

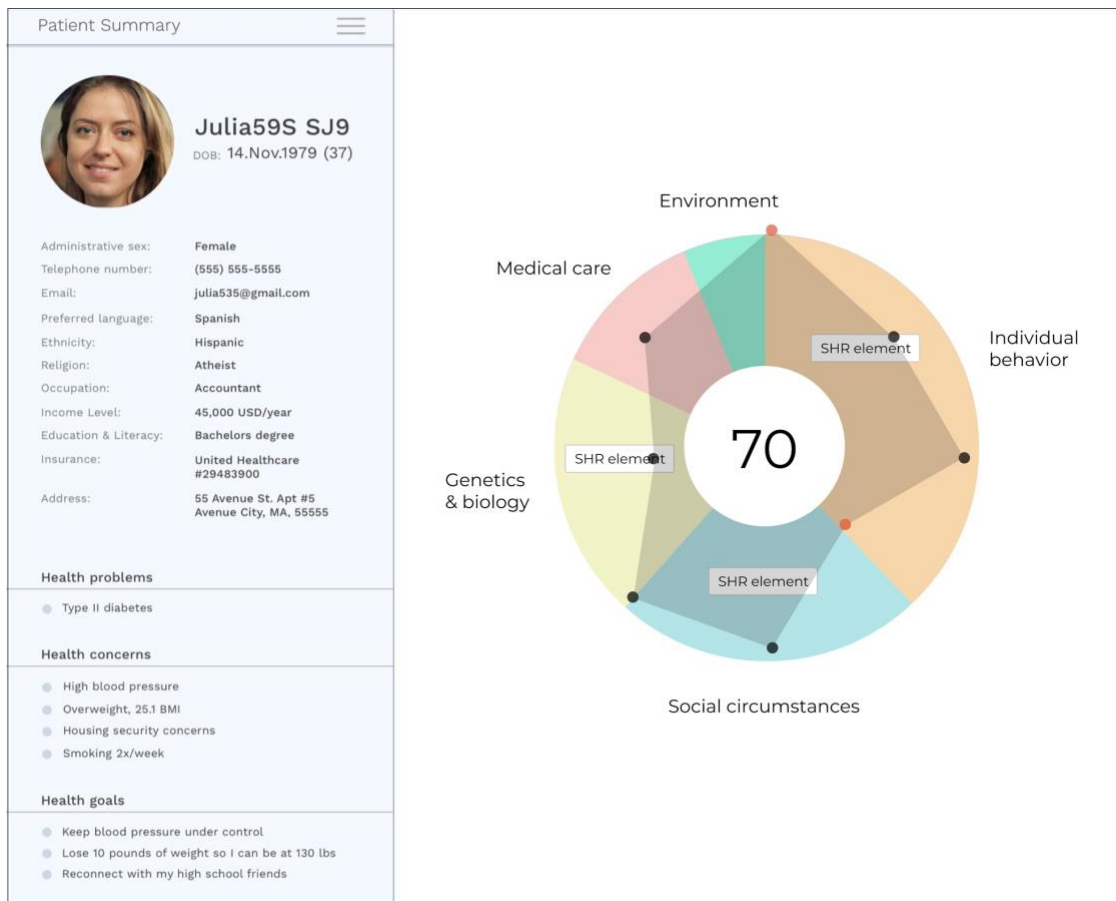
DETERMINANTS OF HEALTH HEALTHSCORE BRIEF

