Supplemental materials for:

Gold R, Bunce A, Cowburn S, et al. Adoption of social determinants of health EHR tools by community health centers. *Ann Fam Med*. 2018;16(5):399-407.

Supplemental Appendix 1. SDH Screening Questions Included in OCHIN's EHR Tool

Question #	Question & Response Options (from paper version or Flowsheet)	Responses that Flag a Positive Screen
1.	*How do you learn best?* □ Reading □ Listening □ Pictures	None
2.	*What is the highest level of school that you have finished?* □ Less than a high school diploma □ High school diploma / GED □ More than high school	None
3.	*How hard is it for you to pay for the very basics like food, housing, heating, medical care, and medications?* □ Not hard at all □ Somewhat hard □ Very hard	Somewhat hard or very hard
	If you answered "Somewhat hard" or "Very hard," what is it hard to pay for? Food, Utilities, Transportation, Medicine or Medical Care, Health Insurance, Clothing, Rent/Mortgage Payment, Child Care, Phone	Yes to any of these
4a.	*In the last month: Have you slept outside, in a shelter, or in a place not meant for sleeping?* □ Yes □ No	Yes
4b.	*In the last month: Have you had concerns about the conditions and quality of your housing?* □ Yes □ No	Yes
5.	*In the last 12 months, how many times have you moved from one home to another?*	2 or more moves flagged for follow-up
6a.	*In the last 12 months: (I/we) worried whether (my/our) food would run out before (I/we) got money to buy more.* □ Often true □ Sometimes true □ Never true	Often true or sometimes true
6b.	*In the last 12 months: The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more.* □ Often true □ Sometimes true □ Never true	Often true or sometimes true
6c.	*In the last 12 months: (I/we) couldn't afford to eat balanced meals.* □ Often true □ Sometimes true □ Never true	Often true or sometimes true
7.	*In the last 12 months: Have you ever been physically or emotionally hurt or threatened by a spouse/partner or someone else you know?* □ Yes □ No	Yes
8a.	*On average, how many: Days per week do you engage in moderate to strenuous exercise (like walking fast, running, jogging, dancing, swimming, biking, or other activities that cause a light or heavy sweat)?* (0 – 7)_____	Multiply days per week (8a) by number of minutes (8b); <150 flagged for follow-up
8b.	On average, how many: Minutes do you exercise at this level? _____	

Question #	Question & Response Options (from paper version or Flowsheet)	Responses that Flag a Positive Screen
9.	*Are you married or living together with someone in a partnership?* □ Married or domestic partner □ Living with partner in committed relationship □ In a serious or committed relationship, but not living together □ Single □ Separated □ Divorced □ Widowed	Questions 9-13: Scoring is based on the Berkman-Syme Social Network Index (SNI). Pantell M, et al. Social isolation: A predictor of mortality comparable to traditional clinical risk factors. *AJPH* 2013; 103(11):2056–62. Question 9: 1 point for "Married or domestic partner," "Living with partner in committed relations," or "In a serious or committed relationship, but not living together" Question 10a-c: 1 point if they have a total of 3 or more contacts per week. Question 11a: 1 point for attending church or religious services 4 or more times a year ("4 or more times a year," "At least once a month," or "At least once a week") Question 11b: 1 point if attends meetings at least twice a year ("2-3 times a year," "4 or more times a year," "At least once a month," "At least once a week") Maximum points = 4; High risk (flagged for follow-up) = 0-2
10a.	*In a typical week, how often do you: Talk with family, friends, or neighbors by phone or video chat (e.g. Skype, Facetime)?* □ Never □ Once a week □ 2 days a week □ 3-5 days a week □ Nearly every day	
10b.	*In a typical week, how often do you: Get together with family, friends, or neighbors?* □ Never □ Once a week □ 2 days a week □ 3-5 days a week □ Nearly every day	
10c.	*In a typical week, how often do you: Use email, text messaging, or internet (e.g. Facebook) to communicate with family, friends, or neighbors?* □ Never □ Once a week □ 2 days a week □ 3-5 days a week □ Nearly every day	
11a.	*How often do you: Attend church or religious services?* □ Never □ Once a year □ 2-3 times a year □ 4 or more times a year □ At least once a month □At least once a week	
11b.	*Attend meetings of the clubs or organizations you belong to?* □ Never □ Once a year □ 2-3 times a year □ 4 or more times a year □ At least once a month □ At least once a week	
12.	*How often do you feel lonely or isolated from those around you?* □ Never □ Rarely □ Sometimes □ Often □ Always	
13.	*Do you have someone you could call if you needed help?* □ Yes □ No	
14.	*During the past month, how much stress would you say you experienced?* □ A lot of stress □ A moderate amount of stress □ Relatively little stress □ Almost no stress at all	A lot of stress or A moderate amount of stress

