# Life's Simple 7: At the Intersection of Diabetes, Cardiovascular Disease and Cancer

Joshua J. Joseph, MD

Assistant Professor of Medicine

Division of Endocrinology, Diabetes and Metabolism

The Ohio State University Wexner Medical Center

ENDOCRINE SOCIETY

American Heart Association. life is why™

Clinical Affairs Core Committee

2020 Goal Metrics Committee;
EPI Early Career Committee of the Council on Epidemiology and Prevention

@joshuajosephmd

Wexner Medical Center

---

Financial Disclosures: None
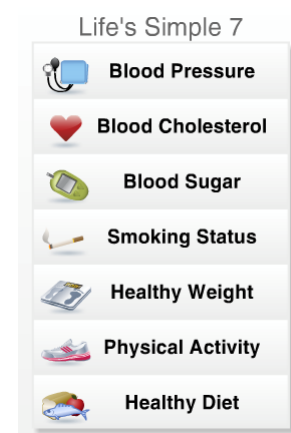
Unlabeled/Unapproved Uses Disclosure: None

## Objectives

1. What are the American Heart Association's Life's Simple 7?

2. What is the relationship of individual components of Life's Simple 7 with cancer?

3. Life's Simple 7 from the Population Perspective: The African American Male Wellness Walk Initiative

4. Life's Simple 7 and Social Determinants of Health

## The American Heart Association's Strategic Impact Goal Through 2020 and Beyond

"To improve the cardiovascular health of all Americans by 20% while reducing deaths from cardiovascular diseases and stroke by 20%"

Defining and Setting National Goals for Cardiovascular Health Promotion and Disease Reduction

Life's Simple 7

- Blood Pressure
- Blood Cholesterol
- Blood Sugar
- Smoking Status
- Healthy Weight
- Physical Activity
- Healthy Diet

## Life's Simple 7

| Goal/Metric | Poor health | Intermediate health | Ideal health |
|---|---|---|---|
| Current smoking | Yes | Former ≤ 12 months | Never or quit ≥12 months |
| Total cholesterol | ≥ 240 mg/dl | 200-239 mg/dl or treated to goal | <200 mg/dl |
| Blood pressure | SBP ≥140 or DBP ≥90 mmHg | SBP 120-139 or DBP 80-89 mmHg or treated to goal | <120/<80 mmHg |
| Body mass index | ≥30 kg/m$^2$ | 25-29.9 kg/m$^2$ | <25 kg/m$^2$ |
| Physical activity | None | 1–149 min/wk moderate intensity or 1–74 min/wk vigorous intensity | 150 min/wk moderate intensity or 75 min/wk vigorous intensity |
| Healthy diet score | 0-1 components | 2-3 components | 4-5 components |
| Fasting glucose | ≥126 mg/dl | 100-125 mg/dl or treated to goal | <100 mg/dl |

## Life's Simple 7 and Cardiovascular Disease

| Metric | Ideal |
|---|---|
| Current smoking | Never or quit ≥12 months |
| Total cholesterol | <200 mg/dl |
| Blood pressure | <120/<80 mmHg |
| Fasting glucose | <100 mg/dl |
| Body mass index | <25 kg/m$^2$ |
| Physical activity | ≥150 min/week moderate or ≥75 min/week vigorous intensity |
| Healthy diet score | 4-5 components (Fiber, fish, SSB, Sodium, Fruits and Vegetables) |

| Northern Manhattan Study 1993-2011 | | |
|---|---|---|
| | Non-Hispanic White | African American |
| Attainment of ≥ 4 Life's Simple 7 Metrics | 29.7% | 19.5% |