Edwin Choi (edwin@goinvo.com), Juhan Sonin (juhan@goinvo.com)
25.Mar.19

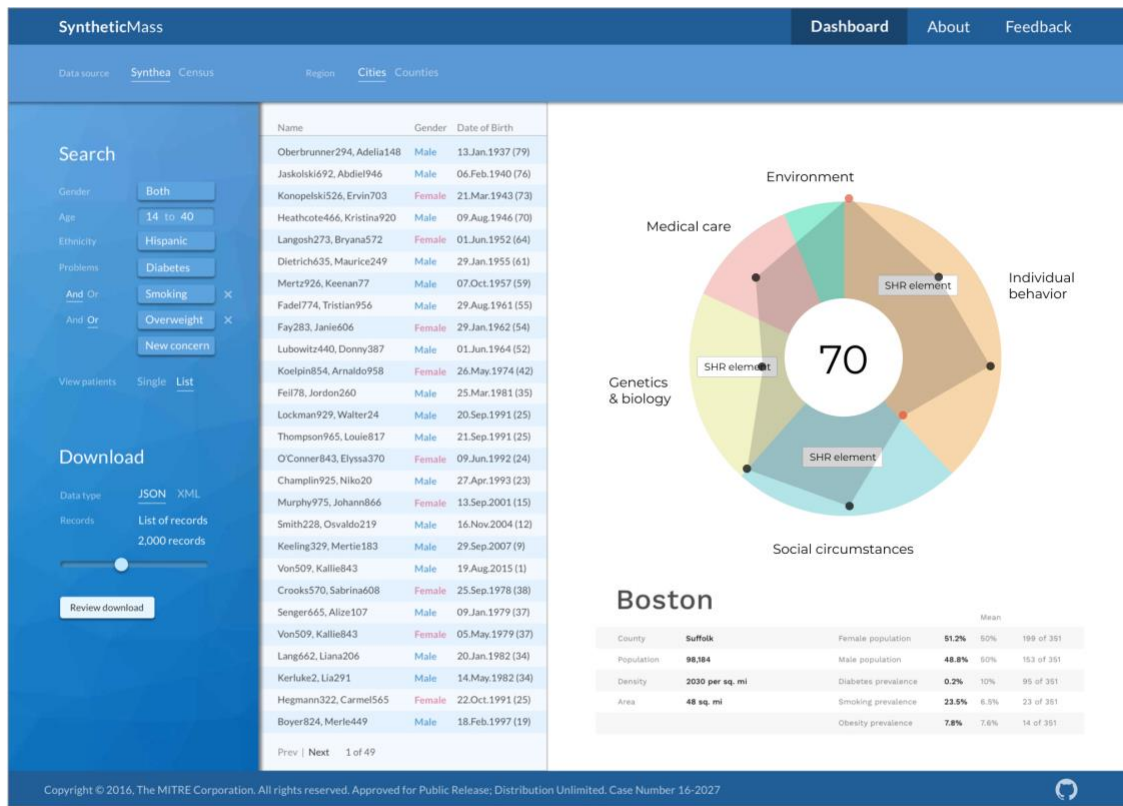
PROJECT SUMMARY

Design a data-driven summary of the determinants of health (DOH) to aid health decision making at the individual, and population level. View appendix A for possible stages of design. View appendix B for healthscore considerations.

Individual level



Population level



View additional designs in appendix C

OBJECTIVES

- Establish an accurate, high fidelity, evidence-based list of determinants in 2019
 - Identify an accurate, v01 minimum list of determinants
 - Identify the relationships/correlation between the determinants
 - Weight of each determinants impact to health outcome (overall 1 - N weighting)
- Explore the mapping of existing data models/elements to the DOH
 - Outline the minimum determinants SHR data elements
- Generate a composite score for the DOH using real data
 - Define the DOH and their criteria for data inclusion
 - Identify sources of DOH data
- Use the DOH to inform existing services
 - Evolve representation of social impact data in Synthea
 - Pilot use for individual health decision making
 - Pilot use for public health decision making

RESEARCH

- Scoring methodology
 - The Development and Application of a Composite Score for Social Determinants of Health
<https://support.sas.com/resources/papers/proceedings17/0882-2017.pdf>
 - Measuring early childhood health: a composite index comparing Colombian departments
https://www.researchgate.net/publication/254424704_Measuring_early_childhood_health_a_composite_index_comparing_Colombian_departments
 - View Appendix B for a possible scoring approach
- Similar services
 - Healthiest Communities Rankings
<https://www.usnews.com/news/healthiest-communities/rankings>
 - Dacadoo
<https://www.dacadoo.com/>
- Additional references may be viewed in Appendix D

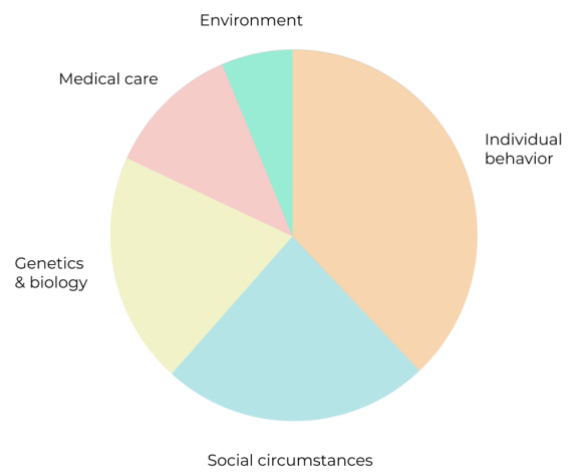
RESOURCES

- List of potential data elements and their sources
https://docs.google.com/spreadsheets/d/1yMVds2L3ZIB7P62Anx_rTtGo_Qhrqqq87Y1wj_r4Nx9k/edit?usp=sharing
- Methodology for organizing the determinants within the Determinants of Health viz
<https://docs.google.com/spreadsheets/d/1XkuFdOYs-czohqkVOJDUIYmUM0n0NktxBmrtUT00b14/edit?usp=sharing>
- Additional resources may be viewed in Appendix E

