

MEDINFO 23

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AUSTRALIA



Social determinants of health: Data capture, analysis, interpretation and applications in clinical care and safety

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Social determinants of health: Data capture, drivers, impact, and analysis

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SDOH definitions / context

Social determinants of Health (SDOH) definitions
WHO
U.S. HHS - Healthy People 2030



World Health Organization

Contextual SDOH data sets (e.g. American Community Survey v. individual patient SDOH (aka “HRSN”))

Background

Heightened U.S. interest
DEI; disparities surrounding COVID-19

Social Determinants of Health





SDOH impact / U.S. drivers

What do we know about impact of SDOH in healthcare interactions?

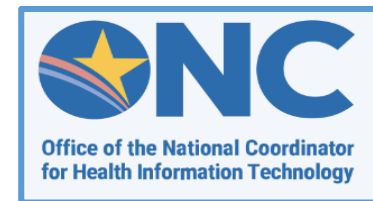
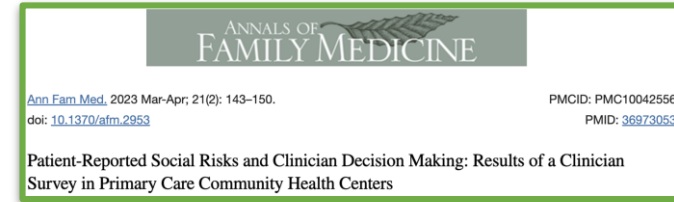
Medicare data study

Annals of Fam Med study

Recent U.S. regulatory drivers for increased SDOH collection via EHR for individual patients:

CMS - ACOs, AHCs

ONC - USCDI→FHIR





SDOH data collection varies

Level of U.S. individual SDOH collection in the EHR?

CHCs; academic health centers and others

Fraze study

PCORnet survey

AHIMA survey

Standardized structured instruments w/in the EHR

Texas Regional CTSA Consortium (TRCC) - 4 hubs -
w/ similar coll. rates to natl.; working
system-
level SDOH struct

harmonization in EHRs



SDOH collection considerations

Privacy concerns - sensitivity
Changing not constant
Cost to healthcare institutions
Referral to resources -

community dependent; not always sufficient to meet needs; geographical component; lack of direct closed loop from community based orgs (CBOs) to hc orgs

International Journal of Circumpolar Health
Taylor & Francis
Taylor & Francis Group

[Int J Circumpolar Health, 2021; 80\(1\): 1943983.](#) PMID: PMC8276667
Published online 2021 Jul 12. doi: [10.1080/22423982.2021.1943983](#) PMID: [34252016](#)

"Engaging stakeholders in integrating social determinants of health into electronic health records: a scoping review"

> [Am J Prev Med. 2019 Dec;57\(6 Suppl 1\):S38-S46. doi: 10.1016/j.amepre.2019.07.016.](#)

Part II: A Qualitative Study of Social Risk Screening Acceptability in Patients and Caregivers

> [AMIA Jt Summits Transl Sci Proc. 2020 May 30;2020:308-316. eCollection 2020.](#)

Developing a real-time EHR-integrated SDOH clinical tool



Motivators: SDOH data collection/referral to services/closing data loop

Clinical motivators for SDOH moving forward

Informing individual patient care and improving outcomes

Aiding population health management analytics

Secondary-use motivators

For health equity research

→ solutions → better policy

Richer large data set ML/AI

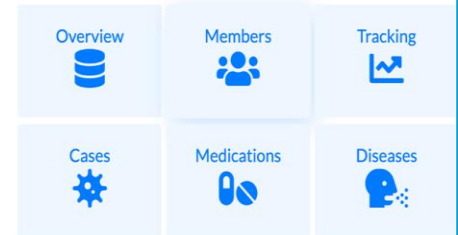
The N3C Data Enclave represents one of the largest secure collections of harmonized clinical health data in the United States.