Dong et al. *Circulation*, 2012

3

# Life's Simple 7 is Associated with Lower Risk of CVD
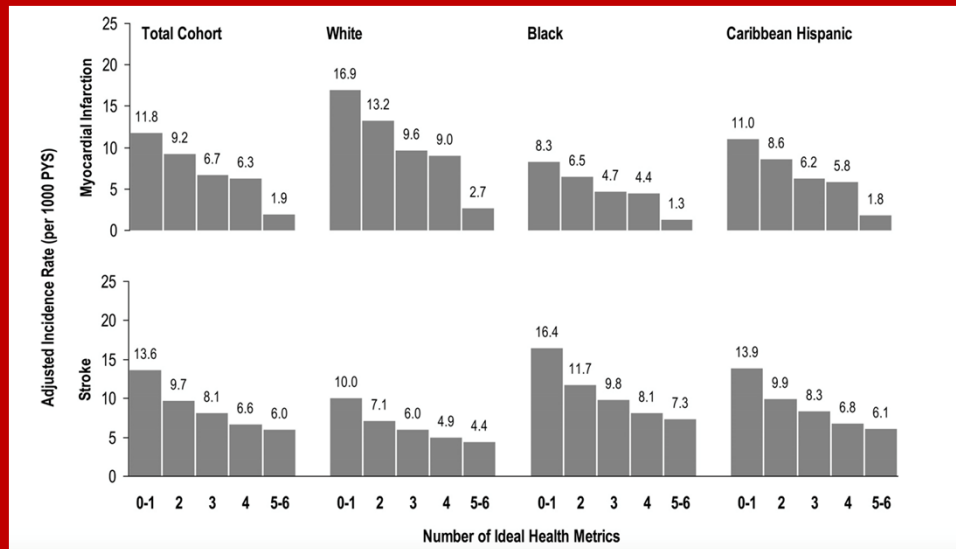


Dong et al. *Circulation*, 2012

# Life's Simple 7 is Associated with Lower Risk of Diabetes

| Metric | Ideal |
|---|---|
| Current smoking | Never or quit ≥12 months |
| Total cholesterol | <200 mg/dl |
| Blood pressure | <120/<80 mmHg |
| Fasting glucose | <100 mg/dl |
| Body mass index | <25 kg/m$^2$ |
| Physical activity | ≥150 min/week moderate or ≥75 min/week vigorous intensity |
| Healthy diet score | 4-5 components (Fiber, fish, SSB, Sodium, Fruits and Vegetables) |

| Multi-Ethnic Study of Atherosclerosis (2000-2012) | |
|---|---|
| Diabetes Risk with ≥ 4 Life's Simple 7 Metrics | **75% Lower Risk** |
| Attainment of ≥ 4 Life's Simple 7 Metrics | **23%** |

Joseph et al. *Diabetologia*, 2016

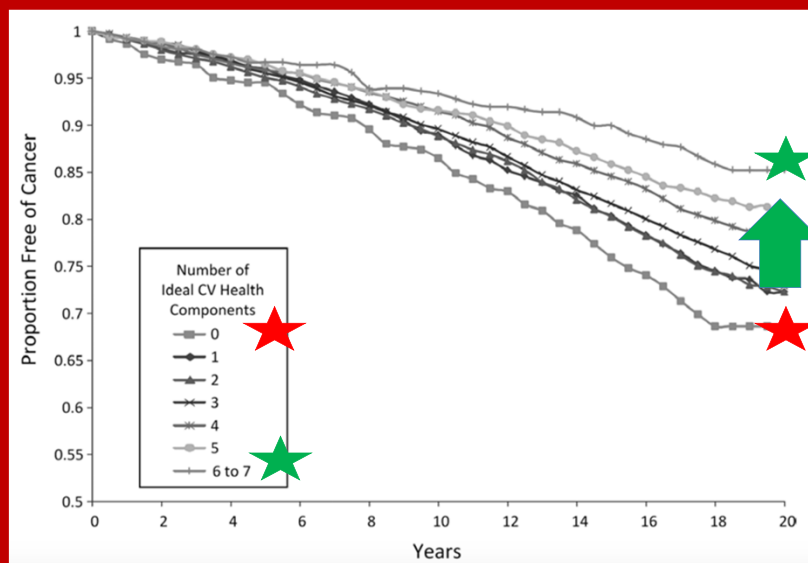## Life's Simple 7 is Associated with Lower Risk of Cancer

| Metric | Ideal |
|---|---|
| Current smoking | Never or quit ≥12 months |
| Total cholesterol | <200 mg/dl |
| Blood pressure | <120/<80 mmHg |
| Fasting glucose | <100 mg/dl |
| Body mass index | <25 kg/m$^2$ |
| Physical activity | ≥150 min/week moderate or ≥75 min/week vigorous intensity |
| Healthy diet score | 4-5 components (Fiber, fish, SSB, Sodium, Fruits and Vegetables) |

| The Atherosclerosis Risk in Communities Study 1987-2006 | |
|---|---|
| | Non-Hispanic Whites & African Americans |
| Attainment of ≥ 4 Life's Simple 7 Metrics | 29.7% |

Rasmussen-Torvik et al. *Circulation*, 2013

## Cancer Rates from 1987 – 2006 By Number of Life's Simple 7 Ideal Metrics

## Life's Simple 7 and Incident Cancer

Multi-Ethnic Study of Atherosclerosis:
- **Optimal vs. Poor Life's Simple 7 score** was associated with a **20%** lower risk of cancers over 10 years in middle aged adults
- **Smoking and Physical Activity - Significant**
- Body Mass Index and Diet – Trends

Southern Community Cohort Study:
The presence of 5 or 6-7 ideal health metrics, compared with 0:
- Whites: **OR 0.62 (0.40-0.97) and OR 0.46 (0.26-0.82)**
- Blacks: **OR 0.68 (0.50-0.93) and OR 0.37 (0.20-0.64)**