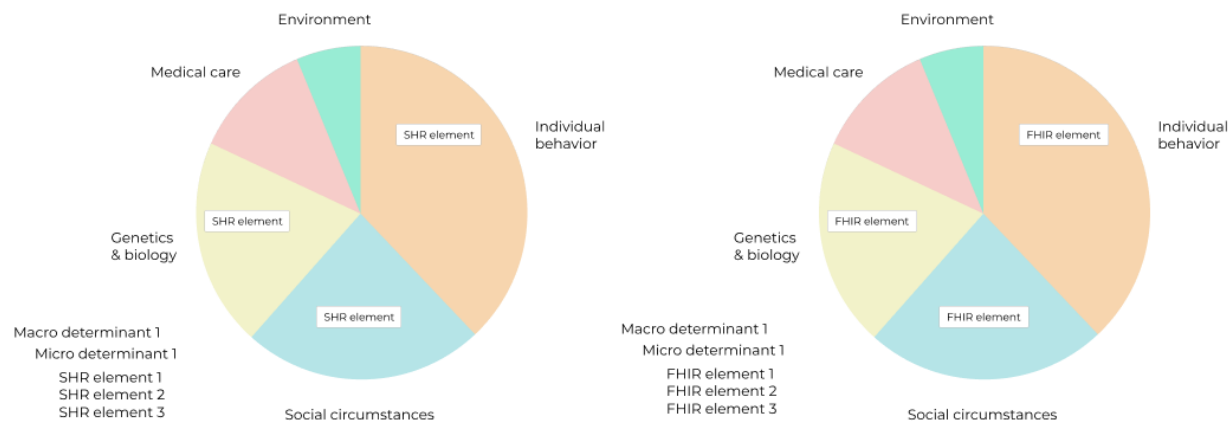
APPENDIX

APPENDIX A: STAGES OF DESIGN

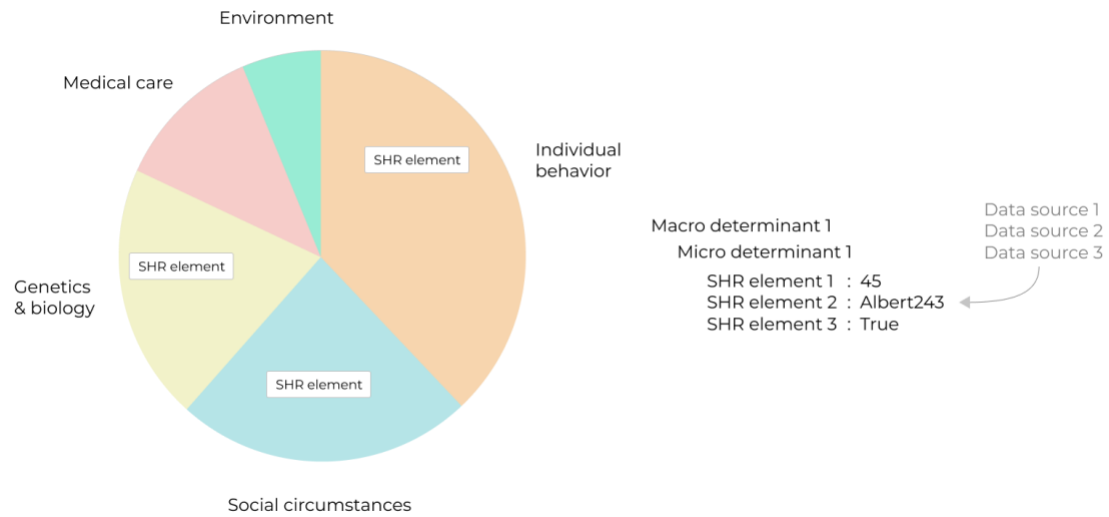
STAGE 1: THE DETERMINANTS OF HEALTH



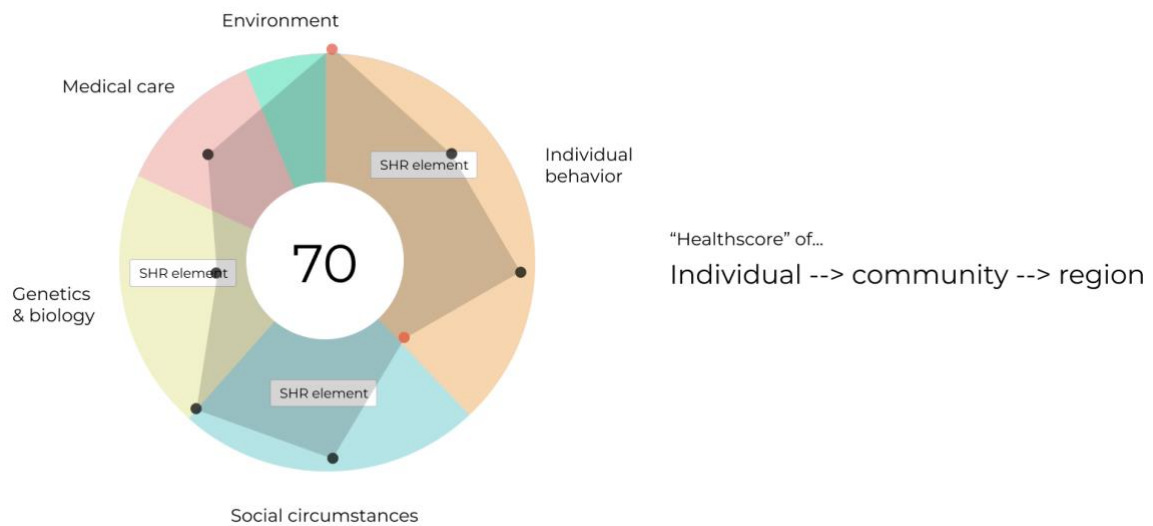
STAGE 2: MAPPING STANDARDS ONTO THE DETERMINANTS



