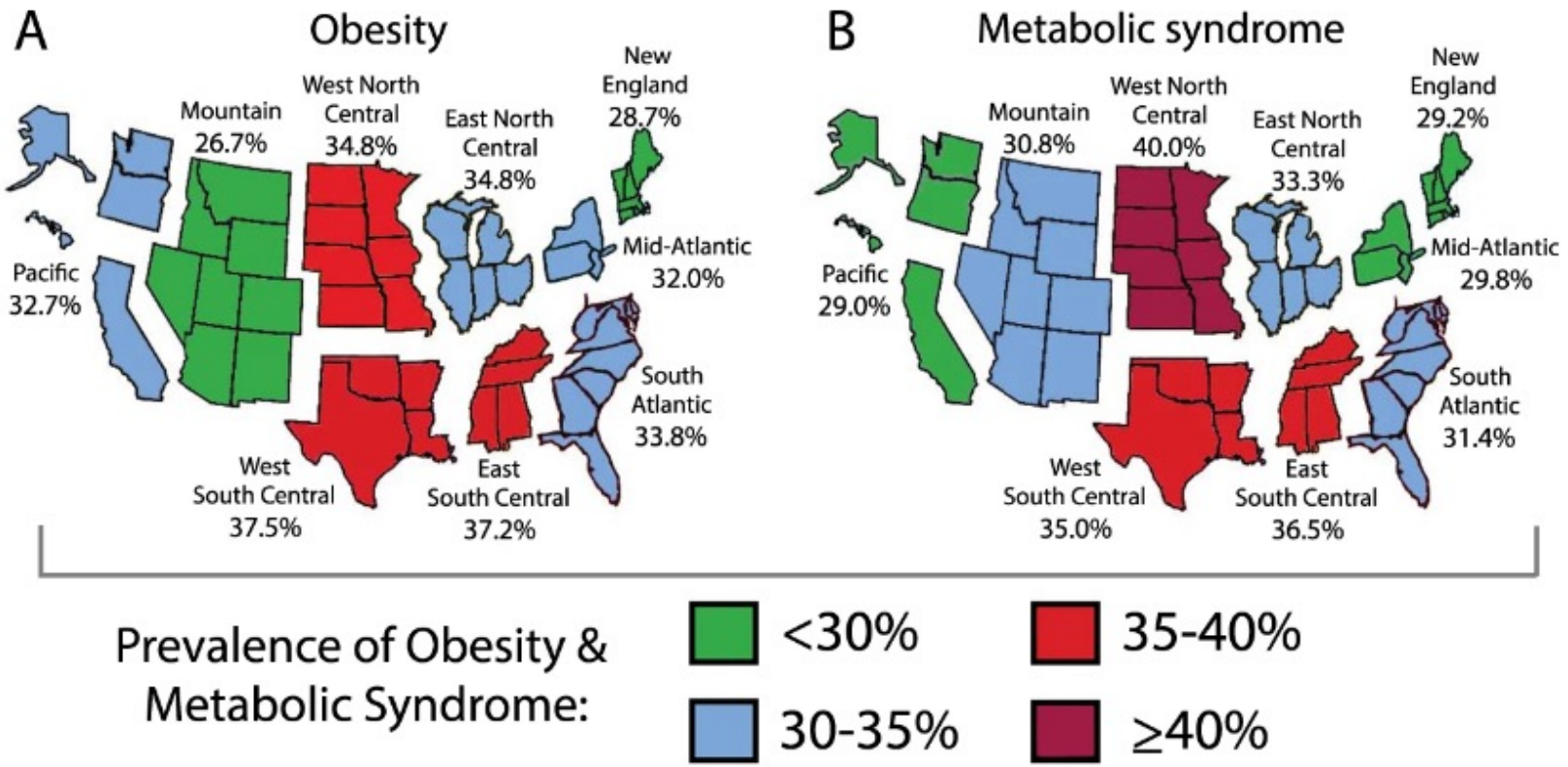
- International Diabetes Federation (IDF) Task Force on Epidemiology and Prevention and the American Heart Association/National Heart, Lung, and Blood Institute (AHA/NHLBI)

Measure	Cut Point
Elevated **waist circumference**	Population- and country-specific definitions
Elevated **triglycerides** (drug treatment for elevated triglycerides is an alternate indicator)	≥150 mg/dL
Reduced **HDL-C** (drug treatment for reduced HDL-C is an alternate indicator)	<40 mg/dL in males <50 mg/dL in females
Elevated **blood pressure** (antihypertensive drug treatment in a patient with a history of hypertension is an alternate indicator)	Systolic ≥130 and/or diastolic ≥85 mm Hg
Elevated **fasting glucose** (drug treatment of elevated glucose is an alternate indicator)	≥100 mg/dL

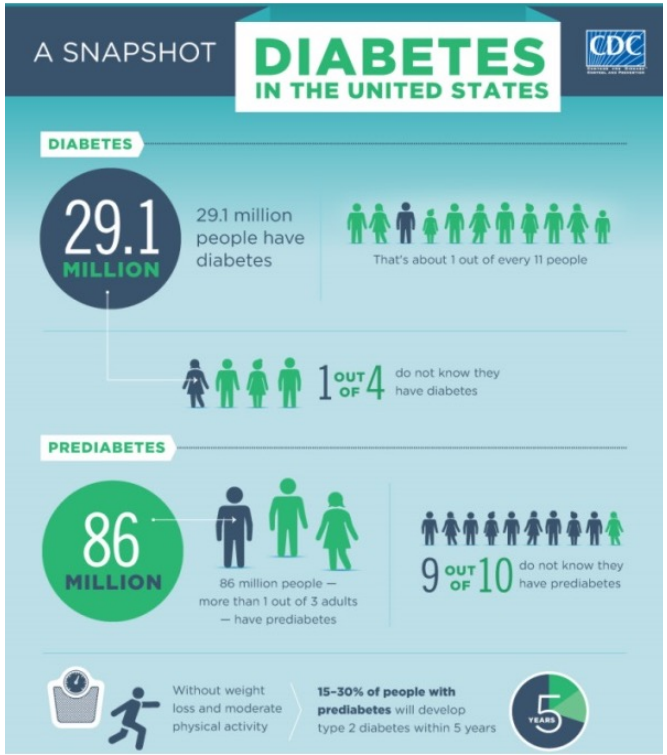
Metabolic Syndrome – Epidemiology

Age	Male	Female
Overall	35.10%	32.60%
≥ 60 years	51.50%	54.40%
40-59 years	40.80%	37.20%
20-39 years	20.30%	15.60%

CDC, 2020


A
Obesity
Mountain
26.7%
West North
Central
34.8%
East North
Central
34.8%
New
England
28.7%
Mid-Atlantic
32.0%
Pacific
32.7%
South
Atlantic
33.8%
West
South Central
37.5%
East
South Central
37.2%
B
Metabolic syndrome
Mountain
30.8%
West North
Central
40.0%
East North
Central
33.3%
New
England
29.2%
Mid-Atlantic
29.8%
Pacific
29.0%
South
Atlantic
31.4%
West
South Central
35.0%
East
South Central
36.5%
Prevalence of Obesity &
Metabolic Syndrome:
<30%
35-40%
30-35%
≥40%

Diabetes by Numbers



HOW TO DIAGNOSE **PREDIABETES**

Test	Prediabetes
Fasting plasma glucose (Identifies impaired fasting glucose)	100 to 125 mg/dL
Two-hour oral glucose tolerance test (Identifies impaired glucose tolerance)	140 to 199 mg/dL
HbA1c (Identifies average blood glucose levels over the previous two to three months)	5.7% to 6.4%