*Ogunmoroti, JAHA, 2016; Singh, JACC, 2016*

# What is the relationship of individual components of Life's Simple 7 with cancer?

## Worldwide burden of cancer attributable to diabetes & high body-mass index: a comparative risk assessment
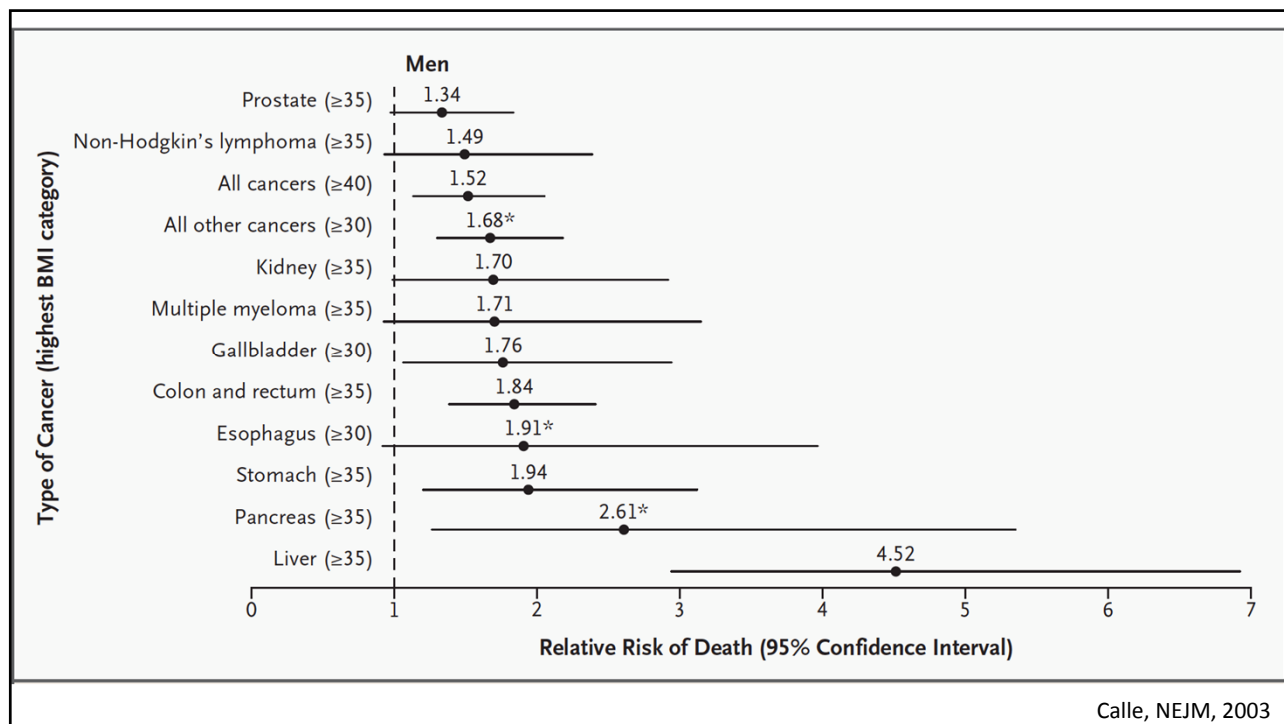
In 2012:
- 5.6% of all incident cancers were attributable to the combined effects of diabetes and high BMI (> 25 kg/m$^2$) corresponding to 792,600 new cancers
- 187,600 (24.5%) of 766,000 cases of liver cancer
- 121,700 (38.4%) of 317 000 cases of endometrial cancer were attributable to these risk factors

*Jonathan Pearson-Stuttard, Lancet Diab & Endocr, 2017*
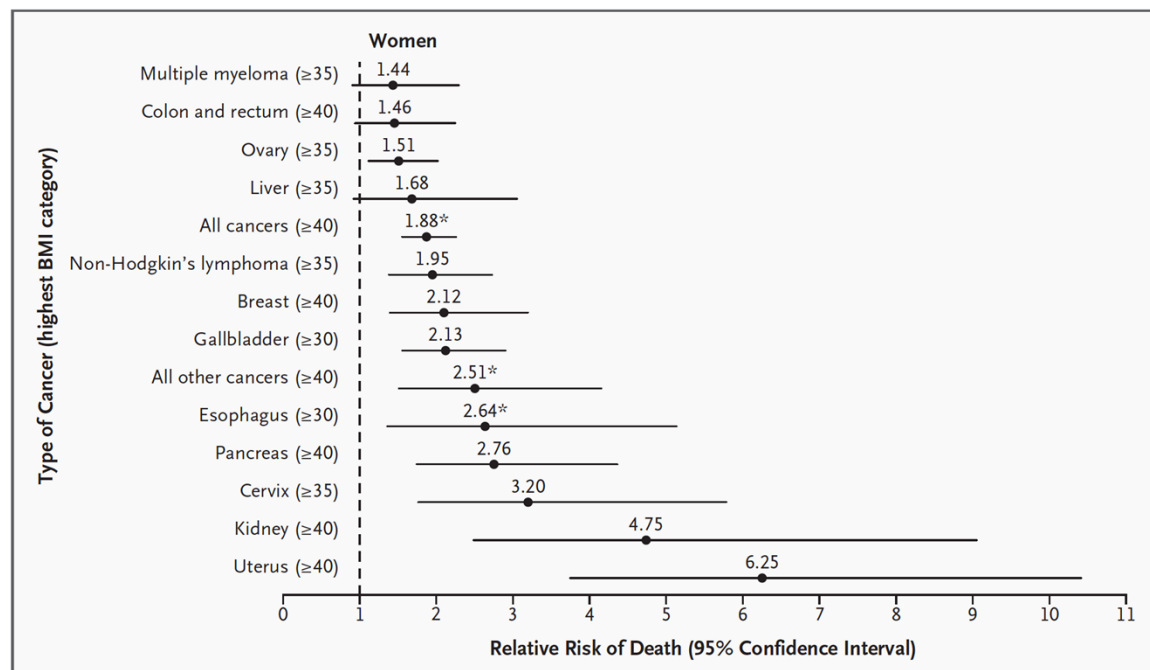


