

**Appendix**  
**Social Needs Resource Connections: A Systematic Review of Barriers, Facilitators, and Evaluation**  
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**Appendix Table 1.** Systematic Mixed Studies Review Search Strategy

<b>PubMed (MEDLINE) Search Strategy</b>
<b>Concept #1 – Screening</b>
mass screening [MeSH Terms] OR screening [Title/Abstract] OR surveys and questionnaires [MeSH Terms] OR needs assessment [MeSH Terms] OR needs assessment [Title/Abstract] OR assessing [Title/Abstract] OR identifying [Title/Abstract]
<b>Concept #2 – Social Needs</b>
social determinants of health [MeSH Terms] OR social determinants of health [Title/Abstract] OR health-related social needs [Title/Abstract] OR social needs [Title/Abstract] OR social risks [Title/Abstract] OR food [Title/Abstract] OR housing [Title/Abstract] OR violence (Title/Abstract)
<b>Concept #3 – Referral</b>
referral and consultation [MeSH Terms] OR referral [Title/Abstract] OR patient navigation [MeSH Terms] OR navigation [Title/Abstract] OR navigating [Title/Abstract] OR social support [MeSH Terms] OR connecting [Title/Abstract] OR linking [Title/Abstract]
<b>Additional Filters</b>
<ul style="list-style-type: none"> <li>• English</li> <li>• Articles published from 10/01/2015 through 12/23/2020</li> </ul>

**Final Search:**

Concept #1 AND Concept #2 AND Concept #3

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**Appendix Table 2.** Mixed Methods Appraisal Tool (MMAT) Results<sup>a</sup>

	Qualitative					RCT					Non-Randomized					Descriptive					Mixed Methods				
	1.1 <sup>b</sup>	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5
Bottino (2017) <sup>29</sup>															Y	Y	Y	Y	Y						
Fargo (2017) <sup>30</sup>															Y	Y	Y	Y	Y						
Fox (2016) <sup>31</sup>															Y	Y	Y	Y	Y						
Hassan (2015) <sup>32</sup>															Y	Y	Y	Y	Y						
Polk (2020) <sup>33</sup>															Y	Y	Y	Y	Y						
Power-Hays (2019) <sup>34</sup>															Y	Y	Y	Y	Y						
Manian (2020) <sup>35</sup>															Y	Y	Y	Y	Y						
Smith A (2020) <sup>36</sup>															Y	Y	Y	Y	Y						
Smith S (2017) <sup>37</sup>															Y	Y	Y	Y	Y						
Uwemedimo (2018) <sup>38</sup>															Y	Y	Y	C	Y						
Fiori (2020) <sup>39</sup>															Y	C	Y	C	Y						
Nguyen (2016) <sup>40</sup>															Y	C	Y	C	C						
Martel (2018) <sup>41</sup>															C	C	Y	C	Y						
Fritz (2020) <sup>42</sup>															Y	N	Y	N	Y						
Knowles (2018) <sup>52</sup>	Y	Y	C	Y	Y										Y	Y	Y	Y	Y						
Ray (2020) <sup>53</sup>	N	N	C	Y	N										Y	Y	Y	N	Y						
Cullen (2020) <sup>43</sup>	Y	Y	Y	Y	Y																				
Cusack (2020) <sup>44</sup>	Y	Y	Y	Y	Y																				
Hsu (2020) <sup>45</sup>	Y	Y	Y	Y	Y																				
Marpadga (2019) <sup>46</sup>	Y	Y	Y	Y	Y																				
Orr (2019) <sup>47</sup>	Y	Y	Y	Y	Y																				
Palakshappa (2017b) <sup>c 48</sup>	Y	Y	Y	Y	Y																				
Hamity (2018) <sup>49</sup>	Y	C	Y	Y	C																				
Zhu (2020) <sup>50</sup>	Y	C	C	Y	Y																				
Emengo (2020) <sup>51</sup>	Y	N	Y	Y	C																				
Gottlieb (2020) <sup>58</sup>						Y	Y	Y	Y	Y															
Garg (2015) <sup>59</sup>						C	Y	Y	Y	Y															
Gottlieb (2016&2018) <sup>60,61</sup>						N	Y	N	N	Y															
Swavely (2019) <sup>54</sup>	Y	Y	Y	Y	Y										Y	C	Y	Y	Y	Y	Y	Y	Y	Y	
Montgomery (2020) <sup>55</sup>	Y	C	Y	Y	Y										Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Palakshappa (2017a) <sup>c 56</sup>	Y	Y	Y	Y	Y										Y	C	Y	C	Y	Y	Y	Y	Y	Y	
Berkowitz (2019) <sup>57</sup>	Y	Y	Y	Y	Y						Y	Y	Y	N	Y						Y	Y	Y	Y	
Schickedanz (2019) <sup>62</sup>											Y	Y	Y	Y	Y										

