Applying risk prediction to social service referrals

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DISCLOSURES

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Work was a collaboration with many colleagues:

Kasthurirathne SN, Vest J, Menachemi N, Halverson PK, Grannis SJ. Assessing the capacity of social determinants of health data to augment predictive models identifying patients in need of wraparound social services. Journal of the American Medical Informatics Association 2018;25. doi:10.1093/jamia/ocx130

Vest JR, Menachemi N, Grannis SJ, Ferrell J, Kasthurirathne S, Zhang Y, Tong Y, Halverson P. Impact of Risk Stratification on Referrals and Uptake of Wraparound Services That Address Social Determinants: A Stepped Wedged Trial. American journal of preventive medicine 2019;56:e125–33. doi:10.1016/j.amepre.2018.11.009

Vest JR, Grannis SJ, Haut DP, Halverson PK, Menachemi N. Using structured and unstructured data to identify patients' need for services that address the social determinants of health. International Journal of Medical Informatics. 107:101-106; 2017. doi: 10.1016/j.ijmedinf.2017.09.008. PMID: 29029685.

Joshua Vest is a founder partner in Uppstroms and a has provided consulting services to the New York eHealth Collaborative.

Social determinants, social factors, and social needs

Determinants

The conditions in which people are born, grow, live, work, and age.
Shaped by the distribution of money, power and resources.

Factors

Nonclinical, economic, contextual, and psychosocial characteristics that are associated with poor health.

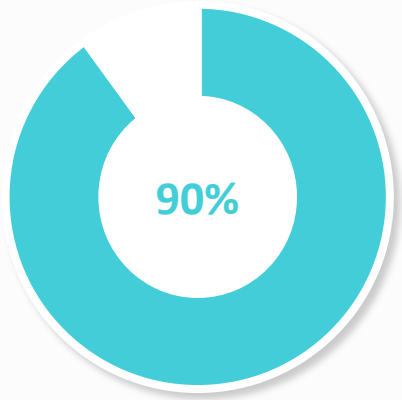
Needs

Immediate needs facing individuals.

doi:10.1111/1468-0009.12390; www.healthaffairs.org/do/10.1377/hblog20191025.776011/full/

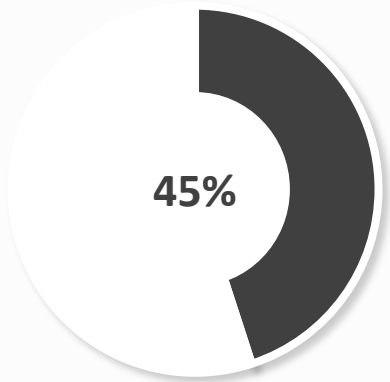
Social factors and needs

Nonclinical, economic, contextual, and psychosocial characteristics



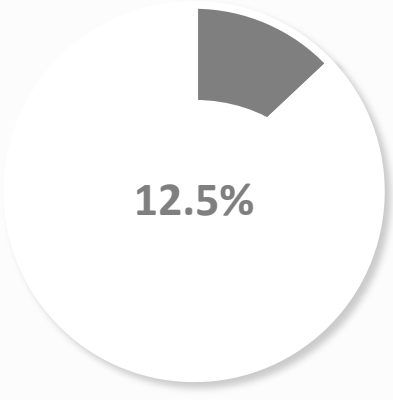
High school graduates

Higher education is associated with higher paying jobs which is associated with better health outcomes. Individuals with lower educational attainment have higher rates of poor health behaviors like smoking.



Children are low income

Children in poorer families tend to have poorer health outcomes than children in wealthier families. Children in lower income families have higher rates of asthma, injuries, and obesity.



Food insecure households

Food insecure individuals are disproportionally affected by diabetes and high blood pressure. Food insecurity is associated with depression, anxiety and other behavioral health issues.

www.census.gov/newsroom/press-releases/2017/educational-attainment-2017.html; www.nccp.org/publications/pub_1074.html

