

Interventions to Address the Social Determinants of Health in Primary Care Settings

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Abstract

Social determinants of health (SDOH) are conditions in the environment of individuals' lives that impact their health, such as where they live, their socioeconomic status, and their access to education. These factors contribute meaningfully to health and can explain a significant portion of disease burden, but they have not traditionally been addressed within healthcare settings. However, a growing understanding of the negative health outcomes associated with SDOH factors has led some health systems and providers to implement interventions within healthcare settings in order to address these issues in patients' lives.

The purpose of this research was to produce a critical literature synthesis of interventions to address the SDOH in primary care settings. While this topic is being focused on more by health systems and providers, there was a need for a comprehensive review of interventions that are being implemented specifically within primary care. This research is significant to public health because intervention to address the SDOH in patients' lives and communities is essential to accomplish the public health aims of disease prevention and health promotion.

A literature search was conducted within the *PubMed* and *Scopus* databases and 11 relevant interventions were reviewed. These interventions covered the SDOH-related factors of food insecurity, transportation, unmet legal needs, and interventions that were designed to address

multiple factors at once. Interventions fell into two main types: those that involved the direct provision of a good or service and those that involved patient consultation with an individual trained to help them meet their SDOH needs. Based on the interventions reviewed, recommendations for future practice in primary care are discussed. These recommendations include collocating staff who specialize in the SDOH in the primary care office, creating strong relationships between primary care practices and community partners, and that primary care providers engage in advocacy to address the SDOH at structural levels.

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Preface

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Thank you to my parents who instilled in me a love of reading and learning from a very young age. And who have walked with me and encouraged me every step of the way since then. Thank you to my partner, Andrew Myers, for being the best support system I could ask for in graduate school and in life. And most importantly, thank you to God for creating me with a desire to serve others and allowing me to be a small part of the restoration of this world. All glory be to Christ.

1.0 Introduction

In the United States there are serious disparities in health based on racial/ethnic background, socioeconomic status, and geographic region of residence. These disparities can be seen in areas such as life expectancy, infant and child mortality, cancer, diabetes, homicide, cardiovascular disease, and obesity (Singh et al., 2017). Health inequities are inextricably tied to the social determinants of health (SDOH), which are conditions in the environment of individuals' lives that impact health. For example, ethnic minorities are more likely to live in low income, less resourced neighborhoods when compared to non-Hispanic whites (Singh et al., 2013). Unemployment rates are also over two times higher in American Indian/Alaska Natives and African Americans than in non-Hispanic whites (US Census Bureau, 2016). Life expectancy is also lower for rural residents when compared to those living in urban areas (Singh et al., 2017).

These are just a few examples, out of many that could be presented, of how SDOH factors contribute to the perpetration of health disparities in the United States. In the last two decades there has been a growing acknowledgment by health systems and providers of this body of research and the role of the SDOH in contributing to individuals' health. Overall, there is a greater acceptance of the fact that medical care is insufficient on its own to explain disease (Braveman & Gottlieb, 2014). Health systems and providers recognize that certain patients have higher exposure to risk factors, which can negatively impact health because of factors such as where they live, learn, work, and play (Andermann, 2016). This understanding has pushed many health systems and providers to begin to take action to address the SDOH during clinical interactions that they have with patients, including within the primary care setting.

The purpose of this review is to produce a critical literature synthesis of interventions to address the SDOH in primary care settings. While SDOH are being focused on more by health systems and providers, there is a need for a comprehensive review of interventions that are being implemented within primary care to address these in patients' lives. The primary care setting in particular will be examined as this is a critical touchpoint between patients and providers where prevention is typically highlighted. This, and other unique characteristics of the setting which will be explored, make it an appropriate location for conducting meaningful interventions to address SDOH factors.

I organized the review in the following way. This first chapter serves as an introduction to the topic and the purpose of the research conducted. The second chapter will provide background on the concept of the SDOH and on the primary care setting. It will also describe the current state of knowledge on SDOH screening in primary care. Finally, it will elucidate what facilitators and barriers exist to implementing SDOH interventions in primary care. The third chapter will describe the methodology used to conduct this literature synthesis. The fourth chapter will be made up of the results of the review, including summaries of the interventions included. Lastly, the fifth chapter will consist of a discussion of the results and recommendations to health systems or providers seeking to implement SDOH interventions in their own primary care practices.

2.0 Background

2.1 Social Determinants of Health

Social determinants of health (SDOH) are the environmental conditions in patients' lives, which can be social, economic, or physical, that contribute to, or detract from, health (Office of Disease Prevention and Health Promotion, 2019). Such social, behavioral, and environmental factors can explain up to 60% of an individual's health (Vaida, 2017). SDOH-related factors are often rooted in poverty and can include things such as food insecurity, low educational attainment, unemployment, and unstable housing. Some also consider behavioral health conditions, such as depression and substance use as SDOH factors, however for this review I will not specifically examine these factors as they have a stronger history of being addressed in the clinical setting and may be addressed through distinct systems.

SDOH needs are prevalent among patients who are seen in primary care. For example, in one study conducted in university and neighborhood primary care clinics in the Southern U.S. 40.8% of patients screened positive for food insecurity (A. Kopparapu et al., 2020). The exact number of patients will vary based on the setting, with some settings, such as free clinics, likely to see a higher level of need. However in diverse settings, including Federally Qualified Health Centers in Indianapolis, Veterans Affairs primary care offices in California, and primary care offices in high-income counties in Virginia, a large proportion of patients had at least one SDOH need (Bikson et al., 2009; Tong et al., 2018; Vest et al., 2017).

The mechanisms by which these factors influence health are complex and multifaceted. One challenge in this area of research is the fact that disease, especially chronic disease, can take

years to develop. It can be difficult to tease out the impact of each of the SDOH, as they may exert their influence over time and work in concert with one another. The link between poverty and health may be mediated by way of higher exposure to pollution, violence, availability of alcohol, poor working conditions, limited access to fresh produce, and limited recreational options. It also may be related to allostatic load, which refers to the biological damage caused by chronic exposure to stressors (Braveman & Gottlieb, 2014).

However, while the exact mechanisms may be debated, the association is clear. Research has demonstrated the existence of a social gradient, whereby step-wise decreases in income, education level, social status, and social support are associated with corresponding increases in morbidity and premature mortality (Andermann, 2018). Thus, who gets sick or injured often has more to do with SDOH-related factors than anything else (Braveman & Gottlieb, 2014).

2.2 Connection Between SDOH and Health Outcomes

In order to be a SDOH-related factor, the factor must have a demonstrated impact on health outcomes for individuals with that factor. Thus, I am going to spend some time considering a few examples of SDOH-related factors and the research that exists exploring how they are associated with health outcomes. These examples will be relevant to the remainder of this review; however, it should be noted that many other examples could have been chosen and a similar process could have been carried out to look at health impacts. The examples that I will discuss here are food insecurity, transportation, and unmet legal needs.

2.2.1 Food Insecurity

Food insecurity is defined as an “economic and social condition of limited or uncertain access to adequate food.” In 2018, 37.2 million people in the United States lived in food-insecure households according to this definition (United States Department of Agriculture, 2019). However, food insecurity is not only an important SDOH to consider because of its prevalence, but also because of its connection to poor health outcomes. Food insecurity has been associated with negative outcomes across the life span. In children under age four it has been associated with increased developmental risk (Drennen et al., 2019). Other studies of food insecurity in children have shown that it is associated with cognitive problems, aggression, anxiety, and poorer general health (Gundersen & Ziliak, 2015).

In adults it has been associated with higher rates of depression, diabetes, hypertension, and hyperlipidemia (Gundersen & Ziliak, 2015). It can also act as a barrier for adults who are living with chronic conditions. For example, in a sample of adults with Type 2 diabetes seen in primary care, food insecurity was associated with skipping meals more often, being less adherent to medication, and having worse glycemic control (Heerman et al., 2016). Finally, in older adults food insecurity has been shown to be associated with depression and limitations in the Activities of Daily Living (Gundersen & Ziliak, 2015). These health issues may also contribute to greater usage of healthcare, as food insecurity has also been associated with more emergency department visits and inpatient hospitalizations (Berkowitz et al., 2018).

One mechanism by which food insecurity impacts health may be through individuals’ inability to follow a specific diet that has been recommended to them by healthcare providers. For example, patients with Type 2 diabetes may be instructed to keep their caloric intake constant to promote glycemic control, but if they don’t have a steady supply of food that may not be possible

(Heerman et al., 2016). It also may be the case that individuals who experience food insecurity have to make choices between purchasing food and other needs, such as health related services (Berkowitz et al., 2018). In addition, they may be forced to purchase cheaper, less nutritionally dense food, which can contribute to the development of health problems later on.

2.2.2 Transportation

Transportation barriers to healthcare can occur when patients do not have an affordable and accessible mode of transportation to travel to health sites, such as primary care appointments. Higher rates of transportation barriers are seen in patients with low socioeconomic status and a lack of transportation has been associated with missed medical appointments (Syed et al., 2013). This points to a mechanism by which transportation barriers can impact health outcomes. If patients miss appointments, they may delay interventions that are important for disease prevention or for reducing chronic disease complications (Syed et al., 2013).

An example of this being played out can be seen in a study by Strauss et al. (2006) of older adults living in rural areas with diabetes. As part of this study they measured the shortest driving distance from patients' homes to their primary care office. They found that driving distance was significantly associated with glycemic control, with every additional 22 miles of distance associated with a 0.25% increase in HbA1c. In this study transportation distance required seems to have operated as a barrier to appropriate chronic disease care.

2.2.3 Unmet Legal Needs

In this context, unmet legal needs refer to social conditions that have remedies in law or policies. Things that may appear at first to be resource needs may actually be legal issues (Sandel et al., 2014). For example, food insecurity is related to a resource need, but being wrongfully denied SNAP benefits is a legal need (Sandel et al., 2010). Some common unmet legal needs, especially among patients from lower socioeconomic statuses, are related to safe housing, education, access to income support, and protection from violence (Sandel et al., 2014). Adolescent patients in particular may have unique areas of unmet legal need, including school accommodations due to disability or name/gender marker changes (Gilbert et al., 2019).

