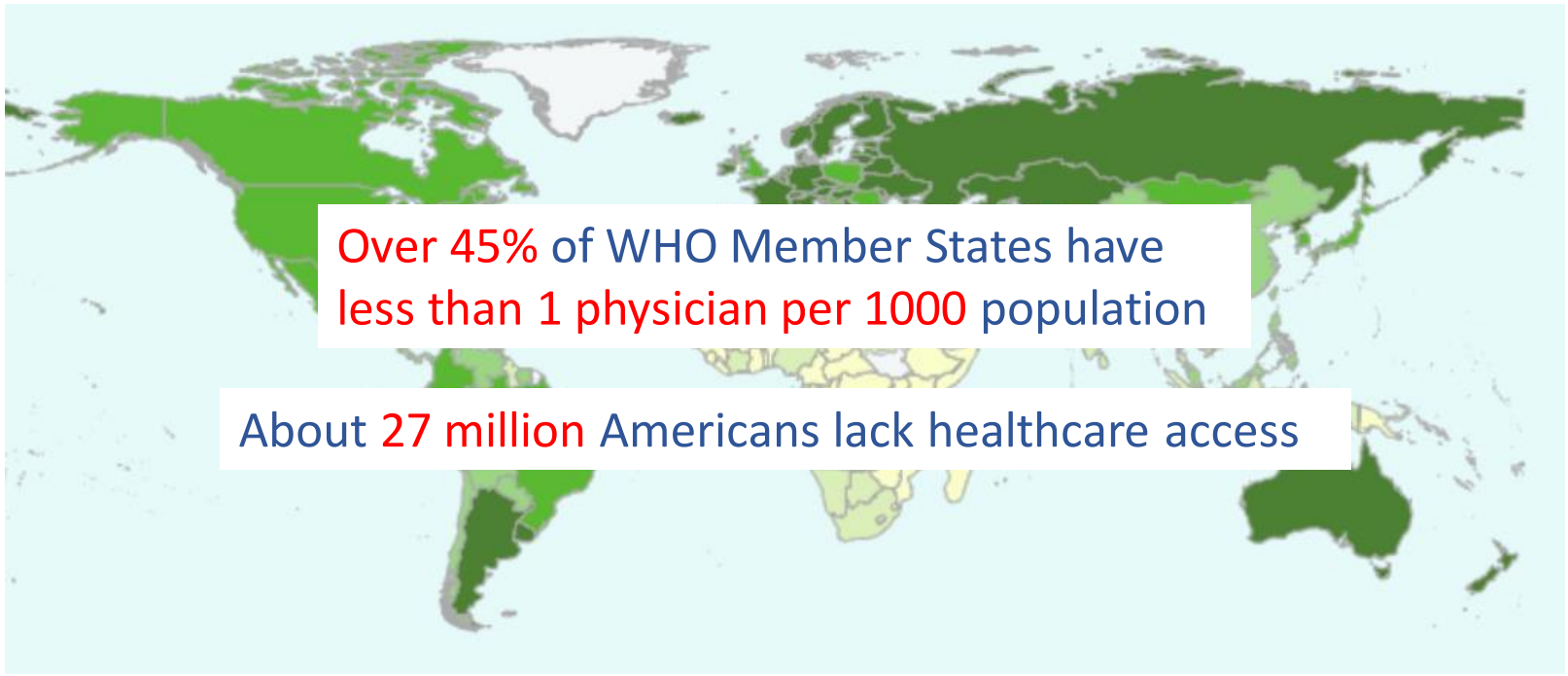



# Healthcare's Big Wave: Data

Shomit Ghose – May 4, 2021 – shomit@berkeley.edu

# Healthcare Access



# Healthcare's (Idealized) Asymptotic Goal #1

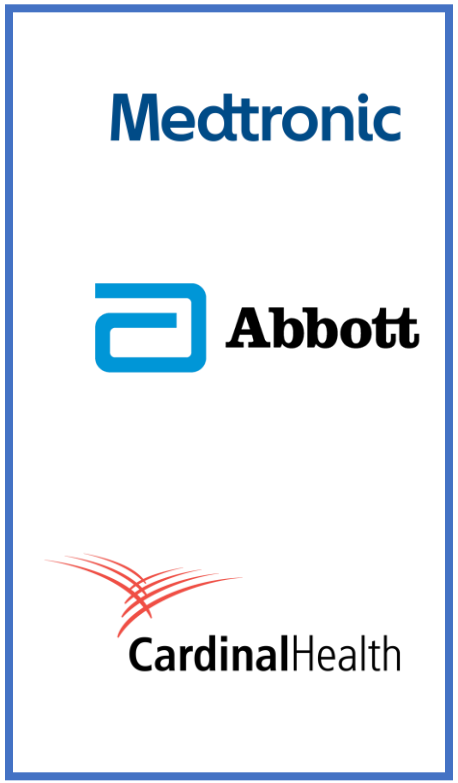
- That healthcare be accessible to everyone; a human right
  - ➢Scalable & frictionless

# Healthcare's (Idealized) Asymptotic Goal #2

- That we all die in our sleep at age 115 with $0 in lifetime healthcare needs
  - ➢ Predictive & preventive