Calle, NEJM, 2003

Calle, NEJM, 2003

## The Effect of Bariatric Surgery on Cancer Mortality?

| | Surgery Group (#/10,000 person-yr) | Control Group (#/10,000 person-yr) |
|---|---|---|
| **All causes of death** | 37.2 | 61.1 |
| CV disease | 8.5 | 19.3 |
| Diabetes | 0.3 | 3.5 |
| **Cancer** | **5.4** | **15** |
| Other disease | 11.4 | 17 |
| **Non-disease causes** | | |
| Accident | 3.7 | 2.7 |
| Poisoning | 1.9 | 0.6 |
| Suicide | 2.7 | 1.2 |

Adams TD et al. *N Engl J Med* 2007;357:753-761.

# T2DM and Cancer Incidence and Mortality



Harding, Diabetes Care, 2015

# Mechanisms Linking Type 2 Diabetes and Cancer



Gallagher EJ, LeRoith D. Curr Opin Endo Diab Obes 2013; 20(5) 485-94

## Cholesterol and Cancer

| Study | Number of participants | Association studied | OR/HR |
|---|---|---|---|
| Framingham Offspring Cohort | 3,278 | VLDL-C and overall cancer risk | 1.54 |
| Atherosclerosis Risk in Communities (ARIC) | 7,575 | Low HDL-C (<50 mg/dL) and breast cancer incidence | 1.67* |
| Malmö Preventive Project (Sweden) | 9,738 | Total cholesterol and breast cancer risk | 1.64** |
| Furberg et al., 2004 (Norway) | 38,823 | HDL-C (>1.64 mmol/L vs <1.20 mmol/L) and breast cancer risk | 0.43** |
| ATBC Cancer Prevention Study (Finland) | 27,074 | HDL-C (highest vs lowest quintile) and risk of Non-Hodgkin Lymphoma | 0.35 |
| Andreotti et al., 2008 (China) | 460+858 | HDL-C (lowest vs median quintile) and gallbladder/bile duct cancer risk | 11.63/16.81 |
| Magura et al., 2008 (North Dakota) | 312+319 | Total cholesterol, LDL-C (high vs normal), HDL-C (low vs normal) and prostate cancer risk | 1.64 (TC) 1.60 (LDL-C) 1.57 (HDL-C) |
| Atherosclerosis Risk in Communities (ARIC) | 14,547 | Low HDL-C and lung cancer incidence | 1.45 |

## Diet, Blood Pressure, Physical Activity, Smoking & Cancer

- **Inflammatory** Dietary Patterns: increase cancer risk

- 10% Increase in **Ultra-Processed** food: 11% higher all cancer risk; 12% higher breast cancer risk

- **Hypertension** increases cancer risk

- Lack of **Physical Activity** increases cancer risk

- **Smoking** increases cancer risk

*Fiolet, BMJ, 2018; Tabung, Jama Oncology, 2018;*

# Life's Simple 7 from the Population Perspective:
# The African American Male Wellness Walk Initiative
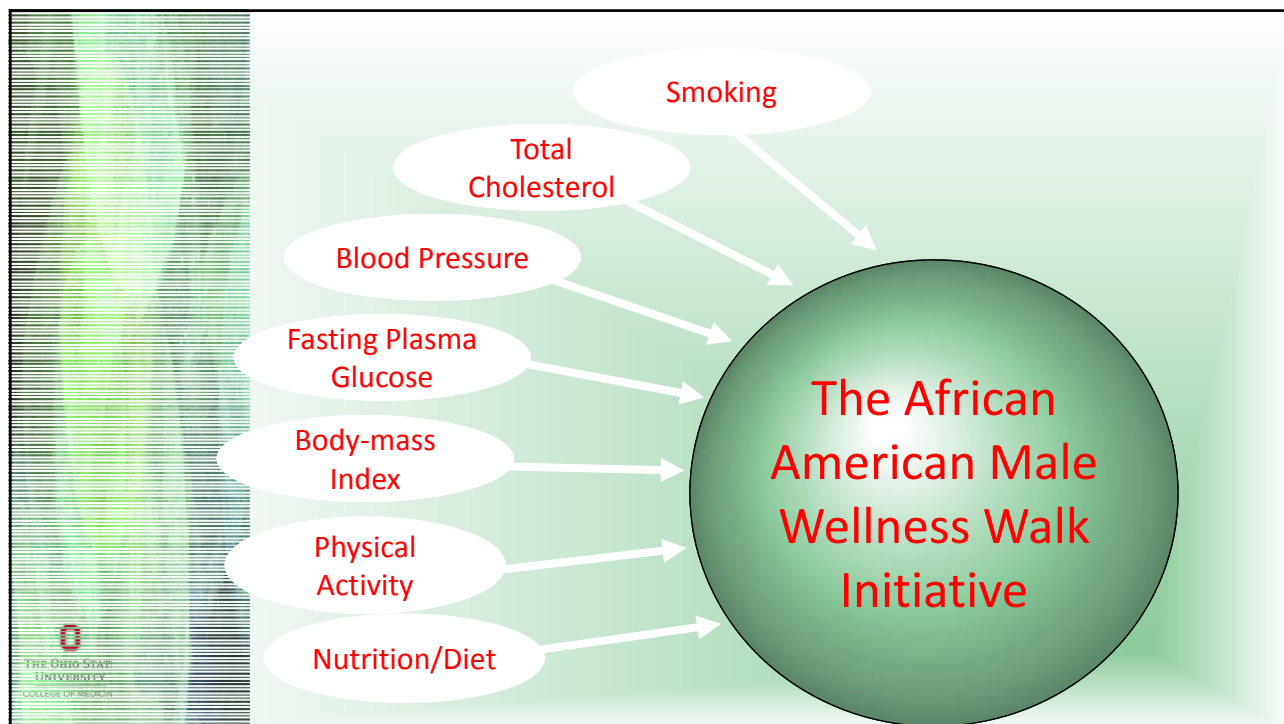


