Social Determinants of Health and Desirable Financial Behaviors: The Mediation Effect of Financial Knowledge

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Abstract

The social determinants of health (SDH) include several conditions in a person's environment, including economic stability, educational access and quality, health care access and quality, neighborhood and built environment, and social and community context. In this study, we investigated how SDH is related to desirable financial behaviors while considering financial knowledge as a mediation variable, using data collected in 2021 during the COVID-19 pandemic. Social cognitive theory (SCT) was used to develop the theoretical framework. The results of this study indicate that economic stability, educational access and quality, health care access and quality, and social and community context are positively associated with desirable financial behaviors. Further, financial knowledge plays a significant role in mediating the relationships between SDH and desirable financial behaviors. This paper provides implications on the effect of SDH on financial behaviors, underscoring the relevance of applying the SCT framework to examine the interplay between social factors and financial behaviors. The discussion and implications section of this paper provides strategic direction to enhancing financial behaviors through the improvement of SDH and financial knowledge.

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Introduction

The worldwide COVID-19 pandemic struck the United States in March 2020, resulting in health inequalities and disparities raised by financial burdens for economically disadvantaged households (Shek, 2021). COVID-19 affected people's physical and mental health for short- and long-term periods (Mueller et al., 2021). While much of the extant literature focuses on the impacts of COVID-19 on the traditional criteria of health, this research broadens the scope by examining consumers' social factors of health, which are defined as social determinants of health (SDH) by the World Health Organization (WHO). These factors, which include economic stability, educational access and quality, health care access and quality, neighborhood and built environment, and social and community context, are expected

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to better describe an individual's well-being during the pandemic (Office of Disease Prevention and Health Promotion, 2023).

COVID-19 caused negative economic and financial consequences at the family and personal level (Anand et al., 2020; Shek, 2021; Yuesti et al., 2020). The pandemic contributed to family poverty and a reduction in financial capital (Buheji et al., 2020; Shek, 2021). The scope of personal or family-level finances includes savings, spending, borrowing, and planning (Xiao, 2016). For many consumers, it was challenging to maintain desirable financial behaviors and make reasonable financial decisions during the financial crisis resulting from the pandemic. For families that had financial difficulties before the pandemic, their situation worsened (Cantor & Landry, 2020). However, families that had sufficient liquid savings and were making stable debt and saving payments before the pandemic found it easier to survive and recover from the resulting financial shocks (Fox & Bartholomae, 2020). Households experiencing unstable economic resources due to unemployment, however, were more likely to experience financial adversities (Fox & Bartholomae, 2020). Overall, 42% of U.S. households experienced economic instability during the pandemic (Parker et al., 2020). All these issues are closely related to the domain of SDH.

For this research, we investigated how the social determinants of health relate to desirable financial behaviors, while considering the mediation effect of financial knowledge, which is expected to help consumers with financial adversities face financial shocks (Yuesti et al., 2020). Implications from the findings include approaches consumers can use to stabilize their finances in preparing for future unexpected financial shocks. This information will help consumers make more appropriate financial decisions and engage in desirable financial behaviors even during a pandemic so that they will quickly recover from financial shocks. The results of this study indicate that economic stability, educational access, healthcare access, and social context are significantly associated with desirable financial behaviors. These social factors are also associated with financial knowledge, which has a significant mediation effect on the relationship between the SDH and desirable financial behaviors. Results indicate that consumers with more financial knowledge are more likely to demonstrate desirable financial behaviors. Therefore, before and during the pandemic, consumers might consider stabilizing their economic resources, maintaining or creating better education and healthcare access, enhancing their social connections, and gaining more personal financial knowledge to improve financial behaviors and financial decisions.

The results also provide valuable implications for policymakers and financial advisors. Before or during a future pandemic or other crisis, policymakers could implement timely approaches to prevent income drops, increase the accessibility of education and healthcare, and create more opportunities for consumers to improve social connections. While working with clients, financial advisors can assess their clients' five components of SDH. Based on the information obtained, financial advisors can create personalized plans and targeted strategies to assist their clients in enhancing financial behaviors.

Literature Review and Hypotheses

Social Determinants of Health

The traditional criterion for assessing health conditions is to use self-reported health status or reports of access to health care and/or health insurance. However, over the past few decades, researchers have defined more comprehensive measures for determining health status. These measures increase the scope of health by taking social factors into consideration. This body of evidence does not deny the importance of perceived health, health insurance, or access to health care in affecting health but instead illustrates that these are not the only determinants of health outcomes (Braveman & Gottlieb, 2014). The social factors included in the SDH domain are more related to the conditions experienced by people daily; for example, their unemployment, education, and community engagement status (Commission on Social Determinants of Health, 2008).

The World Health Organization (WHO) defines the social determinants of health (SDH) as "the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life" (Commission on Social Determinants of Health, 2008). In general, SDH represents nonmedical factors associated with health outcomes. The U.S. Department of Health and Human Services has divided SDH into five domains: (a) economic stability; (b) educational access and quality; (c) healthcare access and quality; (d) neighborhood and built environment; and (e) social and community context (Office of Disease Prevention and Health Promotion, 2023).

In one study using the five social determinants of health categories, medical care was found to explain only 10% to 15% of preventable deaths in the United States (McGinnis et al., 2002), while another study indicated that 40% of mortality is caused by behavioral issues that can be prevented (Olsen et al., 2010). Several previous articles have confirmed the notion that health outcomes are strongly associated with social factors, including employment, income, and environment (Braveman et al., 2011; Mackenbach, 1996; McGinnis et al., 2002). Research by Holt-Lunstad (2022) introduced a systemic framework to justify the prioritization of social connection in SDH.

Recent studies have demonstrated the presence of specific social factors in determining health outcomes. Social frailty (Ragusa et al., 2022) and social isolation (Naito et al., 2023) are known to be significant factors increasing the risk of all-cause mortality, where social frailty is characterized as the lack of social resources, social activities, and self-management abilities (Ma et al., 2018), and social isolation is defined as the state of lacking social relationships, which encompass social contacts, social resources, and participation in social or religious activities (Umberson & Karas, 2010). Additionally, education is known to be associated with health outcomes (Bautista et al., 2021; González et al., 2022), with half of all deaths of working adults being accounted for by factors related to lower education (Jemal et al., 2008).