- Sites: 79
- Persons: 19.8 million
- COVID+ Cases: 7,841,487
- # of Rows: 26.5 billion
- Clinical Observations: 2.4 billion

- Lab Results: 12.8 billion
- Medication Records: 4.1 billion
- Procedures: 1.0 billion
- Visits: 1.4 billion

Data as of June 29, 2023

Explore Our Dashboards





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Social determinants of health & natural language processing (NLP)

Joseph M. Plasek, PhD

Postdoctoral Research Fellow
Mass General Brigham





Social determinants of health (SDOH)

- Account for 80%-90% of modifiable health factors, whereas medical care accounts for only 10-20%
- Are more commonly found in unstructured free-text clinical notes



Social History Annotation Corpus (SHAC)

4405 social history sections were annotated at event level for:

- Tobacco, Alcohol, Illicit substance
- Employment status/occupation
- Housing instability/homelessness



Journal of Biomedical Informatics
Volume 113, January 2021, 103631



Original Research

Annotating social determinants of health using active learning, and characterizing determinants using neural event extraction

[Kevin Lybarger^a](#) [Mari Ostendorf^b](#), [Meliha Yetisgen^a](#)



n2c2/UW Challenge using SHAC corpus

15 teams participated on up to 3 subtasks:

- Information extraction (90.1% F1)
- Generalizability (77.4% F1)
- Learning transfer (88.9% F1)

- Pretrained deep-learning language models like T5 and BERT-variants performed best

Article Contents

Abstract

BACKGROUND AND
SIGNIFICANCE

OBJECTIVE

RELATED WORK

JOURNAL ARTICLE

The 2022 n2c2/UW shared task on extracting social determinants of health

[Kevin Lybarger](#) ✉, [Meliha Yetisgen](#), [Özlem Uzuner](#)

Journal of the American Medical Informatics Association, ocad012,
<https://doi.org/10.1093/jamia/ocad012>

Published: 16 February 2023 [Article history](#) ▾



Implications

- SDOH extraction is a task where large language models are most performant as the semantics of the task are consistent with common sense
- Automatically extracting SDOH potentially can inform clinical decision support and guide follow-up resource allocation but there are challenges with electronic health record re-ingestion of discrete NLP-processed SDOH.

arXiv > cs > arXiv:2305.14825

Computer Science > Computation and Language

[Submitted on 24 May 2023 (v1), last revised 8 Jun 2023 (this version, v2)]

Large Language Models are In-Context Semantic Reasoners rather than Symbolic Reasoners

Xiaojuan Tang, Zilong Zheng, Jiaqi Li, Fanxu Meng, Song-Chun Zhu, Yitao Liang, Muhan Zhang



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Social determinants of health as narratives

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FACEP**

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Patient story

- Human beings interpret their everyday life through narratives, created through relationships, between narrators and audiences.
- This social, historical and cultural context provides key concepts that may be missed in more closed-ended questions or questionnaires.
- By inviting patients to tell the story of their illness experience, patients share the components of their experience that may not be revealed in other forms of direct data creation
- Narratives can superseded evidence, credentials, and ratings and inform preferences in care





Patient generated data

- *OurNotes* Initiative: results of intervention have been positively received by doctors and patients
 - Adopted by four health health systems
 - UCH: 2 years, 200 clinics, 465k patient responses
- However, much of the data is unstructured and not readable by the EHR or a CDS system
- Can we use NLP to process and structure narrative information for SDOH so it can be made actionable and tracked in EHR



eCheck-In

Allergies Medications Health Issues Insurance Travel History Questionnaires Sign Documents

OurNotes Visit Questionnaire
For an upcoming appointment with _____ on 12/14/2022

Thank you for taking the time to answer these questions. We will be able to talk about your answers during your appointment.

However, if you are worried about anything right now, please call our office.

If you cancel this appointment, your provider will not see your answers. The questions below are optional.

What should your doctor/provider know about your health? Please read these important instructions.

New concern or new doctor/provider
If this appointment is with a new doctor/provider or you have a new concern you have not talked about with your current doctor/provider, please let us know: What is your health concern? When did your symptoms start? What medications or treatments have you tried?

Follow-up appointment with your current doctor/provider
If this is a follow-up appointment with your current doctor/provider, please let us know: What has changed since your last appointment?