# Who Will Disrupt Healthcare's Future?


Drug companies

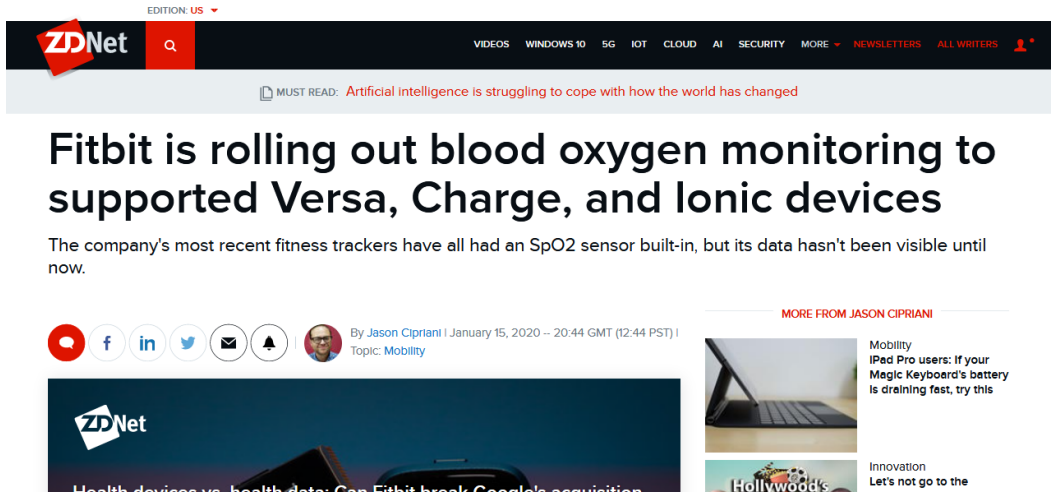



Device companies


Data companies

# Data Enables Healthcare to be…

## … Frictionless & scalable




## … Predictive & preventive

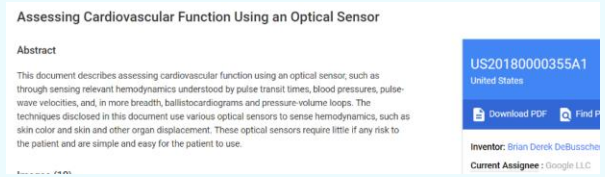

**Data brings healthcare access, data brings healthcare disruption**


# Can "All" Data Speak?

- How about negative online reviews for scented candles…
- … correlating with COVID-19 outbreak?(!)