Unmet legal needs can impact health according to direct or indirect pathways. An example of a more direct pathway would be a patient that has mold in their home and a need for legal assistance with a landlord who has not addressed the mold. The unaddressed mold is associated with subsequent asthma complications in that patient, representing a direct pathway. An example of a more indirect pathway could be through the mediating factor of psychological stress (Ryan et al., 2012). So, a patient may experience stress related to an unmet legal need and then that prolonged stress may contribute to negative health outcomes.

Looking at this research on food insecurity, transportation barriers, and unmet legal needs which connects the SDOH to health outcomes, there is clear opportunity for interventions to address them. These interventions have the potential for significant downstream effects in terms of improving individual and population health. This potential has been the driver for discussions within health systems and among providers to consider implementing SDOH interventions within clinical settings and to think about what specific setting would be the most appropriate for this kind of work to be carried out.

2.3 Primary Care Setting

The primary care setting is a fundamental building block of a comprehensive healthcare system. It is also unique, when compared to other entities such as hospitals, in its ability to provide long-term preventive care for patients. Traditionally, this has consisted of medical prevention, for example the provision of vaccines, however the setting is also appropriate to facilitate the prevention of the long-term harmful effects associated with unaddressed psychosocial issues. This vision of using primary care to address the SDOH finds some of its roots in the Alma Ata Declaration, published by the World Health Organization (WHO) and The United Nations Children's Fund (UNICEF) in 1978. This document declared health as a fundamental right and as a collective goal that everyone must work together to achieve. It also pushed for the establishment of comprehensive primary care instead of selective primary care. While selective primary care focuses on curative care and the health sector as the primary mode of delivery, comprehensive primary care involves other sectors and seeks to remove the root causes of illness (Baum, 2007).

Despite the spirit of Alma Ata in promoting a collective responsibility for health among primary care and other sectors of society, there has been a tendency of all sectors to push the responsibility of addressing the SDOH onto one another. Some see work to address the SDOH as only the responsibility of the social service sector. Others think that the public health system should take the lead in this work. And yet another group thinks that the health care system, including primary care, should have primary responsibility (Coughlin et al., 2019; Runyan, 2018). This lack of consensus can prevent the coordination of SDOH work and keeps it from achieving its maximum potential. However, there is a growing acknowledgement that it will require work from all of these sectors, along with others, in order to make meaningful progress in addressing the SDOH.

The primary health care and SDOH paradigms share several important similarities, including their focus on health equity, prevention, health promotion, and facilitating access to resources necessary for health (Rasanathan et al., 2011). These core similarities are a driver for work to address the SDOH in primary care, because the ultimate goals are well-aligned. In particular, the shared focus on prevention is an important piece of why primary care is so well poised to take action on the SDOH. Just like a pap smear performed by a primary care provider (PCP) is a form of secondary prevention, screening for SDOH risk in primary care can be used as a secondary prevention measure (Andermann, 2018).

The negative effects of poverty and other SDOH factors on health are well-established, so PCPs may be seeking ways to address these things within their own practices. A comprehensive view of primary care recognizes that to be high quality, care must involve efforts to reduce the negative impact of poverty on health (Coughlin et al., 2019). Its power to make a difference in decreasing these health impacts makes “primary care a highly appropriate environment for measuring and intervening on social determinants of health” (Katz et al., 2018, p. 218).

Another reason that the primary care setting is highly appropriate for this work is its focus on continuity. The setting is structured to promote a sense of continuity versus, for example, an emergency room visit where a patient may interact with a provider only once. In primary care the continuity of being connected to one provider long-term allows for work to address SDOH-related concerns to happen over time (Andermann, 2018). This is a key strength as SDOH issues are almost always going to take more than one visit for meaningful progress to be made.

However, locating SDOH interventions in primary care doesn't just have the possibility to positively impact patients, it can also have a positive impact on PCPs. One argument against adding SDOH work into primary care is that providers are already stressed and burnt out (Solberg,

2016). It is true that PCPs are at a high risk for burnout, which can decrease the quality of care for patients. But, there is evidence that having clinic strategies to address the SDOH can actually decrease burnout, while increasing self-efficacy and job satisfaction (Byhoff et al., 2018).

One study of primary care clinicians in California found that those with low or average emotional exhaustion and depersonalization, which are measures of burnout, were more likely to be confident in their offices having the resources necessary to meet social needs. So, implementing SDOH interventions actually has the potential to reduce burnout. The mechanism for this is likely a reduction of the frustration that occurs when treatment plans don't work because of social needs. The clinicians reported that it was emotionally taxing to feel responsible for patients, but to not feel like they had the ability to help them address their needs (Kung et al., 2019). So, by creating interventions whereby PCPs feel that they do have an avenue to provide assistance or connect patients to another staff member who can provide assistance, SDOH interventions may actually be protective against the harmful effects of burnout. By talking about SDOH needs more openly, PCPs also may improve their interactions with patients and can build a stronger patient-provider relationship (Tong et al., 2018).

2.4 Screening for SDOH in Primary Care

Before even considering interventions that may be implemented to address the SDOH in primary care, it is necessary to think about strategies that can be used to identify patients who have SDOH-related needs. A more traditional approach, referred to as surveillance, is waiting to see if a provider identifies a need during their time with a patient (Garg & Dworkin, 2016). However, as PCPs are increasingly pressed for time during the clinical encounter and some patients may be

unfamiliar with discussing these topics in a medical setting, needs may go unidentified using surveillance alone. A more proactive approach is accomplished by having patients complete a SDOH screening when they come to the office for a visit with their PCP. In the past this kind of systematic screening for SDOH needs was not part of medical practice, but there has been an increase in the number of screening tools developed for this use (Andermann, 2018).

The content of these screenings varies, but they all contain questions that address SDOH domains and seek to identify patients who are at risk for negative health consequences due to these concerns. For example, a commonly used tool is The Hunger Vital Sign™, a validated screening tool that can be used to identify patients experiencing food insecurity. It is a brief, two-question screening with a sensitivity of 97% and a specificity of 83% (Hager et al., 2010). This is an example of a tool that only addresses one SDOH domain, but other screening tools have questions which get at multiple domains. For example, the HealthBegins Social Screening Tool is composed of questions related to fourteen domains including education, social isolation, financial strain, and housing insecurity (LaForge et al., 2018). There is variability in terms of whether or not instruments have undergone rigorous research to be validated. Some may be developed in a clinic, but never undergo testing to determine their psychometric properties.

There are some major advantages of carrying out SDOH screening in primary care. First and foremost, it is an opportunity to identify patients with needs that may affect their health now or in the future that may otherwise “slip through the cracks.” Even when PCPs intend to identify these through surveillance, they tend to underestimate the proportion of patients with a problem (Bikson et al., 2009). Thus, by implementing universal SDOH screening, providers can better understand the scope of issues affecting their patient panel and decrease the likelihood that individual patients’ needs are never identified.

PCPs may also change their clinical encounters with patients based on reviewing the screening that the patient completed. One study of PCPs in Virginia found that having patients complete a social needs survey led to changes to care in 22.5% of encounters. For example, providers considering the cost of medication before prescribing it. In addition, PCPs reported that the survey helped them to know their patients better in 52.5% of encounters (Tong et al., 2018). The effect of this improved understanding and care may positively impact patient health in the long run. Another advantage is that patients seem to be comfortable responding to these types of questions, as low refusal rates for SDOH screens are generally seen, including for sensitive subjects (LaForge et al., 2018; Pinto et al., 2016). Results from SDOH screening can also be added to the EHR and this can be used to track referrals made (Gold et al., 2018). The ability to view this information in the EHR is an advantage of SDOH screening because it takes it one step further to promote shared decision making with the PCP, make it easier to identify risk factors for disease, and give population level information to health systems which could be used to create programs (Adler & Stead, 2015)

On the other hand, there are some disadvantages for screening for SDOH-related needs in primary care or reasons why it shouldn't be done. These way help explain why, despite the fact that many practices have begun to incorporate SDOH screening into medical care, 33.3% of physicians practices responding to the National Survey of Healthcare Organizations and Systems reported that they do not screen for food insecurity, housing instability, utility needs, transportation needs, or interpersonal violence (Fraze et al., 2019).

Some feel that these kinds of needs are outside of the scope of primary care and that screening for them is fundamentally different than traditional medical screening (Garg et al., 2016). Following this argument, screening puts too much responsibility on health systems for

needs that ought to be addressed by other entities (Davidson & McGinn, 2019). Even if there is agreement that the SDOH should be something that health systems tackle, there are also disadvantages at the provider level.

PCPs are often overworked and SDOH screening may add to this while taking time away from medical care for patients (Andermann, 2018; Davidson & McGinn, 2019; Runyan, 2018). One study found that the median visit length with a sample of PCPs was only 15.7 minutes (Tai-Seale et al., 2007). With such a limited amount of time and considering the complexity of addressing things such as chronic conditions, PCPs may not have the bandwidth to incorporate information from SDOH screenings into their care. They also may not know how to ask follow-up questions or respond appropriately (Andermann, 2018). Finally, it can create an additional administrative burden to document all the screenings that are completed (Tong et al., 2018).

Another disadvantage of screening is that it can produce false positives and false negatives, even when the tool used has high sensitivity and specificity (Garg et al., 2018). False positives may be a concern, as they can lead to resources being distributed where they are not truly needed. This is especially true for questions related to financial strain, as stress surrounding money is common for individuals with varying income levels (Health Leads, 2016). Finances also may be difficult to operationalize, for example, patients that screen positive for debt might have only student loan or mortgage debt that does not cause them financial stress (Sundar, 2018). False negatives could also have serious consequences and may emerge especially in individual's with low health literacy or who have trouble understanding screening questions. The final disadvantage of screening is that actually addressing needs after they are identified can prove to be very difficult. So, patients and providers could become frustrated when they talk about issues, but are not able to resolve them (Garg et al., 2016).