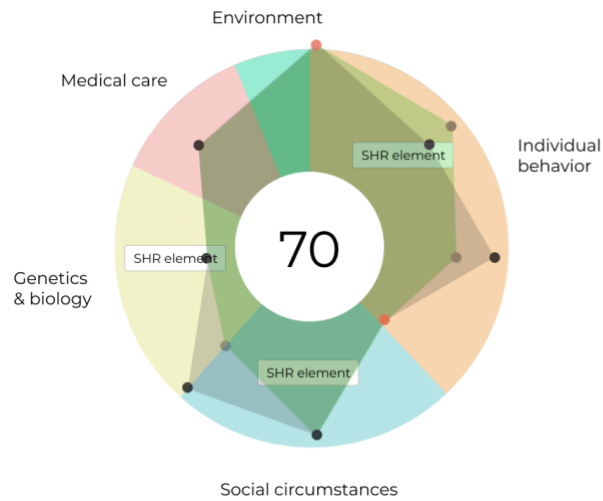
STAGE 3: POPULATING THE DETERMINANTS WITH DATA



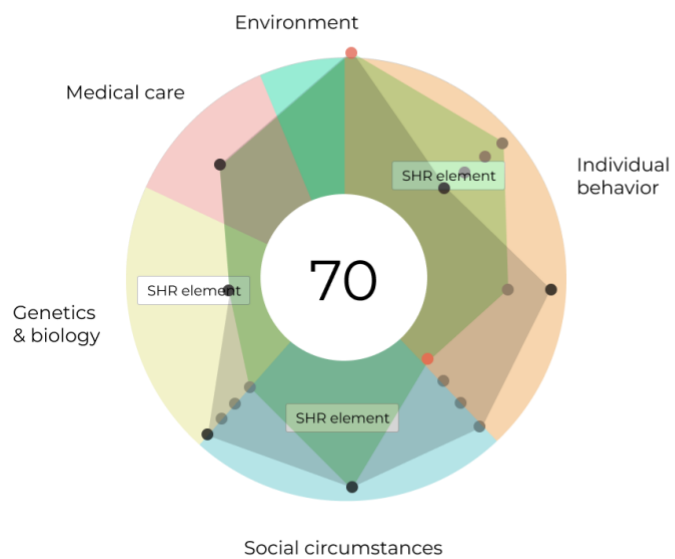
STAGE 4: HEALTHSCORE ACROSS SOCIETY



STAGE 5: HEALTH POLICY SIMULATOR



STAGE 6: PREDICTIVE HEALTH SYSTEM



"Healthscore" trajectory of...

Individual --> community --> region

APPENDIX B: HEALTHSCORE CONSIDERATIONS

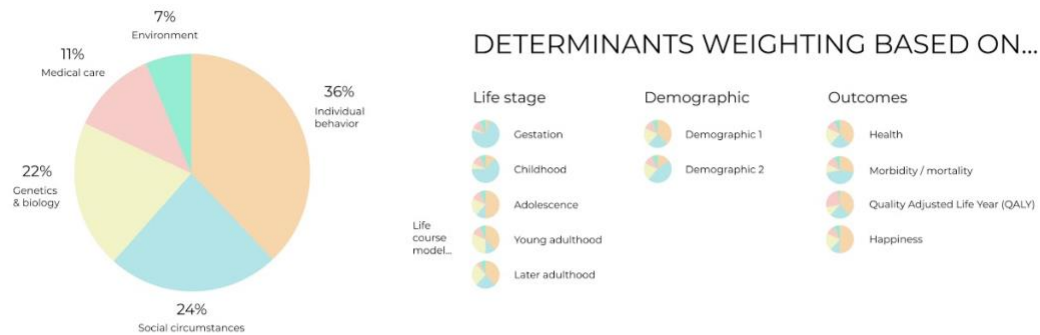
- Determinants

- Require a distinguishing capacity (e.g. has been in a car is not distinguishing because almost everyone's been in a car before)
 - Each determinant must correlate with the healthscore
 - Determinants need to be normalized/rescaled (e.g. the difference between doing sports or not vs difference between doing what # of sports are different)
 - Choice of the macrodomains is more important than the determinants within it
 - What are the causal pathways linking upstream determinants with downstream determinants?
 - It's easier to study & address downstream determinants, at the risk of failing to address fundamental causes
 - No single research study with encompass entire pathway from upstream factors to downstream factors and outcomes due to complex causal chains and long periods of time involved. Linking results from studies of specific pathway segments is realistic
 - Must design and study multidimensional interventions that address multiple factors simultaneously
 - How do the determinants regular gene expression & suppression (epigenetics)? How does the allostatic load index explain the impact of "x" determinant?
 - Determinants effect on health outcomes depending on demographic
 - Difficulty of obtaining information across multiple sectors (education, planning, housing, health, etc...)
 - After a threshold is reached for a determinant, it may no longer yield better health
 - Healthscore
 - Must focus on the individual
 - Estimates the *possibility* of having a 'worse' or 'better' health outcome
 - Does not include conditions or diseases
 - The health effects of upstream factors & interventions to address them, may not manifest for decades or generations
 - Longitudinal studies are expensive and access to longitudinal databases is limited in US
 - What is the connection to outcome? Mortality/morbidity, function, emotional/psychological, safety/physical
-
- Benefits
 - Payers can identify members that are higher risk
 - Makes the cumulation of effects more visible
 - Easier communication tool for multiple stakeholders
 - Makes complex, multidimensional concepts more understandable
 - Easier to quickly compare individuals with each other

