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## Addressing social adversity to improve outcomes for children after liver transplant

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### Abstract

The social determinants of health, defined as the conditions in which we live, learn, work, and play, undoubtedly impact health outcomes. Social adversity in childhood perpetuates over the life course and has consequences extending into adulthood. This link between social adversity and adverse outcomes extends to children undergoing liver transplant, with children from socioeconomically deprived neighborhoods experiencing a greater burden of morbidity and mortality after transplant. Yet, we lack an in-depth understanding of how to address social adversity for these children. Herein, we lay out a strategy to develop and test interventions to address social adversity for children undergoing liver transplant. To do so, we believe that more granular data on how specific social risk factors (e.g., food insecurity) impact outcomes for children after liver transplant. This will provide the liver transplant community with knowledge on the most pressing problems to address. Then, using the National Academies of Sciences, Engineering, and Medicine framework for integrating social needs into medical care, the health system can start to develop and test health system interventions. We believe that attending to our patients' social adversity will realize improved outcomes for children undergoing liver transplant.

### Keywords

social determinants of health; health equity; disparities; pediatric; socioeconomic deprivation

Clinical scenario: Luis (age 5 years), transplanted 2 years ago for biliary atresia, in liver clinic for his annual appointment. When the hepatologist opens the electronic health record, she notices that his medication level variability index (MLVI) is high, suggesting poor medication adherence. She counsels the patient/family on the importance of taking his medications and advises them to set up an app on their smart phone. What she does not realize, however, is that the family has been receiving eviction notices from their landlord. They have been so pre-occupied with the threat of eviction that they have overlooked aspects of their child's liver transplant care. This physician, without the proper tools at her

disposal, missed an important root cause of this child's poor adherence and, in turn, missed an opportunity to improve this child's adherence. Yet, a brief screening tool in the clinic waiting room may have allowed this clinician to identify and intervene on Luis' unstable housing.

The social determinants of health, defined as the conditions in which we live, learn, work, and play, strongly influence health outcomes;<sup>1</sup> health and disease are inextricably linked to factors extending beyond the walls of the hospital or clinic.<sup>2</sup> The term "social determinants of health" reflects many intersecting domains, including structural issues like affordable housing, school quality, and neighborhood safety that lead to downstream consequences such as poverty. These environmental influences are particularly salient for children and accumulate over the life course.<sup>1</sup> For example, exposure to violence in childhood leads to lower intelligence quotient (IQ) later in life;<sup>3</sup> thereby limiting future earning potential. The link between social adversity and disease extends to hepatology. For example, food insecurity, an adverse social determinant of health, is an independent predictor for the development of non-alcoholic fatty liver disease (NAFLD) and liver fibrosis.<sup>4</sup> Defined as "a household-level economic and social condition of limited or uncertain access to adequate foods," food insecurity affects metabolic outcomes, possibly through consumption of poor quality, inexpensive, and high caloric density foods. Emerging evidence suggests that health care teams can affect patient health by addressing these environmental conditions. Intervening on food insecurity, for example, has led to improved glycemic control for patients with type 2 diabetes.<sup>5</sup> Furthermore, screening for social adversity can be accomplished using brief, validated tools.<sup>6,7</sup>

Children undergoing liver transplantation are medically fragile and are at risk of impaired growth,<sup>8</sup> reduced quality of life,<sup>9</sup> and cognitive delays.<sup>10</sup> Post-transplant, pristine allograft health is essential to ensuring long-term allograft survival. Therefore, these children are especially vulnerable to environmental influences. Social adversity can not only hinder the child/family's ability to manage the health needs of a child after transplant<sup>11</sup> but also may affect the allograft through biologic pathways that alter immune function and the inflammatory response,<sup>12</sup> thereby jeopardizing the allograft organ's lifespan. The result is that long-term outcomes for children after liver transplant remain suboptimal; with racial minorities and socioeconomically deprived children experiencing a larger burden of post-transplant morbidity and mortality.<sup>13-15</sup> The Maxim Principle states that inequalities should only be tolerated if "they are the greatest benefit to the least-advantaged members of society"<sup>16</sup> and provides a strong moral imperative to study and address social adversity as a possible key to improving child health and health equity.<sup>2</sup>

One barrier to addressing racial and socioeconomic disparities in post-transplant outcomes is that we do not yet understand the underlying drivers of these health disparities. Before we can develop high impact interventions to address adverse social determinants, we need to know which determinants have the largest impact on post-transplant outcomes. Yet, research and clinical guidelines on optimizing post-transplant care principally focus on individual- and center-level factors affecting care.<sup>17</sup> However, before we can intervene on a patient's social needs, clinicians will need better tools to allow for the provision of such holistic care. A more nuanced understanding of the most salient environmental factors contributing to

outcomes could spur innovation in post-transplant care delivery. In this paper, we describe what is currently known about disparities in pediatric liver transplantation, highlight our vision for a more equitable future, and define a path to getting there (Figure 1).