This potential frustration points to the idea of the importance of considering the ethics of screening for SDOH in primary care. It can be considered unethical to screen unless you are prepared to ensure that patients are connected to treatment, or in this case to resources (Garg et al., 2016). Following the example of traditional clinical screenings, the linkage to treatment is a crucial piece. For example, children are screened for lead poisoning in pediatric primary care, not in order to produce data on the problem, but in order to get them treatment (Beck & Klein, 2016). The U.S. Preventive Services Task Force is the group that makes recommendations for preventive care in clinical settings and one of their requirements in order to make a recommendation is that the screening has been shown to improve health, not just identify the problem (Garg et al., 2018).

The obvious solution would seem to be just ensuring that if a patient screens positive for a SDOH need, they receive the resources they need to address it. Indeed, the focus of this systematic review is on interventions that take place at this point. However, many of these interventions require significant investment on the part of the health system or established partnerships with community organizations. In cases where resources are nonexistent or limited, as is the case with affordable housing in many communities, linkages may be difficult or impossible to make (Garg et al., 2016).

However, the ethics of screening for SDOH when treatment or resources are not available can be considered from another angle. Rather than seeing this an unethical practice, some believe that screening is still important to do because it can identify those who need support with a particular issue. This data can then be used for advocacy and in order to justify the development of interventions in the future to help address that issue (Andermann, 2018; LaForge et al., 2018). As with most ethical issues there is not a clear consensus on which viewpoint is correct, but it is

apparent that this is something health systems, practices, and providers must grapple with when considering the decision whether or not to screen for SDOH in primary care.

Another thing to consider regarding SDOH screening is what level this screening is operating on. Most screening occurs at the individual level where patients are asked to self-report information regarding individual factors. However, this is not the only possibility. There is an emerging push to screen for community level factors, though in practice this isn't being carried out often yet. These are referred to as "community vital signs" and they relate to characteristics of the neighborhoods where patients live. Some examples include crime rates, walkability, average educational attainment, and the presence of environmental toxins (Hughes & Likumahuwa-Ackman, 2017; Hughes et al., 2016).

This kind of population health data is already available from sources such as Census data or disease surveillance data. However, it is not typically captured by the EHR, which means that PCPs don't have access to that data when talking with patients. There have been some early efforts to incorporate community vital signs into the EHRs for primary care. In one study the authors were working with Federally Qualified Health Centers in order to incorporate geocoded data into each patient's EHR. So using the patient's home address, information was added about their community, such as the percentage of the population living within a half mile of a park (Bazemore et al., 2016). The aim of integrating this information is to allow PCPs to use social risk as a factor when discussing goals with patients (Hughes et al., 2016). While this has a different feel when compared to individual level screening for SDOH, it is important to keep in mind as another form of screening that can be done within the primary care setting.

2.5 Barriers and Facilitators for SDOH Interventions

Screening represents an important piece of the process, however once risk factors or needs are identified, systems and providers have to decide what their next step will be. This is where interventions conducted in the primary care setting come in. As part of this literature synthesis, I reviewed research on existing interventions. My goal is to provide information on what is being done now, so that more health systems and providers can take action in the future. However, before exploring specific interventions I want to provide some background on barriers and facilitators that exist for health systems or providers who are considering implementing SDOH interventions.

One barrier to implementation is the fact that PCPs generally lack expertise regarding strategies to address the SDOH (Solberg, 2016). There have been increasing efforts to incorporate information on the SDOH into medical education, but this may be insufficient in terms of actually giving PCPs the tools they need to take action. Many just don't have the training or knowledge of community resources necessary to be effective in this role and providers themselves recognize this as a barrier (Davidson & McGinn, 2019; Garg & Dworkin, 2016). While that kind of education or training could be provided it may be adding work onto providers that are already stretched thin. PCPs have taken on several additional responsibilities in recent years, including a more formal role in mental health care and more documentation (Solberg, 2016). So, an already full workload and lack of expertise on SDOH are barriers for PCPs in that they negatively affect their ability to create or sustain SDOH interventions in their practices.

A related barrier is the fact that there may be a need for additional staff members in order to create effective SDOH interventions. If PCPs are unable to be the main drivers of interventions due to heavy workload, lack of time, and lack of expertise, then there is a need for someone else to fill that role if an intervention is going to happen. This needs to be someone who has expertise

and knows how to leverage resources (Kung et al., 2019). There are certainly professionals, including social workers and community health workers, who match this skillset, however incorporating them into practices requires a significant financial investment which may act as a barrier.

One factor that also may prevent health systems and practices from implementing SDOH interventions is that there is a need for more research into their effectiveness (Runyan, 2018). When considering making a financial investment, systems want evidence that what they are putting money towards is going to achieve its intended purpose. Some of the studies that have been done on physicians' ability to impact the SDOH are primarily theoretical (Solberg, 2016). This may not be enough to convince systems, who have many potential areas where they can make investments, to choose SDOH interventions. In addition, evaluations of programs that do already exist may focus more on process outcomes rather than health outcomes (Davidson & McGinn, 2019; Gottlieb et al., 2017). That is to say, there may be evidence showing that a program is operating well, but not downstream evidence that it ultimately improves the health of patients who are a part of it. Some of this may be due to the fact that much of the research in this area is in its early stages and there is a need to show effectiveness of the program itself in the short-term (Gottlieb et al., 2017). Thus, in the future there may be more research published examining health impacts over time as programs and interventions mature.

Another barrier is traditional payment models which do not give PCPs reimbursement for addressing social needs. While providers can bill a patients' insurance for many services provided, such as an influenza vaccine, SDOH services are often not associated with a billing code (Vest et al., 2017). This can make it difficult for practices to justify the addition of SDOH services, especially if they need to be supported by the hiring of additional staff members. Because of these

traditional payment models most health systems lack the incentives needed to implement SDOH screenings and referrals, especially for complex patients with multiple SDOH needs who require significant staff resources (Alley et al., 2016; Byhoff et al., 2018).

However, even though traditional payment models are a barrier to implementation, emerging payment models can act as a facilitator. The Patient Protection and Affordable Care Act (ACA) laid the groundwork for health systems to be able to address the SDOH. It pushed new payment structures that incentivize systems for investing money in prevention (Kaufman, 2016). In addition, the Centers for Medicare and Medicaid Services (CMS) is making changes to their payment policies to focus more on population health. One example is a CMS-funded program which is testing the Accountable Health Communities (AHC) model. The central tenet of this model is comprehensive SDOH screening for all and participating organizations are part of different tracks to determine the effect of differing levels of investment. This program is underway and CMS is collecting data to determine healthcare savings that might happen as a result of this investment in work to address the SDOH (Alley et al., 2016). If the AHC model proves to be effective at producing savings, this could lead CMS, and other insurers, to invest more money into SDOH screenings and interventions.

Another example of a potential incentive for PCPs is the process of being certified as a Patient Centered Medical Home (PCMH). The National Committee for Quality Assurance (NCQA), the entity responsible for certifying practices as PCMHs, measures SDOH as one of the competencies that they examine. They require not only that practices collect data on SDOH, but that they also develop an approach to meet those needs once they are identified (Coughlin et al., 2019). Thus, if practices are looking to obtain this designation, this is a strong facilitator for them to implement SDOH interventions.

Another facilitator is having staff members available to implement interventions. As previously mentioned, financial considerations and some current payment models mean that not every practice can hire additional staff members. But when practices already have staff members in certain roles, or they are able to hire them, this facilitates SDOH interventions. Colocation of staff can make referrals for SDOH needs much easier because it eases the burden for PCPs by placing someone else as the one primarily accountable for addressing those needs (Kung et al., 2019). Colocation can also facilitate interventions by acting as a mechanism to decrease the stigma that patients may feel regarding SDOH needs (Davidson & McGinn, 2019). By having a staff person in the primary care office who works with the SDOH, patients may be better able to understand the fact that these issues are related to their medical care and feel less stigma seeking help.

Something else that facilitates SDOH interventions in primary care is the existence of a strong social service network in the community that practices can develop partnerships with. From its inception primary health care was conceived as involving connections with other sectors, like food, housing, and education (Rasanathan et al., 2011). SDOH interventions offer an opportunity to build on that legacy by linking patients to community-based programs. This can be thought of as an expansion of the medical home into a “health neighborhood” that goes beyond what is offered only in the medical realm (Garg & Dworkin, 2016). For example, this can look like practices forming partnerships with legal aid societies, so that “referrals to attorneys can be made as simply as referrals to cardiologists” (Beck & Klein, 2016, p. 98).

By forming partnerships with the community PCPs can expand their reach and create opportunities for their patients to benefit from work that is already being done. Engaging the community also has the potential to create a bi-directional process by which other organizations

can make referrals to primary care when they identify needs, especially for free or sliding scale clinics. In cases where there is a gap in services offered by the community, PCPs can still form partnerships with community organizations, but in that case to work together to advocate for patients. When providers are willing to put in what is undeniably extra work to form connections and partnerships within the community, this can facilitate SDOH interventions. These interventions are rooted in the primary care setting but take advantage of existing resources and expertise within the community.

3.0 Methods

As I've discussed thus far, the SDOH can have a large impact on individuals health and when they are not addressed this can lead to avoidable healthcare spending by health systems. The primary care setting is uniquely poised to take action on the SDOH, however there is a need for a systematic review of existing interventions in this setting in order to understand current practices which will inform recommendations for future work. To produce this review and synthesis a systematic search of the literature was performed to identify articles describing interventions to address the SDOH in the primary care setting.

3.1 Literature Search Process

I completed this literature search using the *PubMed* and *Scopus* databases. The Boolean operators “AND” and “OR” were used in order to combine search terms to identify appropriate studies. To help limit the search to relevant articles, terms searched in *PubMed* were limited to articles where they appeared within the article title or abstract and in *Scopus* limited to articles where they appeared within the article title or abstract or as keywords.