# Life's Simple 7: Saving Black Men's Lives

# Life's Simple 7: Poor, Intermediate, and Ideal Health

| Goal/Metric | Poor health | Intermediate health | Ideal health |
|---|---|---|---|
| Current smoking | Yes | -- | None |
| Total cholesterol | ≥ 240 mg/dl | 200-239 mg/dl or treated to goal | <200 mg/dl |
| Blood pressure | SBP ≥140 or DBP ≥90 mmHg | SBP 120-139 or DBP 80-89 mmHg or treated to goal | <120/<80 mmHg |
| Body mass index | ≥30 kg/m$^2$ | 25-29.9 kg/m$^2$ | <25 kg/m$^2$ |
| Physical activity | Exercise < 3 times per week | -- | Exercise 3 or more times per week |
| Healthy diet | -- | -- | -- |
| Fasting glucose | ≥126 mg/dl | 100-125 mg/dl or treated to goal | <100 mg/dl |
| Random glucose | ≥200 mg/dl | 140-199 mg/dl | < 140 mg/dl |

THE OHIO STATE UNIVERSITY COLLEGE OF MEDICINE

THE NATIONAL AFRICAN AMERICAN MALE WELLNESS WALK INITIATIVE

## AAMWWI Health Screenings

- 562 Participants in 2015
- 707 Participants in 2016
- 859 Participants in 2017

THE OHIO STATE UNIVERSITY COLLEGE OF MEDICINE

THE NATIONAL AFRICAN AMERICAN MALE WELLNESS WALK INITIATIVE

## AAMWWI Health Screenings

# 2015: 47 [18-81] Years of Age
# 2016: 48 [18-85] Years of Age
# 2017: 49 [18-85] Years of Age



## Smoking

| Life's Simple 7 | Poor health | Intermediate health | | Ideal health |
|---|---|---|---|---|
| Current smoking | Yes | -- | | None |
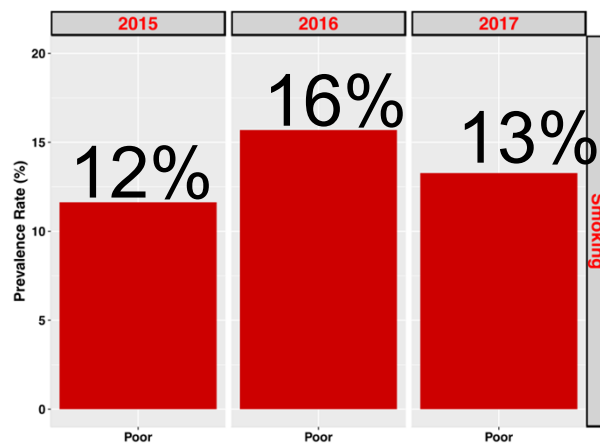
## Total Cholesterol

| Life's Simple 7 | Poor health | Intermediate health | Ideal health |
|---|---|---|---|
| Total cholesterol | ≥ 240 mg/dl | 200-239 mg/dl or treated to goal | <200 mg/dl |



Prevalence Rate (%) — Total Cholesterol

2015: 6% (Poor) — 2016: (Poor) — 2017: 5% (Poor)

Cholesterol
Good (HDL)   Bad (LDL)
Blood vessel

---
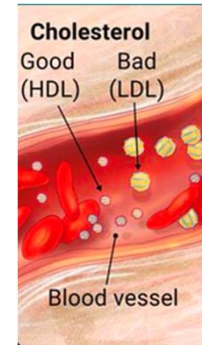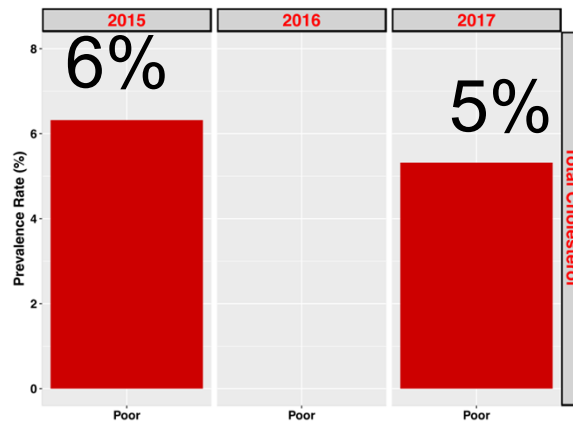
## Blood Pressure

| Life's Simple 7 | Poor health | Intermediate health | Ideal health |
|---|---|---|---|
| Blood pressure | SBP ≥140 or DBP ≥90 mmHg | SBP 120-139 or DBP 80-89 mmHg or treated to goal | <120/<80 mmHg |