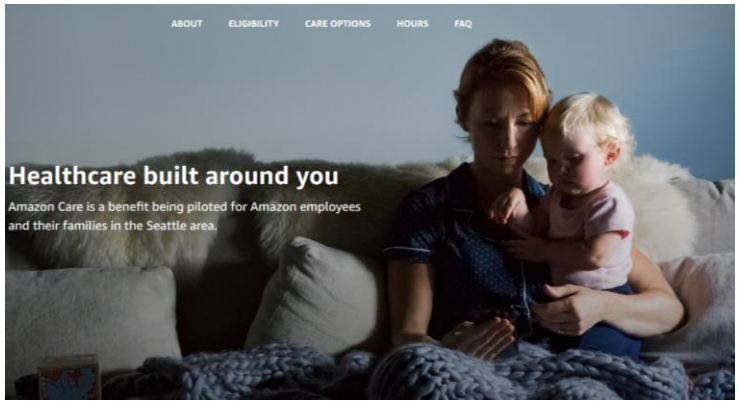
# The Data Monopolies Understand…

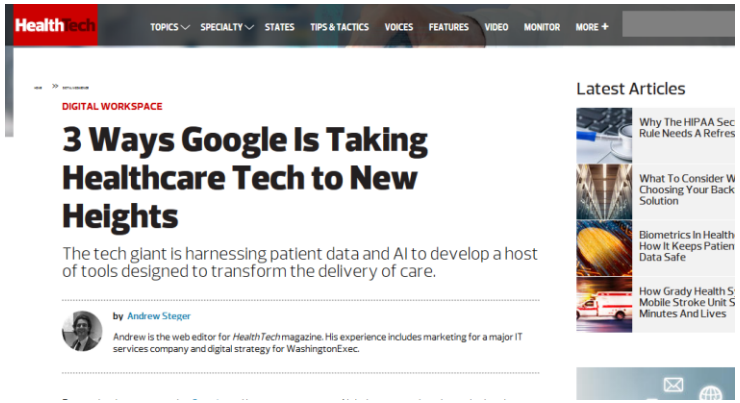
- … And are aggressively pursuing data-driven solutions to scalable healthcare

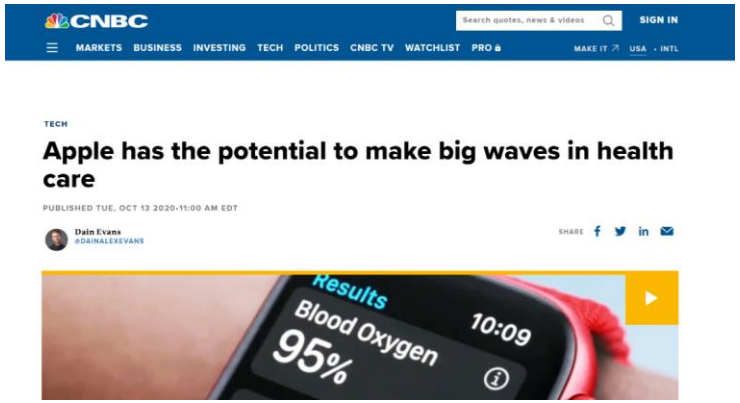




# Providing the Counterweight to the Data Monopolies?

## Data Lake?




- Big Tech is disrupting healthcare using data
- Are we well served if the only source of scalable healthcare is from these companies?
  - As healthcare consumers?
  - As healthcare innovators?

# The Opportunity: Impact-driven Innovation

- If *a* = impact and *b* = complexity…
- … then identify the unsolved *a*/*b* innovation equations with the biggest values of *a*, not *b*
- Digital healthcare solutions have biggest impact due to ubiquity of mobile devices and our deluge of data

# Digital Health: A Broad Spectrum

Forbes

131,259 views | Jan 16, 2019, 12:02am EST

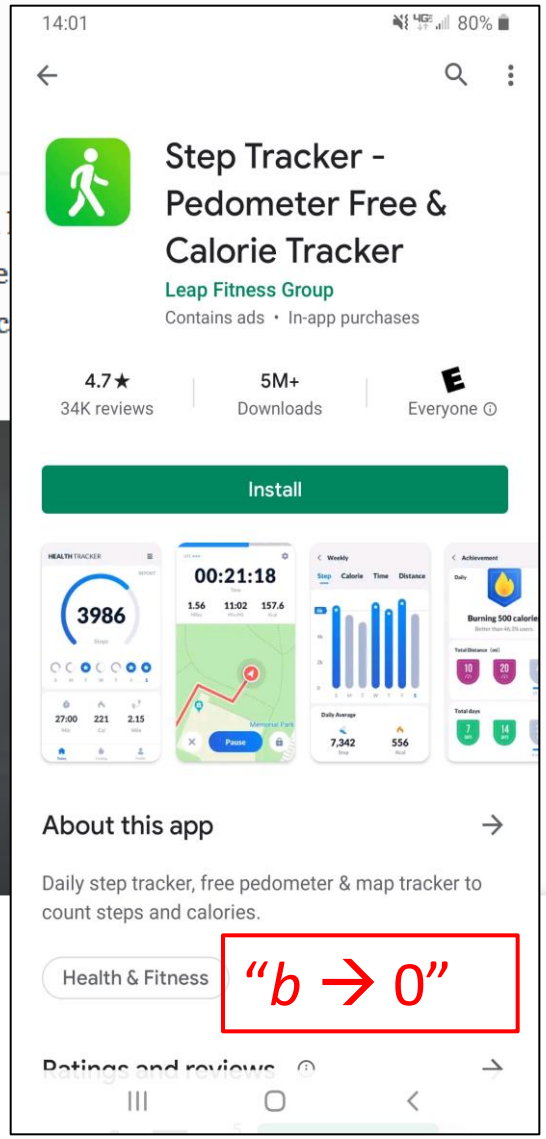
## Novartis CEO Who Wanted To Bring Tech Into Pharma Now Explains Why It's So Hard