The search terms that I used are presented in Table 1. I referenced the search terms used by Gottlieb et al. (2017) in their review of SDOH interventions as a guide when compiling terms that would encompass the scope of the SDOH. I paid careful attention to identifying terms that fall under the category of SDOH, because in some professional research more specific terms are used and the connection to SDOH may not be explicitly made. Tables 2 and 3 list how the search terms

were combined in *PubMed* and *Scopus*, respectively, and the results procured from each step of the search process. To note, in Table 2 “primary health care” is a *PubMed* MeSH term used to index articles within the database. Using this search term also includes other variations of the concept, including “primary care.”

Table 1: Search Terms

Social determinants of health	Primary care	Intervention
Poverty	Internal medicine	Program
Housing	Family medicine	Pilot
Food insecurity		Community health worker
Social Isolation		Patient navigator
Unemployment		Social worker
Transportation		Medical-legal partnership
Socioeconomic factors		Referral
Child care		
Educational status		

Table 2: PubMed Search History

Search #	Number of Results	Filters Applied	Search Terms Used
1	11,146	In the last 10 years, English	primary health care[Title/Abstract]
2	4,200	In the last 10 years, English	social determinants of health[Title/Abstract]
3	124	In the last 10 years, English	#1 AND #2
4	11	In the last 10 years, English	(#1 AND #2) AND (intervention[Title/Abstract])

Table 2 Continued

5	66,277	In the last 10 years, English	(((((#2) OR (poverty[Title/Abstract])) OR (housing[Title/Abstract])) OR (food insecurity[Title/Abstract])) OR (social isolation[Title/Abstract])) OR (unemployment[Title/Abstract])) OR (transportation[Title/Abstract])) OR (socioeconomic factors[Title/Abstract])) OR (child care[Title/Abstract])) OR (educational status[Title/Abstract]))
6	23,873	In the last 10 years, English	((#1) OR (internal medicine[Title/Abstract])) OR (family medicine[Title/Abstract])
7	353,440	In the last 10 years, English	intervention[Title/Abstract]
8	1,106,397	In the last 10 years, English	(((((#7) OR (program)) OR (pilot)) OR (community health worker)) OR (patient navigator)) OR (social worker)) OR (medical-legal partnership)
9	254	In the last 10 years, English	#5 AND #6 AND #8

Table 3: Scopus Search History

Search #	Number of Results	Filters Applied	Search Terms Used
1	69,031	In the last 10 years, English	TITLE-ABS-KEY("primary care")
2	9,494	In the last 10 years, English	TITLE-ABS-KEY("social determinants of health")
3	434	In the last 10 years, English	TITLE-ABS-KEY ("primary care") AND TITLE-ABS-KEY ("social determinants of health")
4	783,954	In the last 10 years, English	TITLE-ABS-KEY (intervention)
5	130	In the last 10 years, English	#1 AND #2 AND #4
6	547,522	In the last 10 years, English	TITLE-ABS-KEY("social determinants of health") OR TITLE-ABS-KEY(poverty) OR TITLE-ABS-KEY(housing) OR TITLE-ABS-KEY("food

Table 3 Continued

			insecurity") OR TITLE-ABS-KEY("social isolation") OR TITLE-ABS-KEY(unemployment) OR TITLE-ABS-KEY(transportation) OR TITLE-ABS-KEY("socioeconomic factors") OR TITLE-ABS-KEY("child care") OR TITLE-ABS-KEY("educational status")
7	97,662	In the last 10 years, English	TITLE-ABS-KEY("primary care") OR TITLE-ABS-KEY("internal medicine") OR TITLE-ABS-KEY("family medicine")
8	1,974,216	In the last 10 years, English	TITLE-ABS-KEY (intervention) OR TITLE-ABS-KEY (program) OR TITLE-ABS-KEY (pilot) OR TITLE-ABS-KEY (referral) OR TITLE-ABS-KEY ("community health worker") OR TITLE-ABS-KEY ("patient navigator") OR TITLE-ABS-KEY ("social worker") OR TITLE-ABS-KEY ("medical-legal partnership")
9	2,796	In the last 10 years, English	#6 AND #7 AND #8
10	458	In the last 10 years, English United States Title/Abstract Only Document Type: Article	#6 AND #7 AND #8

3.2 Inclusion Criteria

Inclusion criteria for articles included research that was peer-reviewed, written fully in English, and conducted in the United States. I chose to limit the scope of this review to U.S. articles because of the unique structure of the healthcare system, including payment models, which may affect implementation of SDOH interventions. Studies also had to be published between 2010-

2020 in order to be included. The purpose of this temporal limitation was to capture recent research in this area. Finally, articles had to describe a specific intervention to address some factor(s) related to the social determinants of health (i.e. food insecurity) which was conducted in or integrated with the primary care setting.

3.3 Exclusion Criteria

Exclusion criteria included systematic reviews or meta-analyses, as the purpose of this search was to produce a review which examined individual interventions. Studies were excluded if they described SDOH screening protocols but did not include a specific intervention that was conducted in response. In addition, “referral only” interventions that only consisted of a referral to an outside organization made by the primary care provider, without any type of additional support, were excluded. I chose to not include “referral only” interventions because these may be insufficient to address needs for vulnerable patients (Moss & Phillips, 2020). This may be related to the fact that eligibility criteria for resources are not appropriately reviewed, leading to inappropriate referrals, or to the fact that patients need more support to overcome barriers to making connections. An example of an intervention excluded for this reason was a model in which patients were screened for food insecurity in pediatric primary care and the main intervention for positive screens was discussion with the primary care provider and a list of community food resources added to the patients’ visit instructions for home (Adams et al., 2017).

Articles were also excluded if they occurred in non-medical settings or in any setting other than primary care, such as a hospital, or if they were related to healthcare access, for example mobile health services. Finally, articles were excluded if their primary focus was on resident or

physician training in addressing the SDOH. While medical education has an important role to play in changing the culture surrounding the value of addressing SDOH, those types of interventions were outside the scope of this review which is focused on interventions that directly impact patients.

4.0 Results

The search process identified 254 potentially eligible records from *PubMed* and 458 potentially eligible records from *Scopus*. When both duplicates and triplicates were removed there was a total of 231 unique records from the databases. Based on the above exclusion criteria I did an initial screen of these records by their title, which led to the exclusion of 168 records. I then screened the remaining 63 records based on their abstracts. This screen led to the exclusion of 39 records – 10 were interventions conducted outside of the United States, nine were related to physician/resident training, six did not describe a specific intervention, five were related to SDOH screening only, five were systematic reviews, three were not primarily SDOH focused, and one was not in a primary care setting.

After the abstract screening, 24 articles were reviewed as full text to assess if they were eligible for the review by meeting inclusion criteria and to determine if a more detailed review revealed that they should be excluded. Based on the full text review I excluded an additional 13 articles. Four of these were not primarily SDOH focused, for example one study researched an integrated HIV care services model. One component of the model was social support services (i.e. transportation, emergency food assistance), but this was not the main focus as the intervention also included case management, HIV health care, behavioral health care, and medication adherence counseling. The authors also did not provide details on how social support services were delivered (Melvin & Gipson, 2019). In addition, among articles excluded, four did not describe a specific intervention, three were “referral only” interventions, and two were interventions conducted outside of the United States. Figure 1 depicts the screening process used to narrow results and

select articles. At the conclusion of this process 11 articles remained that met the full inclusion criteria to be reviewed as part of this literature synthesis.