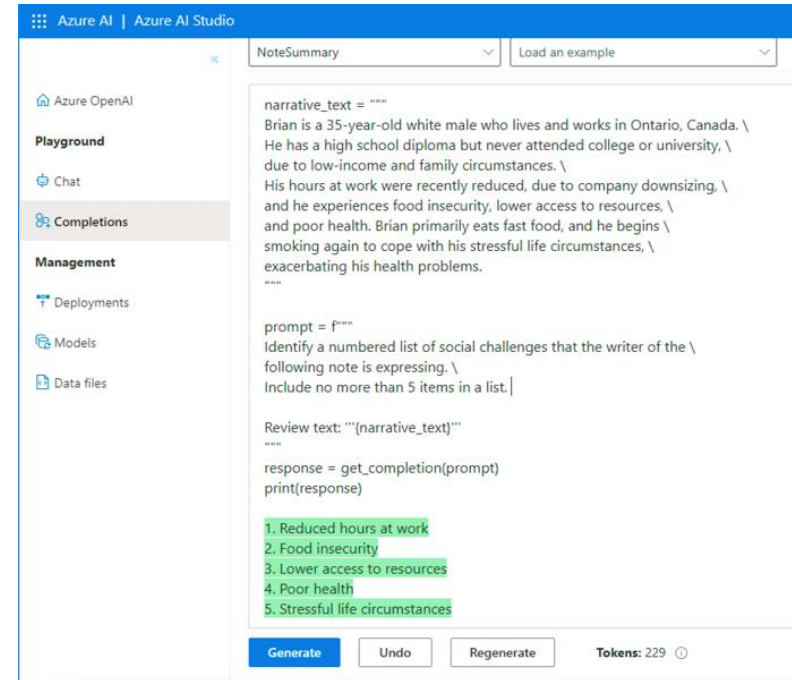
If you ran out of space above, please enter additional comments here.



Large language models



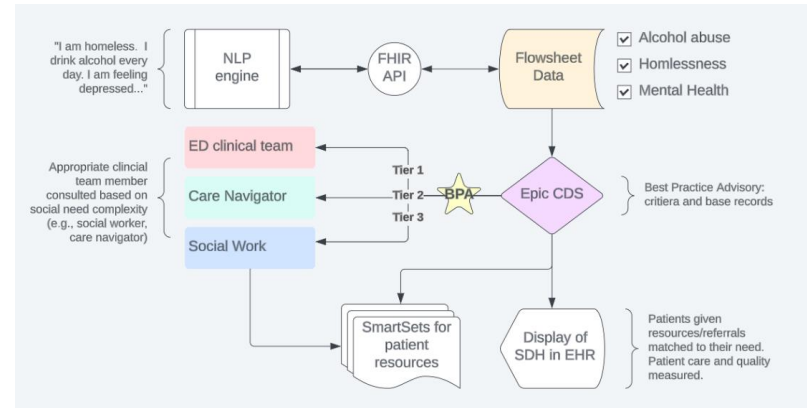
- Represents a new era of NLP
- Given the common nature of SDOH information, across multiple non-clinical domains, there is an opportunity to capture SDOH through LLMs
 - Moving beyond classical survey methods to a more dynamic and interactive method that can capture narrative or audio input.
- Data can then be formatted into JSON or XML for secondary use.





Translation into clinical workflows

- Capture patient narrative during self registration process in ED
- Process patient generated narratives for SDOH using LLM
- Pass this data into Epic as flowsheet for which CDS can be triggered
- Provide link to patient narrative information so clinician or social worker can review what patient entered from within the EHR workflow





Drive targeted interventions

- Appropriate resource matched to patients need (e.g., social worker, care navigator, ED team)
- Contextualize CDS intervention (e.g., link to patient narrative from BPA for clinical review)
- Automate adding Z-codes and trigger SDOH smartsets for clinical use

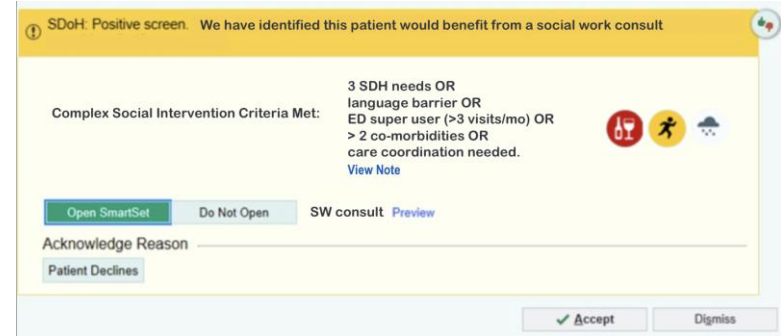


Table 1: Social Needs Screening BPA

Level	SDH Needs	Intervention
Tier 1	Not Complex intervention	Resources provided by treatment team
Tier 2	Not Complex intervention, care coordination needed.	Patient Navigator evaluation
Tier 3	Complex Intervention: >3 SDH needs, language barrier, ED super user (>3 visits/mo), > 2 co-morbidities, care coordination needed.	Social Worker evaluation



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Social determinants of health applications in clinical care during the COVID-19 pandemic

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Professor, Deputy CIO
Weill Cornell Medicine



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INSIGHT Clinical Research Network (CRN) is the largest urban clinical network in the nation. Bringing together the top health systems across New York City, INSIGHT collects comprehensive clinical records for 15 million unique patients. INSIGHT's robust dataset reflects the racial, ethnic, and socioeconomic diversity of the population as well as the extensive set of healthcare services offered across a fragmented healthcare landscape.



