Chronic Disease and Future Perceptions of Financial Control

Results From the Midlife in the United States Cohort Study

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Objective: Rising health care costs and chronic disease prevalence have increased concerns about health-related financial burden. This study examined how baseline chronic disease burden was associated with subsequent perceptions of financial control ~9 years later.

Methods: Data came from the Midlife in the United States (MIDUS) cohort, with MIDUS 1 and 2 used as baseline predictors for future perceived financial control outcomes at MIDUS 3. Adjusted mixed effect models examined the relationship between baseline chronic disease burden on 4 variables representing future perceptions of financial control.

Results: A total of 3297 participants [mean (SD) age: 54 (11.36) y] were included. Greater chronic disease burden and medication use at baseline were associated with a higher likelihood of inadequate resources [adjusted odds ratio (AOR) = 1.22; 95% CI: 1.07–1.38; $P = 0.001$ and AOR = 1.29; 95% CI: 1.13–1.46; $P = 0.001$, respectively]. Having more chronic conditions predicted reduced feelings of financial control (AOR = 0.85; 95% CI, 0.78-0.93; $P < 0.001$) and a more pessimistic financial outlook (AOR = 0.87; 95% CI: 0.79–0.97; $P < 0.01$). Higher baseline cholesterol levels showed mixed associations: better perception of current finances (AOR = 1.36; 95% CI: 1.22–1.51; $P = 0.001$) but reduced sense of financial control (AOR = 0.86; 95% CI: 0.78–0.95; $P < 0.001$) and more negative financial outlook (AOR = 0.69; 95% CI: 0.62–0.77; $P < 0.001$). No baseline factors predicted bill payment capability.

Conclusion: The findings suggest a need for additional strategies to reduce the financial burden of chronic diseases.

Key Words: financial stress, financial control, chronic disease, financial toxicity, social determinants of health

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Chronic diseases are the top cause of morbidity and mortality in the United States.[1] Alongside the growing prevalence of chronic diseases,[2] out-of-pocket health care expenses have also risen over time[3] with increased financial burden linked to medical care.[4]

The relationship between chronic disease burden and financial perceptions operates through multiple pathways. First, managing chronic conditions creates immediate financial pressure through out-of-pocket costs for medications, medical visits, and lifestyle modifications.[2] Second, chronic disease often affects work capacity and earning potential, creating longer-term financial strain.[5] Third, individuals with chronic conditions must anticipate future health care needs and potential complications, which may influence their perception of financial security and control.[6] This complex relationship between health and financial well-being can create a cyclical pattern: chronic disease increases financial strain, which may lead to cost-related nonadherence to treatment, potentially worsening health outcomes. Understanding how chronic disease burden influences perceptions of financial control is crucial because these perceptions often drive health-related decision-making and behavior.[6]

Existing research has focused on cross-sectional analyses. For example, a cross-sectional analysis of adults by Becker et al[7] enrolled in a commercial Michigan insurance and found that individuals with more chronic diseases had a higher likelihood of having medical debt in collections. Few studies have explored the relationship between chronic disease burden and subjective financial control.

While financial circumstances can change over time, chronic disease burden may have lasting effects on individuals' financial outlook through various mechanisms, including ongoing health care costs, impact on work capacity, and anticipated future medical expenses. Understanding these longer-term associations can inform

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interventions to support financial well-being among people managing chronic conditions.

Our longitudinal analysis examined how baseline chronic disease burden was associated with subsequent financial perceptions measured ~9 years later. We examined multiple indicators of chronic disease burden—including condition count, medication use, and metabolic markers—as each captures different aspects of disease management and potential financial impact. Number of conditions reflects overall disease burden and complexity of care. Medication count indicates treatment intensity and recurring costs. Metabolic markers, particularly HbA1c, serve as indicators of disease control that may influence anticipated future health care needs and costs. For example, poor glycemic control often predicts future complications and higher health care utilization. We hypothesized that individuals with higher disease burden would report reduced financial control due to health care costs, those with poorer disease control would have more negative financial perceptions, and these relationships would persist after controlling for baseline financial status, suggesting chronic disease has enduring effects on financial outlook.

METHODS

The cohort study described here is a secondary data analysis of deidentified, publicly available datasets, which are deemed exempt from the University of Michigan Health Sciences Institutional Review Board.