**David Shaywitz** Contributor

Healthcare

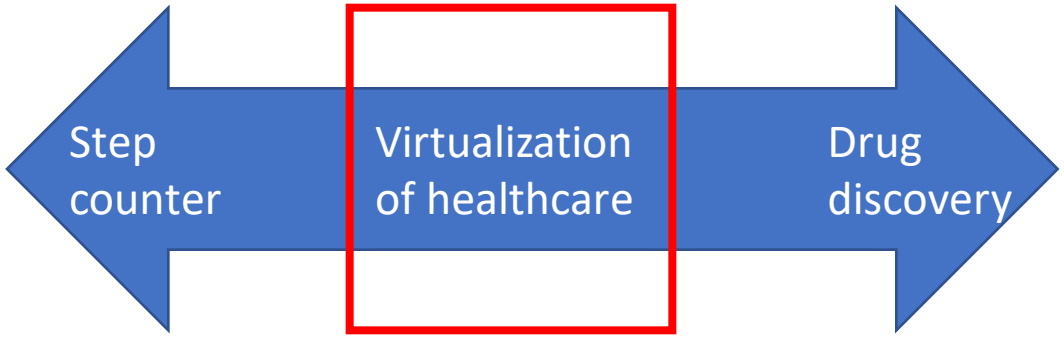
"$b \rightarrow \infty$"

The current challenge for data science and technology (DST) in
the "dancing bear" stage, where "the wonder is not how well the
dances at all." It's time for DST to evolve past the novelty public
demonstrate its ability to materially impact health and disease.



# Impact Innovation

- Start-ups will never have enough $ to innovate on “large *b*” problems. Leave that to the giants.
- Innovate on large *a*, with tractable *b*



# With the Right Data You Can Do: a/b Diagnosis

Suicidal Ideation Detection: A Review of Machine Learning Methods and Applications

Shaoxiong Ji, Shirui Pan, *Member, IEEE*, Xue Li, Erik Cambria, *Senior Member, IEEE*, Guodong Long, and Zi Huang

*Abstract*—Suicide is a critical issue in modern society. Early detection and prevention of suicide attempts should be addressed to save people's life. Current suicidal ideation detection methods include clinical methods based on the interaction between social workers or experts and the targeted individuals and machine learning techniques with feature engineering or deep learning for automatic detection based on online social contents. This is the first survey that comprehensively introduces and discusses the methods from these categories. Domain-specific applications of suicidal ideation detection are also reviewed according to their data sources, i.e., questionnaires, electronic health records, suicide notes, and online user content. To facilitate further research, several specific tasks and datasets are introduced and summarized. Finally, we summarize the limitations of current work and provide an outlook of further research directions.

suicidal thoughts [2]. According to the American Foundation for Suicide Prevention (AFSP), suicide factors fall under three categories: health factors, environment factors, and historical factors [3]. Ferrari et al. [4] found that mental health issues and substance use disorders are attributed to the factors of suicide. O'Connor and Nock [5] conducted a thorough review of the psychology of suicide and summarized psychological risks as personality and individual differences, cognitive factors, social factors, and negative life events.

Suicidal ideation detection is to determine whether the person has suicidal ideation or thoughts by given tabular data of a person or textual content written by a person. Due to the advances in social media and

LIVESCIENCE

'Silent hypoxia' may be killing COVID-19 patients. But there's hope.