Economic Stability

Based on the Healthy People 2020 framework on SDH, economic stability is thought to be influenced by various factors, including employment and work environment, food and housing instability, and poverty rates (Office of Disease Prevention and Health Promotion, 2023). Employment status has also been recognized as a significant component of economic stability (Hergenrather et al., 2015). Employment and reemployment are positively associated with better physical health, whereas unemployment and job loss are associated with worse physical health (Hergenrather et al., 2015). Individuals with different levels of employment engage in financial behaviors differently, which typically has a positive influence on individuals' long-term financial health (Rostamkalaei et al., 2022).

In times of economic difficulties, such as a pandemic, fluctuations in income may serve as an indicator of economic stability. An individual's financial behaviors are influenced by their expectation of income volatility (Sherraden et al., 2000). However, during periods of economic difficulties, individuals who encounter fluctuations in their income and a lack of sufficient information about their future income prospects may confront challenges in managing their savings and consumption levels. This can lead to less effective coping mechanisms and hinder their ability to exhibit desirable financial behaviors.

Literature has also linked financial knowledge to economic stability. Previous studies show that consumers with more financial knowledge are more likely to save and invest (Lusardi & Mitchell, 2014). They are also more likely to manage their finances effectively (Thomas, 2019). Abdullah et al. (2023) indicated that financial literacy is positively associated with financial stability for low-income households.

Educational Access and Quality

Human capital is a crucial investment that individuals make to increase their potential earnings and build wealth (Wolla & Sullivan, 2017). Well-educated individuals are more likely to report better financial conditions (Wolla & Sullivan, 2017). A higher level of attained

education is not only associated with increased earning potential; individuals with a higher level of education also demonstrate a preference for proactive engagement in preventative health measures (Fletcher & Frisvold, 2009). This propensity toward health-conscious practices highlights the comprehensive benefits of education, which go beyond monetary gains. Individuals with higher educational attainment are more likely to have a solid foundation in numeracy and literacy (Richards et al., 2009), which is essential for comprehending complex financial products. These foundational skills, frequently refined through extended schooling, enable individuals to make informed financial decisions (Wolla & Sullivan, 2017).

Research has also established a positive association between education level and favorable outcomes such as financial market participation, investment income, and retirement income (Cole et al., 2014). Even an additional year of education has been found to positively affect credit rating scores, borrowing choices, and credit behaviors, substantially decreasing the likelihood of individuals declaring bankruptcy or experiencing foreclosure (Cole et al., 2014). Additionally, education is known to be positively associated with financial knowledge (Rothwell & Wu, 2019; Walstad et al., 2010; Xiao & O'Neill, 2016).

Healthcare Access and Quality

The availability of healthcare services can impact the financial burdens associated with medical expenses and the demand for health-related financial products and services (Social Policy Institute, 2022). Health insurance serves a dual purpose of protecting individuals in times of health-related challenges and generating positive impacts beyond the realm of health. Having medical debts in collections is often seen as a sign of broader financial distress (Batty et al., 2022), which suggests that having sufficient health insurance coverage has a positive impact on various financial behaviors.

The literature has documented the influence of insurance ownership on several financial behaviors, such as mortgage decisions (Houle & Keene, 2014), ownership of risky assets (Li et al., 2021), retirement planning (Rogowski & Karoly, 2000), and saving behaviors (Costa-Font & Vilaplana-Prieto, 2017; Laffargue & Padieu, 2016). For example, changes in health status increase the risk of mortgage default and foreclosure, which can be partially mediated by health insurance (Houle & Keene, 2014). The availability of health insurance with better insurance terms is also associated with households' investment portfolio allocation to risky assets (Li et al., 2021). Holding health insurance has been shown to have a significant impact on retirement behaviors. Specifically, the ability to acquire retiree health benefits increases the probability of retirement (Rogowski & Karoly, 2000). Similarly, the provision of public funding for long-term care has also been shown to be associated with a reduction in household savings, as individuals rely on this support to meet their long-term care needs (Costa-Font & Vilaplana-Prieto, 2017). Consumers with private medical insurance, on the other hand, have greater savings and are more likely to actively save for future healthcare costs against future uncertainty (Guariglia & Rossi, 2002). Consumers who report higher educational attainment, with more subjective knowledge, are more likely to hold health insurance coverage (Abdel-Ghany & Wang, 2001; Dewar, 1998). O'Connor and Kabadayi (2020) also suggested that health insurance literacy is positively associated with subjective and objective financial knowledge.

Neighborhood and Built Environment

A well-constructed environment can mitigate health and safety issues, thus enhancing overall quality of life (Office of Disease Prevention and Health Promotion, 2023). Government safety nets for assistance are generally designed to support eligible people in need. Government assistance takes various forms, including Medicaid, the Earned Income Tax Credit (EITC), and the Supplemental Nutrition Assistance Program (SNAP). This assistance has been found to promote financial satisfaction (Lee et al., 2023).

Economic downturns and natural disasters contribute significantly to the rise in enrollment in government aid programs (Gruber & Sommers, 2020). According to Lee et al. (2023), government safety net programs are often implemented as temporary solutions, which may

not transform into accumulated savings and asset ownership. However, one study found that individuals who received stimulus checks during the COVID-19 pandemic exhibited a greater propensity to save as the amount increased (Liu et al., 2023).

The literature shows that there is a positive association between receiving government assistance and an individual's level of financial satisfaction (Lee et al., 2023), which in turn may potentially result in positive financial behaviors, especially for low-income families. Assistance from the government can support low-income households in increasing savings, reducing outstanding medical debts, preventing new delinquencies, and enhancing credit ratings (Brevoort et al., 2017). Placing confidence in the government's ability to offer aid in times of crisis might motivate individuals to adopt proactive actions, thereby fostering the development of positive financial practices and bolstering their sense of safety.

Someone's neighborhood and built environment is also thought to be associated with financial literacy or financial knowledge. Li et al. (2022) suggested the built environment could impact a consumers' financial literacy through exposure to knowledge acquisition opportunities. Barrafrem et al. (2021) noted that trust in the government is related to financial literacy and education. Public trust in government, however, tends to be associated with higher financial knowledge (Nițoi & Pochea, 2024).