/ **PRISMA Flow Diagram**

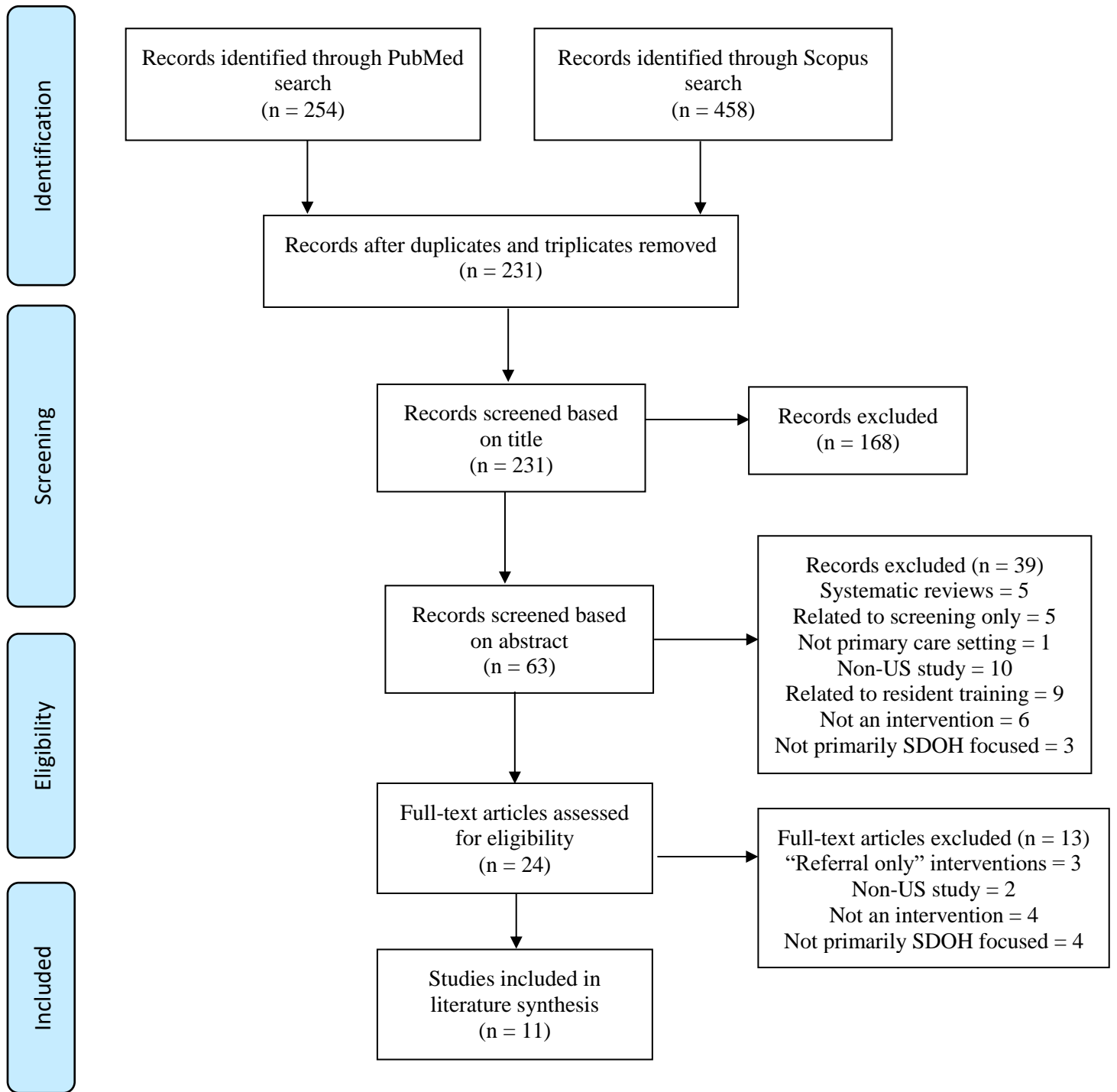


Figure 1: Prisma Flow Diagram

4.1 Characteristics of Included Articles

While all eleven articles that I reviewed for this synthesis have a focus on addressing SDOH, there was diversity in terms of the specific factor(s) that either the researchers or the practices themselves chose to target. In describing each of the interventions I will organize them by grouping them together with other interventions that had the same target SDOH. These categories will include food insecurity, transportation barriers, unmet legal needs, and multiple, for those interventions that sought to address more than one SDOH factor.

4.2 Food Insecurity

4.2.1 Beck et al., 2014

This study discusses the design and evaluation of the Keeping Infants Nourished and Developing (KIND) program in a pediatric primary care center in Cincinnati, Ohio. This program was developed in response to data showing that 1 in 3 households at the clinic were food insecure and 15% of households with infants in the clinic reported stretching, diluting, or limiting formula. KIND is a collaboration between the clinic and the Freestore Foodbank, the largest food bank in the Cincinnati region.

As part of the KIND program primary care providers distribute supplemental infant formula from the food bank to families with infants under twelve months of age who are identified in the clinic as experiencing food insecurity. Identification occurs using two evidence-based food insecurity screening questions integrated into the EHR or by providers if families endorse food

insecurity in conversations with them. Families are eligible for KIND at each of their infants' well or ill child visits. At each visit families receive one can of generic formula and educational brochures focusing on infant nutrition, food budgeting, and community resources. Infants who are breastfed only receive the educational material and a referral to the Center for Breastfeeding Medicine that is part of the health system.

In the study of 1042 families with infants receiving KIND, Beck et al. found that when compared to non-recipients, infants who received KIND were more likely to have a completed lead test, a completed Ages & Stages questionnaire, and to have attended all recommended well-infant visits by 14 months. KIND recipients were also more likely to be connected to social work and the medical-legal partnership in the clinic. There was no difference between the groups in weight-for-length percentile at 9 months.

4.2.2 Ferrer et al., 2019

This intervention focused on adults with poorly controlled type-2 diabetes mellitus. It was carried out by a primary care practice in San Antonio, Texas in collaboration with the San Antonio Food Bank. In order to be eligible for the intervention patients had to have an HbA_{1c} value greater than 9% and screen positive for food insecurity. Patients were randomized to the intervention (n = 29) or control (n = 29) group. The intervention lasted 6 months.

Patients in the intervention group received a biweekly share of fresh produce and canned food which was delivered by a "Mobile Mercado" truck from the food bank to the clinic, brief nutritional education by a registered dietician during the food distributions, and up to 3 home visits by a promotor (community health worker) to help them set self-management goals. The control group received diabetes care as usual from their PCP.

After 6 months, patients in the intervention group had a drop in HbA_{1C} that was 1.4% (absolute difference) greater than the decrease in the control group. Patients in the intervention group also improved by 2.47 points on the “Starting the Conversation-Diet” scale (representing an increase in healthier behaviors), versus no change in the control group. BMI did not change significantly in either group.

4.2.3 Hickey et al., 2020

This intervention to address food insecurity was implemented in the Hopple Street Health Center in Cincinnati, Ohio, a community-based pediatric primary care center. It was developed in collaboration with the Freestore Foodbank. The office created the Food As Medicine in Low-Income Youth (FAMILY) pantry within their clinic. If families screen positive for food insecurity on the clinic’s social screening questionnaire or are identified by staff, they are eligible to receive a 3-day supply of shelf-stable food from the pantry. When the family uses the pantry staff members also try to identify other needs and refer families to clinic or community resources.

In the first 22 months of the FAMILY pantry operation they distributed 32,000 pounds of food for the families of 504 index patients. In addition, 267 referrals were made to social work, 207 to the medical-legal partnership, and 72 to mental health services. When patients who accessed the pantry were age-matched with controls who did not use the pantry there was not a significant relationship between accessing the pantry and up-to-date immunization status, completed lead screening, or completed developmental screening at 27 months of age. Families (n = 14) who participated in interviews regarding their experience expressed increased feelings of connectedness and trust toward the office.

4.2.4 Smith et al., 2017

The setting for this intervention was three University of California San Diego student-run free clinics in San Diego, California that serve uninsured patients. In this study, patients who attended the clinic and screened positive for food insecurity on the USDA US Household Food Security Survey (30-day version) were provided food pantry information tailored to their home address. Study volunteers then verbally screened patients for Supplemental Nutrition Assistance Program (SNAP) eligibility and conducted the two-step application process with them onsite if they were eligible. Same-day SNAP enrollment was offered onsite once a month. Patients that also had a diagnosis of diabetes could receive monthly food distributions onsite. Study volunteers followed up with patients on later visits to the clinics to identify barriers to connecting to food resources.

Of patients screened across all three sites ($n = 430$), 74% ($n = 318$) were food insecure. Feeding San Diego, a community partner of the program, provided monthly food boxes for 201 patients with diabetes as part of the intervention. In subsequent visits to the clinic volunteers recorded that 66 patients received food from an off-site pantry and 64 patients were receiving SNAP. No health outcome measures were reported.

4.3 Transportation

4.3.1 Chaiyachati, Hubbard, Yeager, Mugo, Shea, et al., 2018

This study describes a pilot program conducted in two internal medicine outpatient practices in Philadelphia, PA. The practices are located in the same building, one was assigned to be the intervention practice and one to be the control practice. During the study period adult patients in the intervention practice who were insured by Medicaid and established patients (n = 60) received a telephone reminder from researchers 2 days before their clinic appointment in which they were offered rideshare-based transportation (a Lyft ride). This was offered free of charge and could be used both to and from the appointment. For patients who requested the service, researchers scheduled the Lyft ride using an online platform and patients called researchers after their appointment in order to receive a ride home. Eligible patients with appointments at the control practice (n = 67) were not offered the rideshare service. During the study period, the show rate for appointments increased from 54% to 68% at the intervention practice where rideshare transportation was offered. At the control practice the patient show rate declined from 60% to 51% during that same period.

4.3.2 Chaiyachati, Hubbard, Yeager, Mugo, Lopez, et al., 2018

The above pilot program was expanded to a clinical trial using the same internal medicine practices in Philadelphia, PA. In this study patients were allocated to the intervention group (n = 395) or control group (n = 392) not based on practice, but on the day of the week (odd versus even numbered days) that their appointment was scheduled. Eligible patients in the intervention group

were again offered free rideshare-based transportation to their appointment using Lyft. The same process as the pilot study was used to schedule rides. In this study patients in the control group also received a call from researchers as an appointment reminder, but they were not offered transportation during this call.

The researchers found that there was no significant improvement in missed appointments for those offered free rideshare services to their appointment. During the study period, the missed appointment rate was 36.5% in the intervention group and 36.7% in the control group. There were also no significant differences in 7-day or 30-day rates of emergency department visits between the groups.

4.4 Unmet Legal Needs

4.4.1 Klein et al., 2013

The Klien et al. study describes a medical-legal partnership that was implemented in three pediatric primary care clinics in Cincinnati, Ohio. The medical-legal partnership, termed the Cincinnati Child Health-Law Partnership (Child HeLP), is a collaboration with the Legal Aid Society of Greater Cincinnati. It was developed with the aim of addressing unmet legal needs such as public benefit denial or unsafe housing for families whose children are patients at the clinics. The intervention involved co-location of an attorney and paralegal in clinics. If patients screened positive for a social need or one was identified by providers, a referral order was placed to the onsite Child HeLP legal staff using the EHR. The legal staff then interviewed the family during

their visit to the clinic and opened cases when needed. They then worked to identify potential interventions for cases.

During the study period, there were 1,808 Child HeLP referrals placed for 1,614 patients across the three clinic sites. The most common referrals were made due to concerns with housing (37%) and income/health benefits (33%). These referrals resulted in 1,945 legal outcomes, of which 89% were positive. Most positive outcomes involved legal advice given to families, for example the advice to request a school evaluation. The efforts of the legal staff also led to almost \$200,000 in actual recovered back benefits. No health outcome measures were reported.

4.5 Multiple Factors

4.5.1 Garg et al., 2010

This intervention consisted of the creation of a Family Help Desk (FHD) located within the Harriet Lane Clinic, a medical home for low-income children in Baltimore, MD. The purpose of the desk is to connect families to community resources, and it is staffed by undergraduate students who provide education and act as patient advocates. Primary care providers can refer families if they think they may have problems related to the SDOH or families can self-refer by walking up to the desk directly. At the desk students complete a family needs questionnaire with families which covers domains such as employment, childcare, public benefits, and education. Students then provide education on appropriate community resources, found using an electronic database.

Of parents who accessed the FHD (n = 59) during the study period, 64% contacted a community resource or service and 19 parents reported enrolling in a least one community program. The student who completed the intake also contacted the parent at least bi-monthly for a 6-month period to assess satisfaction. Over 90% of those enrolled in community resources or services were very or somewhat satisfied with them. No health outcome measures were reported.