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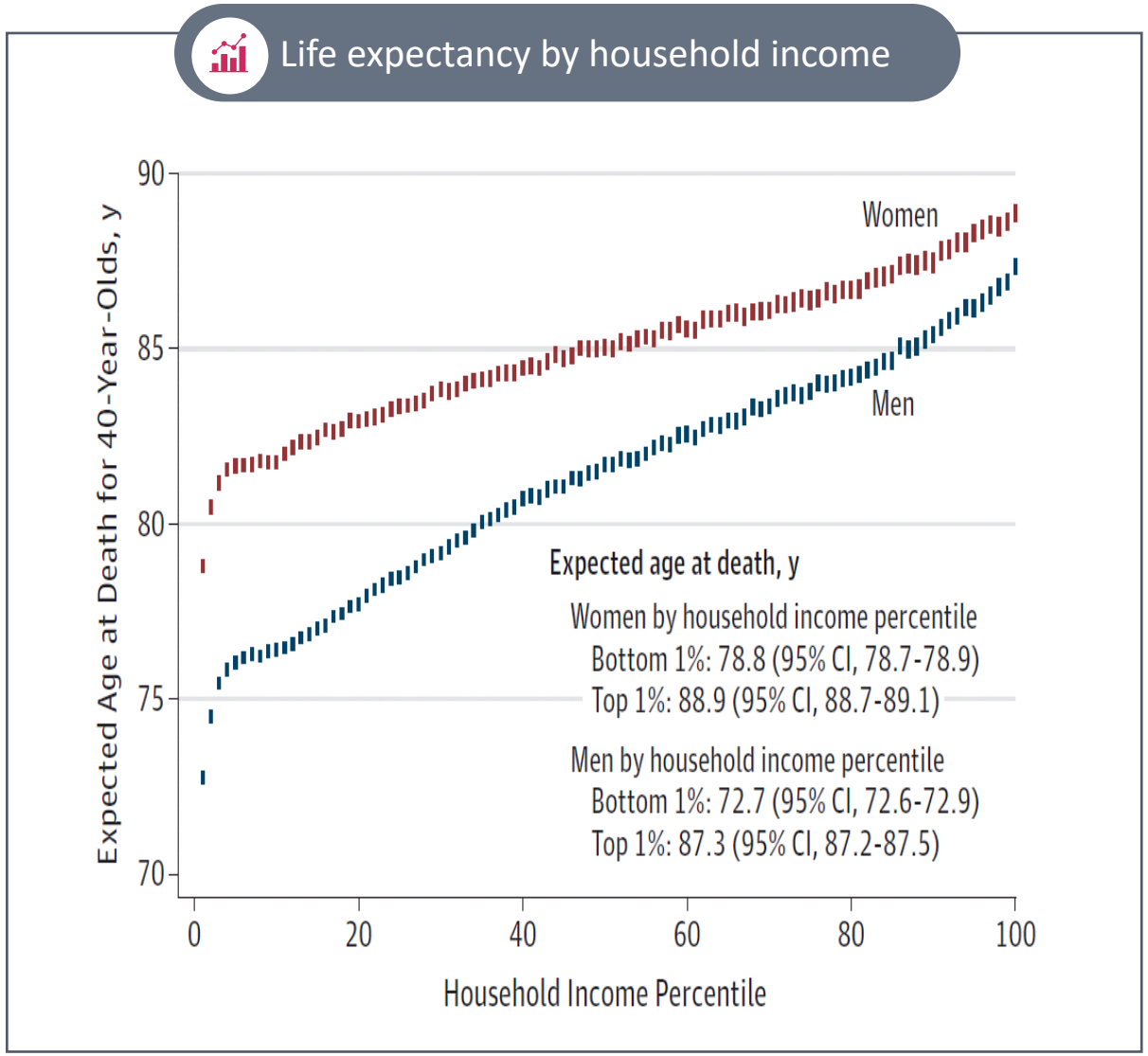
Increasing income associated with longer life expectancy



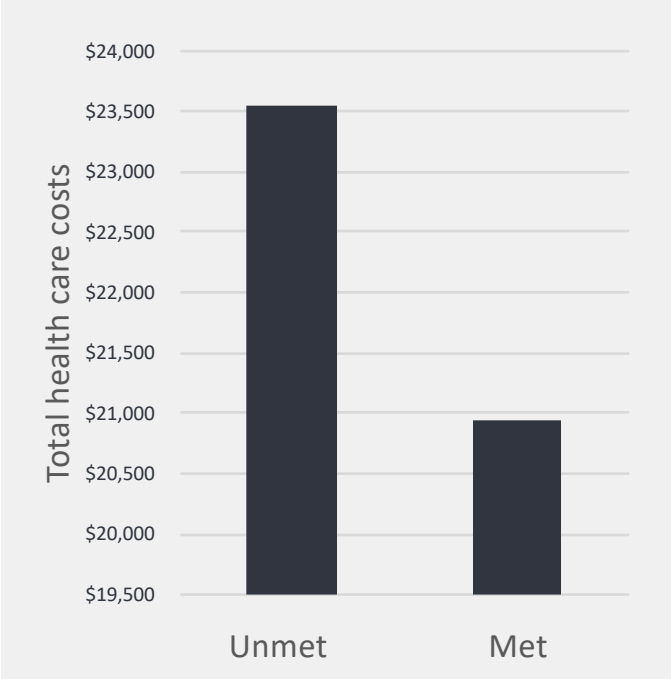
- ...men in the bottom 1% of the income distribution at the age of 40 years in the US have life expectancies similar to the mean life expectancy for 40-year-old men in Sudan and Pakistan…

- The 10-year gap in life expectancy between women in the top 1% and bottom 1% of the US income distribution is equivalent to the decrement in longevity from lifetime smoking.