SOURCE: AMERICAN DIABETES ASSOCIATION

CDC, 2021

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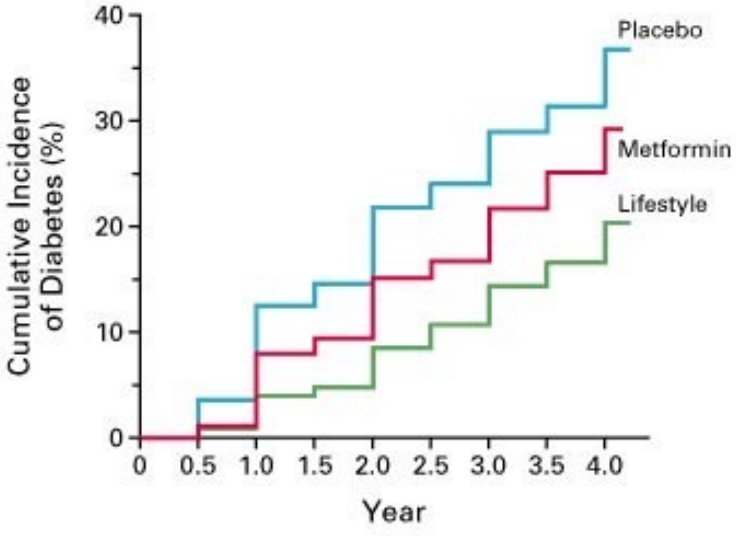
Exercise and Metabolic Syndrome

Observational Studies			
Author, Year; (Reference)	***N* (Men/Women), Mean Age**	**Assessment**	**Key Results**
Thune, 1998; [25]	5220/5869 34.4 and 33.7 years, respectively	PA self-report	Higher PA associated with better lipid profile, overall metabolic risk profile over 7 years
Laaksonen, 2002; [26]	612 men 51.4 years	Assessment of LTPA over previous 12 months among high risk men; followed for 4 years	>3 h/week moderate to vigorous LTPA half as likely as sedentary men to have MetSyn Men in top 33% VO_2max 75% less likely than unfit men to develop MetSyn over 4 years
Sisson, 2010; [27]	697/749 47.5 years	Accelerometry	MetS prevalence decreased as steps/day increased; odds of having MetSyn were 10% lower for each additional 1000 steps/day
Healy, 2008; [28]	67/102 53.4 years	Accelerometer evaluation of time spent in sedentary, light, moderate-to-vigorous, and mean activity intensity in participants with diabetes and obesity	Moderate-to-vigorous activity associated with lower triglycerides. Sedentary time, light-intensity time, and exercise intensity associated with waist circumference and clustered metabolic risk
Ekelund, 2007; [29]	103/155 40.8 years	Accelerometry, exercise test, biometric measures on adults with a family history of type 2 diabetes	Total body movement inversely associated with triglycerides, insulin, HDL and clustered metabolic risk; moderate-and vigorous-intensity PA inversely associated with clustered metabolic risk

Type II DM – Exercise vs. Metformin

- 3234 nondiabetic ppl (pre-diabetic), elevated fasting and post-load plasma glucose
- 3 groups: placebo, metformin (850 mg twice daily), or a lifestyle-modification program (exercise)
- 2.8 year f/u
- Incidence of Diabetes/100 person yrs
  - Placebo – 11/100
  - Metformin – 7.8/100
  - Exercise – 4.8/100



N Engl J Med 2002; 346:393-403 DOI: 10.1056/NEJMoa012512

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Cardiovascular Disease

- Leading cause of morbidity and mortality worldwide
- >50% of adults have at least one risk factor for developing CVD
- Cost > $320 Billion/Year

American Heart Association. *American Heart Disease and Stroke Statistics*, 2019

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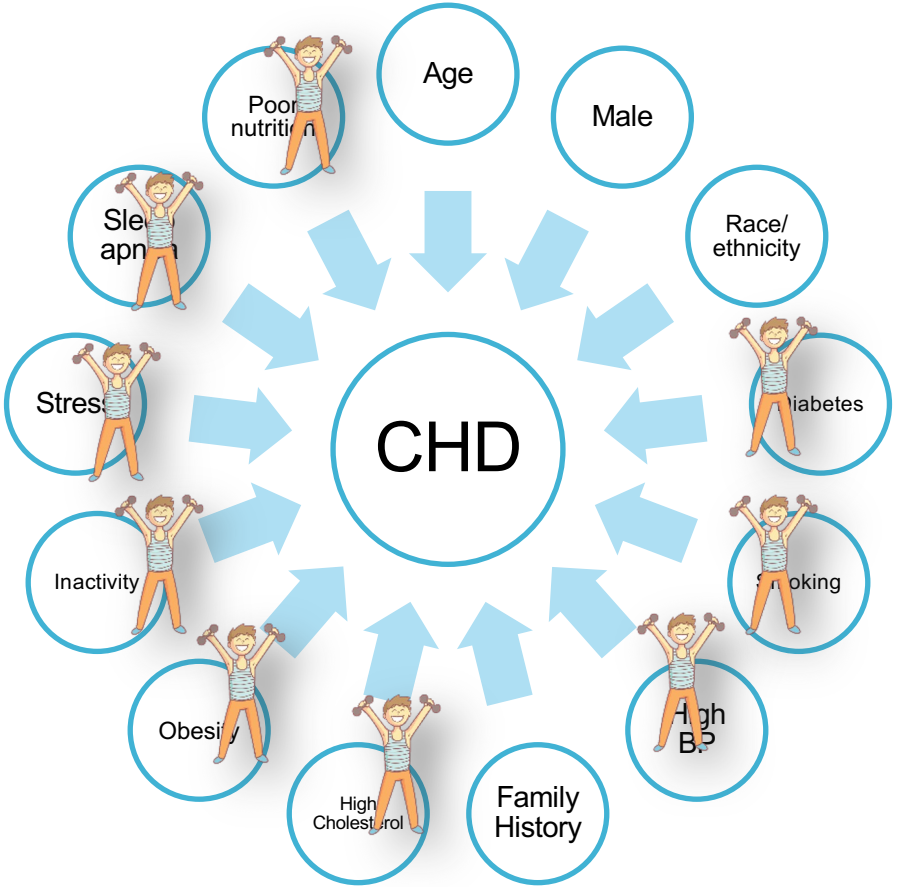
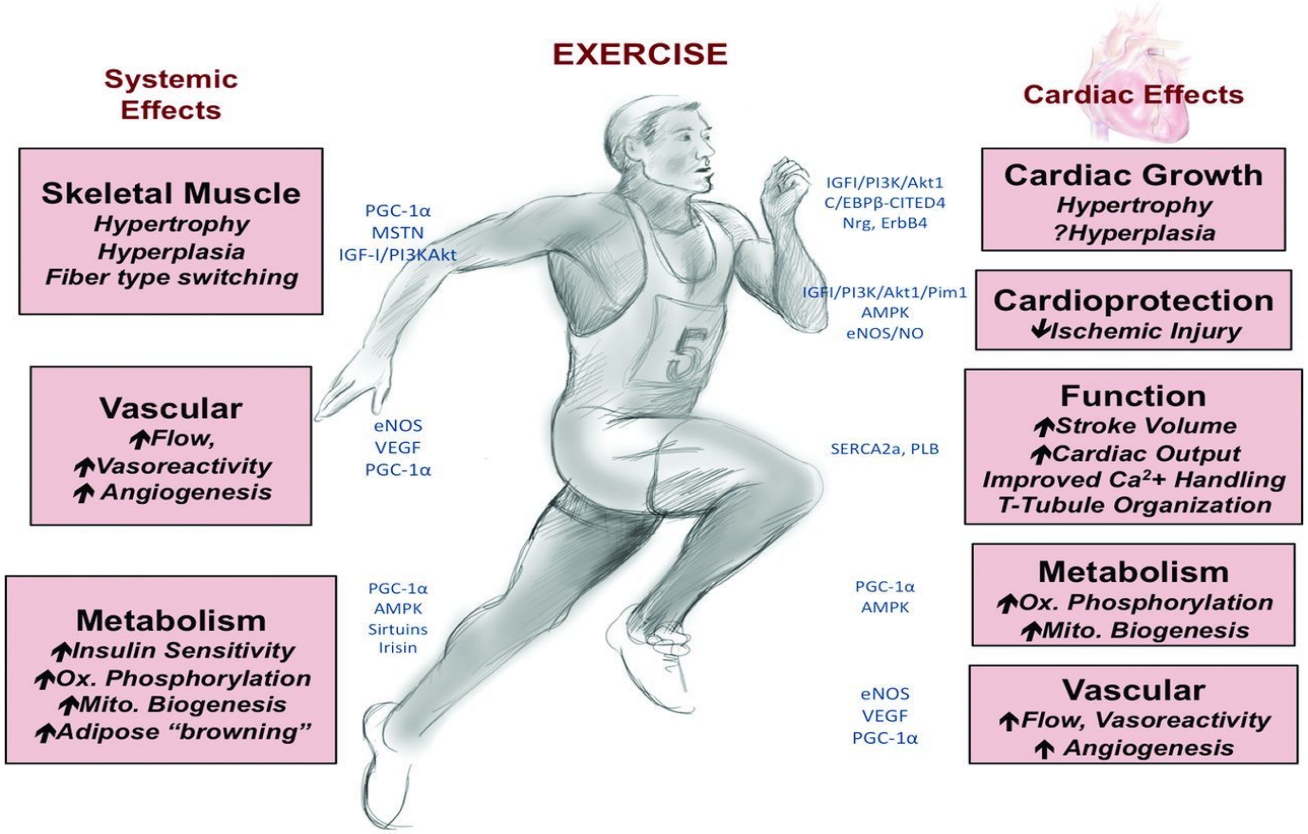
Risk Factors– Coronary Heart Disease