The Journal of the Acoustical Society of America

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Full . Published Online: 21 April 2016

Speaking one's mind: Vocal biomarkers of depression and Parkinson disease

The Journal of the Acoustical Society of America 139, 2193 (2016); https://doi.org/10.1121/1.4950530

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Gregory Ciccarelli
more...

TOPICS
- Diseases and conditions
- Fuso
- Biomarker discovery
- Speech production
- Machine learning
- Speech communication

ABSTRACT

Mental health disorders affect one in four adult Americans and have a staggering impact on the economy. Improved assessment and early detection of mental health state can reduce this impact. Voice analysis has been linked to depression and other mental health disorders. However, difficulties in data collection, variation in collection methods, and computational demands of analysis methods have limited the use of voice in mental health assessment. The pervasive use of smartphones offers a unique opportunity to understand mental health symptoms and speech variation in large groups. We have developed open source mobile applications to collect data and developed voice-based algorithms for predicting mental health state in major depressive disorder and Parkinson disease. We demonstrate the use of biophysical

GIZMODO

Fitbit Really Wants to Be Able to Diagnose Your Sleep Apnea

THE LANCET Digital Health

Harnessing wearable device data to improve state-level real-time surveillance of influenza-like illness in the USA: a population-based study

Summary

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Depression & Anxiety

RESEARCH ARTICLE | Free Access

Speech-based markers for posttraumatic stress disorder in US veterans

Charles R. Marmar, Adam D. Brown, Meng Qian, Eugene Laska, Carole Siegel, Meng Li, Duna Abu-Amara, Andreas Tsiartas, Colleen Richey, Jennifer Smith, Bruce Knoth, Dimitra Vergyri

First published: 22 April 2019 | https://doi.org/10.1002/da.22890

PLOS ONE

Point-of-care, smartphone-based, dual-modality, dual-view, oral cancer screening device with neural network classification for low-resource communities

# With the Right Data You Can Do: a/b Prevention

NCBI Resources How To

PMC US National Library of Medicine National Institutes of Health

PMC Advanced Journal list

Journal List > Internet Interv > v.6; 2016 Nov > PMC6096297

ELSEVIER Internet Interventions

Internet Interv. 2016 Nov; 6: 89–106. PMCID: PMC6096297

Published online 2016 Nov 2. doi: 10.1016/j.invent.2016.10.002 PMID: 30135818

Gamification for health and wellbeing: A systematic review of the literature

Daniel Johnson,[a,*] Sebastian Deterding,[b] Kerri-Ann Kuhn,[a] Aleksandra Staneva,[a] Stoyan Stoyanov,[a] and Leanne Hides[a]

Author information ▸ Article notes ▸ Copyright and License information Disclaimer

Internet Interv

LSE Research Online

LSE The London School of Economics and Political Science

Benjamin G. Voyer

'Nudging' behaviours in healthcare: insights from behavioural economics

Article (Accepted version) (Refereed)

Original citation:

Voyer, Benjamin G. (2015) *'Nudging' behaviours in healthcare: insights from behavioural economics.* British Journal of Healthcare Management, 21 (3). pp. 130-135. ISSN 1358-0574

PLOS ONE

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RESEARCH ARTICLE

Testing the decoy effect to increase interest in colorectal cancer screening

Sandro Tiziano Stoffel, Jiahong Yang, Ivo Vlaev, Christian von Wagner

Published: March 26, 2019 • https://doi.org/10.1371/journal.pone.0213668

Article Authors Metrics Comments Media Coverage

Correction

Abstract

Introduction

Study 1

Study 2

General discussion

Supporting information

References

Reader Comments (0)

Media Coverage (0)