Social and Community Context

Individuals' well-being can be influenced by various factors, including the conduct of their peers, societal standards, and the availability of community resources (Office of Disease Prevention and Health Promotion, 2023). Those who possess robust social networks and support systems generally exhibit improved financial behavior, resulting in enhanced financial well-being (LeBaron & Kelley, 2020). Recent studies on family socialization show that constructive familial and social interactions foster desirable financial behaviors. This interaction includes verbal and nonverbal communication between parents and their children, among other family members, and within romantic partnerships (LeBaron & Kelley, 2020). Social networks can serve as valuable resources for obtaining knowledge and guidance on financial matters. Engaging in social interactions provides valuable learning opportunities, which may promote the development of positive financial behaviors (LeBaron & Kelley, 2020). For example, college students' savings and budgeting behaviors have been shown to be positively associated with financial social learning opportunities (Gutter et al., 2010). The influence of co-workers also plays a crucial role in determining an individual's ability to save (Jamal et al., 2015). Strong social relationships can thus serve as a protective barrier, enabling individuals to maintain positive behavior despite facing challenging situations. Social context is also associated with financial literacy. Bongomin et al. (2020) noted that financial literacy and social networks are positively related (i.e., social networks and relationships can act as conduits for consumers to obtain access to and gain financial knowledge) (Reagans & McEvily, 2003; Uzzi, 2018).

Based on the reviews of each SDH factor from above, we propose a positive relationship between SDH and desirable financial behavior and a positive association between SDH and financial knowledge, such that:

> H_1: Social determinants of health are positively associated with desirable financial behaviors.
>
> H_2: Social determinants of health are positively associated with financial knowledge.

Financial Knowledge and Financial Behavior

The Oxford Dictionary (n.d.) defines "knowledge" as "facts, information, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject." In this sense, financial knowledge can be thought of as a basic understanding of financial concepts and the practical use of that knowledge (Delgadillo & Law, 2019). Previous studies demonstrate that individuals must know financial concepts to help motivate behaviors in managing taxes (Baumeister et al., 2003). Tang and Baker (2016) used financial knowledge as one of the antecedents of financial behavior and

concluded that objective financial knowledge is associated with financial behavior. Therefore, in this study (and more broadly), objective financial knowledge is expected to determine financial decisions.

Past literature provides empirical evidence on the positive relationship between objective financial knowledge and financial behavior (Courchane & Zorn, 2005; Robb & Woodyard, 2011; Tang & Baker, 2016). Chen and Volpe (1998) used a college student sample to identify the relationship between financial knowledge and financial decisions, concluding that students with more financial knowledge are more likely to report desirable financial behaviors such as keeping financial records. Lusardi and Mitchell (2007) indicated that individuals with more financial knowledge tend to exhibit better retirement preparedness. Further, Mitchell and Lusardi (2022) showed that financial knowledge helped improve financial decisions and well-being during the COVID-19 pandemic. Another study focusing on older people indicated that individuals with greater financial knowledge tend to better manage their finances (Kim et al., 2018). Therefore, in this study, financial knowledge is expected to be positively associated with desirable financial behavior, such that:

> H_3: Financial knowledge and desirable financial behavior are positively related.

Theoretical Framework

Social cognitive theory (SCT) was utilized as the conceptional framework of this research. SCT was developed from social learning theory (SLT), which explains the importance of environmental and cognitive factors in affecting human learning activities (Bandura & Walters, 1977). Bandura (1986) revised SLT to SCT and posited that behavioral outcomes occur in a social context with interactions among the environmental, personal, and behavioral factors. Another feature of SCT is the concentration on personal social experiences while interacting with personal traits to shape individual behavior (Bandura, 1991).

In this sense, SDH can be fitted as an environmental factor that explains the nonmedical part of health outcomes, including economic stability, educational access and quality, health care access and quality, neighborhood and built environment, and social and community context (Office of Disease Prevention and Health Promotion, 2023). Since financial behavior refers to practices, including cash, credit, and saving behaviors (Xiao, 2008), desirable financial behavior was used as the behavioral factor in the model. Financial knowledge is a personal factor that indicates how well an individual understands financial concepts and uses the knowledge (Delgadillo & Law, 2019). The theoretical framework, developed by adapting SCT, is shown in Figure 1.

Method

Survey Design

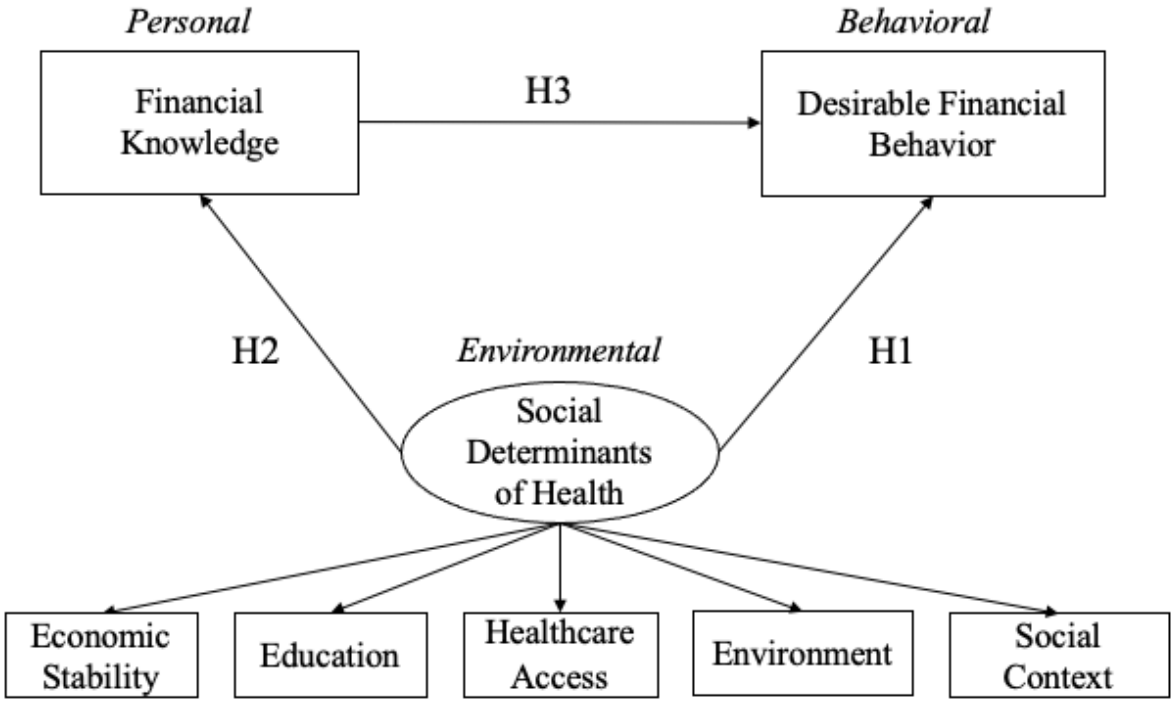
The processes of survey development, data collection, and data documentation were completed as part of USDA Agricultural Experiment Station Research. This work was supported by the USDA National Institute of Food and Agriculture, Hatch-Multistate project 1017241, and cooperating universities as an output of the project officially known as NC2172: "Behavioral Economics and the Intersection of Healthcare and Financial Decision Making across the Lifespan." Researchers are the project investigators in their respective states, which include California, Colorado, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Maryland, Mississippi, Missouri, North Dakota, Ohio, Pennsylvania, Rhode Island, South Dakota, Texas, Utah, Virginia, and Washington.