Circulation. Can Exercise Teach Us How to Treat Heart Disease?, Volume: 126, Issue: 22, Pages: 2625-2635, DOI: (10.1161/CIRCULATIONAHA.111.060376)

Benefits of Exercise – Coronary Heart Disease

Mechanism

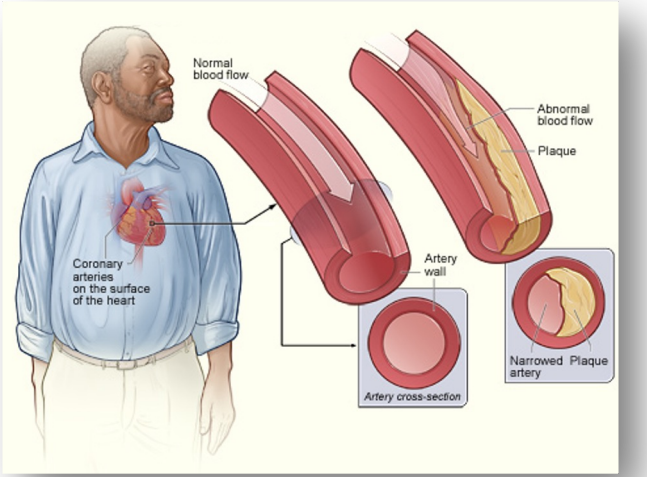
Direct antiatherogenic effects

—↓ atherogenic cytokines

IL-1α, TNF-α, and IFN-γ

—↑ atheroprotective cytokines

IL-4, IL-10, and TGF-β1



Antithrombotic effects

—↑ resting tPA activity, ↓ fibrinogen and PAI-1 activity

—Platelet activation: ↑ short-term / ↓ long-term

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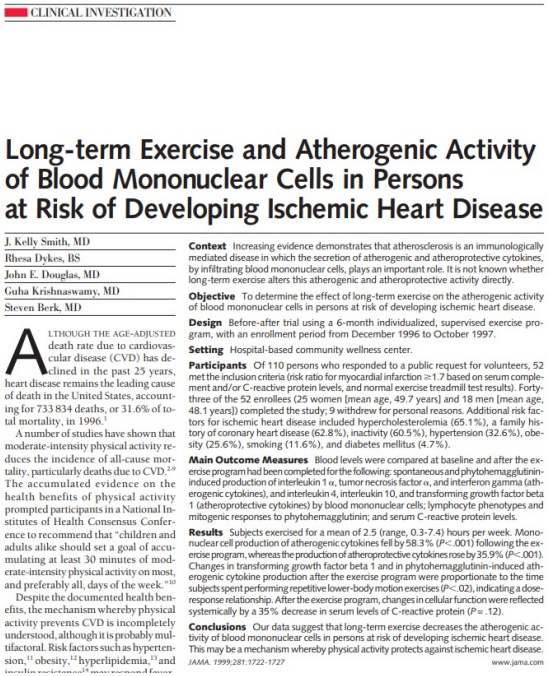
Exercise Effect on CVD Prevention

- 52 subjects in study examining the role of exercise in CVD prevention
- Blood levels drawn @ baseline & after 6 mo exercise program
- Exercise ↓ atherogenic activity of blood mononuclear cells



CLINICAL INVESTIGATION

Long-term Exercise and Atherogenic Activity of Blood Mononuclear Cells in Persons at Risk of Developing Ischemic Heart Disease

J. Kelly Smith, MD
Rhesa Dykes, BS
John E. Douglas, MD
Guha Krishnaswamy, MD
Steven Berk, MD

ALTHOUGH THE AGE-ADJUSTED death rate due to cardiovascular disease (CVD) has declined in the past 25 years, heart disease remains the leading cause of death in the United States, accounting for 733 834 deaths, or 31.6% of total mortality, in 1996.[1]

A number of studies have shown that moderate-intensity physical activity reduces the incidence of all-cause mortality, particularly deaths due to CVD.[2-9] The accumulated evidence on the health benefits of physical activity prompted participants in a National Institutes of Health Consensus Conference to recommend that "children and adults alike should set a goal of accumulating at least 30 minutes of moderate-intensity physical activity on most, and preferably all, days of the week."[10]

Despite the documented health benefits, the mechanism whereby physical activity prevents CVD is incompletely understood, although it is probably multifactoral. Risk factors such as hypertension,[11] obesity,[12] hyperlipidemia,[13] and

Context Increasing evidence demonstrates that atherosclerosis is an immunologically mediated disease in which the secretion of atherogenic and atheroprotective cytokines, by infiltrating blood mononuclear cells, plays an important role. It is not known whether long-term exercise alters this atherogenic and atheroprotective activity directly.

Objective To determine the effect of long-term exercise on the atherogenic activity of blood mononuclear cells in persons at risk of developing ischemic heart disease.

Design Before-after trial using a 6-month individualized, supervised exercise program, with an enrollment period from December 1996 to October 1997.

Setting Hospital-based community wellness center.

Participants Of 110 persons who responded to a public request for volunteers, 52 met the inclusion criteria (risk ratio for myocardial infarction ≥1.7 based on serum complement and/or C-reactive protein levels, and normal exercise treadmill test results). Forty-three of the 52 enrollees (25 women [mean age, 49.7 years] and 18 men [mean age, 48.1 years]) completed the study; 9 withdrew for personal reasons. Additional risk factors for ischemic heart disease included hypercholesterolemia (65.1%), a family history of coronary heart disease (62.8%), inactivity (60.5%), hypertension (32.6%), obesity (25.6%), smoking (11.6%), and diabetes mellitus (4.7%).

Main Outcome Measures Blood levels were compared at baseline and after the exercise program had been completed for the following: spontaneous and phytohemagglutinin-induced production of interleukin 1 α, tumor necrosis factor α, and interferon gamma (atherogenic cytokines), and interleukin 4, interleukin 10, and transforming growth factor beta 1 (atheroprotective cytokines) by blood mononuclear cells; lymphocyte phenotypes and mitogenic responses to phytohemagglutinin; and serum C-reactive protein levels.