4.5.2 Berkowitz et al., 2016

Patients were enrolled in this program, conducted in two hospital-based primary care practices in Boston, Massachusetts, if they screened positive for needs on a form during clinic check-in and indicated they wanted help. The needs screened fell into the domains of health (i.e. difficulty affording medication), employment, financial, food, housing, legal, transportation, and utilities. Primary care providers could also make referrals for patients. Those enrolled worked with one of the service connection programme advocates, who staffed a desk in the clinic, to be connected to resources to meet their needs, taking into account the patient's eligibility and accessibility. Advocates then followed up with patients regularly to assess progress.

The most common needs were difficulties affording or receiving healthcare, difficulties affording food, and trouble paying for utilities. Of patients enrolled (n = 416), 62% had their needs closed by advocates as "successful" (meaning they had achieved predetermined criteria for the specific need) or "equipped" (patient had information needed and did not want further help), 34% were closed as "disconnected" (lost to follow-up) and 4% were closed as "failure." No health outcome measures were reported regarding clinical differences in enrolled versus unenrolled patients.

4.5.3 Page-Reeves et al., 2016

This study was a pilot to determine the feasibility of carrying out this SDOH intervention in three family medicine clinics in Albuquerque, New Mexico. Researchers developed the WellRx questionnaire, an 11-item questionnaire, to identify SDOH needs such as food insecurity, housing, utilities, income, and transportation. The questionnaires were completed by patients either when they were waiting for their appointment or by medical assistants (MAs) while they were recording vital signs. Patients who screened positive for a need were offered resource sheets by MAs or connected to community health workers (CHWs). CHWs conducted continuing follow-up with patients and could meet with patients outside of the clinic. They did things like help patients fill out job applications and accompany patients to apply for SNAP benefits.

Out of the patients screened (n = 3048), 46% (n = 1413) reported at least one social need and out of those reporting a need 63% (n = 890) reported multiple needs. The most common needs were related to utilities, income, employment, and education. No health outcome measures or measures of patient success in resolving their needs were reported.

4.5.4 Gunderson et al., 2018

Community health workers (CHWs) took the lead in this intervention to address the SDOH for patients who are attributed to Mayo Clinic Employee and Community Health in Minnesota. The practice established a partnership with the Intercultural Mutual Assistance Association and the United Way of Olmstead County Minnesota in order to train CHWs. When a patients' clinical lead in the office feels that a patient could benefit, they place a referral for a CHW. Once one is assigned the CHW can fill many roles, including conducting home visits and connecting patients

to community resources. The purpose of home visits is for the CHW to glean information to report back to the clinical team regarding the extent of the impact of the SDOH on patients' current health status. CHWs also act as health educators by providing basic information on disease prevention and management, which goes a step beyond SDOH to include some basic clinical education.

During the study period, 735 patients worked with CHWs with a mean program participation of 196.1 days. The most common reasons for referral were for health insurance and non-health system navigation (i.e. housing, transportation). The researchers evaluated a 6-month period made up of time before and after CHW program engagement and found that there was a significant decrease in outpatient visits and emergency department utilization among those engaged compared to their prior utilization. This was especially true for patients with high medical complexity.

Table 4: Results Summary by SDOH Factor

Reference	SDOH Factor(s) Addressed	Intervention Used	Setting
Beck et al. (2014)	Food insecurity	Keeping Infants Nourished and Developing (KIND) program, supplemental infant formula	Cincinnati, OH
Ferrer et al. (2019)	Food insecurity	Biweekly food distributions, nutrition education, and promotores (community health workers) for patients with diabetes	San Antonio, TX
Hickey et al. (2020)	Food insecurity	Food As Medicine in Low-Income Youth (FAMILY) food pantry in clinic	Cincinnati, OH
Smith et al. (2017)	Food insecurity	Food pantry information, SNAP enrollment, and onsite food distributions	San Diego, CA
Chaiyachati, Hubbard, Yeager, Mugo, Shea, et al. (2018)	Transportation	Free rideshare-based transportation to primary care appointments for those with Medicaid	Philadelphia, PA
Chaiyachati, Hubbard, Yeager, Mugo, Lopez, et al. (2018)	Transportation	Free rideshare-based transportation to primary care appointments for those with Medicaid	Philadelphia, PA
Klein et al. (2013)	Unmet legal needs	Medical-legal partnership, attorney or paralegal onsite to help patients with legal needs	Cincinnati, OH
Garg et al. (2010)	Multiple	Family Help Desk in the clinic staffed by students who connect patients to community resources	Baltimore, MD
Berkowitz et al. (2016)	Multiple	Service connection program advocates in the clinic to help with SDOH needs	Boston, MA
Page-Reeves et al. (2016)	Multiple	Community health workers to help with SDOH needs	Albuquerque, NM
Gunderson et al. (2018)	Multiple	Community health workers to help with SDOH needs	Minnesota

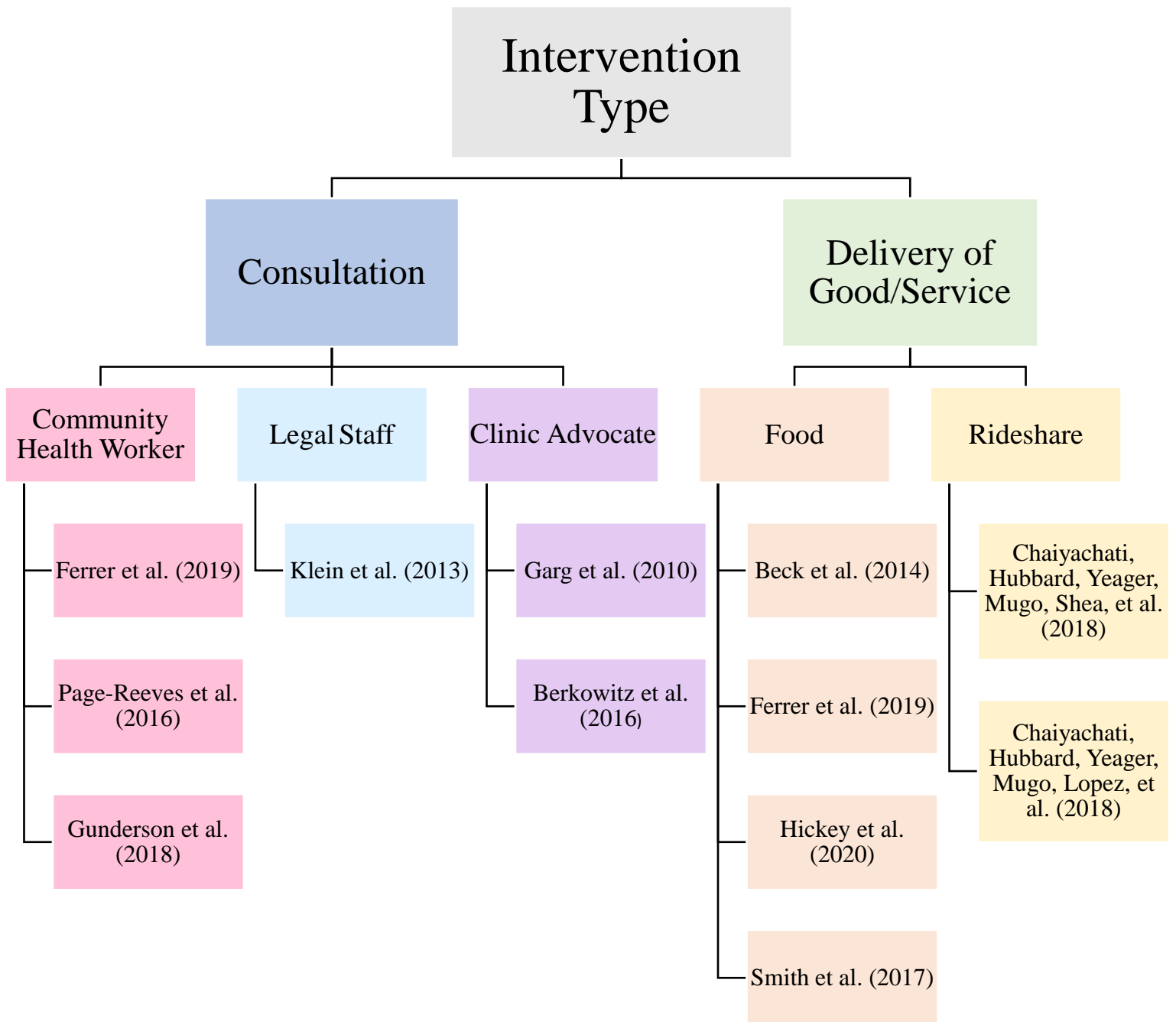


Figure 2: Results Summary by Intervention Type

Ferrer et al. (2019) is listed under multiple categories because the intervention took a multi-faceted approach.

5.0 Discussion

The purpose of this review was to examine existing interventions that are being carried out in the primary care setting to address the SDOH. Understanding current models is a critical piece of determining what features may lend themselves to increasing effectiveness of interventions. It can also provide evidence that primary care is, or is not, an appropriate setting to carry out this work. In this section I will discuss the findings of the review, first considering the findings as a whole and then separating the interventions again by the SDOH factor that they primarily seek to address in order to provide more targeted comment on the interventions. Then I will explore some of the limitations associated with this review. Finally, I will offer recommendations to health systems or providers who are considering implementing interventions to address the SDOH in primary care.

5.1 Discussion of Findings

This systematic review covered eleven studies of SDOH interventions in primary care and highlighted the fact that they have some similar characteristics, but also some diversity in their design and implementation. This first way I am going to examine these interventions is by considering the level that they target in the Social Ecological Model. The Social Ecological Model is a framework which establishes different levels at which factors may influence an individual's health. These levels include intrapersonal, interpersonal, institutional, community, and policy. Interventions may target one level or multiple levels simultaneously. One common characteristic

among almost all of the studies included in this review was that the focus on the intervention was centered on the patient or on the family. Thus, the interventions can be classified as targeting the intrapersonal and interpersonal levels of the Social Ecological Model.