Data were collected during the COVID-19 pandemic from May 24, 2021 to June 18, 2021 by Qualtrics Research Services. Qualtrics was contracted to collect at least 2,000 completed cases. To confirm the identity of respondents, Qualtrics sample partners verified each respondent's address, demographic information, and email address upon registration. Qualtrics also checked every IP address and applied unique digital fingerprinting techniques to ensure validity and exclude duplication. To ensure reliability, sample blend was replicated across multiple projects. Quotas were used while collecting the data. Within each group, the following additional sampling parameters were used:

(a) Gender: approximately 49.5% Male, 50.5% Female;
(b) Region: approximately 16% Northeast, 21% Midwest, 41% South, 22% West; and
(c) Race: approximately 60.1% Non-Hispanic White, 13.4% Non-Hispanic Black, 18.5% Hispanic, 8% Other.

To be in the study, respondents needed to be between ages 18 and 65 and live in the United States. Respondents received an incentive based on the completion of the survey.

Figure 1. Theoretical Framework



Dataset

In the final dataset, 2,318 respondents completed all the survey questions. IP addresses were deleted before the data were analyzed. The survey included detailed information about respondents' sociodemographic characteristics, healthcare access, government assistance during the pandemic, the social connections of respondents, and questions related to objective financial knowledge from the National Financial Capability Study (NFCS). Descriptive statistics are shown in Table 1 and Table 2.

Table 1. Description of the Variables used in the Study

Variables	Mean/Percentage	Min	Max	Type
Desirable Financial Behavior	41.33%	0	1	Binary
Social Determinants of Health				
Economic Stability	32.79%	0	1	Binary
Education	2.77	0	5	Continuous
Healthcare	82.75%	0	1	Binary
Environment	24.16%	0	1	Binary
Social Context	2.22	0	5	Continuous
Financial Knowledge	2.26	0	6	Continuous

Variables

Dependent Variable

The dependent variable of interest in this study was desirable financial behavior. According to Xiao et al. (2014), desirable financial behavior includes numerous factors related to savings, retirement, and mortgage use. In this paper, desirable financial behavior was measured based on the respondents' answers about whether they engaged in desirable financial behaviors in the past 12 months (i.e., during the COVID-19 pandemic). As shown in Table 2, three desirable financial behaviors were used to construct the variable: (a) "added additional money to a retirement saving account (yes = 10.91%; no = 89.09%)"; (b) "paid additional money toward mortgage principle (yes = 6.73%; no = 93.27%)"; and (c) "saved additional money (yes = 31.10%; no = 68.90%)." As shown in Table 1, desirable financial behavior (yes = 41.33%; no = 58.67%) was coded as 1 if a respondent engaged in at least one of the three desirable financial behaviors in the past 12 months and coded as 0 if a respondent did not engage in any of these behaviors. Desirable financial behavior was coded as a binary variable. As shown in Table 2, the statistics for desirable financial behavior showed that only 0.95% of respondents engaged in all three desirable financial behaviors, whereas 5.52% of respondents engaged in two. Therefore, a new variable was created where respondents who engaged in at least one of the three desirable financial behaviors were coded 1, otherwise 0.

Table 2. Descriptive Statistics

Variables	Mean/%	SD	Freq.
Added additional money to a retirement saving account			
Yes	10.91%		253
No	89.09%		2,065
Paid additional money toward mortgage principle			
Yes	6.73%		156
No	93.27%		2,162
Saved additional money			
Yes	31.10%		721
No	68.90%		1,597
The number of engaged Desirable Financial Behavior			
None	58.67%		1,360
One	34.86%		808
Two	5.52%		128
Three	0.95%		22
Employment			
Working	73.42%		1702
Not working	26.58%		616
Educational Attainment			
High school or less (ref)	27.69%		642
Some college	21.92%		508
Associate's degree	9.92%		230
Bachelor's degree	24.33%		564
Graduate or Professional degree	16.13%		374
Health Insurance			
Yes	82.57%		1,914
No	17.43%		404
Favorable Environment			
Yes	24.16%		560
No	75.84%		1,758
Age	36.46	8.745	
Gender			
Male	50.52%		1,171
Female	48.27%		1,119
Other	1.21%		28
Race			
Non-Hispanic White	59.36%		1,376
Other	40.64%		942
Health Condition	0.00%		

Excellent	24.81%		575
Very Good	28.73%		666
Good	28.86%		669
Fair	13.76%		319
Poor (ref)	3.41%		79
Marital Status			
Married	47.45%		1,100
Other	52.55%		1,218
Household Size	2.97	1.396	
Income			
Less than $30,000 (ref)	32.53%		754
$30,000 to $99,999	43.74%		1,014
$100,000 to $200,000	20.19%		468
More than $200,000	3.54%		82
N = 2,318			

Independent Variables

The key independent variable used in this research was SDH. The five categories of SDH were economic stability, educational access, health care access, neighborhood and built environment, and social and community context. As shown in Table 1, economic stability (yes = 32.79%; no = 67.21%) was measured based on whether a respondent's income was higher, lower, or about the same in 2020 compared with 2019 before the pandemic. Economic stability was coded as 1 if income was about the same; otherwise, it was coded as 0.