## What We Know

The social science literature definitively demonstrates that measures of race and ethnicity are social constructs.<sup>18</sup> Race, rather than a measure of differing biologic or genetic predilections to health and disease, represents one's racial hierarchy stemming from historically inequitable race relations. Therefore, racial health disparities approximate the effects of institutional and interpersonal racism, segregation, and decreased trust in the healthcare system.<sup>18</sup> While ethnicity is an overlapping social construct to race, it also measures cultural identification, capturing shared attitudes, language, and religion. Ethnic health disparities may occur from similar underlying causes as race and might also include indirect effects such as language barriers or differing health beliefs. However, these categorizations of race/ethnicity do little to further our understanding of the underlying causes of racial and ethnic disparities and may do more harm by making racial and ethnic disparities appear to be genetically and biologically driven. Therefore, more nuanced individual and household-level measures of social risks and assets may allow for more precise risk categorization.

Socioeconomic deprivation indices, linked to one's home address, contextualize one's neighborhood and were developed to serve as a better proxy for the underlying determinants (such as segregation) that might account for racial and socioeconomic health inequities. These measures may approximate individual or household-level socioeconomic status. Socioeconomic status, itself, is a multi-dimensional construct that represents one's education, wealth, and income, and can influence health from different levels (e.g. individual, household, and neighborhood).<sup>19</sup> In our previous work, we utilized a composite neighborhood level measure of socioeconomic deprivation that incorporates poverty, healthcare coverage, housing, and education. This measure captures the relative socioeconomic milieu of the neighborhood that a child lives in and approximates the child's household socioeconomic conditions. Yet, this measure is imperfect and likely overlooks certain children with adverse social determinants.<sup>20</sup> Furthermore, it provides little specific information that can be used to strengthen child or family-level social assets or intervene on social adversity to improve outcomes for children at highest risk. Therefore, while measures of neighborhood deprivation might allow health systems to identify high risk neighborhoods for placed-based interventions at the population level,<sup>21</sup> individual clinicians/liver transplant teams need more granular and readily available social risk data to properly address the underlying social needs.

Our current understanding of racial and socioeconomic disparities in pediatric liver transplantation is insufficient for targeting interventions (Figure 1, first panel). Although we have documented that Black race and neighborhood socioeconomic deprivation are associated with worse medication adherence, graft failure, and death after transplant,<sup>13–15</sup> highlighting these racial and socioeconomic disparities has not helped to narrow disparities and deliver more equitable care. New ways of surfacing health-related social needs in a

fast-paced hepatology clinic and new evidence on effective interventions will be critical to improve health outcomes.

## Gaps in Knowledge

We highlight (Figure 1, second panel) that in order to move the field closer to delivering equitable outcomes for all children, we need a more nuanced understanding of how specific adverse social determinants contribute to worse outcomes for children after liver transplant. Such work would provide the field with intervention targets, and related interventions should be developed and refined to ensure they improve transplant outcomes. However, we must also acknowledge that there are determinants that will be more difficult for the liver transplant team and health system to influence. Connecting families to external social services or resources to cover out-of-pocket drug expenses feels more feasible than influencing the regional job market. Therefore, we suggest that the transplant field focus more immediately on household-level social risks that are potentially *modifiable* by the transplant team and health system.

Specific modifiable social risks closest to the healthcare system level of influence (Table 1) include health literacy, material economic hardship (e.g. food insecurity, lack of transportation access), intimate partner violence, social isolation, caregiver mental health, and perceived discrimination in health care. These constructs can be screened for using existing screening tools and are important predictors of outcome in other pediatric chronic illnesses.<sup>6,21,22</sup> Furthermore, we must enrich patient/family data about these social circumstances with a deeper understanding of the everyday medical and social needs of pediatric liver transplant recipients and their caregivers to better understand how social conditions influence post-transplant care. Finally, we must engage clinic stakeholders to identify strategies that do not increase the burden on the providers. Together, these data will provide the pediatric liver transplant community with a path forward to addressing the most pressing adverse social determinants.