<sup>a</sup>“Y” = Yes – study adheres criterion; “N” = No – study doesn’t adhere to criterion; “C” = Can’t tell – study doesn’t include enough information to make a clear judgement about criterion. Detailed descriptions of MMAT criteria are here:

[http://mixedmethodsappraisaltoolpublic.pbworks.com/w/file/fetch/127916259/MMAT\\_2018\\_criteria-manual\\_2018-08-01\\_ENG.pdf](http://mixedmethodsappraisaltoolpublic.pbworks.com/w/file/fetch/127916259/MMAT_2018_criteria-manual_2018-08-01_ENG.pdf)

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<sup>b</sup>MMAT methodological quality criteria:

- 1.1. – Is the qualitative approach appropriate to answer the research question?
- 1.2. – Are the qualitative data collection methods adequate to address the research question?
- 1.3. – Are the findings adequately derived from the data?
- 1.4. – Is the interpretation of results sufficiently substantiated by data?
- 1.5. – Is there coherence between qualitative data sources, collection, analysis and interpretation?
- 2.1. – Is randomization appropriately performed?
- 2.2. – Are the groups comparable at baseline?
- 2.3. – Are there complete outcome data?
- 2.4. – Are outcome assessors blinded to the intervention provided?
- 2.5. – Did the participants adhere to the assigned intervention?
- 3.1. – Are the participants representative of the target population?
- 3.2. – Are measurements appropriate regarding both the outcome and intervention (or exposure)?
- 3.3. – Are there complete outcome data?
- 3.4. – Are the confounders accounted for in the design and analysis?
- 3.5. – During the study period, is the intervention administered (or exposure occurred) as intended?
- 4.1. – Is the sampling strategy relevant to address the research question?
- 4.2. – Is the sample representative of the target population?
- 4.3. – Are the measurements appropriate?
- 4.4. – Is the risk of nonresponse bias low?
- 4.5. – Is the statistical analysis appropriate to answer the research question?
- 5.1. – Is there an adequate rationale for using a mixed methods design to address the research question?
- 5.2. – Are the different components of the study effectively integrated to answer the research question?
- 5.3. – Are the outputs of the integration of qualitative and quantitative components adequately interpreted?
- 5.4. – Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?
- 5.5. – Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?

<sup>c</sup>While Palakshappa 2017a & 2017b articles came from the same study (i.e., focusing on the same intervention in the same setting), the 2017b article was qualitative and the 2017a article applied mixed methods.

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**Appendix Table 3.** Study Participants and Settings (n=32 studies)

<b>Author/year</b>	<b>Patient Population<sup>a</sup></b>	<b>Exclusion Criteria</b>	<b>Sample Size</b>	<b>Setting</b>	<b>U.S. State</b>	<b>Geography</b>
Smith A (2020) <sup>36</sup>	Pts of all ages	Unspecified	2,314	Large health system (16 primary care clinics)	Massachusetts	Unspecified
Manian (2020) <sup>35</sup>	Pts of all ages	Pts w/o social needs Pts with missing data	38,404	Hospitals & clinics; FQHCs & academic medical centers	Nationwide “11 states”	Unspecified
Martel (2018) <sup>41</sup>	Pts visiting the ED	N/A	1,519	County ED	Minnesota	Urban
Schickedanz (2019) <sup>62</sup>	Adult pts	Not in top 1% of care utilization	34,225	KP Southern California	California	Unspecified
Marpadga (2019) <sup>46</sup>	Adult pts w/diabetes	Non-English or Spanish spkrs	240 total; 31 qual	Hospital-based diabetes clinic	California	Urban
Zhu (2020) <sup>50</sup>	Adult pts	Unspecified	19	Hospital-affiliated primary care center & children’s hospital	Rhode Island	Urban
Berkowitz (2019) <sup>57</sup>	Adult pts	Unable to complete screening; Non-English or Spanish spkrs	141 quant; 80 qual	3 academic primary care clinics	Massachusetts	Urban
Hamity (2018) <sup>49</sup>	Adult Medicare pts, w/complex needs: Georgia; primary care panel: Northwest	Unspecified	10 Georgia; 11 Northwest	KP Georgia & Northwest	Georgia & “Northwest”	Unspecified