Results Subjects exercised for a mean of 2.5 (range, 0.3-7.4) hours per week. Mononuclear cell production of atherogenic cytokines fell by 58.3% ($P<.001$) following the exercise program, whereas the production of atheroprotective cytokines rose by 35.9% ($P<.001$). Changes in transforming growth factor beta 1 and in phytohemagglutinin-induced atherogenic cytokine production after the exercise program were proportionate to the time subjects spent performing repetitive lower-body motion exercises ($P<.02$), indicating a dose-response relationship. After the exercise program, changes in cellular function were reflected systemically by a 35% decrease in serum levels of C-reactive protein ($P=.12$).

Conclusions Our data suggest that long-term exercise decreases the atherogenic activity of blood mononuclear cells in persons at risk of developing ischemic heart disease. This may be a mechanism whereby physical activity protects against ischemic heart disease.

JAMA. 1999;281:1722-1727
www.jama.com

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The Effect of Habitual, Intense Exercise on Chronic Disease

- **Prospective cohort, n=17321 to examine the independent associations of vigorous (≥6 [MET] score) and nonvigorous (<6 MET score) physical activity with longevity**
- **Self-reported, physician-diagnosed cardiovascular disease, cancer, or chronic obstructive pulmonary disease, 1962-1978**
- Age adjusted incidence rate of first MI who expended less than 2,000 kcal per week was 1.64X higher than those who expended 2,000 or more kcal per week
- Relationship held true after adjustment for several factors including age, cigarette smoking, hypertension, diabetes mellitus, BMI, and early parental death

April 19, 1995

Exercise Intensity and Longevity in Men

The Harvard Alumni Health Study

I-Min Lee, MBBS, ScD; Chung-cheng Hsieh, ScD; Ralph S. Paffenbarger Jr, MD, DrPH

Lee I et al. Exercise Intensity and Longevity in Men: The Harvard Alumni Health Study. *JAMA.* 1995 doi:10.1001/jama.1995.03520390039030

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Original Investigation | Cardiology

Association of Cardiorespiratory Fitness With Long-term Mortality Among Adults Undergoing Exercise Treadmill Testing

Kyle Mandsager, MD; Serge Harb, MD; Paul Cremer, MD; Dermot Phelan, MD, PhD; Steven E. Nissen, MD; Wael Jaber, MD

Objective: To assess the association between all cause mortality and cardiorespiratory fitness in patients undergoing exercise treadmill testing

Design: retrospective cohort study, 1991-2014

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Table 1. Patient Demographics[a]

Demographic	All Patients (N = 122 007)	Performance Group				
		Low (n = 29 181)	Below Average (n = 27 172)	Above Average (n = 31 897)	High (n = 30 187)	Elite (n = 3570)
Age, mean (SD), y	53.4 (12.6)	53.7 (12.5)	53.2 (12.7)	53.3 (12.5)	53.5 (12.6)	53.3 (12.6)
Male	72 173 (59.2)	17 496 (60.0)	15 333 (56.4)	19 040 (59.7)	18 073 (59.9)	2231 (62.5)
Maximum No. of METs, mean (SD)	9.0 (2.7)	6.1 (1.7)	8.2 (1.6)	9.6 (1.7)	11.4 (1.8)	13.8 (1.5)
Estimated METs, mean (SD), %	101.2 (27.1)	68.0 (15.4)	92.5 (8.6)	107.6 (10.3)	128.0 (15.7)	155.9 (23.5)
BMI, mean (SD)	28.7 (5.8)	31.7 (7.3)	29.8 (5.5)	28.0 (4.6)	26.2 (3.9)	24.5 (3.4)
CAD	19 197 (15.7)	6472 (22.2)	4411 (16.2)	4409 (13.8)	3551 (11.8)	354 (9.9)
CABG or PCI	10 735 (8.8)	3975 (13.6)	2393 (8.8)	2350 (7.4)	1843 (6.1)	174 (4.9)
Diabetes	14 115 (11.6)	6387 (21.9)	3537 (13.0)	2590 (8.1)	1514 (5.0)	87 (2.4)
Hypertension	53 307 (43.7)	16 820 (57.6)	12 998 (57.8)	12 693 (39.8)	9846 (32.6)	2620 (26.6)
Hyperlipidemia	32 953 (27.0)	7323 (25.1)	7114 (26.2)	8552 (26.8)	8836 (29.3)	1128 (31.6)
ESRD	1385 (1.1)	900 (3.1)	251 (0.9)	148 (0.5)	79 (0.3)	7 (0.2)
Current or prior smoker	55 577 (45.6)	16 522 (56.6)	13 292 (48.9)	13 732 (43.1)	11 014 (36.5)	1017 (28.5)
Medication use						
Aspirin	40 680 (33.3)	11 353 (38.9)	9137 (33.6)	10 055 (31.5)	9051 (30.0)	1084 (30.4)
β-Blocker	29 620 (24.3)	10 975 (37.6)	6770 (24.9)	6476 (20.3)	4957 (16.4)	442 (12.4)
Statin	32 000 (26.2)	8617 (29.5)	7177 (26.4)	7991 (25.1)	7360 (24.4)	855 (24.0)
Follow-up, median (IQR), y	8.4 (4.3-13.4)	7.9 (3.8-13.1)	9.0 (4.5-14.2)	8.9 (4.6-14.1)	8.2 (4.3-12.8)	7.1 (3.8-10.7)
Death (all-cause)	13 637 (11.2)	6904 (23.7)	2888 (10.6)	2340 (7.3)	1412 (4.7)	93 (2.6)

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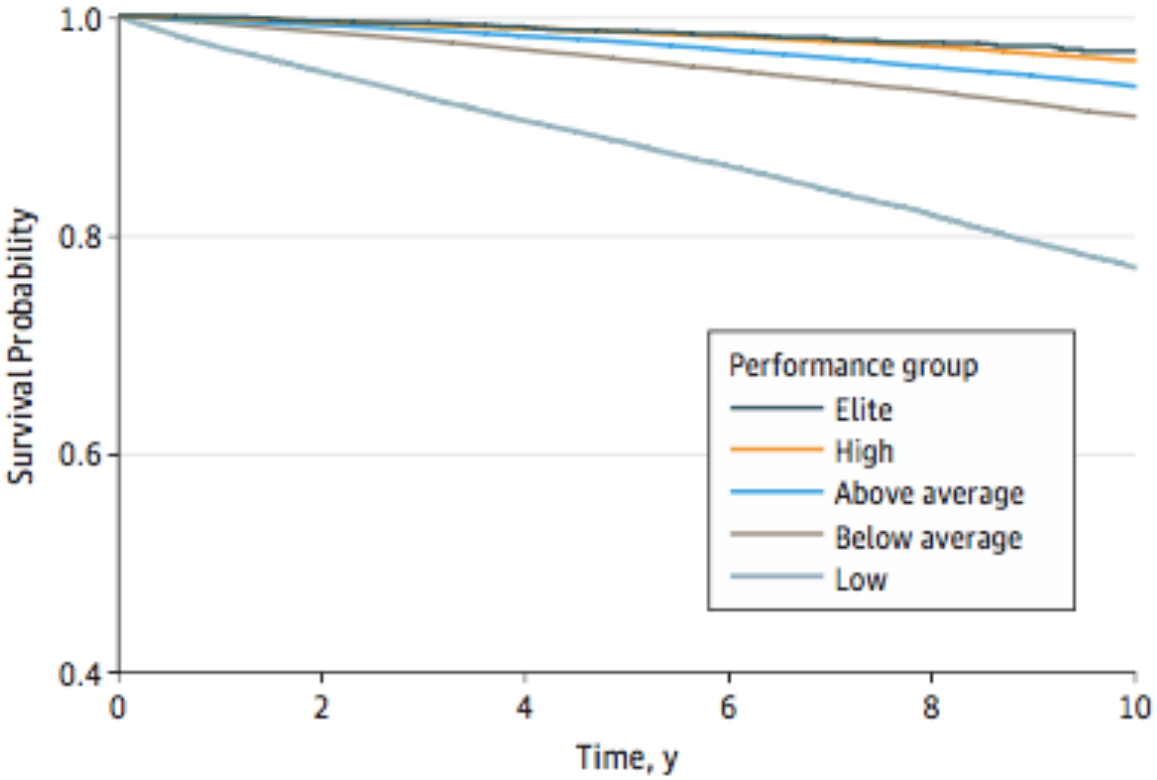
Figure 1. Patient Survival by Performance Group