Whether by adjusting care to accommodate child/family social conditions or by reducing social barriers themselves, acknowledging and intervening on social adversity is likely to affect both short- and long-term outcomes. Proximal outcomes might include total hospitalized days after transplant, re-admission, medication adherence, adherence to clinic visits and blood draws, and episodes of acute cellular rejection. Long-term outcomes might include medication adherence, adherence to routine blood draws, immunosuppression minimization, and Ideal Outcome – 3,<sup>15</sup> a composite marker of morbidity in children after transplant, and quality of life. We should also track missed clinic and lab appointments. Finally, we should define and measure patient reported outcomes, such as care experience and trust in providers.

## Opportunities for Social Care Intervention Research

In 2018–2019, the NASEM convened an expert committee to better articulate the ways health care systems might envision their roles and responsibilities around social care.<sup>23</sup> The committee defined five types of social care activities relevant to health care systems,

including *Awareness, Adjustment, Assistance, Alignment, and Advocacy*. In the liver transplant field, each of these activities will benefit from stakeholder engagement, including liver transplant team members, patients, and their caregivers, who can collaboratively identify intervention opportunities and critical research questions relevant to the course of a child's transplant care.

*Awareness* refers to knowing what our patients' specific social needs are. Research questions include if, when, how, and who should conduct social risk screening in liver transplant settings. *Adjustment* refers to activities to alter clinical care to accommodate a patient's social barriers. As an example, could expanded telehealth in the post-COVID era reduce transportation barriers to follow-up appointments for liver transplant patients? *Assistance* refers to the ability of the health system to systematically refer patients with social needs to relevant social services. Research is needed on effective and feasible strategies for providing social services information and referrals, e.g. to medical legal partnerships for families threatened with eviction. *Alignment* refers to ways health care institutions can better align their own practices, e.g. data collection, aggregation, and sharing on liver transplant disparities, to improve community-level health and equity goals. In pediatric liver transplantation, more intentional alignment efforts across regulatory bodies (e.g. UNOS), societies (e.g. SPLIT), and learning health systems (e.g., the Starzl Network) could enable synergy and collective action. For example, just as 1 and 3 year survival outcomes are publicly reported, regulatory bodies could incentivize transplant institutions to provide social care by developing and reporting a 'health equity' metric.<sup>24</sup> Finally, the NASEM committee underscored a final community-focused social care activity: *Advocacy*, which refers to work that changes policies that influence the availability of health and social services. In liver transplant, this advocacy work might target policies that determine the out-of-pocket expenses encountered by children/families after liver transplant. Together, these types of social care activities can help health care teams understand and intervene on the social and environmental factors that affect post-transplant morbidity and mortality. If more systematically incorporated into liver transplant care, we anticipate that they can fundamentally shift outcomes and improve disparities.

In the introductory case, we highlighted a child and family who face a threat of eviction. For this example, one promising strategy to address social adversity, and thereby improve outcomes, may be through the use of health advocates. Health advocates are members of the clinical team without an advanced degree who can screen and intervene on social risks, coordinate care, and facilitate self-management.<sup>25</sup> In one randomized control trial in pediatric primary care, health advocates screening and referral to community-based resources resulted in decreased social needs and improved overall health.<sup>26,27</sup> In more comprehensive health advocate programs, health advocate 'interventionists' provide comprehensive services, including care coordination and skills training, to patients/families and have resulted in improved Type I diabetes outcomes.<sup>22</sup> For these programs to be efficacious in pediatric liver transplantation, we must define and adapt the health advocate role to meet the needs of our patients, and then rigorously test the effect of such a program within our clinics.