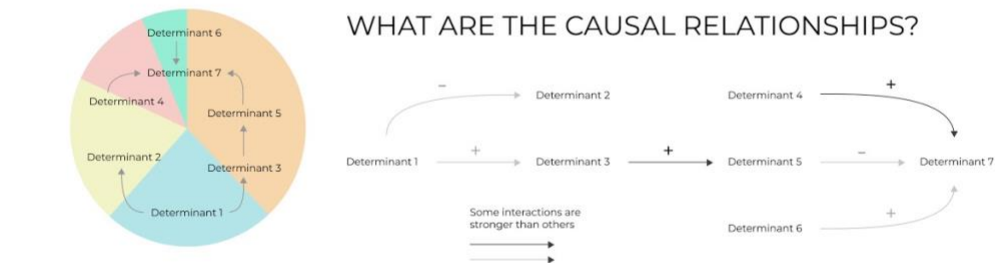
- Easier to examine situations at group demographics level
- Identifying levels of interventions: clinician/patient, delivery system, community
- Needs
 - Academics predominantly don't write about action on the DoH in ways that focus on upstream macrosocial factors in their research
- Potential resources/partnerships
 - World Health Organization (WHO) commission on Social Determinants of Health
 - MacArthur Foundation Network on Socioeconomic Status and Health
 - Robert Wood Johnson Foundation (RWJF) Commission to Build a Healthier America
 - Johns Hopkins University Center for Population Health Information Technology
 - Health Leads
- References
 - [paper] Pathways between socioeconomic determinants of health
<https://jech.bmj.com/content/58/4/327.full>
 - [paper] The Social Determinants of Health: Coming of Age
<https://www.annualreviews.org/doi/full/10.1146/annurev-publhealth-031210-101218>
 - [paper] The Social Determinants of Health: It's Time to Consider the Causes of the Causes
<https://journals.sagepub.com/doi/pdf/10.1177/003335491412915206>
 - [paper] A conceptual framework for action on the social determinants of health
https://apps.who.int/iris/bitstream/handle/10665/44489/9789241500852_eng.pdf;jsessionid=C72265A4725FE72082653293D6C63193?sequence=1

DETERMINANTS OF HEALTH HEALTHSCORE CONSIDERATIONS

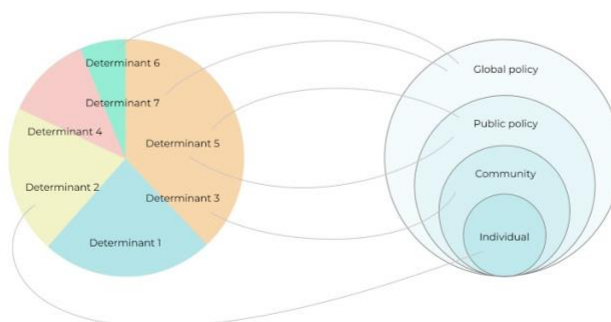
Edwin Choi (edwin@goinvo.com), Juhan Sonin (juhan@goinvo.com), 29.JAN.19