Figures

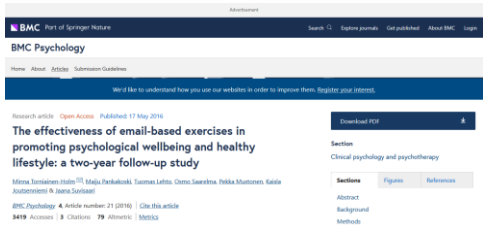
Correction

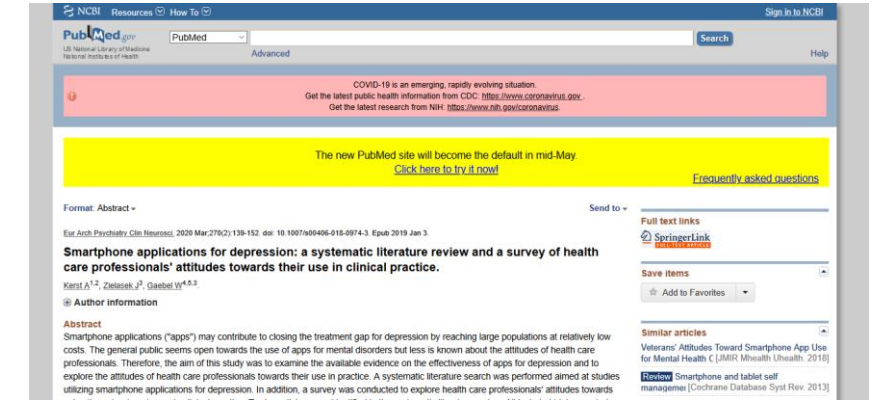
10 Jul 2019: Stoffel ST, Yang J, Vlaev I, von Wagner C (2019) Correction: Testing the decoy effect to increase interest in colorectal cancer screening. PLOS ONE 14(7): e0219811. https://doi.org/10.1371/journal.pone.0219811 | View correction

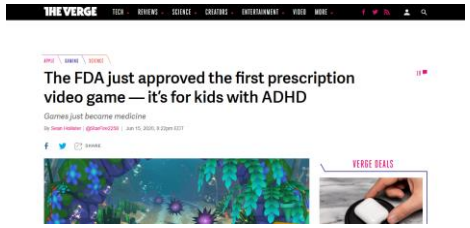
Abstract

Literature on consumer choice has demonstrated that the inclusion of an inferior alternative choice (decoy) can increase interest in a target product or action. In two online studies, we tested the impact of decoys on the probability of previous non-intenders to have a screening test which could significantly lower their chances of dying of colorectal cancer. We find that the presence of a decoy increased the probability to choose screening at the target hospital (over no screening) from 39% to 54% and 37% to 59% depending on how many hospital attributes were communicated and how strongly the decoy was dominated by the target. We also show that the presence of the decoy was associated with lower levels of reported decisional complexity while not undermining information seeking and knowledge acquisition. These findings offer a 'proof of principle' that decoys have the potential to increase screening uptake without negatively influencing informed choice.

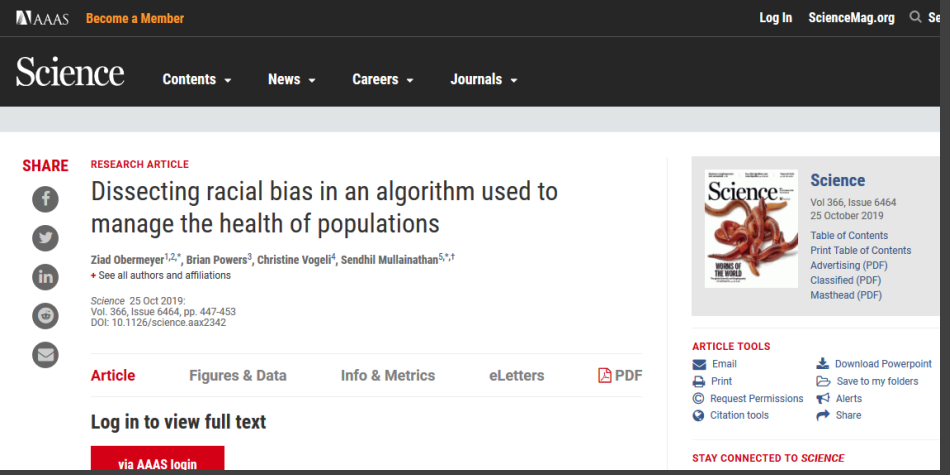
# With the Right Data You Can Do: a/b Treatment