## Clinical scenario, integrating social care into transplant medicine

Imagine again that same child, Luis, with evidence of poor adherence and whose landlord is threatening eviction. When the hepatologist opens the electronic health record, she not only notices that his MLVI is high, but she also sees that his parents have reported new onset financial strain on the social risk/asset screening form they completed in the waiting room. Rather than focusing exclusively on the importance of taking immunosuppressive medications, the doctor refers them to a health advocate who inquires more about the family's financial circumstances and learns that the family's landlord is threatening eviction for late rent payments. The child's parents have been so pre-occupied with the threat of eviction that they sometimes forget to give their child his tacrolimus. Armed with this insight, the health advocate connects Luis's family to an on-site Medical-Legal Partnership. The MLP team's lawyer helps the family overcome the threat of eviction and stay in their home. The family can now focus on their child's health; the MLVI normalizes at the next appointment. Evidence already exists to suggest that similar programs are both feasible and effective.<sup>21,22</sup>

Here, we lay out a path forward for the pediatric liver transplant community to address the disparities in transplant outcomes. As we seek to improve the children's liver transplant outcomes, we must develop a robust system for identifying and addressing social adversity that caters to each child/family's unique needs. We believe such a system will result in more equitable and durable long-term outcomes.

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### List of Abbreviations:

**NAFLD** non-alcoholic fatty liver disease

### REFERENCES

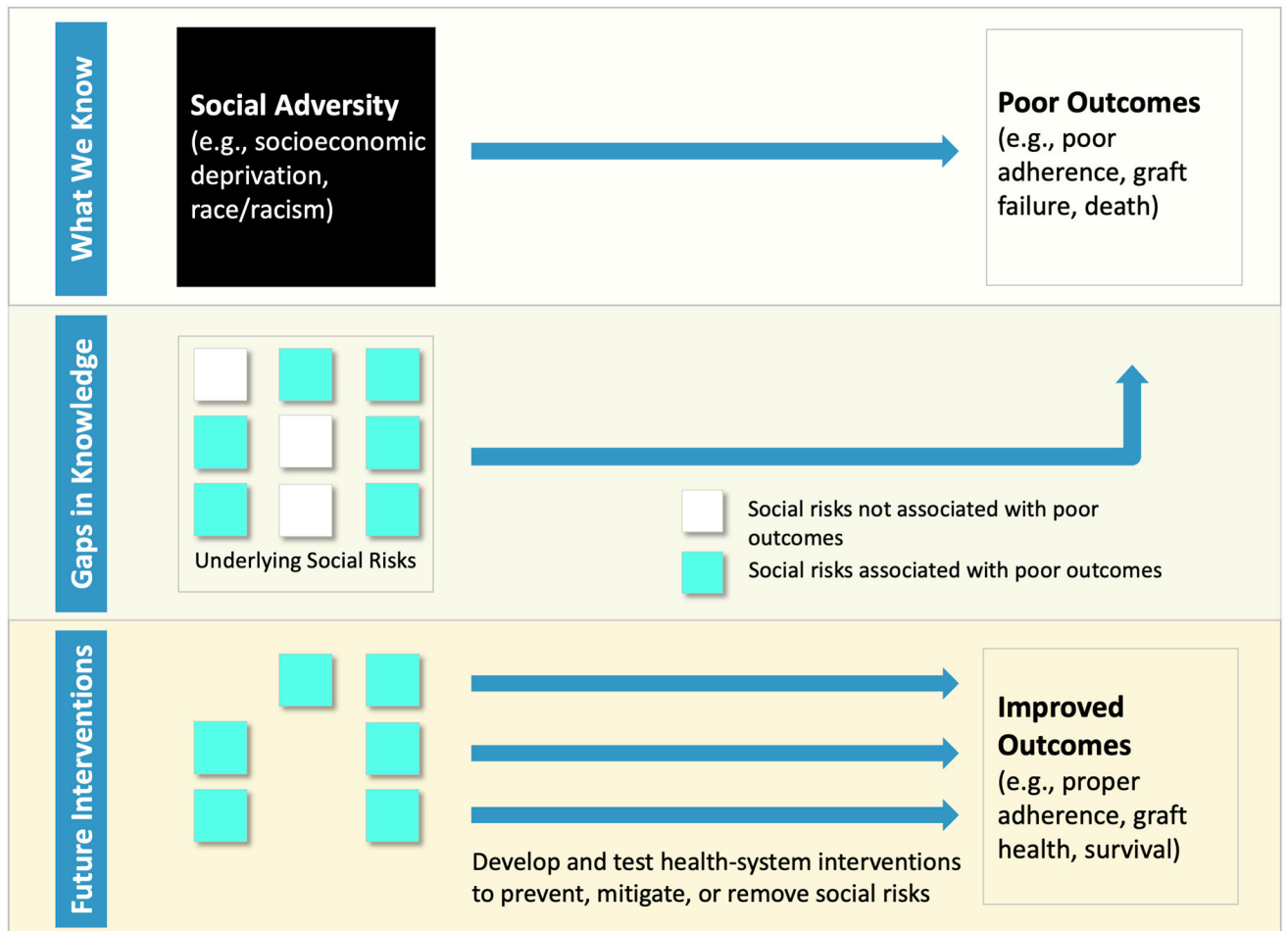
1. Braveman P, Egerter S, Williams DR. The Social Determinants of Health: Coming of Age. *Annu Rev Public Health*. 2011;32(1):381–398. doi:10.1146/annurev-publhealth-031210-101218 [PubMed: 21091195]
2. Berwick DM. The Moral Determinants of Health. *JAMA*. 2020;324(3):225. doi:10.1001/jama.2020.11129 [PubMed: 32530455]
3. Koenen KC, Moffitt TE, Caspi A, Taylor A, Purcell S. Domestic violence is associated with environmental suppression of IQ in young children. *Dev Psychopathol*. 2003;15(2):297–311. doi:10.1017/S0954579403000166 [PubMed: 12931829]
4. Golovaty I, Tien PC, Price JC, Sheira L, Seligman H, Weiser SD. Food Insecurity May Be an Independent Risk Factor Associated with Nonalcoholic Fatty Liver Disease among Low-