Educational access was indicated by respondents' educational attainment. A higher education value indicates that a respondent had better access to education. Table 1 shows that the mean score (*M* = 2.77) of education ranged from 0 = "less than high school" to 5 = "graduate or professional degree."

Healthcare access was measured by whether a respondent was currently covered by health insurance. As shown in Table 1, 82.57% of respondents were covered by health insurance.

The neighborhood and built environment variable was created based on this question: "How much do you worry about your ability to rely on a government safety net for financial assistance during times of crisis?" The environment factor (yes = 24.16%; no = 75.84%) was coded as 1 when a respondent reported, "Don't worry at all," indicating they were living in a safe and supportive environment. The variable was coded as 0 if a respondent answered, "I worry some" or "I worry a lot."

The social and community context variable was constructed based on answers ranging from "Strongly Disagree" to "Strongly Agree" to the following questions:

(a) I frequently pass on social events at work due to my financial situation.
(b) My financial situation frequently interferes with my relationship with co-workers/colleagues.
(c) I find it difficult to talk about money with my spouse/significant other.
(d) I frequently avoid attending family events because of my financial situation.
(e) My financial situation frequently interferes with my family relationship.

Each of the questions was coded as 1 if a respondent "Strongly Disagreed" or "Disagreed"; otherwise, it was coded as 0. The social and community context variable was then estimated as the sum of the values of the five single variables. As shown in Table 1, social and

community context scores ranged from 0 to 5 (*M* = 2.22). A lower score means a respondent was experiencing a less-than-optimal social context; a higher score indicates a respondent had excellent social connections. The Cronbach's alpha for the summed scale was 0.86.

Financial knowledge was used as a mediator in this research. The mediation effect of financial knowledge on the relationship between SDH and desirable financial behavior was evaluated in this study. The financial knowledge variable was constructed based on answers to six household finance-related questions from the National Financial Capability Study (NFCS). As shown in Table 1, financial knowledge (*M* = 2.26) was coded so that scores ranged from 0 to 6.

Respondent demographics were used as control variables in this research. The variables included age, gender, health situation, household size, marital status, and income. The descriptive statistics for the variables are shown in Table 2. The average age of respondents was 36 years. Males comprised 50.52% of the sample, females were 48.27%, and 1.21% were other gendered respondents. The percentage of non-Hispanic White respondents was 59.36%, and 45.45% of respondents were married, with an average household size of three. Also, in this study, 32.53% of respondents reported having an income less than $30,000, whereas 3.54% of respondents had an income greater than $200,000. Among the respondents, 73.42% were working, and 26.58% were not working. As shown in Table 2, 27.69% of respondents had an education of high school or less, 21.92% had completed some college, 9.92% had an associate degree, 24.33% had earned a bachelor's degree, and 16.13% had completed a graduate or professional degree. Additionally, respondents were asked about their self-reported physical health. The responses were excellent (24.81%), very good (28.73%), good (28.86%), fair (13.76%), and poor (3.41%).

Empirical Models

This study used causal steps to access mediation (Baron & Kenny, 1986; MacKinnon et al., 2007). Since the dependent variable was categorical and the mediator was treated as a continuous variable, the techniques of ordinary least squares (OLS) regression and Probit regression were used to evaluate the mediation effect of financial knowledge (MacKinnon et al., 2007). First, a Probit regression model was used to determine model relationships. The Probit regression was formulated as follows:

$$\Phi^{-1}(p) = \beta_0 + \beta_1 S + \beta_2 C + \varepsilon \qquad (1)$$

where p = P (desirable financial behavior = 1/S, C), S is the combination of the five factors of social determinants, C is the vector denoting control variables, and ε is the error term.

A second estimation (Equation 2) was used to validate the associations between SDH and financial knowledge:

$$f = \beta_0 + \beta_1 S + \beta_2 C + \varepsilon \qquad (2)$$

where f is financial knowledge, S is the combination of the significant factors of social determinants according to the result of the last step, C is the vector denoting control variables, and ε is the error term.

Equation 3 was used to examine the relationship between financial knowledge and desirable financial behavior:

$$\Phi^{-1}(p) = \beta_0 + \beta_1 f + \beta_2 C + \varepsilon \qquad (3)$$

where p = P (desirable financial behavior = 1/*S*, *C*), f is financial knowledge, C is the vector denoting control variables, and ε is the error term.

The direct and indirect effects of SDH on desirable financial behavior were investigated after all the above relationships were validated. The product of coefficients method was used to estimate the direct and indirect effects (Alwin & Hauser, 1975; StataCorp, 2023). The estimated total effect (TE), natural indirect effect (NIE), and natural direct effect (NDE) were estimated in Stata using a causal mediation model (StataCorp, 2023).

Results

The Probit regression results are presented in Table 3. The model indicated that economic stability (beta = 0.209; $p < 0.001$), educational access (beta = 0.052; $p < 0.05$), healthcare access (beta = 0.214; $p < 0.01$), and social context (beta = 0.098; $p < 0.001$) had significant positive relationships with desirable financial behaviors; however, the built environment was not

significant. Compared with the reference group whose annual income was lower than $30,000, those who earned between $100,000 and $200,000 (beta = 0.210; $p < 0.05$) were more likely to report desirable financial behaviors during the pandemic.