Social determinants of health sources

- Individual-level payer data
- Starting to collect food/housing insecurity data at the individual level, but this relies on point of care input which has been inconsistent
- Zip code, Census tract and block group data to provide linkage to neighborhood-level variables of relevance to SDoH
- Site-level, secure address mapping to census tract/block group with the DeGAUSS tool <https://degauss.org>
- Can work with SDoH variables associated with small geographies without revealing the exact census tract/block group



Social determinants of health sources

- Geocoded measures have enabled study teams using INSIGHT data to link to
 - Area Deprivation Index (ADI - <https://www.neighborhoodatlas.medicine.wisc.edu/>)
 - Social Vulnerability Index (SVI -- <https://www.atsdr.cdc.gov/placeandhealth/svi/index.html>)
 - American Community Survey - <https://www.census.gov/data.html>
 - environmental health data and socioeconomic (SES) measures linkable at the zip code and more granular levels
 - Atmospheric Composition Analysis Group (ACAG <https://sites.wustl.edu/acag/datasets>)



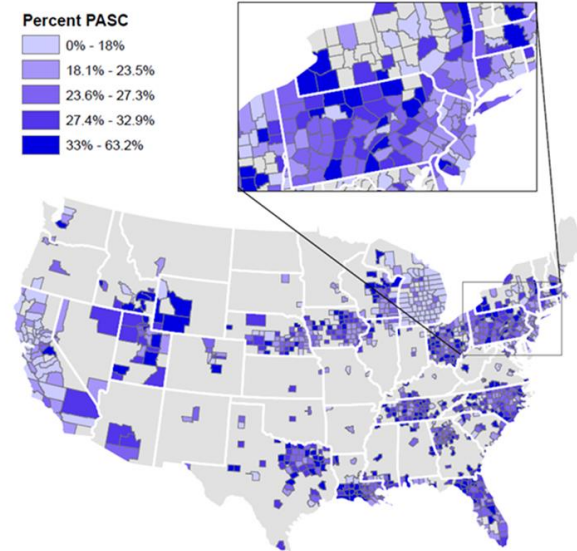
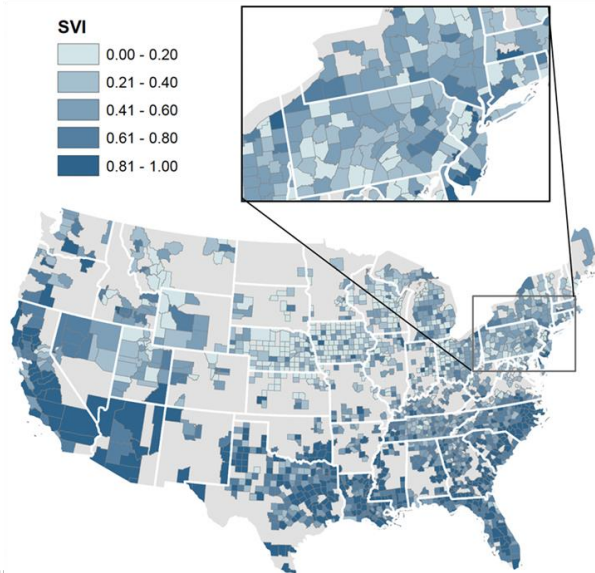
Social determinants of health sources

- AHRQ's publicly available database on social determinants of health (SDOH) which combines over 35 sources spanning 5 SDoH domains and is linkable at the county, zip code and census tract levels
- Variables in the files correspond to five key SDOH domains linkable at the zip code level:
 - Social context (e.g., age, race/ethnicity, veteran status)
 - Economic context (e.g., income, unemployment rate)
 - Education, physical infrastructure (e.g, housing, crime, transportation)
 - Healthcare context (e.g., health insurance).
- <https://www.ahrq.gov/sdoh/data-analytics/sdoh-data.html>