SOCIAL DETERMINANTS OF HEALTH (SDH) Citations and Copyright Information June 1, 2016

1. Developed by OCHIN's Clinical Operations Review Committee.
2. Adapted from standard education questions to align with patient population of OCHIN membership.
3. Slight modification of IOM-recommended financial hardship item (medications added to list of examples) Puterman E, Haritatos J, Adler NE Sidney S, Schwartz JE, Epel ESl. 2013. Indirect effect of financial strain on daily cortisol output through daily negative to positive affect in the coronary artery risk Psychoneuroendocrinology 2013; 38:12. doi:10.1016/j.psyneuen.2013.07.016. Hall, MH., Matthews KA, Kravitz HM, Gold EB, et al. 2009. Race and financial strain are independent correlates of sleep in midlife women: The SWAN Sleep Study. *Sleep*

32(1):73–82. Follow-up question, “What is it hard to pay for?” was added to get more granularity and enable care team to identify needed interventions. This follow-up question was adapted from a Kaiser Permanente SDH questionnaire, with permission.

4.-5. Housing questions from Health Begins Upstream Risk Screening Tool (http://www.healthbegins.org/).

6. US Department of Agriculture 18-item Household Food Security Survey (HFSS).

7. Adapted from a Kaiser Permanente SDH questionnaire, with permission.

8. Exercise Vital Sign – Question 1 & 2. Sallis RE. Developing health care systems to support exercise: exercise as the fifth vital sign. *Br J Sports Med*. 2011;45:473–4. Epic already has copyright permission.

9.-11. Third National Health and Nutrition Examination Survey (NHANES III). Epic already has copyright permission to use this question. Scoring is based on the Berkman-Syme Social Network Index (SNI). Pantell M, Rehkopf D, Jutte D, Syme SL, Balmes J, Adler N. Social isolation: A predictor of mortality comparable to traditional clinical risk factors. *American Journal of Public Health* 2013; 103(11):2056–62. Item 10c was created as a parallel to items 10a and 10b to capture social connection via newer electronic modes that weren’t available when Berkman-Syme SNI was created. Frequency categories for 10-12 slightly modified from original. Kaiser is also using this approach in their screening tool. Epic already has copyright permission to use this question.

12. Modified from item in PROMIS Item Bank v. 1.0 – Emotional Distress - Anger - Short Form 1 – and AARP overall loneliness item from AARP survey about loneliness in older adults; Original PROMIS item written in 1st person; loneliness added to reduce literacy level.

13. Your Current Life Situation Questionnaire, Kaiser Permanente.

14. 1998 Adult Prevention Module of the National Health Interview Survey.