- Income Adults in the United States. *J Nutr.* 2020;150(1):91–98. doi:10.1093/jn/nxz212 [PubMed: 31504710]
5. Essien UR, Shahid NN, Berkowitz SA. Food Insecurity and Diabetes in Developed Societies. *Curr Diab Rep.* 2016;16(9):79. doi:10.1007/s11892-016-0774-y [PubMed: 27421977]
  6. De Marchis EH, Hessler D, Fichtenberg C, et al. Part I: A Quantitative Study of Social Risk Screening Acceptability in Patients and Caregivers. *Am J Prev Med.* 2019;57(6):S25–S37. doi:10.1016/j.amepre.2019.07.010 [PubMed: 31753277]
  7. Byhoff E, De Marchis EH, Hessler D, et al. Part II: A Qualitative Study of Social Risk Screening Acceptability in Patients and Caregivers. *Am J Prev Med.* 2019;57(6):S38–S46. doi:10.1016/j.amepre.2019.07.016 [PubMed: 31753278]
  8. Mohammad S, Grimberg A, Rand E, Anand R, Yin W, Alonso EM. Long-Term Linear Growth and Puberty in Pediatric Liver Transplant Recipients. *J Pediatr.* 2013;163(5):1354–60.e1–7. doi:10.1016/j.jpeds.2013.06.039 [PubMed: 23916225]
  9. Anthony SJ, Pollock BarZiv S, Ng VL. Quality of Life After Pediatric Solid Organ Transplantation. *Optim Outcomes Child Solid Organ Transplant.* 2010;57(2):559–574. doi:10.1016/j.pcl.2010.01.006
  10. Sorensen LG, Neighbors K, Martz K, Zelko F, Bucuvalas JC, Alonso EM. Cognitive and Academic Outcomes after Pediatric Liver Transplantation: Functional Outcomes Group (FOG) Results. *Am J Transplant.* 2011;11(2):303–311. doi:10.1111/j.1600-6143.2010.03363.x [PubMed: 21272236]
  11. Modi AC, Pai AL, Hommel KA, et al. Pediatric Self-management: A Framework for Research, Practice, and Policy. *Pediatrics.* 2012;129(2):e473–e485. doi:10.1542/peds.2011-1635 [PubMed: 22218838]
  12. Gowda C, Hadley C, Aiello AE. The association between food insecurity and inflammation in the US adult population. *Am J Public Health.* 2012;102(8):1579–1586. doi:10.2105/AJPH.2011.300551 [PubMed: 22698057]
  13. Wadhvani SI, Beck AF, Bucuvalas J, Gottlieb L, Kotagal U, Lai JC. Neighborhood socioeconomic deprivation is associated with worse patient and graft survival following pediatric liver transplantation. *Am J Transplant.* Published online 1 20, 2020:ajt.15786. doi:10.1111/ajt.15786
  14. Wadhvani SI, Bucuvalas JC, Brokamp C, et al. Association between neighborhood-level socioeconomic deprivation and the Medication Level Variability Index for children following liver transplantation. *Transplantation.* Published online 1 19, 2020. doi:10.1097/TP.0000000000003157
  15. Wadhvani SI, Hsu EK, Shaffer ML, Anand R, Ng VL, Bucuvalas JC. Predicting ideal outcome after pediatric liver transplantation: An exploratory study using machine learning analyses to leverage Studies of Pediatric Liver Transplantation Data. *Pediatr Transplant.* Published online 7 22, 2019. doi:10.1111/ptr.13554
  16. Ethical Principles of Pediatric Allocation. Organ Procurement and Transplantation Network. Published 11 2014. <https://optn.transplant.hrsa.gov/resources/ethics/ethical-principles-of-pediatric-organ-allocation/>
  17. Kelly DA, Bucuvalas JC, Alonso EM, et al. Long-term medical management of the pediatric patient after liver transplantation: 2013 practice guideline by the American Association for the Study of Liver Diseases and the American Society of Transplantation. *Liver Transpl.* 2013;19(8):798–825. doi:10.1002/lt.23697 [PubMed: 23836431]
  18. Ford CL, Harawa NT. A new conceptualization of ethnicity for social epidemiologic and health equity research. *Soc Sci Med.* 2010;71(2):251–258. doi:10.1016/j.socscimed.2010.04.008 [PubMed: 20488602]
  19. Williams DR, Priest N, Anderson NB. Understanding associations among race, socioeconomic status, and health: Patterns and prospects. *Health Psychol.* 2016;35(4):407–411. doi:10.1037/hea0000242 [PubMed: 27018733]
  20. Cottrell EK, Hendricks M, Dambrun K, et al. Comparison of Community-Level and Patient-Level Social Risk Data in a Network of Community Health Centers. *JAMA Netw Open.* 2020;3(10):e2016852. doi:10.1001/jamanetworkopen.2020.16852 [PubMed: 33119102]
  21. Beck AF, Anderson KL, Rich K, et al. Cooling The Hot Spots Where Child Hospitalization Rates Are High: A Neighborhood Approach To Population Health. *Health Aff (Millwood).* 2019;38(9):1433–1441. doi:10.1377/hlthaff.2018.05496 [PubMed: 31479350]