Neighborhood-level SDOH and PASC

- Census tracts were linked to SVI classifications to investigate these SDOHs and the associated risk of PASC among patients living in those neighborhoods





Conclusions and limitations

- Neighborhood-level environmental and SDoH factors can be analyzed for associations with health care trends
- Need to be mindful of temporal granularity
 - SDoH generally measured on an annual basis, but assessments may capture different areas at different timepoints with respect to the pandemic
 - Environmental measure may have very high granularity
- Challenges in ascertaining causal relations, especially of impact of pandemic on economic instability



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Social determinants of health applications to medication safety

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Medication Safety & Compliance
Officer
University of Wisconsin
Hospitals & Clinics (UW Health)





Impacts of social determinants of health (SDOH) on medication safety

- Economic Stability \$
- Education Access & Quality
- Health Care Access & Quality
- Neighborhood & Built Environment
- Social & Community Context



Healthy People 2030, U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. Retrieved June 1, 2023, from <https://health.gov/healthypeople/objectives-and-data/social-determinants-health>



Health literacy & language

- Prescriptions
- Discharge education & instructions
- Medication reconciliation

ScriptPro www.scriptpro.com
913.384.1008

02/15/20XX

RX 2220001 DR GAUTHIER PHILLIPE-A

PIERRE, MARCEL
152 W. Woodson, Robertson, KS 66895

PRENDRE 1 COMPRIME 2 FOIS PAR
JOUR DEJEUNER ET SOUPER
DURANT 10 JOURS

20 BIAXIN 250 M CO

QTY 30 REF
02/15/20XX TSO

Continuer la
médication pour
toute la durée du
traitement.

Évitez de prendre
d'autres médicaments
sans consulter votre
médecin ou pharmacien.

Oblong Bright
Yellow a



John J Smith

AMOXICILLIN 250 MG CAPSULE

TOMAR 1 CÁPSULA 3 VECES AL
DÍA TODOS LOS DÍAS. (Take one
(1) capsule three (3) times daily.)

CORNERSTONE PHARMACY 4220 N. RODNEY PARHAM
SUITE 101
LITTLE ROCK, AR 72212
PH: 501-223-2224

CAUTION: Federal law prohibits transfer of this drug to any person other than the patient for whom prescribed.

RX# 164774 DUNN, J., MD 10/11/11

CREST ORR
123 OLD DIRT ROAD, LITTLE ROCK, AR 72212
TAKE ONE TABLET EVERY NIGHT AT
BEDTIME

SIMVASTATIN TAB 10MG # 30
5 REFILL(S) UNTIL: 04/01/12 NORTHST
SR



Discrimination

Discrimination: differential treatment that is unfair (bad) because it is based on factors not relevant to the matter at hand. It can be intentional or unintentional.

- Overt (explicit): out in the open
- Covert (implicit): made to appear socially acceptable or simply hidden.
- Institutional



Discrimination



Pharmacy Hours:
Monday-Friday: 9:30am-5:30pm
Saturday: Closed
Sunday: Closed

COVID-19 VACCINE CLINICS

For all Persons Ages 16 Years* and Older

*Ability to vaccinate 16 and 17 year olds dependent on Pfizer vaccine availability.

WALK-IN EVERY THURSDAY

10:00 AM - 12:00 PM



FREE Drive-Thru COVID-19 VACCINATION POP-UP CLINICS

CAÑADA COLLEGE Lot 7	SKYLINE COLLEGE Lot C	COLLEGE OF SAN MATEO Beethoven Lot 2
TUESDAYS 12 - 4 p.m.	THURSDAYS 12 - 4 p.m.	FRIDAYS 12 - 4 p.m.

HOURS OF OPERATION TEMPORARILY ADJUSTED DUE TO COVID-19

FMC Clinic on Blake Road
Monday - Friday: 8:30am - 4:30pm

FMC Pharmacy hours
Monday - Friday: 8:30am - 4:30pm
Saturday: 9:00am - 12:00pm



References

- RL Ferrer. Social Determinants of Health, 435-449, in TP Daaleman, MR Helton (eds.), Chronic Illness Care. Springer International Publishing; 2018.
- Gerth HH, Mills CW. From Max Weber. Essays in sociology. London: Routledge; 2009.
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