Exercise and Cancer Risk: Mechanisms

Cancer, physical activity, and exercise

Justin C Brown [1], Kerri Winters-Stone, Augustine Lee, Kathryn H Schmitz

- Lowering the levels of sex hormones, such as estrogen, and growth factors
- Preventing high blood levels of insulin
- Reducing inflammation
- Improving immune system function (increased Ig, NK cells)
- Altering the metabolism of bile acids
- Reducing the time it takes for food to travel through the digestive system
- Helping to prevent obesity

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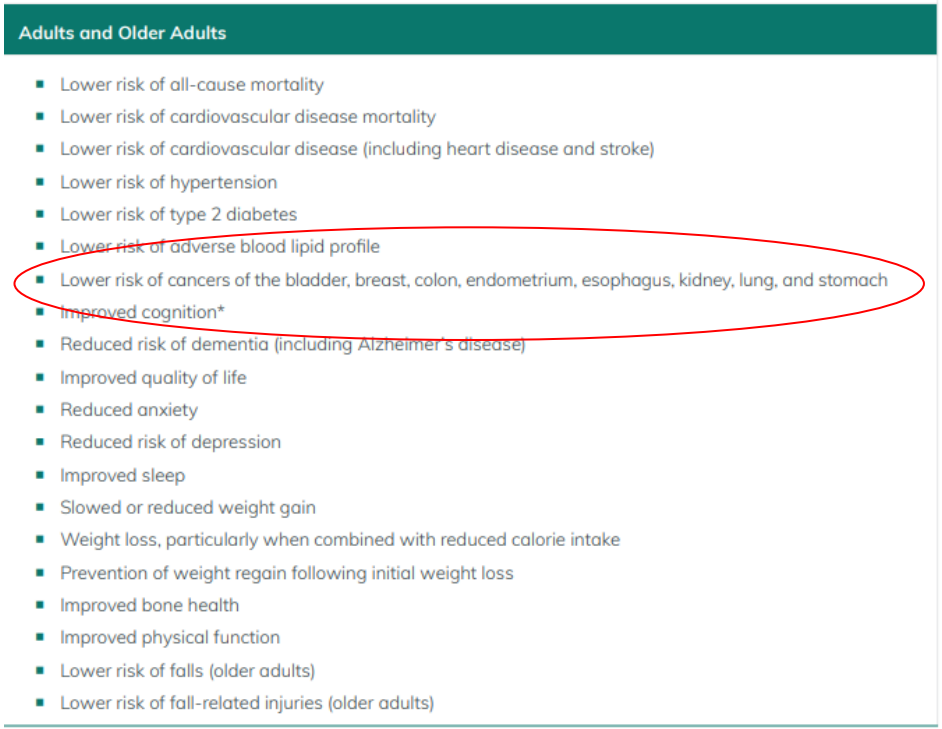
Exercise and Cancer Risk:

Observational Studies

- **Breast Cancer** – 21% reduction in breast cancer risk (Pizot)
- **Bladder Cancer** – 15% reduction with regular exercise (Moore)
- **Colon Cancer** – 19% reduction with regular exercise (Liu)
- Others



Adults and Older Adults

- Lower risk of all-cause mortality
- Lower risk of cardiovascular disease mortality
- Lower risk of cardiovascular disease (including heart disease and stroke)
- Lower risk of hypertension
- Lower risk of type 2 diabetes
- Lower risk of adverse blood lipid profile
- Lower risk of cancers of the bladder, breast, colon, endometrium, esophagus, kidney, lung, and stomach
- Improved cognition*
- Reduced risk of dementia (including Alzheimer's disease)
- Improved quality of life
- Reduced anxiety
- Reduced risk of depression
- Improved sleep
- Slowed or reduced weight gain
- Weight loss, particularly when combined with reduced calorie intake
- Prevention of weight regain following initial weight loss
- Improved bone health
- Improved physical function
- Lower risk of falls (older adults)
- Lower risk of fall-related injuries (older adults)

Physical Activity Guidelines for Americans, 2nd edition
US Department of Health and Human Services

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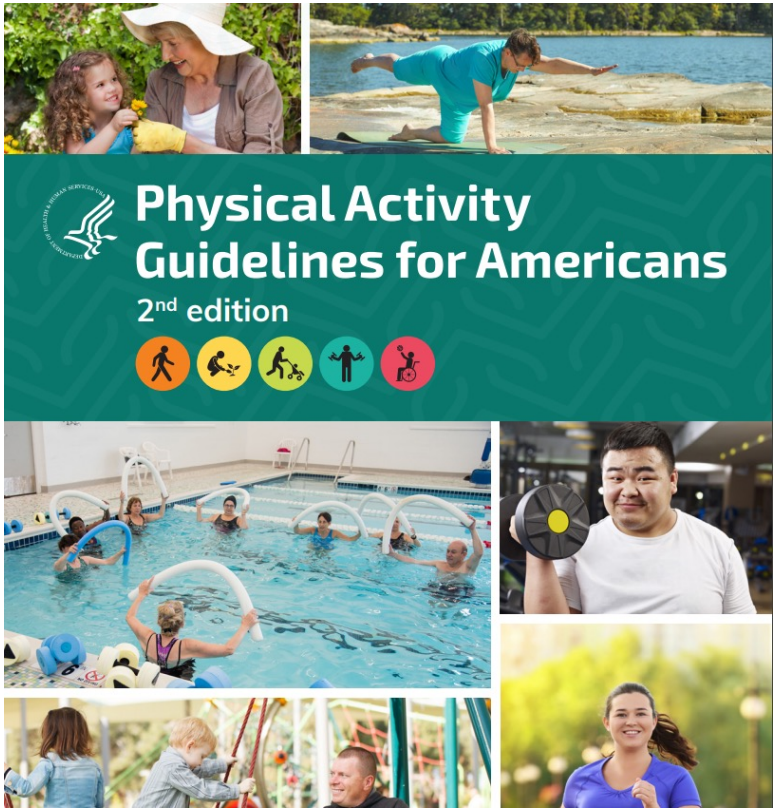
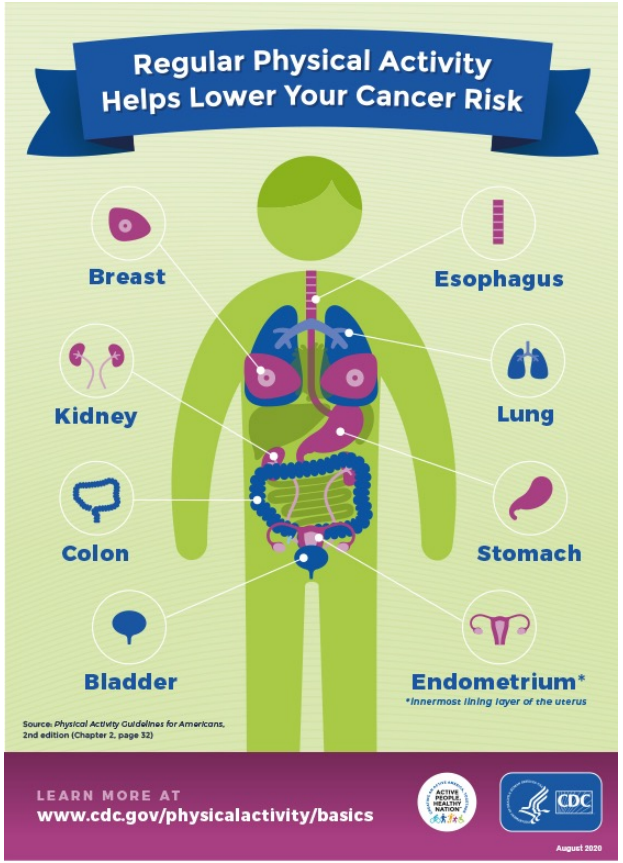