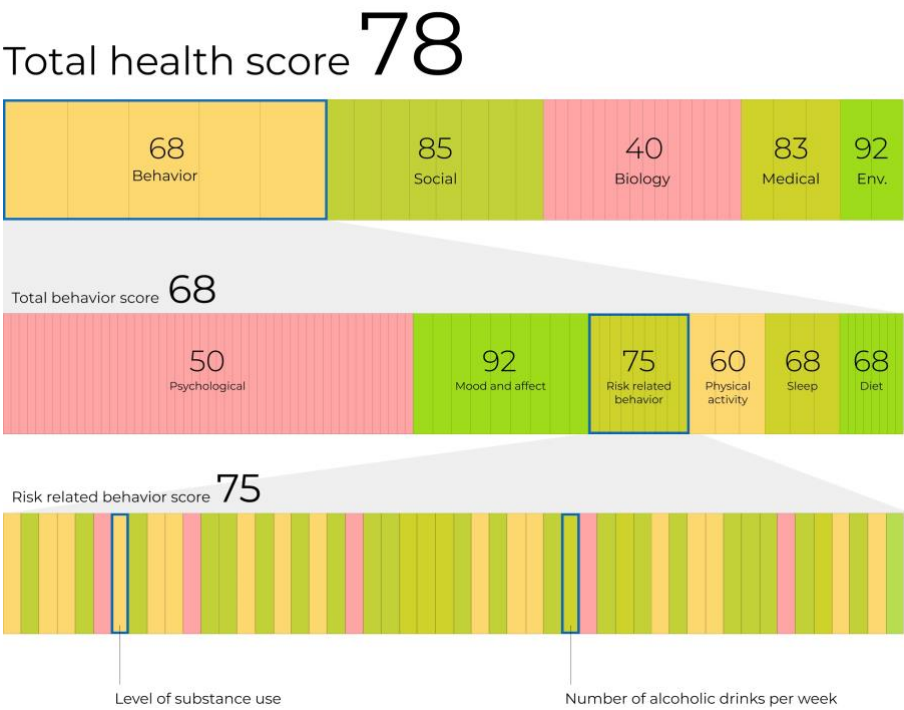
DETERMINANTS WORKFLOW



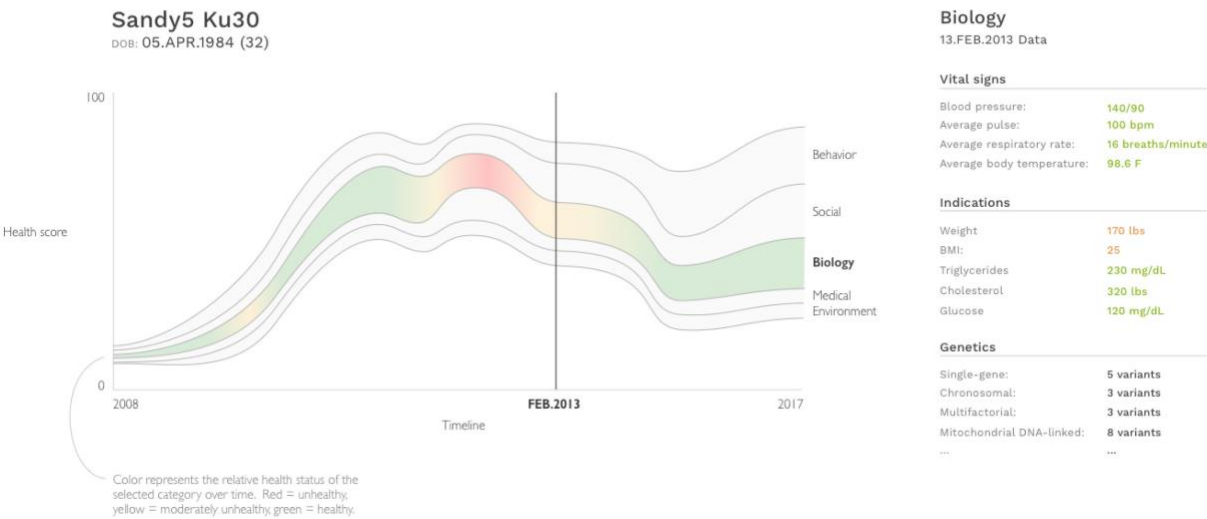
WHICH DETERMINANTS ARE ACTIONABLE? BY WHOM?



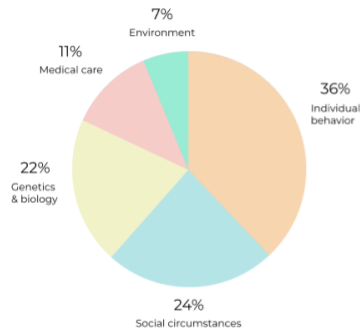
APPENDIX C: ADDITIONAL DESIGNS



Interaction



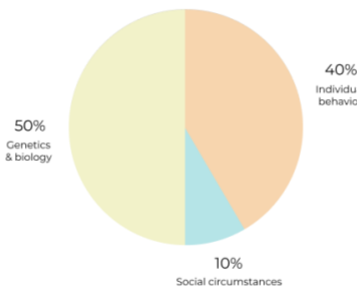
Determinants of Health



Sources

- NCHSTEP Social Determinants of Health (2014)...
- WHO The determinants of health...
- Healthypeople Social Determinants of Health...
- Etc...

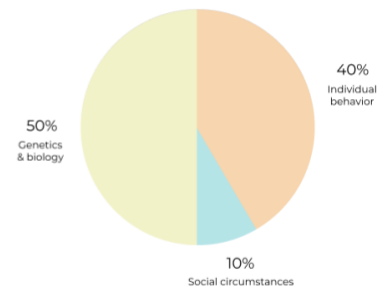
Determinants of Happiness



Sources

- Lyubomirsky, Sonya (2005). Pursuing happiness: the architect...
- Ferrer-i-Cardonell, Ada (2004). How Important is Methodology...
- Etc...

Determinants of Life Expectancy



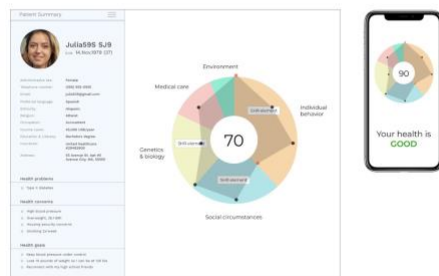
Sources

- Ketenci, Natalya (2017). Some determinants of life expectancy...
- Shaw W, James (2005). The Determinants of Life Expectancy...
- Etc...