Table 3. Probit Regression for the Social Determinants of Health on Desirable Financial Behavior (*N* = 2,318)

	Coefficient	Std. Err.	P > z
Economic Stability	0.209***	0.058	0.000
Education	0.052*	0.022	0.021
Healthcare	0.214**	0.074	0.004
Environment	0.033	0.065	0.609
Social Context	0.098***	0.014	0.000
Age	0.004	0.003	0.264
Female	-0.083	0.059	0.162
Non-Hispanic White	0.008	0.059	0.894
Excellent	-0.011	0.160	0.946
Very good	0.032	0.156	0.838
Good	0.081	0.152	0.597
Fair	-0.042	0.159	0.794
HH Size	0.022	0.021	0.281
Married	-0.041	0.067	0.542
In $30k to $100k	0.058	0.068	0.392
In $100k to $200k	0.210*	0.101	0.039
More than $200k	0.013	0.163	0.937
Employment Status	0.092	0.069	0.182

*Note: Unweighted; Significance: *p < .05, **p < .01, ***p < .001*

The significant social determinants of health factors were used to test Hypothesis 2. Results from the OLS regression on financial knowledge (Table 4) indicated that economic stability (beta = -0.134; $p < 0.001$) was negatively associated with financial knowledge. Educational access (beta = 0.120; $p < 0.001$), healthcare access (beta = 0.210; $p < 0.01$), and social context (beta = 0.076; $p < 0.001$) were positively associated with financial knowledge. Age (beta = 0.021; $p < 0.001$) was positively associated with financial knowledge, whereas female (beta = -0.302; $p < 0.001$) was negatively associated with financial knowledge. Compared with the reference group, whose income was less than $30,000, respondents who made between $30,000 and $100,000 and between $100,000 and $200,000 were more likely to exhibit higher financial knowledge. The results shown in Table 4 provide support for the second hypothesis.

Table 4. OLS Regression for Economic Stability, Educational access, Healthcare Access, and Social and Community Context on Financial Knowledge (*N* = 2,318)

	Coefficient	Std. Err.	P > z
Economic Stability	-0.314***	0.060	0.000
Education	0.120***	0.023	0.000
Healthcare	0.210**	0.074	0.005
Social	0.076***	0.014	0.000
Age	0.021***	0.003	0.000
Female	-0.302***	0.061	0.000
Non-Hispanic White	0.016	0.060	0.794
Excellent	-0.048	0.161	0.768
Very good	0.309	0.158	0.050
Good	0.107	0.154	0.486
Fair	0.086	0.161	0.591
HH Size	-0.038	0.021	0.070
Married	-0.081	0.068	0.236
In $30k to $100k	0.340***	0.070	0.000
In $100k to $200k	0.234*	0.105	0.026
More than $200k	0.041	0.169	0.807
Employment Status	0.062	0.070	0.374

*Note: Unweighted; Significance: *p < .05, **p < .01, ***p < .001*

The financial knowledge probit regression results are shown in Table 5. The findings indicate that financial knowledge (beta = 0.0489; $p < 0.013$) was positively associated with desirable financial behavior. Compared with respondents whose income was less than $30,000, those who made between $30,000 and $100,000 and between $100,000 and $200,000 were more likely to engage in better financial behavior. Results provide support for the third hypothesis.

Table 5. Probit Regression for Financial Knowledge on Desirable Financial Behavior (*N* = 2,318)

	Coefficient	Std. Err.	P > z
Financial Knowledge	0.048*	0.020	0.015
Age	0.005	0.003	0.113
Female	-0.041	0.059	0.483
Non-Hispanic White	0.008	0.058	0.892
Excellent	0.017	0.157	0.913
Very good	0.096	0.154	0.531
Good	0.117	0.150	0.438
Fair	-0.061	0.158	0.697
HH Size	0.021	0.020	0.310
Married	-0.050	0.064	0.440
In $30k to $100k	0.127	0.067	0.058
In $100k to $200k	0.322***	0.095	0.001
More than $200k	0.139	0.158	0.380
Employment Status	0.078	0.067	0.240

*Note: Unweighted; Significance: *p < .05, **p < .01, ***p < .001*

The results of tests of the direct and indirect effects of SDH on desirable financial behavior are displayed in Tables 6 through 9. As shown in Table 6, financial knowledge significantly mediated the relationship between economic stability and desirable financial behavior. The total treatment effect of economic stability on desirable financial behavior was 0.101 ($p < 0.05$), meaning that if every respondent in the sample had stable economic resources, the probability of reporting a higher desirable financial behavior would increase by 0.101 points on the probability scale compared with respondents who had unstable income payments. The natural indirect effect of financial knowledge was -0.010 ($p < 0.05$), whereas the natural direct effect of economic stability was 0.111 ($p < 0.001$). This situation is referred to as "inconsistent mediation" because the mediated effect had an opposite sign than the direct effect in the model (MacKinnon et al., 2000; 2007). Although the indirect pathway had a negative association with desirable financial behavior, the effect was not strong enough to offset the positive effect of the direct pathway (i.e., financial knowledge only explained 10% (0.01/0.101) of the total treatment effect for economic stability on desirable financial behavior). The positive treatment effect on the outcome was almost completely due to the direct effect of economic stability.

Table 6. The Mediation Effect of Economic Stability on the Relationship Between Educational access and Desirable Financial Behavior (*N* = 2,318)

Causal Mediation Analysis			
Outcome model:	Probit		
Mediator model:	Linear		
Mediator variable:	Financial Knowledge		
Treatment type:	Binary		
	Coefficient	Std. Err.	P > z
NIE			
Economic Stability	-0.010*	0.004	0.017
NDE			
Economic Stability	0.111***	0.022	0.000
TE			
Economic Stability	0.101***	0.022	0.000

*Note: Unweighted; NIE: Natural indirect effect, NDE: Natural direct effect, TE: Total effect; Significance: *p < .05, **p < .01, ***p < .001*

As shown in Table 7, financial knowledge was a significant mediator in the relationship between educational access and desirable financial behavior. The total treatment effect was 0.072 ($p < 0.01$), which indicates that if every respondent in the sample had better educational access, the probability of engaging in desirable financial behavior would increase by 0.072 points compared with respondents having worse educational access. Of the total treatment effect, a 0.02 increase in the probability of exhibiting desirable financial behaviors was due to the natural indirect effect of financial knowledge ($p < 0.01$); further, a 0.052% increase in the probability of showing desirable financial behaviors was due to the natural direct effect of educational access ($p < 0.05$). Financial knowledge explained 27.8% of the total treatment effect for educational access on desirable financial behavior.