Physical Activity
Guidelines for Americans
2nd edition


Regular Physical Activity
Helps Lower Your Cancer Risk
Breast
Esophagus
Kidney
Lung
Colon
Stomach
Bladder
Endometrium*
*Innermost lining layer of the uterus
Source: Physical Activity Guidelines for Americans, 2nd edition (Chapter 2, page 32)
LEARN MORE AT
www.cdc.gov/physicalactivity/basics
CDC
August 2020

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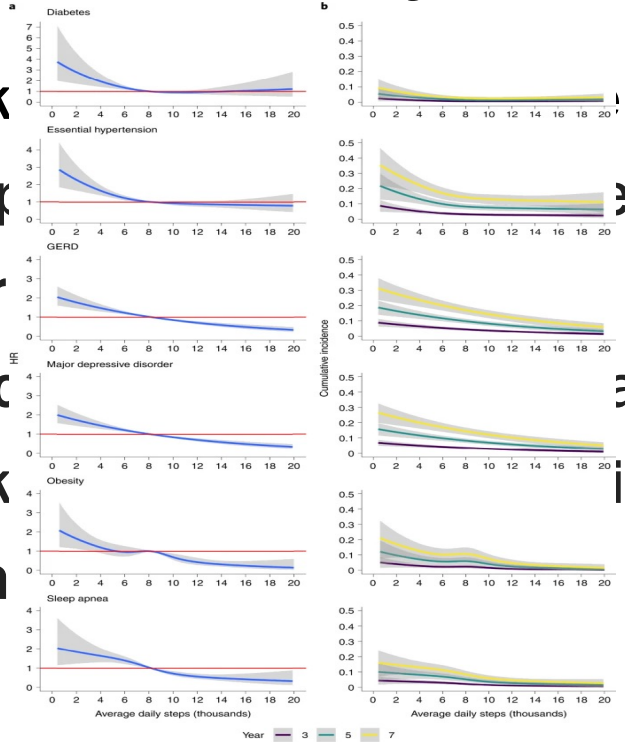
Exercise and Mental Health

- Exercise (30 minutes) reduces short-term depressive symptoms by 15-20% (Chen)
- Exercise (30 minutes) reduces anxiety compared to placebo (HR>60% max) (Ayelett)
- Long-term data less clear

Association of step counts over time with the risk of chronic disease in the *All of Us* Research Program

- Effect of walk … expression
- 6,042 particip… edian age 56.7
- Monitored for …
- Median step c… ay
- Effect of walk … isease over time
- More movem…



Master, H., Annis, J., Huang, S. *et al.* Association of step counts over time with the risk of chronic disease in the *All of Us* Research Program. *Nat Med* (2022)

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Patient Outcomes During COVID-19 Infection are Linked to Fitness Activity

- 48 440 adult patients with a COVID-19 diagnosis from 1 January 2020 to 21 October 2020
- All had three exercise vital sign measurements from 19 March 2018 to 18 March 2020
- Patients with COVID-19 who were consistently inactive had a **greater risk of hospitalization** (OR 2.26; 95% CI 1.81 to 2.83), **admission to the ICU** (OR 1.73; 95% CI 1.18 to 2.55) and **death** (OR 2.49; 95% CI 1.33 to 4.67) due to COVID-19 than patients who were consistently meeting physical activity guidelines.
- **Consistently meeting physical activity guidelines was strongly associated with a reduced risk for severe COVID-19 outcomes among infected adults.**

Sallis R et al. Physical inactivity is associated with a higher risk for severe COVID-19 outcomes: a study in 48 440 adult patients. *Br Jl of Sports Med*. Apr 2021

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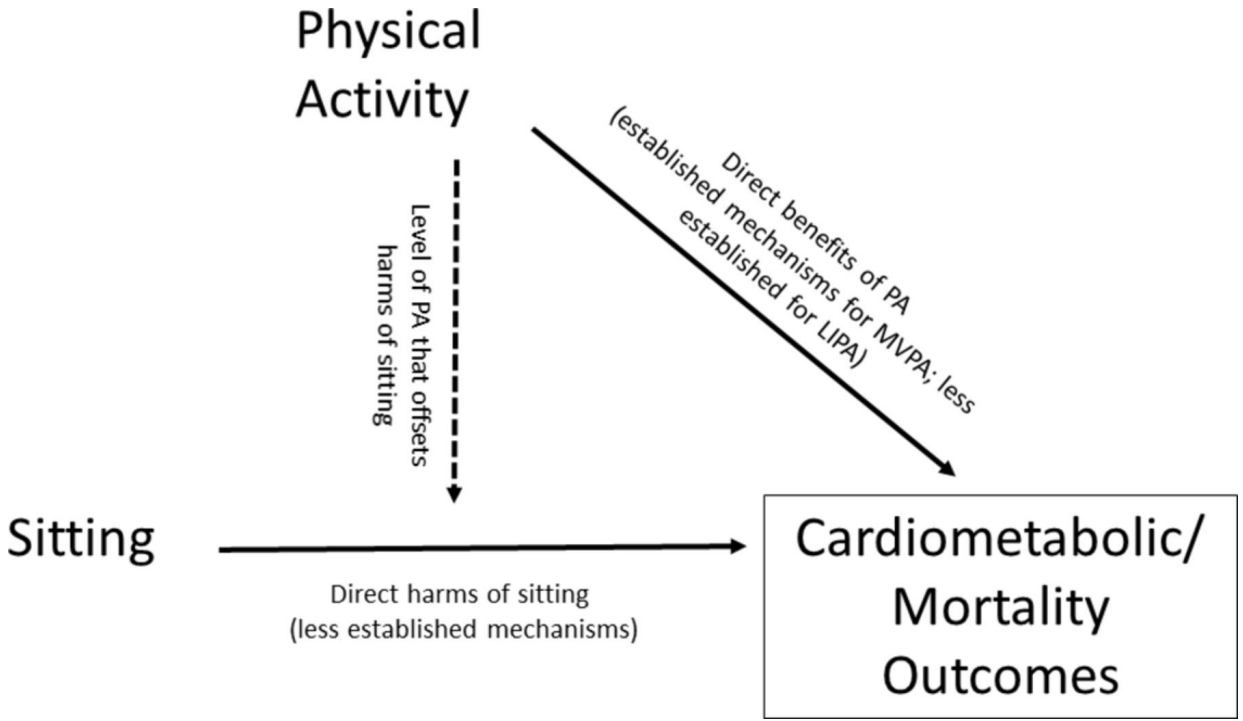
Some Things That We Don’t Fully Understand

Physical Activity as Disease Modifier



Emmanuel Stamatakis et al. Br J Sports Med 2019;53:377-382

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Today's Lecture

- Overview
- A Glance at the Evolution of Fitness
- Lifespan vs. Healthspan
- The Medicine of Exercise
- The Exercise Prescription
- Thoughts on Exercise Intensity
- Conclusions/Recommendations

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Current Adult Physical Activity Recommendations