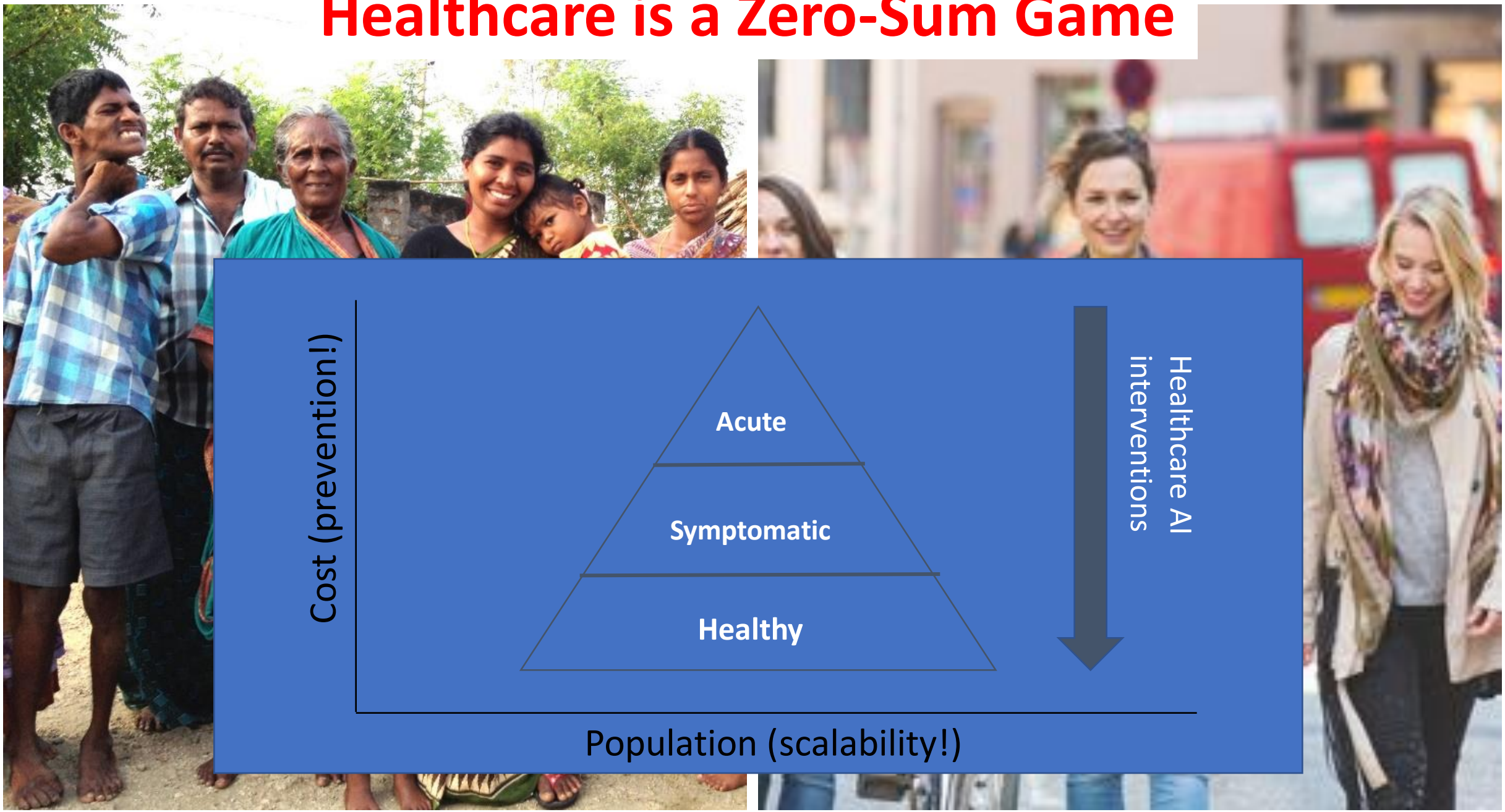





# But Only If You Have the Right Data

- Scale
- Accuracy
- Ethically-sourced
- Bias-free

# Healthcare is a Zero-Sum Game



# Summarizing: What Does This All Mean?

- Focus on tractable problems
- Focus on impact
- “a/b”: Using Data to deliver healthcare that is…
  - Scalable and frictionless
  - Predictive and preventive
- Simple! ☺

**Obrigada!**

# Riding the Data Wave