While there is nothing inherently wrong with interventions that target the intrapersonal and interpersonal levels, there is evidence within the field of public health that the most effective interventions that create sustainable health change target multiple levels, or even all levels, simultaneously. However, despite this recognition there is still a tendency of public health interventions to solely target the intrapersonal and interpersonal levels (Golden & Earp, 2012). The interventions studied in this review therefore may be more limited in their ability to impact the SDOH at a population health scale.

Some of the interventions involved partnerships with other community organizations, but they did not usually involve community level or structural work. One exception is the Gunderson et al. (2018) CHW intervention which did mention some work at the community level, noting that one role of the CHWs was advocating for community needs. However, it was not clear how much of that kind of work was being done and no concrete examples were provided. Additional information would be needed to determine if the intervention could be classified as also targeting the community level of the Social Ecological Model.

Another way that I am going to analyze the interventions is by considering the health outcomes that the studies reported. Clearly, the goal of SDOH interventions is to have positive downstream effects on health. Thus, in order to truly be effective, research on interventions should be able to demonstrate a positive health impact. But there are many challenges to this, including the fact that health issues may take years to develop, necessitating expensive longitudinal research. In addition, it is necessary to control for many other factors besides the intervention that may be

impacting health. Despite these challenges, examining health outcomes is still very important to ensure that an intervention is doing what it was designed to do. Five out of the eleven studies in this review reported at least one health outcome of their intervention. The remaining studies provided only process outcomes. Of the studies that reported health outcomes, one study found a positive association between their intervention and the health outcomes studied (Gunderson et al., 2018), two studies found no association (Hickey et al., 2020; Chiyachati, Hubbard, Yeager, Mugo, Lopez, et al, 2018), and two studies found some positive associations and some nonsignificant associations (Beck et al., 2014; Ferrer et al., 2019).

Finally, when thinking about the interventions as a group I want to consider whether or not the articles suggested the presence of facilitators for SDOH interventions, as discussed in Chapter 2 of this review. These facilitators include emerging payment models, having or hiring the appropriate staff, and opportunities to develop partnerships with community organizations. None of the articles in this review provided specific information on how interventions were funded, so I can't determine whether or not new funding models facilitated their implementation. However, nine of the interventions did involve either new staff, volunteers, or researchers as the individuals primarily carrying out the intervention. Thus, the availability of additional labor facilitated the ability of primary care offices to implement interventions. Eight of the interventions also included defined relationships with other organizations. Most of these partnerships were community-based organizations, but in the case of the transportation interventions it was a national organization (Lyft). These partnerships facilitated the interventions by mechanisms such as providing additional resources or offering technical support.

5.1.1 Food Insecurity

The negative health outcomes that are associated with food insecurity provide weight to the importance of addressing this issue. They also suggest a potential downstream payoff that both health systems and individuals will see if this issue can be appropriately addressed early. In this systematic review, four of the interventions focused specifically on food insecurity in primary care. Each of the interventions had, as at least one of its components, the direct provision of food to patients onsite at the primary care office. In order to be able to offer this distribution all of the interventions involved collaborations with a local food bank. There are many advantages of this method, with the primary one being that patients receive tangible items to meet their need in the short-term. It can also be helpful for patients who have barriers to accessing other forms of food assistance, such as individuals who don't have transportation to get to food banks or immigrants who are out of status and cannot apply for SNAP.

The Ferrer et al. (2019) intervention, which was specifically targeted to patients with Type 2 diabetes who experience food insecurity, was the only one that incorporated in-person nutrition education as part of the intervention. Nutrition education is especially relevant to patients with diabetes, as following the appropriate diet is associated with glycemic control. The KIND program also provided families with information on nutrition, but did so by way of educational pamphlets (Beck et al., 2014). Incorporating nutrition education may be an important piece of interventions to address food insecurity, especially information that is targeted to specific barriers that may be experienced by those experiencing food insecurity, such as the cost of healthy food.

Across these interventions thousands of pounds of food and infant formula were distributed, patients were enrolled in SNAP, and patients were connected to other food resources in their communities. However, this kind of focused intervention, that targets only food insecurity,

may miss opportunities to help patients with other needs. In one study of patients ages 15-25, researchers found that increasing level of food insecurity was significantly associated with a higher burden of other social problems, such as education, housing, and income insecurity (Baer et al., 2015). While focusing an intervention on food can make positive impacts on health, it ignores other social problems such as these that also impact health. But food insecurity interventions may be valuable as a way to open that door. For example, in the FAMILY pantry intervention, staff members took the opportunity to explore other needs and provide referrals while families were getting food from the pantry (Hickey et al., 2020).

Another thing to note is that none of the studies included a follow-up measurement of food insecurity in patients who participated in the interventions. This could have been accomplished by having patients complete the same food insecurity screening tool that was used to identify them for the intervention at a set period after the intervention. Hickey et al. (2020) and Beck et al. (2014) chose to look at other follow-up measures, such as up-to-date immunization status and completed lead screening. However, these are not measures of food insecurity and while they represent health outcomes, it is not clear what mechanism (if any) may link food insecurity to them.

Due to the fact that none of the studies included a follow-up assessment of food insecurity, it is difficult to assess if the interventions truly addressed food insecurity in a meaningful way. It is understandable that the authors chose to look directly at health outcomes instead, because the ultimate goal of SDOH interventions has to be improvement in health. In addition, within the structure of health systems it is often important to demonstrate health impacts that could potentially be tied to healthcare savings in order to secure funding for interventions long-term. However, by not measuring changes in patients' food insecurity status, it can't be determined whether positive health outcomes were mediated by increasing food security or another factor.

5.1.2 Transportation

Because of the association between transportation barriers and health, likely mediated by missed appointments, there have been interventions implemented in some healthcare settings to try to minimize the effects of these barriers. They include things like providing bus passes or taxi vouchers to patients and referring patients to community transportation services. One thing that is important to consider when designing interventions is that the type of transportation offered must also be considered acceptable to the population served. For example, some older adults may not want to take the bus because of issues with accessibility (Starbird et al., 2019).

Both of the studies in this review that looked at transportation barriers as a SDOH followed the same intervention model, as the articles covered a pilot program and a clinical trial of the same program. The population of interest was patients with Medicaid insurance. Those with Medicaid are offered non-emergency medical transportation (NEMT) as a benefit of their insurance. Depending on location this benefit may operate differently, but examples include free bus passes or mileage reimbursement to get to and from appointments. These interventions offered rideshare-based transportation services to NEMT-eligible patients to determine if this might be a cost-effective and acceptable alternative.

In the pilot program study the intervention seemed to be effective, as it improved the appointment show rate among participants. However, when the clinical trial was conducted the researchers found that there was no difference in the missed appointment rate among participants and controls. Thus, the intervention in its current form was not effective in this sample in decreasing missed appointments, which mediate the influence of transportation barriers on health. It is important to note that this intervention only focused on transportation to medical appointments. These are the type of interventions that are the most likely to be implemented by

health systems, because they have the potential to directly impact profits, since systems cannot bill for services if a patient never shows up. However, transportation barriers can also exist unrelated to medical appointments. For example, a patient might be unable to obtain a level of social support that they find acceptable due to lack of transportation. Transportation barriers in general can act as a SDOH, because factors such as loneliness also negatively impact health.

5.1.3 Unmet Legal Needs

Many patients have needs that could be solved through legal remedies and the correct implementation of laws designed to benefit them. However, “primary care efforts to ensure health are undermined when patients do not receive the benefits or protections that these laws afford them” (Sandel et al., 2010, p. 1697). Unfortunately, free or low-cost legal services are often under resourced and have to turn individuals away without offering them support. Thus, medical-legal partnerships (MLPs) have been developed in some primary care clinics as a way to meet patients’ legal needs by connecting them to lawyers that are integrated into the clinic. This is especially helpful when patients don’t initially realize that their issue has a legal remedy (Sandel et al., 2014). The goal of MLPs is for legal staff to help patients address legal needs before health complications associated with them arise (Sandel et al., 2010).

This review only identified one intervention that was specifically targeted to unmet legal needs among patients. This intervention was an MLP, which is unsurprising given that this is the most common model being implemented in primary care to meet legal needs. The article provided some outcomes for the Child HeLP MLP, including the fact that 89% of legal outcomes obtained for patients were positive (Klein et al., 2013). However, no health outcomes were measured. This is a major drawback, as again, the ultimate goal is to understand if interventions are truly making

an impact by improving health. There is some evidence that MLPs could improve health according to certain markers. A study of the Tucson Family Advocacy Program MLP in Arizona found that among patients who participated there were improvements in scores on well-being and perceived stress following the legal intervention (Ryan et al., 2012).

5.1.4 Multiple Factors

There are many other SDOH factors that may be operating in patients' lives that contribute to the development of negative health outcomes. To name just a few, unemployment and inadequate housing can have detrimental effects on health. Involuntary job loss is associated with significantly worse self-reported health and mental health (Burgard et al., 2007). It may be especially damaging for individuals with chronic conditions who lose their primary health insurance due to the job loss. One study found that job loss among this population was associated with a decrease in physician visits and a decrease in prescription drug usage (Schaller & Stevens, 2015). Inadequate housing can jeopardize health by creating opportunities for burns or falls, exposure to toxic substances, or exposure to pest infestations. The effects of home hazards may be seen in health through issues such as asthma and high blood lead levels (Krieger & Higgins, 2002).

Four of the articles included in this review covered interventions that sought to address multiple SDOH factors. They were split in terms of the general model used, with two using a staffed resource desk in the clinic and two utilizing CHWs. The major advantage of interventions to address multiple factors is that they have the potential to be much more comprehensive in terms of meeting a wide array of SDOH needs. This is important because SDOH factors commonly cluster together in patients' lives. Poverty may be accompanied by lack of adequate childcare, food insecurity, and unsafe housing. An intervention that targets only one of these factors may be very

beneficial, however it is limited in its ability to impact health because the other factors will continue to operate unabated.