Frequency	Intensity	Time	Type
5x/week	Moderate	30 minutes	Major muscle groups

OR

Frequency	Intensity	Time	Type
3x/week	Vigorous	25 minutes	Major muscle groups

US Dept of Health and Human Services: Physical Activity Guidelines for Americans, 2018

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Exercise as Medicine

- The Exercise Prescription
  - Directing patients to evidence-based exercise recommendation similarly as you would to any medication
  - Include specific recommendations based on evidence-based guidelines
  - Discuss potential side effects or restrictions

Exercise as Medicine

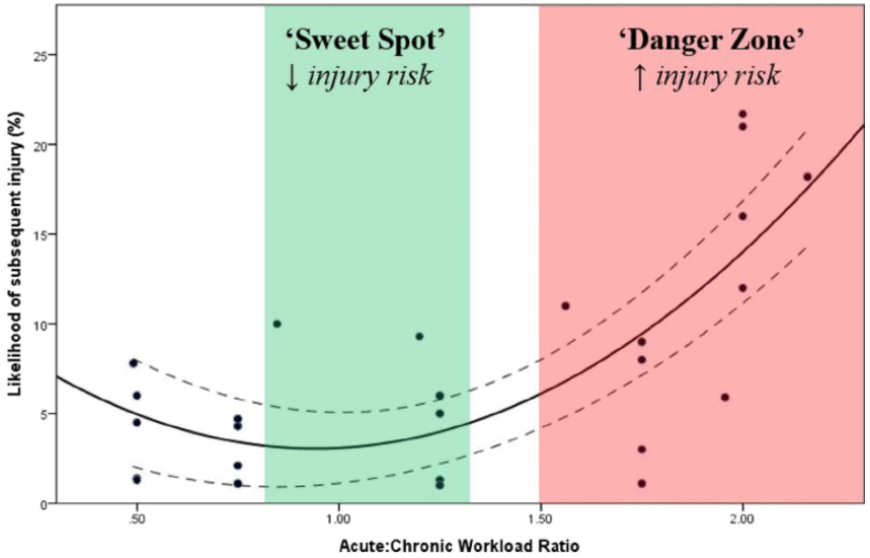
- Integration of exercise principles and behavior techniques
    - Helps motivate participation and increase compliance
- Individualized
- Variability in patient response to exercise
- Preventative Medicine
- Benefits outweigh risk
- Active lifestyles begin in childhood

Components

- *F* requency
- *I* ntensity
- *T* ime
- *T* ype

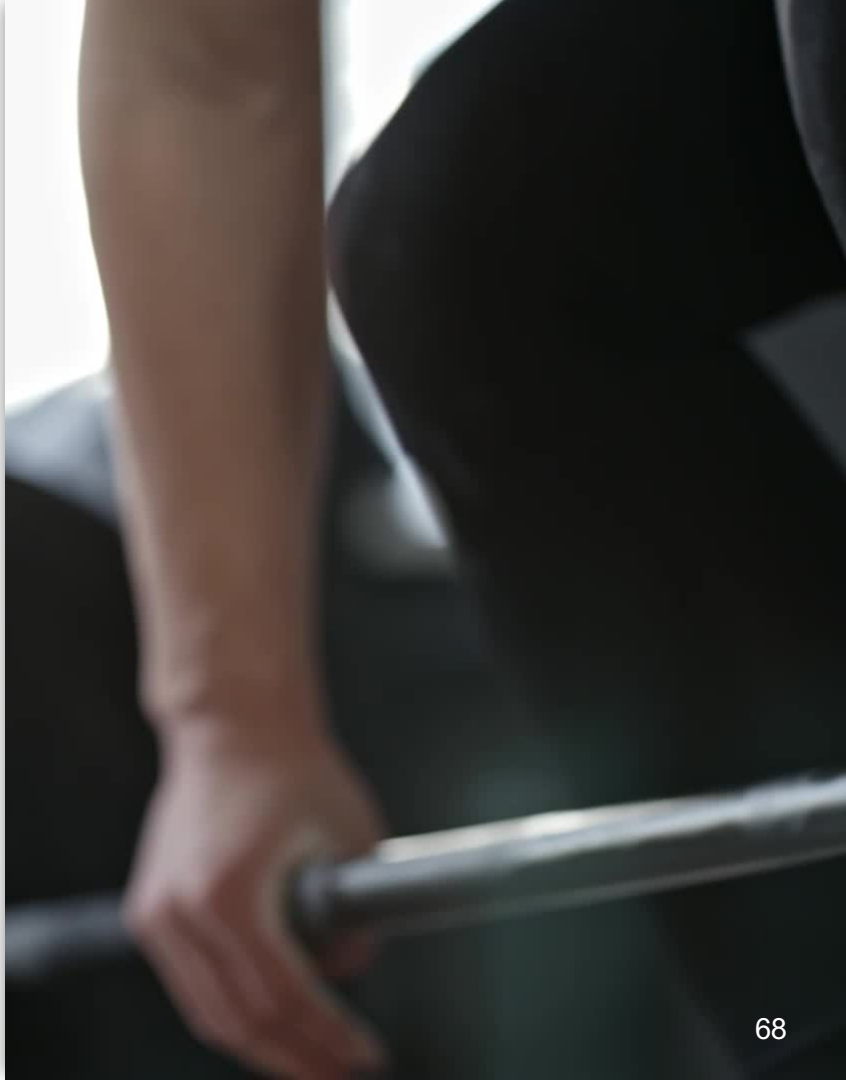
Frequency

- *How often (days per week)*
  - Should be at least 3-4, but shouldn't be 7 of the same exercise
  - Gradual Ramp up
    - 10-15% increase per week
    - Acute : Chronic Workload
      - Workload in last 7 days over average workload in previous 28 days
      - Over 1.2 increased injury risk, very great at 1.5