Supplemental Appendix 2: How the pilot clinics oriented staff to SDH documentation / action, targeted populations for screening, and iterated SDH-relevant workflows

	Clinic A	Clinic B	Clinic C
Staff training / orientation	Medical Director led all-staff training on the SDH screening plan. RN quality coordinator (RNQC) provided suggested workflows for using the tools, and one-on-one training to outreach staff, focused on workflows, use of the EHR, and referral coding. Medical Director created SDH-related activity tracking reports; RNQC reviewed these regularly, checked in with clinic staff as needed. One clinic leader also acted as a 'provider champion' for SDH screening.	Some discussion at staff meetings, as well as one-to-one support of relevant staff members (*e.g.*, CHW) by the clinic manager.	Multiple team meetings with members of the pilot team / key stakeholders to develop, discuss, revise the workflow. Staff-specific workflows created and shared during an all-staff meeting to kick off clinic-wide rollout.
Target population	First screened 1-2 new patients per day; scaled up to all patients that: i) are new to the clinic; ii) complete annual insurance sliding scale reauthorization process (most of the clinic's population); iii) go through the clinic's RN care coordination intake process (high risk diabetes, hypertension, depression), or iv) the clinic's HIV clinic intake process; and v) selected behavioral health patients.	Began by screening adult patients with diabetes or Hepatitis C, if enrolled in the clinic's case management programs. Expanded to all patients 65 and up, then to all patients with an office visit who did not have a completed SDH screening on file.	All new patients seen by a single provider (the project's clinician champion), and any of this provider's patients who had a patient portal account in the EHR and an upcoming visit.

Workflow ***Version 1***	Front desk staff gave paper SDH screening form to targeted patients to complete in waiting room. At rooming, MA reviewed responses, clarified if exposure to interpersonal violence was current or past (as needed). Patients with current interpersonal violence / social isolation considered time-sensitive; handed off to the nurse care coordinator for further assessment and support (face to face, if possible). All other patients' SDH screening forms were placed in the outreach staff person's mailbox. The RN care coordinator / outreach staff person was then responsible for entering the data into the EHR's SDH flowsheet, identifying appropriate community resources using the relevant SDH preference list and creating a referral within the EHR, then printing out the referral information for the patient and giving / sending that information to the patient.	Front desk staff handed paper SDH form to targeted patients (often flagged by MA during pre-visit chart scrubbing). Patient completed form in waiting room; form then handed by front desk or MA to nurse case manager (for patients in the DM / Hepatitis C programs) or behavioral / wellness coaches (for other patients). Next, some entered the data into the EHR, spoke with the patient and made community resource referrals themselves; others delegated pieces of this process to the behavioral or wellness coaches or community health worker (CHW).	Front desk handed paper SDH screening form to new patients of one provider (reminded by MA in appointment note at pre-visit chart scrub), with other new patient forms, for completion in waiting room. MA collected the form at rooming, then immediately entered the data into the EHR. Provider reviewed SDH Summary when seeing the patient. If positive SDH screening results, provider made a non-specific internal referral to clinic CHW who reviewed SDH summary, reached out to the patient to discuss options, documented referrals made in the progress note, and pasted the information into the provider's internal referral. The clinic also planned to email the provider's patients with a portal account and an upcoming visit, to ask them to complete the form via the portal. As none of the emailed patients completed screening via the portal, the clinic stopped this approach.
Issue	Many patients with SDH needs only received written community resource referrals in the mail post-visit. This lack of interaction with clinic staff felt inefficient (staff spent significant time creating and documenting the community referrals), it was unclear if they were truly meeting patient needs, and staff felt demoralized.	Follow-up to paper SDH data collection not standardized, leading to inconsistent EHR documentation of patient-reported data and any ensuing contact or referrals, making it difficult to track.	Community resource referral documentation process was unclear; CHW made referrals but did not have security clearance / training to document them in the EHR using the preference lists, making the referrals difficult to track. Clinic also concerned about overwhelming providers / staff. Work stopped for months while these issues were addressed and a revised workflow approved.