22. Harris MA, Spiro K, Heywood M, et al. Novel Interventions in Children's Health Care (NICH): Innovative treatment for youth with complex medical conditions. *Clin Pract Pediatr Psychol*. 2013;1(2):137–145. doi:10.1037/cpp0000016
23. Committee on Integrating Social Needs Care into the Delivery of Health Care to Improve the Nation's Health, Board on Health Care Services, Health and Medicine Division, National Academies of Sciences, Engineering, and Medicine. *Integrating Social Care into the Delivery of Health Care: Moving Upstream to Improve the Nation's Health*. National Academies Press; 2019:25467. doi:10.17226/25467
24. Wadhvani SI, Huang C-Y, Gottlieb L, et al. Center variation in long-term outcomes for socioeconomically deprived children. *Am J Transplant*. Published online 2 10, 2021. doi:10.1111/ajt.16529
25. Raphael JL, Rueda A, Lion KC, Giordano TP. The Role of Lay Health Workers in Pediatric Chronic Disease: A Systematic Review. *Acad Pediatr*. 2013;13(5):408–420. doi:10.1016/j.acap.2013.04.015 [PubMed: 24011745]
26. Gottlieb LM, Hessler D, Long D, et al. Effects of Social Needs Screening and In-Person Service Navigation on Child Health: A Randomized Clinical Trial. *JAMA Pediatr*. 2016;170(11):e162521. doi:10.1001/jamapediatrics.2016.2521 [PubMed: 27599265]
27. Pantell MS, Hessler D, Long D, et al. Effects of In-Person Navigation to Address Family Social Needs on Child Health Care Utilization: A Randomized Clinical Trial. *JAMA Netw Open*. 2020;3(6):e206445. doi:10.1001/jamanetworkopen.2020.6445 [PubMed: 32478849]
28. Thackeray JD, Hibbard R, Dowd MD, The Committee on Child Abuse and Neglect and the C on I. Intimate Partner Violence: The Role of the Pediatrician. *Pediatrics*. 2010;125(5):1094–1100. doi:10.1542/peds.2010-0451 [PubMed: 20421260]
29. Rivara FP, Anderson ML, Fishman P, et al. Intimate Partner Violence and Health Care Costs and Utilization for Children Living in the Home. *Pediatrics*. 2007;120(6):1270–1277. doi:10.1542/peds.2007-1148 [PubMed: 18055676]
30. Committee on the Health and Medical Dimensions of Social Isolation and Loneliness in Older Adults, Board on Health Sciences Policy, Board on Behavioral, Cognitive, and Sensory Sciences, Health and Medicine Division, Division of Behavioral and Social Sciences and Education, National Academies of Sciences, Engineering, and Medicine. *Social Isolation and Loneliness in Older Adults: Opportunities for the Health Care System*. National Academies Press; 2020:25663. doi:10.17226/25663
31. Mogul DB, Bowring MG, Lau J, et al. Role for Social Media in Pediatric Liver Disease: Caregiver and Provider Perspectives. *Pediatr Gastroenterol Hepatol Nutr*. 2020;23(6):548–557. doi:10.5223/pghn.2020.23.6.548 [PubMed: 33215026]
32. Golfenshtein N, Srulovici E, Deatrick JA. Interventions for Reducing Parenting Stress in Families With Pediatric Conditions: An Integrative Review. *J Fam Nurs*. 2016;22(4):460–492. doi:10.1177/1074840716676083 [PubMed: 27821622]
33. Hassen N, Lofters A, Michael S, Mall A, Pinto AD, Rackal J. Implementing Anti-Racism Interventions in Healthcare Settings: A Scoping Review. *Int J Environ Res Public Health*. 2021;18(6):2993. doi:10.3390/ijerph18062993 [PubMed: 33803942]
34. Monaghan M, Hilliard ME, Cogen FR, Streisand R. Supporting parents of very young children with type 1 diabetes: results from a pilot study. *Patient Educ Couns*. 2011;82(2):271–274. doi:10.1016/j.pec.2010.04.007 [PubMed: 20434293]
35. Sassmann H, de Hair M, Danne T, Lange K. Reducing stress and supporting positive relations in families of young children with type 1 diabetes: a randomized controlled study for evaluating the effects of the DELFIN parenting program. *BMC Pediatr*. 2012;12:152. doi:10.1186/1471-2431-12-152 [PubMed: 22994843]