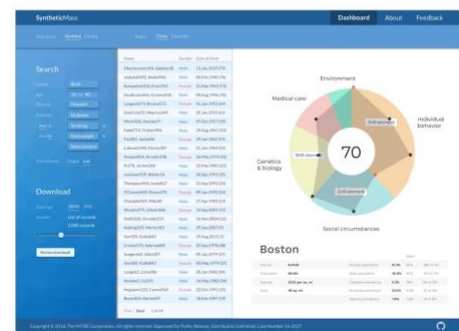
DETERMINANTS OF HEALTH HEALTHSCORE APPLICATIONS

Edwin Choi (edwin@goinvo.com), Juhan Sonin (juhan@goinvo.com), 30.JAN.19

PERSONAL HEALTH TRACKING



SYNTHETIC MASS VISUALIZER



"PROJECT CRUCIBLE" FOR HEALTH SERVICES



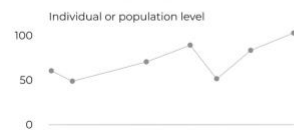
"PROJECT CRUCIBLE" FOR HEALTH STANDARDS



BEGIN REPOSITORY FOR INTERROGATING DETERMINANTS AND ITS STANDARD

- Individual behavior:
 - Psychological assets
 - Negative mood and affects
- Other risk related behavior:
 - Gun behavior
 - Sexual activity
 - Motor vehicle behavior
 - Summary for motor vehicle behavior. Definition.
 - Evidence for inclusion of determinant.
 - Reference 1
 - Reference 2
 - Etc...
- Physical activity
- Sleep patterns
- Diet patterns

DETERMINANTS VISUALIZER OVER TIME

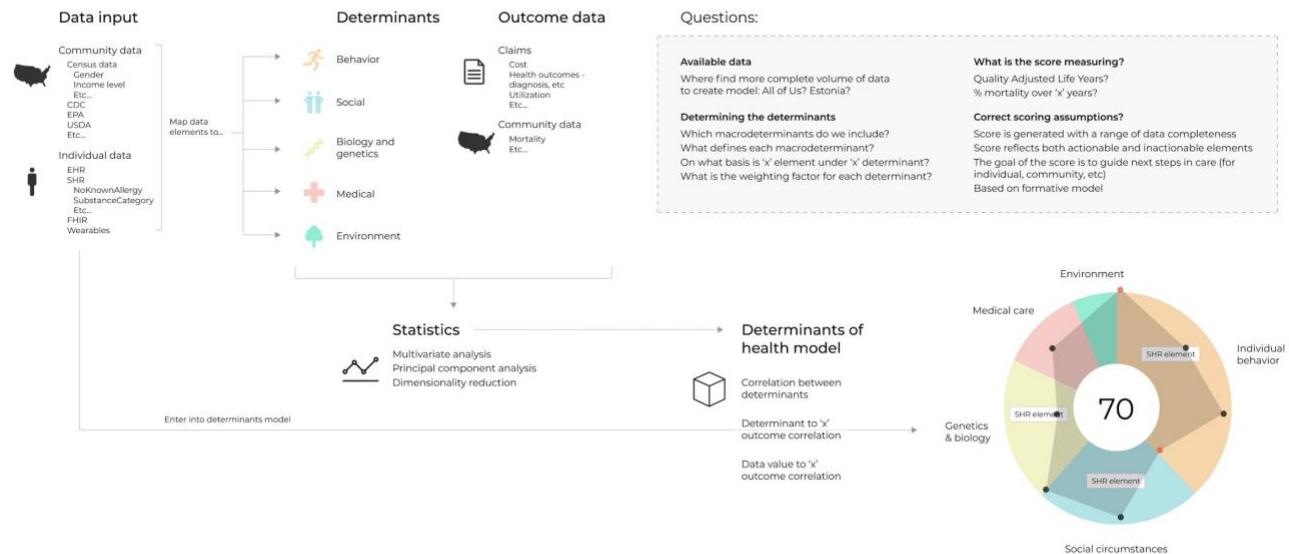


Detail: <https://www.figma.com/file/UL0wWtYmgMfCIJ7E9KliFCGq/Design?node-id=59%3A114>

APPENDIX D: SCORING APPROACH

Creating a Determinants of Health Healthscore

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Detail: <https://www.figma.com/file/UL0wWtYmgMfCIJ7E9KliFCGq/Design?node-id=27%3A1>

APPENDIX E: RESEARCH REFERENCES

Primary relevance

Rough prioritization of resources aiming to form a total “score” of the determinants.

- [interactive] Healthiest communities rankings
<https://www.usnews.com/news/healthiest-communities/rankings>
County level data from CDC, census, IHME, CMS, EPA, etc → raw values from 80 metrics rescaled relative to average among all counties → metrics distributed among 10 categories (pop health, education, housing, etc) → categories weighted based on importance → average of weighted categories = total community livability score.
- [service] Dacadoo
<https://www.dacadoo.com/>

Measures individual health score based on medical, behavior, mental health data.
Appears to have heavy weighting towards passive tracking device data