Chetty et al JAMA 2016

Challenges due to social factors

Unmet social needs drive costs >10%

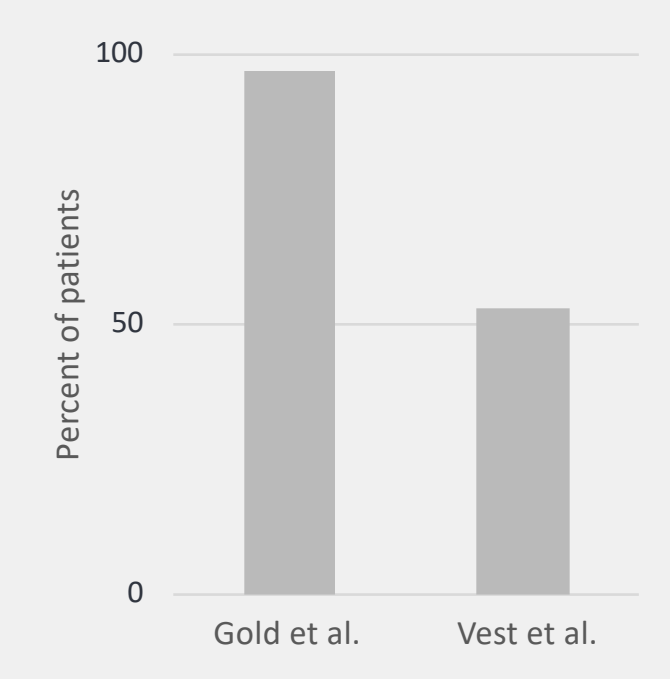


https://www.liebertpub.com/doi/10.1089/pop.2017.0199

Social needs drive utilization 2X

doi: 10.2310/8000.2013.131048.

Social needs are common >50%



dx.doi.org/10.1016/j.ijmedinf.2017.09.008
doi.org/10.1370/afm.2275

Why worry about AI? Why not just ask patients?

Numerous survey screening tools exist, but…

RESPONSE BIAS

Some patients (likely those at highest risk) may not respond to the most sensitive questions or ones they think are unrelated to health care needs

HOW TO SCORE

Survey screening tools collect questions on need but they don't indicate to providers what to do

EHRs largely do not support social data collection, health systems utilize multiple & varying surveys are in use at the same time

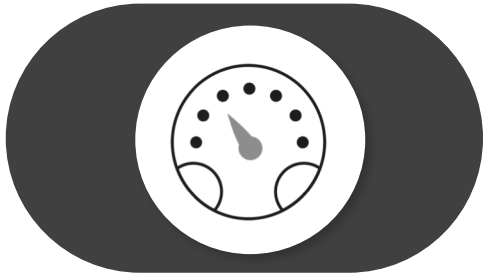
WORKFLOWS

Demographics
Behaviors
Diagnoses
Referral histories

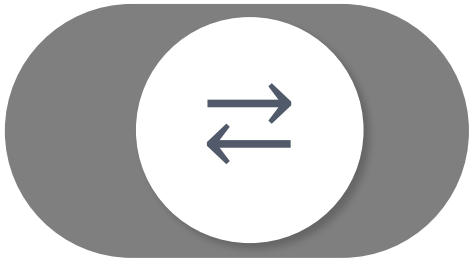
ALREADY HAVE LOTS OF DATA

Project objectives

Improve patient health and wellbeing



Effectively and efficiently address patients' social needs



Proactive instead of reactive approach to social needs

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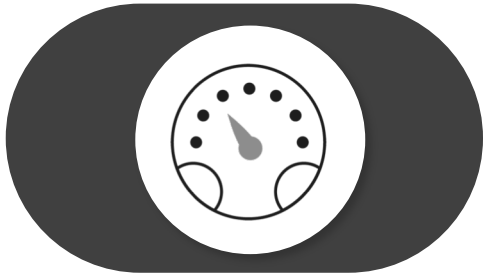