Prevalence Rate (%) — Blood Pressure
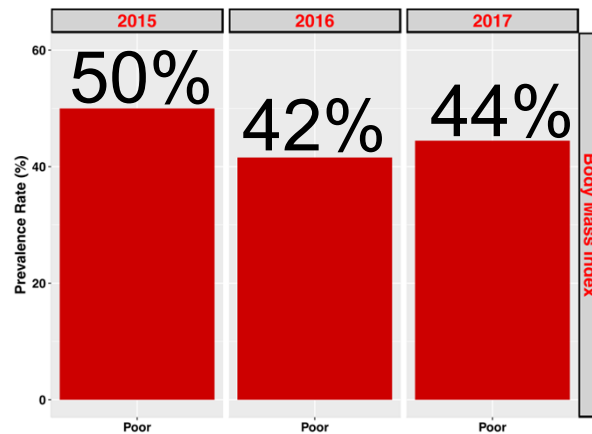
2015: 49% (Poor) — 2016: 45% (Poor) — 2017: 54% (Poor)
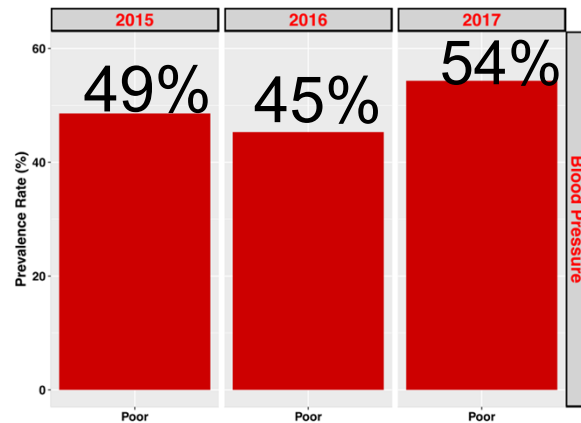
**2017: Average Blood Pressure 140 / 86 mmHg**

## Body Mass Index

| Life's Simple 7 | Poor health | Intermediate health | Ideal health |
|---|---|---|---|
| Body mass index | ≥30 kg/m² | 25-29.9 kg/m² | <25 kg/m² |



**2017: Average Body Mass Index 30.1 kg/m²**

## Physical Activity

| Life's Simple 7 | Poor health | Intermediate health | Ideal health |
|---|---|---|---|
| Physical activity | Exercise < 3 times per week | -- | Exercise 3 or more times per week |
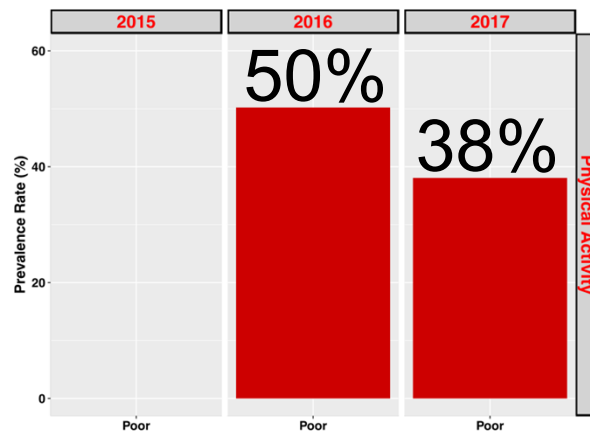
## Glucose

| Life's Simple 7 | Poor health | Intermediate health | Ideal health |
|---|---|---|---|
| Fasting glucose | ≥126 mg/dl | 100-125 mg/dl or treated to goal | <100 mg/dl |
| Random glucose | ≥200 mg/dl | 140-199 mg/dl | < 140 mg/dl |
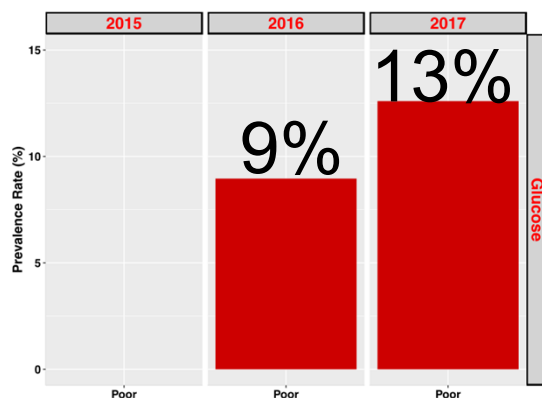