Table 7. The Mediation Effect of Financial Knowledge on the Relationship Between Educational access and Desirable Financial Behavior (*N* = 2,318)

Causal mediation analysis			
Outcome model:	Probit		
Mediator model:	Linear		
Mediator variable:	Financial Knowledge		
Treatment type:	Binary		
	Coefficient	Std. Err.	P > z
NIE			
Economic Stability	0.020**	0.006	0.001
NDE			
Economic Stability	0.052*	0.023	0.021
TE			
Economic Stability	0.072**	0.022	0.001

*Note: Unweighted; NIE: Natural indirect effect, NDE: Natural direct effect, TE: Total effect; Significance: *p < .05, **p < .01, ***p < .001*

The effect of healthcare access on desirable financial behavior when mediated by financial knowledge is shown in Table 8. Financial knowledge significantly mediated the relationship between healthcare access and desirable financial behavior. The total treatment effect of educational access on desirable financial behavior was 0.103 ($p < 0.001$), meaning that if every respondent had better healthcare access, the probability of a higher desirable financial behavior would increase by 0.103 points compared with respondents with worse healthcare access. An 0.009 increase in the probability of exhibiting desirable financial behaviors was due to the natural indirect effect of financial knowledge ($p < 0.05$). An 0.094 increase in the probability of showing desirable financial behaviors was due to the natural direct effect of healthcare access ($p < 0.001$). Financial knowledge explained 8.7% of the total treatment effect for healthcare access on desirable financial behavior.

Table 8. The Mediation Effect of Financial Knowledge on the Relationship Between Healthcare Access and Desirable Financial Behavior (*N* = 2,318*)*

Causal mediation analysis			
Outcome model:	Probit		
Mediator model:	Linear		
Mediator variable:	Financial Knowledge		
Treatment type:	Binary		
	Coefficient	Robust Std. Err.	P > z
NIE			
Healthcare Access	0.009*	0.003	0.021
NDE			
Healthcare Access	0.094***	0.027	0.000
TE			
Healthcare Access	0.103***	0.026	0.000

*Note: Unweighted; NIE: Natural indirect effect, NDE: Natural direct effect, TE: Total effect; Significance: *p < .05, **p < .01, ***p < .001*

Table 9 presents the mediation effect of financial knowledge on the relationship between social context and desirable financial behavior. Financial knowledge significantly mediated the relationship between social context and desirable financial behavior. The total treatment effect of social context on desirable financial behavior was 0.212 ($p < 0.001$), which suggests that if every respondent had an excellent social and community context, the probability of a higher desirable financial behavior would increase by 0.212 points compared with respondents who earned a zero score on social and community context. A 0.022 increase in the probability of reporting desirable financial behaviors was due to the natural indirect effect of financial knowledge ($p < 0.01$); further, a 0.192 increase in the probability of exhibiting desirable financial behaviors was due to the natural direct effect of social context ($p < 0.001$). Financial knowledge explained 9.4% of the total treatment effect for social context on desirable financial behavior.

Discussion

Our study's findings align with expectations from SCT (Bandura, 1986). In the context of the COVID-19 pandemic, this study introduced and developed SCT as the theoretical model using an empirical dataset to explain the connections between SDH and financial behaviors. While much of the past literature has concentrated on the analysis of physical health during the COVID-19 pandemic, this research fills a research gap by introducing consumers' social determinants of health and investigating its connections to financial behaviors. The findings confirm the importance of economic stability, educational access, healthcare access, and social context in describing consumers' financial behaviors.

Table 9. The Mediation Effect of Financial Knowledge on the Relationship Between Social Context and Desirable Financial Behavior (*N* = 2,318)

Causal mediation analysis				
Outcome model:		Probit		
Mediator model:		Linear		
Mediator variable:		Financial Knowledge		
Treatment type:		Binary		
		Coefficient	Robust Std. Err.	P > z
NIE				
	Social Context (5 vs 0)	0.020**	0.007	0.007
NDE				
	Social Context (5 vs 0)	0.192***	0.029	0.000
TE				
	Social Context (5 vs 0)	0.212***	0.028	0.000

*Note: Unweighted; NIE: Natural indirect effect, NDE: Natural direct effect, TE: Total effect; Significance: *p < .05, **p < .01, ***p < .001*

Four of the five SDHs were significant: (a) economic stability, (b) educational access, (c) healthcare access, and (d) social/community context. A strong positive association between economic stability and desirable financial behavior was observed. This suggests that consumers with stable economic resources are more likely to engage in desirable financial behaviors during times of crisis and thus find it easier to survive and recover from financial adversities. This finding confirms the importance of stable economic payments in preventing financial crises (Fox & Bartholomae, 2020).

Educational access was also positively associated with desirable financial behaviors, which means that consumers with better accessibility to education were more likely, during the pandemic, to make less problematic financial decisions. This result confirms the role of education in stabilizing financial situations. Policymakers should consider increasing consumers' overall access to education to prevent and prepare for future financial shocks.

Improving healthcare access is another vital way to help consumers make desirable financial decisions. As shown in this study, healthcare access was positively associated with desirable financial behavior. It is recommended that consumers should have health insurance in place to prepare for a future pandemic and to minimize stress-related financial difficulties resulting from unexpected medical and healthcare costs.

Additionally, social context was found to be positively associated with desirable financial behaviors, meaning consumers reporting healthy social relationships with family, friends, and co-workers are more likely to engage in desirable financial behaviors. It may be worthwhile for consumers to build up social networks as a way to receive support during financial shocks.

The neighborhood and built environment variable was not significant. It is possible that the way the variable was measured explains the non-significant result. One question was used. The item asked about how worried respondents felt

about relying on a government safety net for financial assistance during times of crisis. This question may be more of a measure of trust in government than a measure of healthy and safe neighborhoods and environments. This possibility is worthy of future research.

Findings also indicate that financial knowledge partially mediates the relationships between the SDH and desirable financial behaviors. The results of the mediation effect tests of financial knowledge explained the 10%, 8.7%, and 9.4% of the total treatment effect for economic stability, healthcare access, and social context, respectively. Based on these findings, to improve their overall financial behavior, consumers should be encouraged to focus on increasing their economic stability, healthcare access, and social context. Consumers should also try to acquire more financial knowledge to improve their financial behavior because financial knowledge plays a significant mediation role in explaining desirable behaviors. Moreover, financial knowledge explained 27.8% of the total treatment effect for educational access on desirable financial behavior. This result indicates that enhancing financial education is one way to help consumers manage their finances wisely during an unexpected pandemic or crisis.