On the other hand, there are some disadvantages to using these kinds of models. When an intervention is less targeted this may make it harder to develop the strong community partnerships needed to appropriately serve patients, because sustained effort is not focused on any one specific need. A large number of community partners are needed to address needs in diverse domains, thus limiting the ability of providers to develop strong relationships with any one partner. Another disadvantage is that these interventions tend to be more resource intensive in terms of the staff labor that is required. Every one of the interventions reviewed in this category required additional staff to help patients navigate resources across multiple SDOH domains. However, the Family Help Desk intervention described by Garg et al. (2010) got around the financial burden associated with this by utilizing undergraduate students as advocates.

Though all of these interventions involved referrals to outside organizations or community partners, they all went beyond just that. A simple referral may be enough for a subset of patients, but many need additional support addressing barriers and an ongoing contact for when new SDOH needs arise. Patients and families also may benefit more from in-person support as opposed to a standard list of written resource information (Gottlieb et al., 2016). All of the interventions reviewed in this category involved patients meeting with an individual whose main role was to help them address SDOH needs. Both of the resource desk interventions included continued follow-up by either students or program advocates with patients. The CHW interventions also incorporated follow-up.

The interventions that used CHWs were unique in their ability to follow-up because of their charge to meet patients “where they are at.” Beyond just telephonic support following referrals,

CHWs met with patients in their homes and their communities to address barriers and act as an advocate. This allowed for SDOH work to be done outside the walls of the primary care practice, but still as an integrated part of the primary care experience. In the Gunderson et al. (2018) intervention the CHW reported back to the patients' clinical lead following each contact. Documentation in the EHR also facilitated the strong connection between the work being done on the SDOH and the work being done on the clinical side.

5.2 Limitations

There are several limitations that emerge from this review, some due to the search process itself and others due to the characteristics of the final articles selected. In terms of the search process, the search was conducted using only two databases, *PubMed* and *Scopus*; and it is possible that articles were missed that could have been identified using other databases. The review also only captured published research on SDOH-related interventions that are being conducted in primary care and could not discover interventions that are being carried out in practice but that have not been systematically researched. Finally, I chose to only include articles published in the last 10 years and interventions carried out in the United States. These were purposeful choices in order to capture recent research and interventions that are feasible within the context of the U.S. healthcare system. However, this may have excluded interventions implemented outside this time period and non-U.S. studies which would have been helpful in gaining a wider perspective on work that has been done in this area.

There was also some gray area in terms of interventions that were excluded because they were "referral only." I chose to exclude these interventions because they may not be as effective

as others that include additional support. However, there was some ambiguity in terms of whether or not an intervention should be classified as “referral only” for this review. For example, the Gunderson et al. (2018) intervention was included even though it included a referral to a CHW, because the CHW provided a lot of additional support once assigned to the patient and the onus was on the CHW, not the patient, to make the connection. It is also possible that some valuable interventions were excluded simply because they were referral-based. Thus, a limitation of this study is the fact that I did not evaluate this type of intervention and cannot comment upon their effectiveness in assisting patients with SDOH needs within primary care.

In terms of characteristics of the final articles selected for this systematic review, there are some things that limit their generalizability. First, the studies reviewed are primarily conducted in large cities and urban environments. The only exception to this may be the study by Gunderson et al. (2018) which was conducted in Minnesota, but the authors do not give details about the exact region where the intervention was implemented. This restricts the ability to generalize what outcomes of SDOH interventions may be in more rural areas and limits knowledge on what unique barriers or facilitators may be present in rural settings. Another limitation of a few of the studies in this review is that they do not report health outcomes. As previously mentioned, the ultimate goal of SDOH interventions is to positively impact health, however some studies focus only on process or program outcomes. In order to advocate for more funding for SDOH interventions, as well as ensure that the interventions are actually doing what we hope they will, it is necessary to look at health outcomes. Thus, this review is limited by the fact that not all studies report on those.

5.3 Implications and Recommendations

The final area that I will cover as a part of this literature synthesis is recommendations for health systems or primary care providers who are considering implementing SDOH interventions within their practices. These recommendations are based upon the research that I have explored and the strengths and weaknesses that are inherent within different intervention models. First, I want to say that I do not believe that a “one size fits all” approach will be effective for SDOH interventions in primary care. There is tremendous diversity in practices across the country in terms of geography, the demographics of patients served, the resources that they possess, and the characteristics of their communities. It is important to consider all these factors and the most pressing SDOH needs of the community when selecting the most appropriate intervention. As emerging funding models and government policy begin to support SDOH interventions, it is critical that these are designed to be flexible in order to allow local communities to develop their own tools when needed (Byhoff et al., 2018).

However, despite the fact that the same approach will not be well suited for every practice, there are general principles and characteristics that can be useful as a guide for all. An important thing to remember upon embarking on this journey is that it will take time to develop and implement SDOH screening and interventions in each practice. Rushing into screening for SDOH without first considering interventions can harm patients because it identifies needs without meaningful avenues to address those needs. Similarly, interventions should not just be thrown together. Health systems and providers need to consider evidence of effectiveness, not just implement the intervention that is the most convenient because it fits within the existing workflow. There is a pressing need for work to help patients address the SDOH in primary care, however it is worth the time necessary to carefully consider and develop interventions that serve patients well.

The first step to a SDOH intervention is comprehensive, universal SDOH screening that is conducted prior to or early on in a patient's appointment. I believe that surveillance leaves too high of a possibility that needs will be missed, because of time at best or because of biases at worst. Thus, universal screening for every patient that walks through the door creates the best possible opportunity to identify needs that are present. Seven out of the 11 interventions reviewed incorporated SDOH screening as at least one of the ways in which patients could be identified for participation in the intervention. Of note, all four of the interventions to address food insecurity utilized screening. Screening for food insecurity in primary care has been found to be both comfortable and acceptable to patients (Anil Kopparapu et al., 2020).

Beyond screening, three factors that I have identified that I recommend that systems and providers implement based on the results of this review are co-locating staff, developing strong community partnerships, and advocating for systemic change. I recommend that health systems and providers consider hiring co-located staff members whose primary role within the office is to implement SDOH interventions and assist patients with SDOH needs. Seven of the eleven interventions reviewed included this element of collocating new staff or volunteers.

Primary care practices are often very busy, and PCPs may already be pressed for time with addressing clinical needs alone. For example, the Garg et al. (2010) Family Help Desk intervention could theoretically be carried out by physicians during the patients' appointment if the provider had a strong knowledge of community resources. But the authors found that providers just did not have the time to do this, so the ability to connect patients to student advocates was extremely important for ensuring the SDOH were actually addressed during a visit. Colocation gets around the barrier of time by bringing in individuals for whom the majority of their time is dedicated to addressing SDOH concerns.

PCPs also may lack the background necessary to implement SDOH interventions. For example, for the MLP described by Klein et al. (2013), this intervention literally could not be carried out by physicians because they don't have the needed training and are not permitted to give patients advice related to legal matters. So collocating lawyers or paralegals was critical to this intervention occurring in the primary care setting.

Another reason that I recommend collocation is that it facilitates ongoing communication with the PCP and other clinical providers in the office regarding a patients' SDOH needs. If there isn't a staff member primarily responsible for SDOH needs in an office, when a patient is referred out to a social service organization in the community the office will likely have no idea how the connection went or if it was even made. But a collocated staff member can follow-up with the patient or the organization to see how things are going, then report that back to the PCP via the EHR or just a conversation since they are part of the healthcare team in the office. The Gunderson et al. (2018) intervention exemplified this as CHWs reported back to patients' clinical leads after every encounter they had and PCPs could then incorporate what they learned into the patients' future care.

Collocation will require creativity, flexibility, and patience as the new staff member discovers how they fit within the care team. In addition, it will require a significant financial commitment, but it may ultimately increase the likelihood of success because the responsibility for the intervention is clearly defined and is not placed on already overworked PCPs. Thus, I recommend hiring and collocating a staff member with expertise in SDOH and resource connection because it can make all the difference in ensuring that interventions are carried out well.

Another characteristic of effective SDOH interventions in primary care, and the one that I consider to be the most important, is the development of strong relationships with community

partners. This goes way beyond just listing an organization on a handout that is given to a patient. It involves purposeful conversations between two entities about how they can combine their efforts to better serve vulnerable individuals within the community. There will be different levels of engagement depending on the organization and the needs of the community, but it could include co-locating an organization's staff in the primary care office, developing referral channels that provide feedback to primary care on patient progress, or the provision of material resources to be distributed to patients in the office. The food insecurity interventions covered in this review are perfect examples of why I consider partnerships to be so important, because the partnerships with foodbanks allowed offices to meet the immediate food needs of patients without taking on undue administrative or financial burden. Depending on the intervention, the partnerships needed will vary, but the important point is that drawing on community strengths to better serve patients is a critical piece of effective SDOH interventions.

Finally, I recommend that health systems and providers consider what their role is in advocacy related to the SDOH. PCPs often know firsthand the detrimental effects on patients' health that these issues lead to. Thus, they are equipped to raise their voices and share these concerns, while advocating for better funding models or more resources. This is especially important as medical professionals, specifically physicians, possess a lot of power as a result of their role. The patients that they serve who deal with SDOH concerns may not have that same power. So, PCPs need to use their platform and influence to make the needs of their patients known.

One specific area of advocacy for government action relates to increased funding for social programs and public benefits. Many SDOH interventions in primary care rely on the ability to make referrals to other governmental and community resources. However, these resources are

often not adequately funded and are often at risk of being cut. Because of this, “future social determinants of health interventions will be inherently limited in their capacity to advance equity by the current state of the social safety net in the United States” (Garg et al., 2020, p. 2). I believe that health systems and providers need to recognize their responsibility to advocate for these programs as an avenue to support patient health and also enhance the effectiveness of their own SDOH interventions.

Primary care is both an appropriate setting and an opportune setting to address the SDOH in patients’ lives. As SDOH screening and interventions are increasingly implemented within primary care across the country they will feasibly act as important drivers of change on the persistent health inequalities present in the United States. SDOH interventions recognize the importance of taking a holistic view of patients’ lives, including the structural forces that are preventing them from attaining their highest health potential. Therefore, they are a crucial piece of the public health mission of promoting and protecting health.

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