**2017: Average Fasting Glucose 111 mg/dL**

# 2017: Number of Life's Simple 7 Metrics
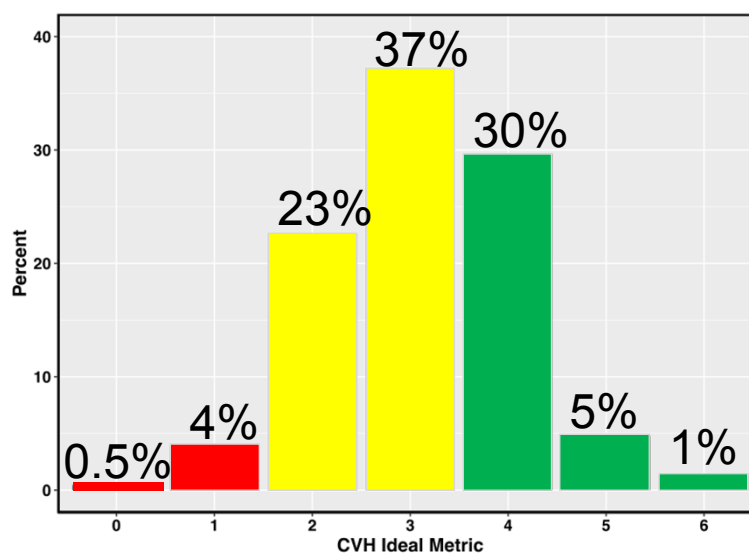
# Life's Simple 7
# and
# Social Determinants of Health

## Social determinants of health are inextricably linked to poorer outcomes

- Whites - Higher neighborhood socioeconomic status is strongly associated with better Life's Simple 7 status, even after adjustment for individual socioeconomic status

- Blacks – The association of neighborhood socioeconomic status with Life's Simple 7 status was much weaker in blacks and was largely attenuated with adjustment for I-SES

- Overall, Blacks have lower levels of Life's Simple 7



Howard, Circ, 2016; healthypeople.gov

# The Columbus Dispatch

## One-third of families experience food 'insecurity,' double previous estimates

By Rita Price
The Columbus Dispatch
Posted Jan 26, 2018 at 5:04 PM
Updated Jan 26, 2018 at 8:17 PM

A study that looked at Columbus neighborhood "food environments" found disparities in access, affordability and availability that could be much worse than previously understood.

The results are yet another indication — one that isn't always easy to see — of the city deep economic divides.

## - Michelle Kaiser, PhD, OSU -

# The Columbus Dispatch

## Officials question Columbus' No. 2 spot as most economically segregated

By Earl Rinehart, The Columbus Dispatch
Posted Mar 9, 2015 at 12:01 AM
Updated Mar 9, 2015 at 11:13 AM

Jason Reece,
PhD
Ohio State

# The Columbus Dispatch

## Income Inequality: Despite thriving economy, many in central Ohio struggle in low-wage jobs

By Mark Ferenchik By Rita Price
Posted Mar 19, 2017 at 3:00 AM
Updated Mar 19, 2017 at 6:21 AM

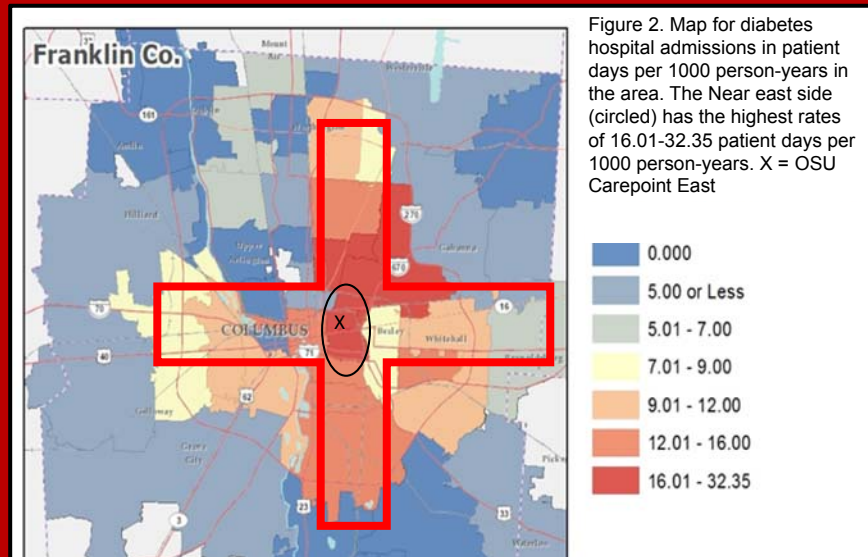# Vulnerability Map, Columbus, OH
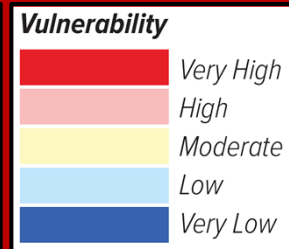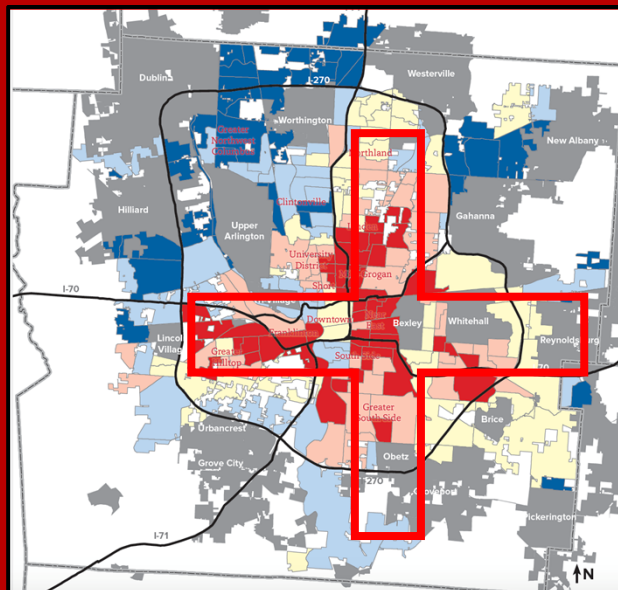