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Nguyen (2016) <sup>40</sup>	Adult pts >60 w/diabetes	Non-English or Spanish spkrs; Not Hispanic; Does not have diabetes	28 total; 18 qual	FQHC	California	Unspecified
Swavely (2019) <sup>54</sup>	Quant: Adult pts >18 Qual: Adult pts 33-69	Unspecified	3,860 total; 123 analysis of interest; 89 qual	Hospital	Pennsylvania	Urban
Hsu (2020) <sup>45</sup>	Adult pts >18	Non-English or Spanish spkrs	102	CHC	California	Urban
Smith S (2017) <sup>37</sup>	Adult pts >18	Unspecified	463	Student-run clinics	California	Urban
Fargo (2017) <sup>30</sup>	Adults, veterans	Unable to perform screening; Prior engagement w/VHA homeless programs; Nursing home residents	5,771,496	VHA, outpatient settings	Nationwide	Unspecified
Montgomery (2020) <sup>55</sup>	Adults, veterans	Veterans w/o housing instability	100,022	VHA, outpatient settings	Nationwide	Varied
Cusack (2020) <sup>44</sup>	Adults, veterans	Veterans w/o housing instability	60	VA medical center, outpatient settings	“Northeast”	Urban
Hassan (2015) <sup>32</sup>	Adolescents/young adult pts 15-25	Distressed at time of visit; Unable to comprehend intervention due to language/developmental barriers	401	Hospital-based adolescent & young adult clinic	Massachusetts	Urban
Polk (2020) <sup>33</sup>	Households w/peds pts	Non-English or Spanish spkrs	10,916	8 peds practices	“Northeast” & “Mid-Atlantic”	Unspecified

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Fox (2016) <sup>31</sup>	Caregivers, peds pts	Unspecified	116	University peds weight management clinic	Minnesota	Urban
Fiori (2020) <sup>39</sup>	Caregivers, peds pts	Unspecified	4,948 total; 287 analysis of interest	FQHC	New York	Urban
Knowles (2018) <sup>52</sup>	Caregivers, peds pts	Unspecified	103 total; 19 qual	Children's hospital: 3 peds primary care clinics	Pennsylvania	Urban
Gottlieb (2018) <sup>b 61</sup> Gottlieb (2016) <sup>60</sup>	Caregivers, peds pts	Families seeking health care for a child w/a severe illness; Non-English or Spanish spkrs	1,237 1,809	Urgent care at 2 safety-net hospitals Primary & urgent care at 2 safety-net hospitals	California	Urban
Power-Hays (2019) <sup>34</sup>	Caregivers, peds pts w/sickle cell disease	Unspecified	132	Peds hematology clinic at academic safety-net hospital	Massachusetts	Urban
Cullen (2020) <sup>43</sup>	Caregivers, pts <18	Those in critical condition; Non-English spkrs; Previously enrolled	40	ED of large children's hospital	Pennsylvania	Urban
Uwemedimo (2018) <sup>38</sup>	Caregivers, pts <18	Unspecified	148	Peds hospital-based primary care practice	New York	Urban

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Emengo (2020) <sup>51</sup>	Caregivers, peds pts	Unspecified	6	Peds hospital-based primary care practice	New York	Urban
Gottlieb (2020) <sup>58</sup>	Caregivers, pts <17	Pts seen for abuse; Non-English or Spanish spkrs; Enrolled in similar program; in foster care	611	Peds urgent care clinic at an urban safety-net hospital	California	Urban
Palakshappa (2017a) <sup>b 56</sup>	Caregivers presenting for well-child visits	Unspecified	4,371 total; 122 analysis of interest	Children's hospital: 6 primary care practices	Pennsylvania	Suburban
Palakshappa (2017b) <sup>48</sup>		Did not report food insecurity; Non-English spkrs; Caregivers <18	23			
Fritz (2020) <sup>42</sup>	Caregivers, well-child visits (primary care); Caregivers (Inpatient); Pts w/asthma (ED)	Non-English or Spanish spkrs; Relationship w/social workers; Screened within 6 months	5,735 total; 371 analysis of interest	Children's hospital: 2 primary care clinics, 1 inpatient setting, & 1 ED	Colorado	Varied
Ray (2020) <sup>53</sup>	Caregivers, pts <5	Presenting w/urgent need; Non-English or Spanish spkrs	146 total; 61 analysis of interest	Academic peds ED	Pennsylvania	Varied
Bottino (2017) <sup>29</sup>	Caregivers, pts 3-10	Pts w/special health needs; Non-English spkrs; Previous screening	340	Peds hospital-based primary care clinic	Massachusetts	Urban
Orr (2019) <sup>47</sup>	Caregivers, pts 1-5	Pts premature or w/condition affecting their eating or growth; Non-English or Spanish spkrs	17	Peds clinic affiliated w/academic medical center	North Carolina	Unspecified

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Garg (2015) <sup>59</sup>	Caregivers, pts <6 mths	Pts w/special health needs; Non-English or Spanish spkrs; Not pts's mother, mother <18, foster parents	336	8 CHCs	Massachusetts	Urban
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<sup>a</sup>While some articles included data from non-patient/caregiver participants, this table focuses on patient/caregiver participants for whom relevant outcome data were collected.

<sup>b</sup>Articles by Gottlieb 2016 & 2018 and Palakshappa 2017a & 2017b each came from the same studies (i.e., focusing on the same intervention in the same setting), respectively.

CHC, Community Health Center; ED, Emergency Department; FQHC, Federally Qualified Health Center; KP, Kaiser Permanente; Peds, Pediatric; Pts, Patients; Qual, Qualitative Data; Quant, Quantitative Data; Spkrs, Speakers; VA, Veterans Affairs; VHA, Veterans Health Administration.