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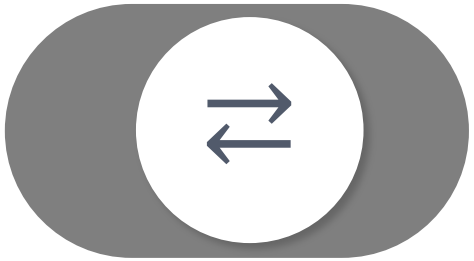
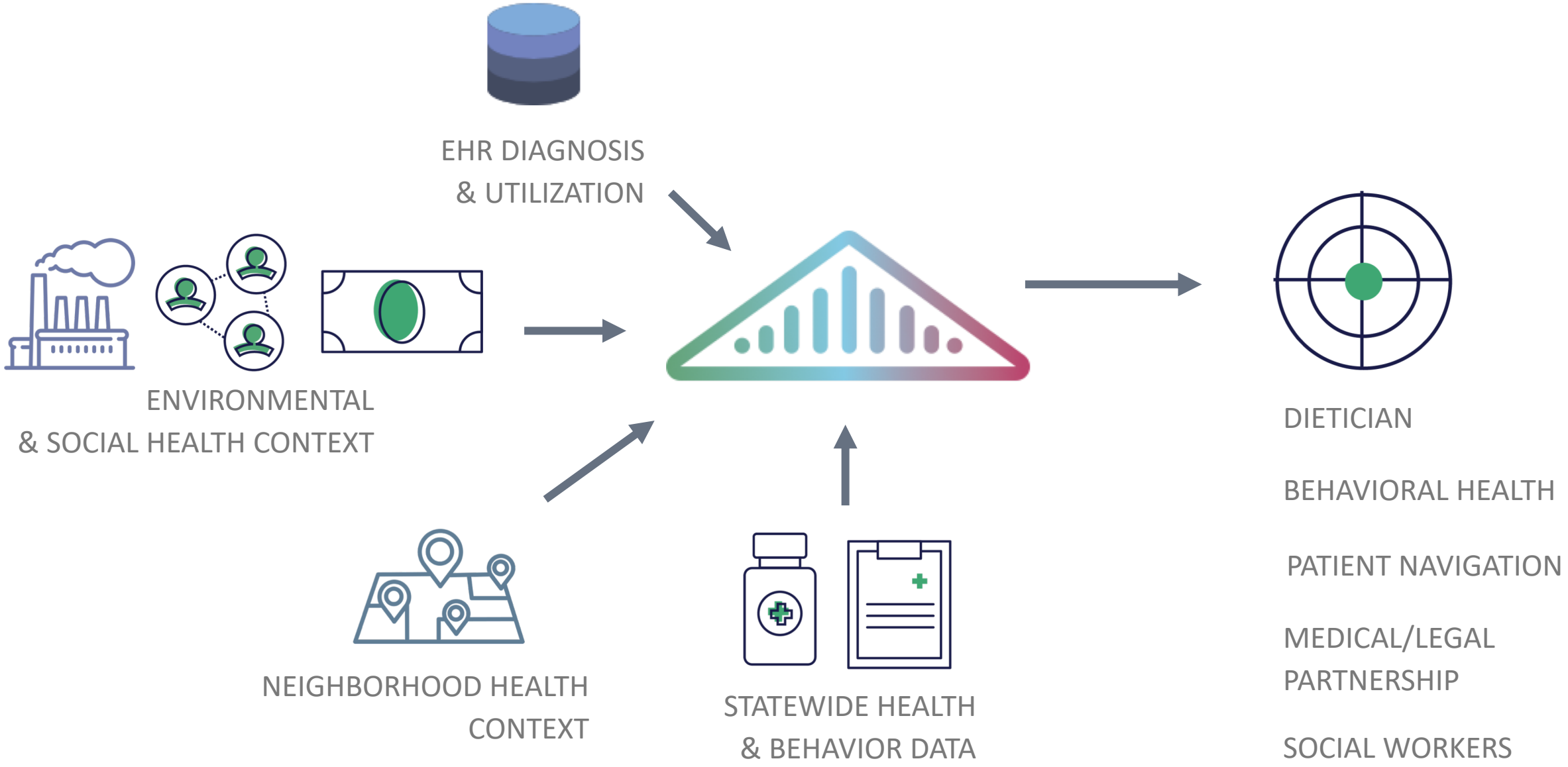