**Social Determinants of Health**

**OSU Kirwan Institute**

## Diabetes Hospital Admissions



Figure 2. Map for diabetes hospital admissions in patient days per 1000 person-years in the area. The Near east side (circled) has the highest rates of 16.01-32.35 patient days per 1000 person-years. X = OSU Carepoint East

| | |
|---|---|
| ▉ | 0.000 |
| ▉ | 5.00 or Less |
| ▉ | 5.01 - 7.00 |
| ▉ | 7.01 - 9.00 |
| ▉ | 9.01 - 12.00 |
| ▉ | 12.01 - 16.00 |
| ▉ | 16.01 - 32.35 |



OP-ED  OP-ED  OPINION

Why do poor Americans eat so unhealthfully? Because junk food is the only indulgence they can afford

Poor parents honored their kids' junk food requests to nourish them emotionally, not to harm their health.

A Taste of Inequality: Food's Symbolic Value across the Socioeconomic Spectrum - Priya Fielding-Singh - 2017
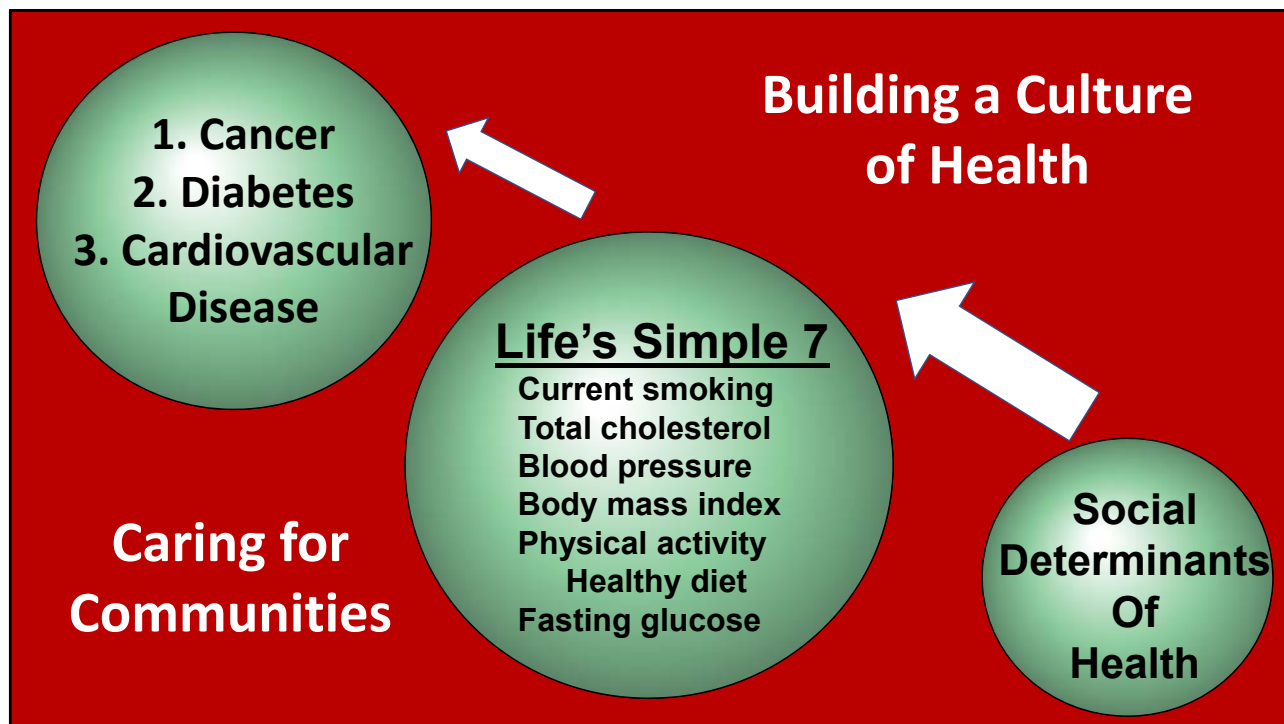
21

## Objectives

1. What are the American Heart Association's Life's Simple 7?

2. What is the relationship of individual components of Life's Simple 7 with cancer?

3. Life's Simple 7 from the Population Perspective: The African American Male Wellness Walk Initiative

4. Life's Simple 7 and Social Determinants of Health

## Acknowledgements

- Darrell Gray, MD, MPH
- Sherita H. Golden, MD, MHS
- Michael Sack, M.D., Ph.D.
- Kenneth C. Edelin, M.D.
- Christopher Saudek, MD
- Willa A. Hsueh, MD
- Kathleen Dungan, MD, MPH
- Kwame Osei, MD
- OSU Division of Endocrinology



# Thank You!

Joshua J. Joseph, MD

Joseph.117@osu.edu
@joshuajosephmd