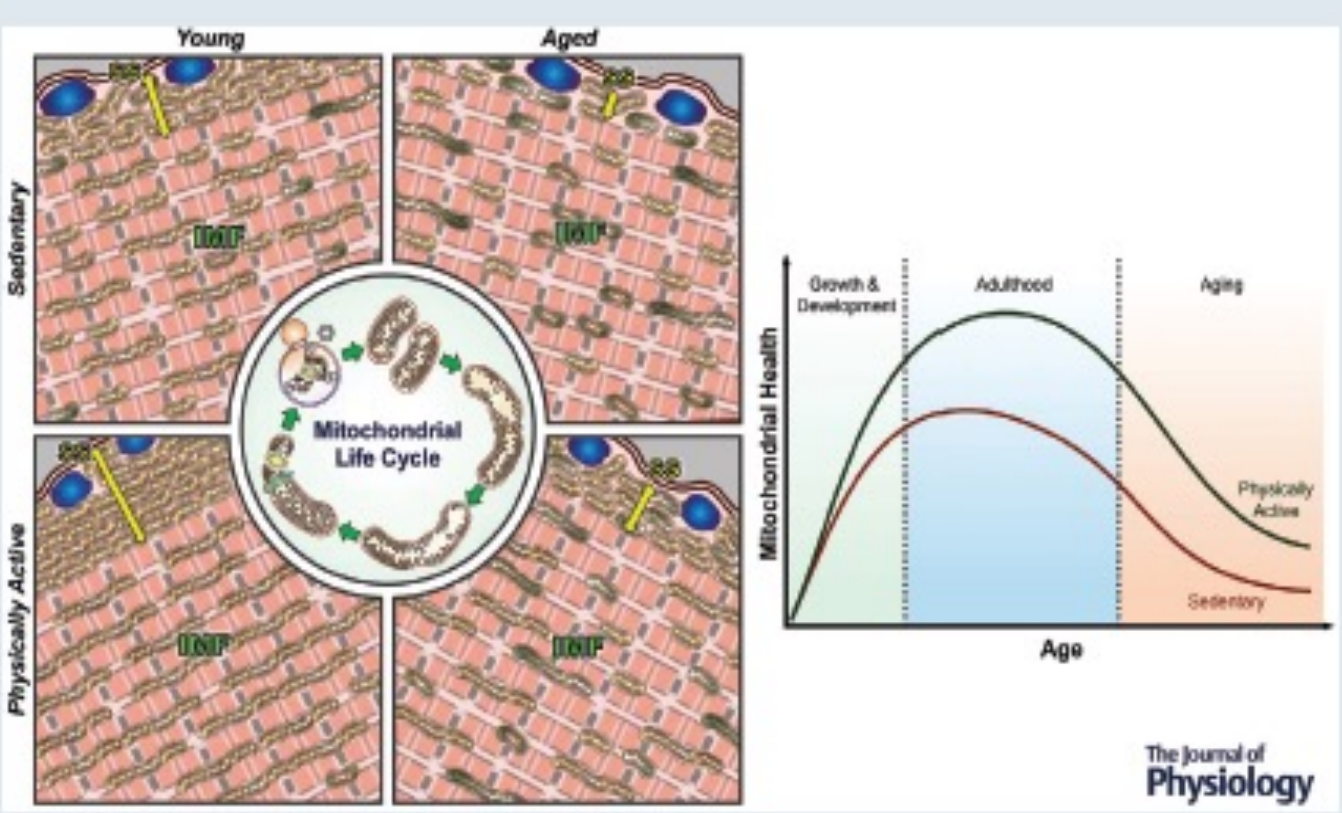
Intensity

- How hard a person works to do the activity
- Exercise intensity is an important determinant of the physiological responses to exercise training
  - Improved glucose utilization when V02 max>80%
  - Short terms effects of exercise on mental health (particularly depression), may be related to intensity

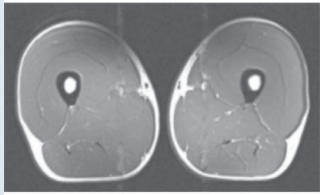


Exercise and mitochondrial health

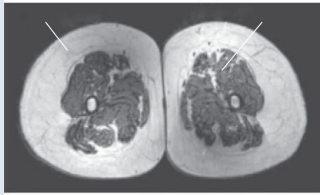
Jonathan M. Memme[1,2], Avigail T. Erlich[1,2], Geetika Phukan[1,2] and David A. Hood[1,2]



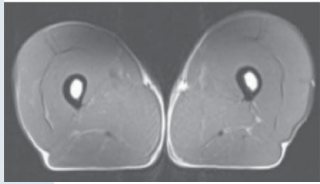
40-year-old triathlete



74-year-old sedentary man



70-year-old triathlete



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Borg's Scale of Ratings of Perceive		
Intensity	Percentage	Description
6	30%	No exertion at all
7	35%	Extremely light
8	40%	Still light
9	45%	Very light nice walk
10	50%	Can't even here my breathing
11	55%	Light jog and talk can hold co
12	60%	Light but finally building some w
13	65%	Somewhat hard feeling tired but
14	70%	Finally hear your breath, but not
15	75%	You can talk but only one to two
16	80%	This is hard and considered your
17	85%	Very hard and fatiguing
18	90%	Breathing is hard can't talk breath
19	95%	Extremely hard hoping it ends soo
20	100%	Maximal exertion hit the floor

How is intensity estimated?

- Borg Perceived Exertional Scale

Time

- *Length of time an activity or exercise is performed*
  - No set recommendation
  - Can be broken up throughout the day “exercise snacks”

Type

- ***Mode of exercise performed***
- Aerobic Activity
  - Any activity that uses large muscle groups, can be maintained continuously and is rhythmical in nature
- Resistance / Muscle Strengthening
- Stretching
- Neuromuscular Activity (Balance, Agility, Propriocpetion)

What About 10,000 Steps/Day?

1964 Tokyo Olympics

First wearable pedometer, *manpo-kei* = 10,000 steps

Association of Step Volume and Intensity With All-Cause Mortality in Older Women. *Lee M et al.*

4400 steps < 2200 steps

6,000 steps/day lowers blood pressure in post-menopausal women. *Moreau KL et al*

American College of Sports Medicine 2023

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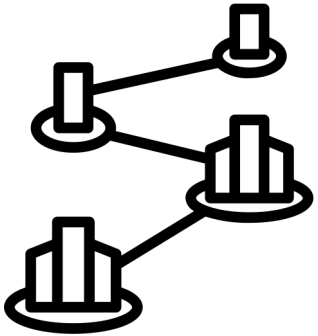
IronStrength/HSS

Prescribing the Medicine of Movement



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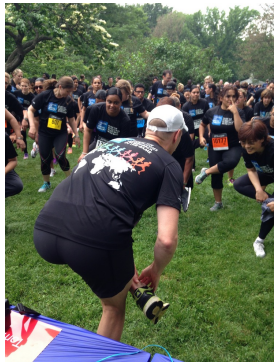

2010
Small group in the basement of a gym

2012
Friends and Family

2013
Year-round community fitness

2015
Workouts at iconic NYC locations

PRESENT
10,000 people moving annually

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IronStrength/HSS at a Glance

- 20-25 events/year
- Collaboration with varied organizations
- Varied types of activities
- Goal is to get 10,000 people moving each year
- Ages, 8-85
- All areas of NYC represented

Asphalt Green

HUDSON RIVER PK

BRYANT PARK

the YMCA

WORLD TRADE CENTER

FRIENDS OF THE EAST RIVER ESPLANADE 60TH - 120TH STREETS

INTREPID SEA, AIR & SPACE MUSEUM COMPLEX

CENTRAL PARK CONSERVANCY

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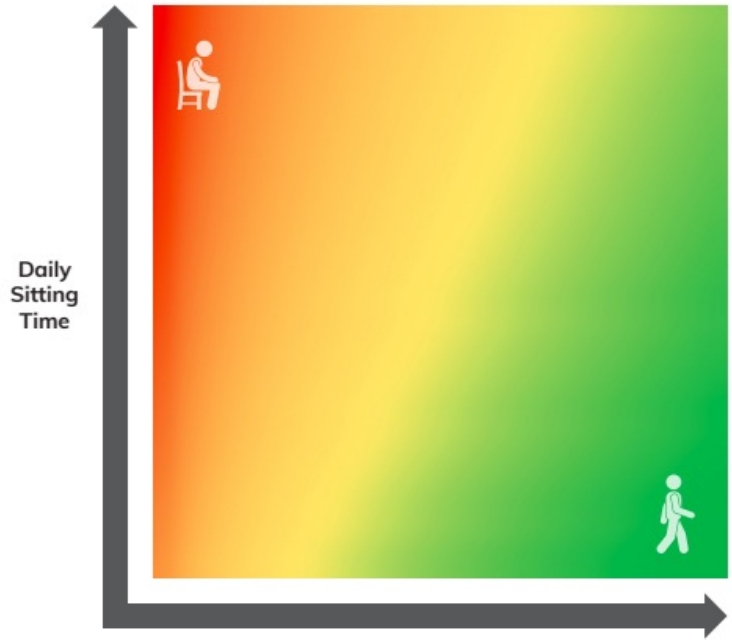
In Summary……

- Physical Activity Guidelines for Americans, 2nd edition
- US Department of Health and Human Services

Figure 1-3. Relationship Among Moderate-to-Vigorous Physical Activity, Sitting Time, and Risk of All-Cause Mortality in Adults



Risk of all-cause mortality decreases as one moves from red to green.

Conclusions

- The medicine of exercise is a powerful tool for optimizing mental and physical health
- In the future, various methods of collecting and disseminating information will allow for greater synergy between medicine and exercise
- HSS has a large role to play in this future course

Thank You

Questions and Discussion

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