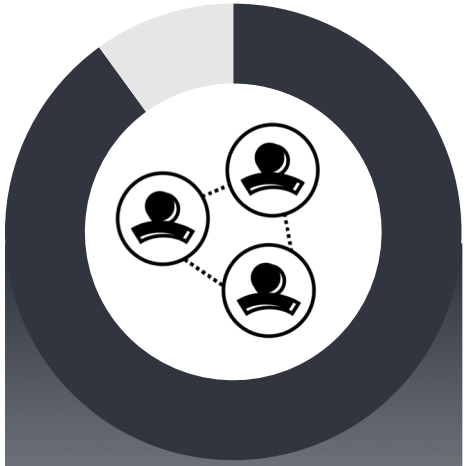
Proactive instead of reactive approach to social needs

Using machine learning approaches to predict referral needs



Referrals to social services

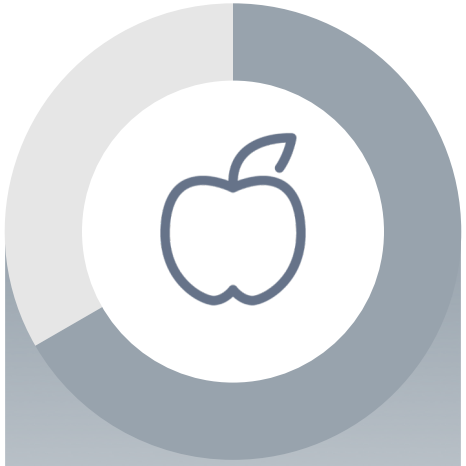
SOCIAL WORKERS



- Increasingly employed by health systems
- Connect patients to community resources
- Coordinate care
- Counsel patients about personal issues

doi: 10.2105/AJPH.2017.304034

DIETITIANS



- Education
- Weight loss
- Better control for diabetic patients
- Support patients with CVD