Workflow *Version 2*	To facilitate patient-staff interaction around SDH, the clinic instituted a multi-pronged approach. Paper SDH screening tool added to all new patient packets, handed out by the front desk. The clinic also added SDH screening to all patients' annual sliding scale re-authorization appointments, and to nurse care coordination, behavioral health, HIV intake processes. Data collection was a mixture of paper-based and direct EHR data entry, depending on time / staff availability. Referrals only made after discussion with the patient; if face-to-face meeting was not possible, outreach worker called the patient to discuss SDH needs and tailor the help provided. Addition of the question asking whether the patient wanted any care team help addressing positive SDH screening results helped keep this workload manageable.	MA scrubbed the chart to find out who needs the SDH screening and tracks past SDH needs and referrals. If screening had not been done in the last six months, front desk gave the patient a paper copy to complete in the waiting room. Patients that needed and requested help were sent to the wellness coach or CHW for follow-up. Wellness coach or MA or RN documented positive screens in the EHR, ordered a referral and designated it 'no follow-up needed.'	Front desk staff still handed the paper form to all new patients of one provider. MA gave completed form to team referrals coordinator, who entered the data into the EHR within 48 hours. Patients who wanted written help / to be contacted were routed to the CHW via internal referral approved by the provider. CHW then tasked with sending the requested referral information with a standardized cover letter, or calling the patient to discuss / provide customized referrals. (Either way, the CHW used EHR preference lists to access / provide community resource information, and documented SDH needs on the problem list using ICD-10 codes. (This workflow went into effect August 2017, just after quantitative data collection stopped.)
Issue	Referral EHR documentation clunky, takes too long.		
Workflow *Version 3*	Once the SmartPhrase .SDHHandouts was available, staff stopped using SDH preference lists, and only used the SmartPhrase to track SDH referrals. This was reported to be faster and smoother than previous workflow iterations while still tracking the specific SDH need for which referrals were made. Details about the specific agencies to which patients are referred were entered in the chart note.		

Supplemental Appendix 3. Key lessons on using EHR tools to document SDH in CHCs

Overall

- Staff EHR proficiency drives uptake. Building needed proficiency may require training and time, particularly for staff unused to EHR-based clinical workflows.
- Use of SDH data to meet certain reporting requirements may add motivation for EHR documentation and action.
- Standard EHR data presentation structures can make it difficult for staff to review all relevant information on a given patient; there is a need to connect and display data so as to enable a comprehensive view of each patient's situation.
- Staff turnover necessitates repeated training in EHR-based SDH workflows.

Documenting SDH Data

- Customizing staff EHR views to facilitate SDH workflows can support SDH documentation by making it easier to find the data entry and review interfaces.
- Time and staffing constraints may mean that clinics often collect SDH data on paper, then enter the data into the EHR; this can yield a lag between collection and EHR documentation.

Reviewing SDH Data

- To encourage review of an individual's SDH data, associated review tools should be easy to find in the EHR, and located in interfaces that staff are used to using.
- To encourage use of SDH data in population management, and / or in review of the clinic's SDH processes, emphasize the importance of such data uses in clinic staff trainings; staff may need to be trained to locate and use these data tools.
- The EHR Summary Tools 'score' and flag positive screens; if staff do not use these tools, they may instead use their personal judgment about what SDH results constitute a positive screen.
- Clinics may want an easy way to determine if / when a patient's last SDH screening was done, or if SDH screening was offered but declined.

Acting on SDH Data

- EHR-based SDH referral-making processes should be simple and efficient, but trackable (e.g., text shortcuts may be preferred over standard clinical referral processes).
- Strategies for SDH referral-making may need to address factors such as: (i) the difficulty of keeping community resource information up to date in the EHR, (ii) the need for unfamiliar competencies from non-clinical staff tasked with making these referrals, and (iii) the difficulty of tracking referral outcomes, since referral follow-up is usually by patient self-report.
- Use of clinical workflows for SDH referrals may necessitate changing EHR security clearances for non-clinical staff.
- Referral 'closure' rates can be a reported quality measure, so it is necessary to enable formally 'closing' SDH referrals / noting them as 'no follow-up needed.'
- Standardized SDH screening using EHR tools may serve as a prelude to a richer conversation with the patient, to hone in on how to most effectively provide support; e.g., CHC staff may want to know if an identified SDH need is a priority for the patient, whether s/he was already receiving help, and whether s/he desires assistance.