- [interactive] AARP livability index
<https://livabilityindex.aarp.org/search#Cambridge+MA+02140+USA>
40 metrics + 20 policies (how livable over time) → metrics distributed among 7 categories (health, environment, housing, etc) → metrics scored on 0-100 scale → average metric scores (each has equal weight) to determine category score, additional points for good policy → total community livability score is relative to communities nationwide. One piece of the determinants healthscore puzzle. Some of the metrics & categories. are less relevant to DoH. methodology feels less sound than usnews community ranking interactive.
- [service] Gallup Sharecare well-being index
https://www.sharecare.com/static/well-being-index?utm_source=link_news9&utm_campaign=item_226517&utm_medium=copy
10k adults surveyed each month. Survey of purpose, social, financial, community, physical → demographic weighting according to gender, age, race, etc. Survey content & methodology unclear...
- [service] LexisNexis socioeconomic health scores
<https://risk.lexisnexis.com/products/socioeconomic-health-score>
Risk analysis scores that incorporates determinants in some way... Methodology unclear
- **[paper] Composite score for DoH**
<https://support.sas.com/resources/papers/proceedings17/0882-2017.pdf>
Scoring using public census data → bucket variables into domains as identified by healthy people 2020 → connect to healthcare claims data → evaluate relationship between utilization, cost, social factors.
- [paper] Composite score for DoH for early childhood
https://www.researchgate.net/publication/254424704_Measuring_early_childhood_health_a_composite_index_comparing_Colombian_departments

- [paper] County health rankings relationships between determinant factors and health outcomes
http://www.countyhealthrankings.org/sites/default/files/Hood_AmJPrevMed_2015.pdf
- [paper] County Health Rankings, Relationships Between Determinant Factors and Health Outcomes
http://www.countyhealthrankings.org/sites/default/files/Hood_AmJPrevMed_2015.pdf
- [service] Carrot Health
https://carrothealth.com/marketview-platform-overview/?utm_campaign=Carrot%20Health%20Insights&utm_source=hs_email&utm_medium=email&hsenc=p2ANqtz-GRfzFq28CMKTzrrkzO5RhS3920BEZRw1pJclh_URc0QYoiTUQBh4sOoX2ScUAFMLCX_T1
Forecasted health outcomes based on DoH data.

Secondary relevance

Rough prioritization of resources that may not “score” the determinants directly, but attempt to measure or rank portions of it.

- [interactive] County rankings
<http://www.countyhealthrankings.org/explore-health-rankings>
County health outcomes rank based on: behavior, clinical care, social & economic, environment
- [interactive] Infrastructure report card
<https://www.infrastructurereportcard.org/>
Scoring overlaps with environment/community related determinants.
- [interactive] City health dashboard
<https://www.cityhealthdashboard.com/>
Specific community metrics compared to average across nation.
- [service] Health catalyst patient stratification application
<https://www.healthcatalyst.com/product/patient-stratification-v1/>
Social determinant risk model platform to identify candidates for intervention
- [survey] PRAPARE assessment tool
<http://www.nachc.org/research-and-data/prapare/>
Health center questionnaire of measures related to DoH, linked to ICD-10 codes
- [paper] Risk adjustment for socioeconomic status or other sociodemographic factors
https://www.qualityforum.org/Publications/2014/08/Risk_Adjustment_for_Socioeconomic_Status_or_Other_Sociodemographic_Factors.aspx
Method for calculating risk adjustment scores for patients based on demographic factors.

Data resources

Rough prioritization of sources that may not attempt to “score” the determinants in any way, but allows exploration of many elements related to the determinants.

- [interactive] IHME health viz
<https://vizhub.healthdata.org/gbd-compare/>
- [interactive] Community commons
<https://www.communitycommons.org/map/>
Community data interactive on housing, economy, incomes, demographics, etc. Create your own map layers from a set of metrics.
- [interactive] Policymap
<https://www.policymap.com/maps>
Community data interactive on housing, economy, incomes, demographics, etc
- [interactive] CARES engagement network
<https://engagementnetwork.org/>
Explore community data and their sources, relating to demographics, social & economic factors, environment, medical, behavior, outcomes.
- [interactive] Dartmouth atlas project
<https://www.dartmouthatlas.org/>
View variations in how medical resources are distributed & used in the US.
- [interactive] Brookings metro monitor dashboard
<https://www.brookings.edu/interactives/metro-monitor-2017-dashboard/>
Tracks economic performance of communities
- [survey] Global appraisal of individual needs
<http://gaincc.org/instruments/>
Questionnaire for understanding DoH related domains for an individual

Exploring similar scoring methodologies

- [paper] Human development index (HDI) methodology
http://hdr.undp.org/sites/default/files/hdi_training.pdf
Calculating human development index using life expectancy, knowledge, standard of life, the geometric mean of normalized indices
- [paper] Social capital methodology
https://commdev.org/userfiles/files/652_file_a020037.pdf
- [paper] Social capital methodology
<https://www.sciencedirect.com/science/article/pii/S1877042813002930>
Combining social capital indicators into one index using structural equation modeling (SEM)

- [paper] Wellbeing in the Netherlands
<https://dspace.library.uu.nl/handle/1874/44890>
 Explores methodology for formulating composite wellbeing
- [paper] Equitable and sustainable wellbeing score
https://www.researchgate.net/publication/291957374_Comparing_Equitable_and_Sustainable_Well-Being_BES_across_the_Italian_Provinces_A_factor_analysis-based_approach
- [paper] Socioeconomic status (SES) index
<http://healthcarefunding.ca/files/2013/04/Review-of-Methods-for-SES-Index-for-BC.pdf>
 Principal variable approach, two-stage principal components analysis approach
- [paper] Dutch sustainability monitor score
<https://download.cbs.nl/pdf/2015-a324-pub.pdf>
 Determining indicators