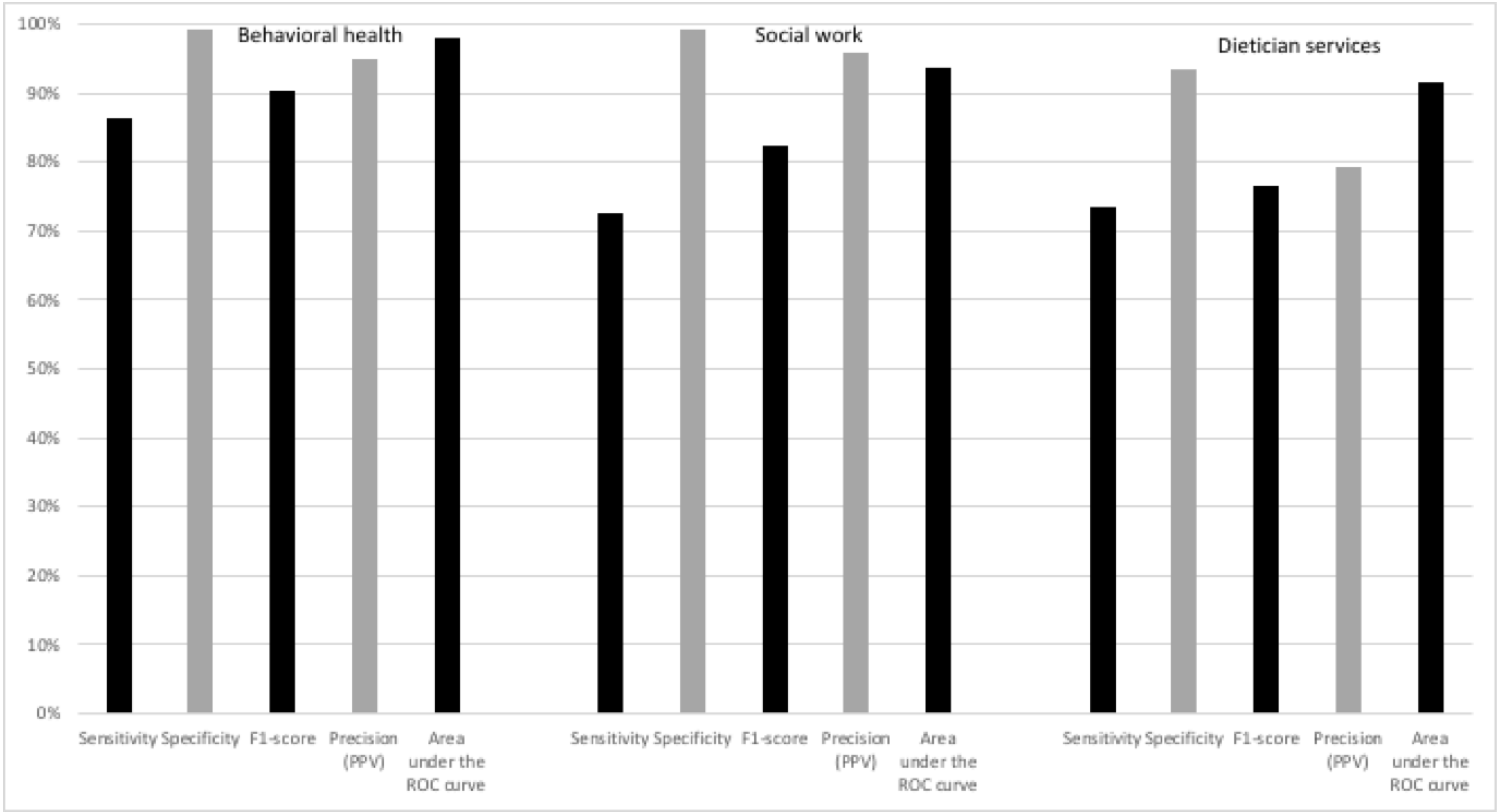
doi: 10.1016/j.jand.2017.06.364

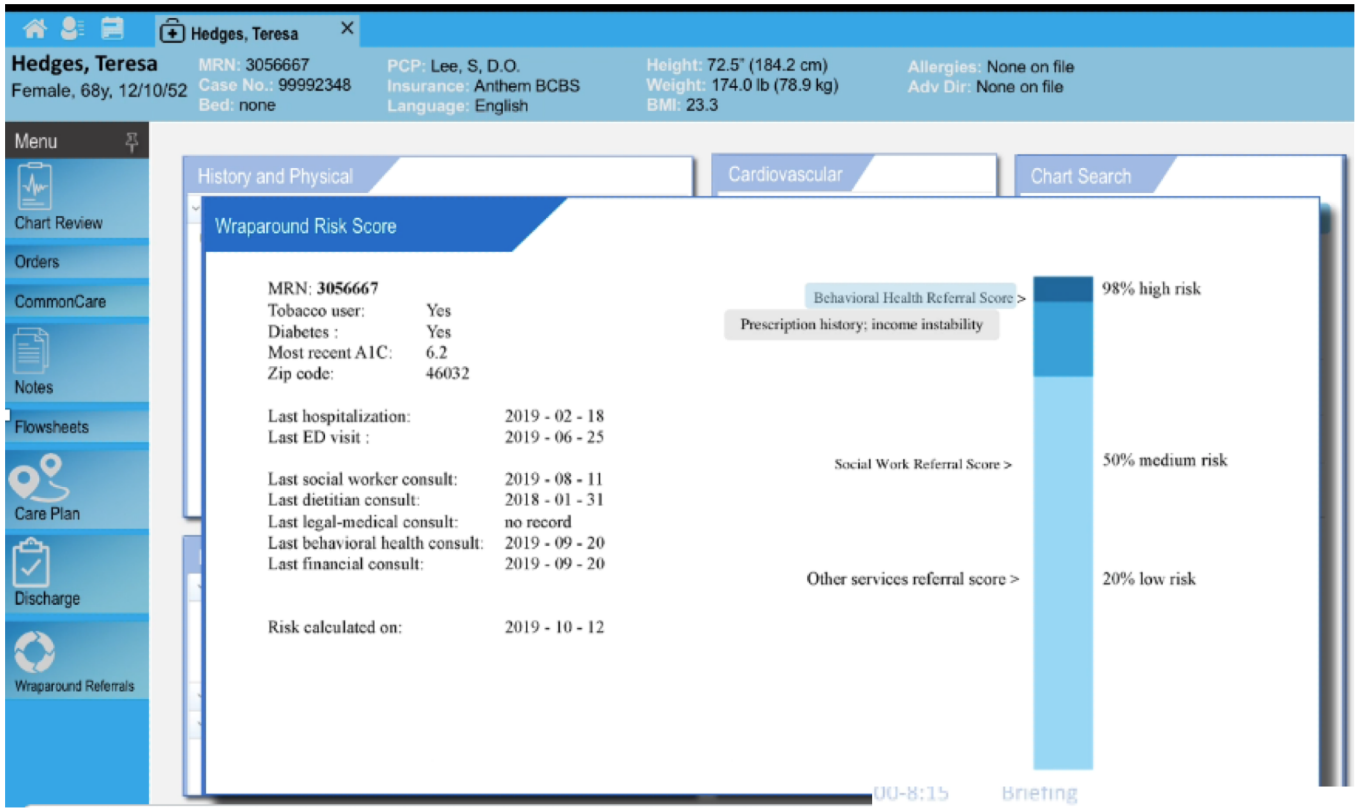
BEHAVIORAL HEALTH

- Improvements in functioning, depression, & anxiety
- Increase engagement in care
- Increased patient satisfaction