It was also found that consumers with more attained education, healthcare access, and a better social context are more likely to report more financial knowledge. This aligns with expectations and conclusions from the literature. However, in this study, there was an unexpected relationship between economic stability and financial knowledge. Surprisingly, the association between economic stability and financial knowledge was negative. Financial worries and perceived stress could manifest in individuals experiencing financial strain, such as that caused by a job loss (Frank et al., 2014; Ryu & Fan, 2023). Those with stable incomes may perceive a lesser sense of urgency to improve their financial knowledge level in times of uncertainty relative to their counterparts with an unstable income stream. Consequently, it is possible that individuals who have encountered fluctuations in their income may find it necessary to allocate time and resources toward acquiring financial knowledge and helping them thrive in difficult situations. Furthermore, if a consumer's salary or wages remain stable, they may be able to save more or pay more on their mortgage; however, it is possible there is no perceived need to improve financial knowledge as long as they are behaving in a way that benefits them in the long run.

Conclusions and Implications

This research considered social factors of health during the COVID-19 pandemic by investigating the connections between SDH and financial behavior while considering the mediating role of financial knowledge. Previous research indicates that SDH affects "a wide range of health, functioning, and quality-of-life outcomes and risks" (Office of Disease Prevention and Health Promotion, 2023). This study shows that SDH is also associated with financial behaviors and knowledge. The results confirm the significance of improving consumers' overall financial behaviors by improving economic stability, educational access, healthcare access, social context, and financial education. The findings of this study can be used to provide guidance to consumers when preparing for unforeseen financial shocks and to help them recover quickly from pandemic adversities.

This study offers several theoretical contributions. One of the major theoretical contributions relates to the validity of SCT and using self-reported data from a U.S. sample during the pandemic. The results confirmed the significance of SDH in explaining desirable financial behaviors and the mediation effect of financial knowledge. This confirmation provides evidence for SCT as the theoretical framework to establish the associations between SDH and financial behavior. Additionally, the mediation effect of financial knowledge on the relationship between SDH and desirable financial behavior was validated in this study. The existence of the mediation effect indicates that SDH can affect desirable financial behaviors directly and indirectly.

The findings have practical implications for consumers, financial service practitioners, and policymakers. To prepare for unexpected financial shocks and build up financial resilience, consumers can enhance their financial situation(s) by improving their economic stability. Stabilizing

employment and income resources increases economic stability and helps to ensure that consumers will have more liquid savings to manage their finances during a financial crisis. At the same time, consumers could improve their financial behaviors by attaining more education since advanced educational degrees and financial knowledge were shown to be directly associated with financial behaviors in this study. Further, it is vital for consumers to have health insurance in place and funded so the expensive cost of healthcare does not significantly impact their finances during a pandemic or other crisis. Moreover, consumers should build social capital and maintain healthy social connections as a way to manage their financial behavior during times of crisis.

The results also have implications for financial service practitioners (e.g., financial counselors and financial planners). While working with clients to help improve their financial situations, financial service practitioners might consider taking some time to understand the conditions related to their clients' social determinants of health. For example, suppose a client does not have reliable economic resources. When clients need help with their budgeting, financial service practitioners typically obtain clients' financial information to identify whether they have stable income resources so that they can save regularly. Financial service practitioners can go further and advise their client to look for employment that can provide stable income to prepare for any unforeseen financial crisis.

Financial service practitioners could also provide suggestions on setting up emergency fund accounts, which could be another avenue for clients to ensure economic support during a financial crisis. When clients need help with retirement planning, financial service practitioners could advise clients to maintain stable economic resources, so they have funds available to invest in their retirement accounts. Clients should also be advised to acquire financial knowledge to improve retirement product choices. Each client will have their own unique situation, so financial service practitioners need to personalize their recommendations based on the client's social factors of health. Educating clients about finances could be another effective approach in assisting clients to improve their financial behaviors. Financial education will be of long-term benefit to clients.

Additionally, policies to improve any social determinant of health can have profound effects on individuals, families, and communities. The stimulus checks issued by the federal government during the COVID-19 pandemic are a noteworthy example of helping clients recover and thrive during financial shocks. Therefore, any policies that can provide income resources or prevent an income drop during a pandemic will be beneficial for clients in improving their financial behavior.

Lastly, policymakers should focus on improving SDH in neighborhoods to help improve the overall financial behavior of residents. Communities can work on economic development and provide job opportunities for community members in preparation for future unexpected crises to raise and stabilize incomes. Government agencies might consider designing and constructing walkable neighborhoods or public transportation to decrease the cost of living for consumers. Local governments could also provide affordable housing in safe neighborhoods for low-income consumers and consumers with financial difficulties to help them navigate financial shocks. Government agencies should also implement programs to improve language and literacy skills, including financial literacy skills, to increase consumers' financial knowledge.

Limitations and Future Research

A limitation of this study is related to the sample collection process. The sampling process did not strictly follow the original quota distributions. A more representative study could be done in the future that draws from a larger population of respondents that adheres to a predefined quota distribution, thus making the dataset nationally representative. This will allow researchers to better examine the associations between the social determinants of health and financial behaviors. Another related limitation of this study is that the dataset was cross-sectional. A future study using a longitudinal or panel dataset is necessary to investigate if the relationships between SDH and financial behaviors remain consistent over time. Similarly, since the dataset

of this study was collected during the COVID-19 pandemic, it would be interesting to test the associations after the pandemic with a representative sample. This would allow researchers to understand whether the implications for consumers, financial service practitioners, and policymakers are valid during normal financial situations.

Finally, as noted earlier, research is needed to investigate how the neighborhood and built environment factor is related to financial behavior. In this study, the neighborhood and built environment variable was the only SDH factor not significantly associated with desirable financial behaviors. As noted in the methods section, neighborhood and built environment was measured using one question about how worried respondents were about relying on government safety nets during times of crisis. This question may be measuring trust in government rather than neighborhood and built environment. Future studies should use revised questions related to the neighborhood and built environment so that the relationship between this factor and desirable financial behaviors can be better tested.

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