**Figure 1.** Conceptual model for addressing adverse social determinants of health for children undergoing liver transplant. The small boxes are individual social risks (e.g., food insecurity) that are associated with adverse outcome. Once the social risks associated with poor transplant outcomes are elucidated, we suggest developing and testing interventions aimed at these specific social risks to improve post-transplant outcomes.

Example domains of social adversity, associated social risks that could be collected by health systems, and potential interventions.

**Table 1.**

<b>Domains of Social Adversity</b>	<b>Social Risk Example</b>	<b>Assistance or Awareness Intervention Examples</b>	<b>Effective Interventions</b>
Financial Circumstances	Food insecurity, housing instability, or utility challenges.	Health advocate connecting patient/family to community services	RCT in pediatric primary care found that health advocates could reduce social needs and improve child health outcomes. <sup>26,27</sup>
Intimate Partner Violence	Close family or friends screaming, talking down to, or hitting the caregiver.	Screening and prompt connection to community resources	Intimate partner violence is associated with increased child healthcare utilization and models exist for screening and referring parents who experience intimate partner violence. <sup>28,29</sup>
Social isolation	Small social networks, single parent households	Use of social networks to facilitate dialogue between transplant families	Social isolation predicts adverse health outcomes across diseases. Healthcare activities that address social isolation may improve child health outcomes. <sup>30,31</sup>
Caregiver Mental Health	Caregiver stress or depression	Referral to caregiver mental health treatment	Parental stress and depression are associated with worse child health outcomes and are potentially modifiable. <sup>1,1,32</sup>
Perceived Discrimination In Healthcare	Subjective perception of discrimination on the basis of one's race	Healthcare provider anti-racism training	Anti-racism training may reduce anti-racist policies and bias, but more research is needed to determine if it results in improved health outcomes for racial/ethnic minorities. <sup>33</sup>
Health Literacy	Inability to do simple math calculations	Make medication administration and dosing instructions easier to understand	Health literacy is associated with improved health outcomes and intervening on poor health literacy may provide benefit. <sup>11,34,35</sup>