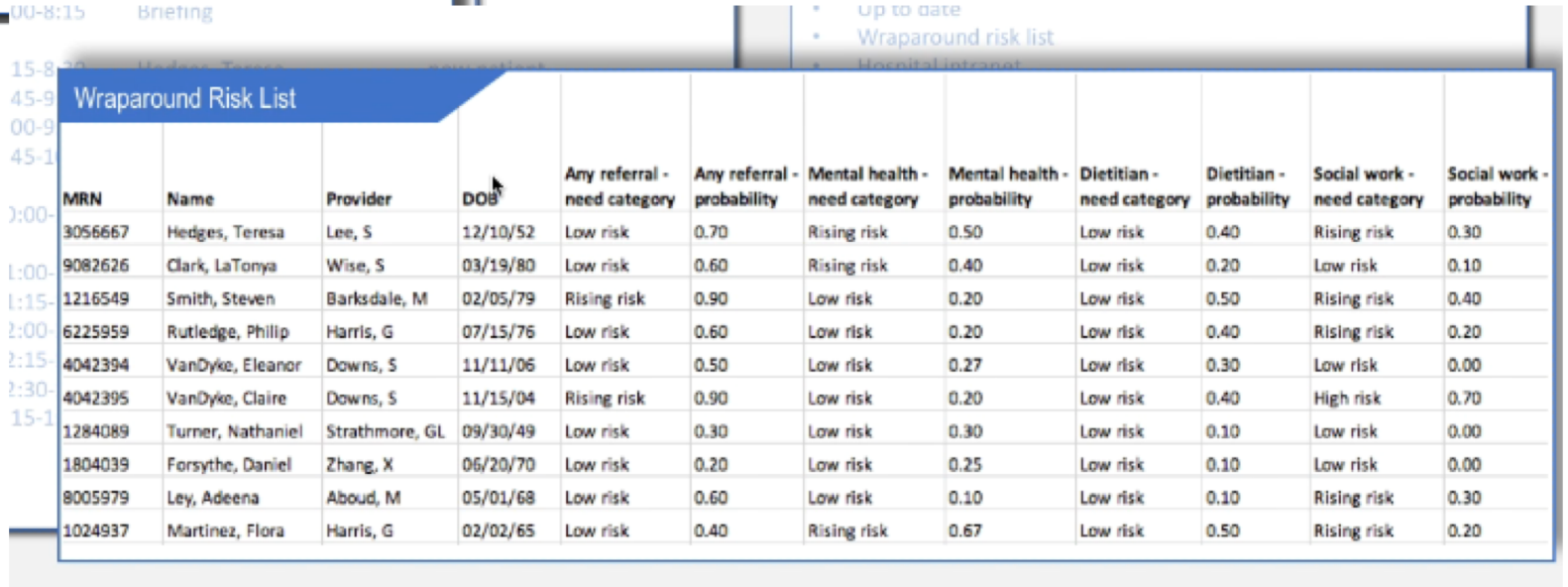
doi: 10.1016/j.genhosppsych.2018.04.002

Prediction performance





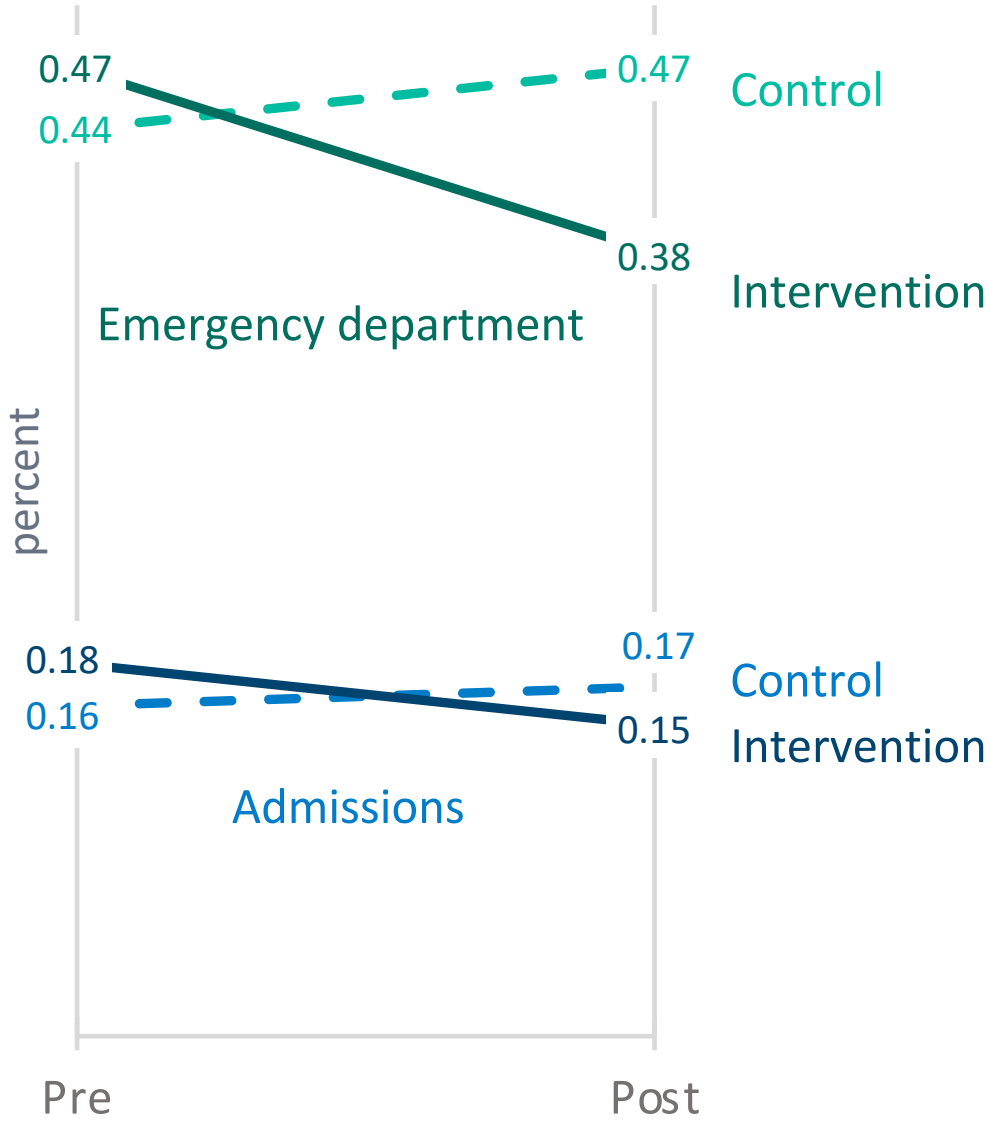
Getting results within provider workflows



Wraparound Risk List

MRN	Name	Provider	DOB	Any referral - need category	Any referral - probability	Mental health - need category	Mental health - probability	Dietitian - need category	Dietitian - probability	Social work - need category	Social work - probability
3056667	Hedges, Teresa	Lee, S	12/10/52	Low risk	0.70	Rising risk	0.50	Low risk	0.40	Rising risk	0.30
9082626	Clark, LaTonya	Wise, S	03/19/80	Low risk	0.60	Rising risk	0.40	Low risk	0.20	Low risk	0.10
1216549	Smith, Steven	Barksdale, M	02/05/79	Rising risk	0.90	Low risk	0.20	Low risk	0.50	Rising risk	0.40
6225959	Rutledge, Philip	Harris, G	07/15/76	Low risk	0.60	Low risk	0.20	Low risk	0.40	Rising risk	0.20
4042394	VanDyke, Eleanor	Downs, S	11/11/06	Low risk	0.50	Low risk	0.27	Low risk	0.30	Low risk	0.00
4042395	VanDyke, Claire	Downs, S	11/15/04	Rising risk	0.90	Low risk	0.20	Low risk	0.40	High risk	0.70
1284089	Turner, Nathaniel	Strathmore, GL	09/30/49	Low risk	0.30	Low risk	0.30	Low risk	0.10	Low risk	0.00
1804039	Forsythe, Daniel	Zhang, X	06/20/70	Low risk	0.20	Low risk	0.25	Low risk	0.10	Low risk	0.00
8005979	Ley, Adeena	Aboud, M	05/01/68	Low risk	0.60	Low risk	0.10	Low risk	0.10	Rising risk	0.30
1024937	Martinez, Flora	Harris, G	02/02/65	Low risk	0.40	Rising risk	0.67	Low risk	0.50	Rising risk	0.20

Impact of risk prediction for referrals



65% increase in social work referrals when risk scoring went live at primary care clinics

48% increase in odds that referred patients will keep their appointments

Key takeaways

SOCIAL FACTORS ARE A CRITICAL PART OF CARE DELIVERY

ASSURING FIT WITH WORKFLOW & ACTIONABLE

NONTRADITIONAL AI TARGETS

EVALUATE IMPACT

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