Participants and Data

The present study used nationally represented panel data from three waves of the Midlife in the United States (MIDUS) study, to understand the relationship between baseline chronic disease burden and subsequent financial perceptions. MIDUS is a longitudinal prospective cohort study that assesses the psychological, social, behavioral, and health trends of a national probability sample of noninstitutionalized, middle-life, English-speaking U.S. adults.[8,9] Each wave involved telephone interviews and self-administered surveys.[8] MIDUS 1 (1995–1996) used a random digit dial sampling method and oversampling in specific cities to collect data from more than 7000 English-speaking adults aged 25–74 years old.[10] MIDUS 2 (2004–2009) collected information from over 4500 individuals including over 1200 individuals who provided biomarker information.[10,11] There was a 75% mortality-adjusted retention rate between MIDUS 1 and 2, and the highest retention was among individuals who had more years of education, identified as White women, were married and in better health.[10,12]

MIDUS 3 (2013–2014) collected follow-up data from over 2500 longitudinal participants, and a biomarker subsample was collected from 2017–2022.[13] The Retention Early Warning Project (2018–2019) reengaged 339 participants in MIDUS 2 and 312 participants in MIDUS 3, which were included in the analysis.[12] We included sociodemographic data collected from MIDUS 1.

We examined associations between chronic disease burden measured at MIDUS 2 (2004–2009) and financial perceptions assessed at both MIDUS 2 and MIDUS 3 (2013–2014), allowing ~9 years of follow-up. While financial measures in MIDUS 3 asked about participants' current circumstances, our analytical framework enables us to understand how baseline health status relates to subsequent financial perceptions, accounting for baseline financial status and other covariates.

Measures

Chronic Disease Burden

Our chronic disease burden assessment incorporated multiple complementary measures to capture both current health status and future health care needs. Disease burden was quantified through participants' self-reported number of chronic conditions, based on "yes" responses to 28 health concerns including asthma, autoimmune disorders, diabetes, hypertension, emotional disorders, and substance use collected during MIDUS 2. We also tracked the total number of medications taken in the previous month and hospital nights in the past year. Disease control was assessed through key biomarkers including HbA1c percentage (indicating glucose control), sitting systolic blood pressure, and low-density lipoprotein–cholesterol levels. Together, these measures provide a comprehensive view of participants' health status and disease management requirements.

Financial Perception Measures

We examined 5 distinct dimensions of financial well-being, as prior research suggests health status may differentially impact various aspects of financial perceptions. These dimensions were assessed through standardized questions at each time point. The current financial situation was rated on a 0–10 scale from "worst possible" to "best possible." The future outlook was measured similarly, asking participants to project their financial situation 10 years ahead. Resource adequacy was assessed by asking whether participants had "more than enough," "just enough," or "not enough" money to meet their needs. Bill payment capability was measured through a question about monthly bill payment difficulty, rated from "very difficult" to "not at all difficult." Finally, financial control was evaluated using a 0–10 scale measuring participants' perceived control over their current financial situation.

Covariates

Our analyses controlled for key sociodemographic variables collected at MIDUS 1, including self-reported race, education, sex, and age, along with marital status, and welfare/Aid to Dependent Children receipt. Health insurance status was categorized as none, Medicare, Medicaid, private, or other. To account for temporal effects, interview timing from MIDUS 2 and 3 was standardized by centering around the mean and dividing by the SD.

Statistical Analyses and Procedures

Our statistical analyses began by excluding participants missing key demographic and baseline data. For the

remaining variables, we conducted multiple imputations using chained equations with 10 iterations, incorporating predictive mean matching for continuous variables. The imputation model included all analysis variables plus auxiliary variables, with convergence assessed through trace plots.

To examine associations between chronic disease burden and financial perceptions, we used linear mixed effects models for outcomes measured on a 0–10 scale (current financial situation, control, and outlook) and generalized linear mixed effect models with logit link for binary outcomes (resource adequacy and bill payment difficulty). As a sensitivity check, we also conducted ordered logistic regression by categorizing the 0–10 outcomes into quartiles: low (0–3), medium-low (4–5), medium-high (6–7), and high (8–10). All models included random intercepts for repeated measures.

We examined childhood financial status as a potential effect modifier of associations between disease burden and financial perceptions. The interaction terms were not significant in any of the models.

Missing rates varied across variables, with 100% complete demographic data and 10%–91% missing rates for health measures or financial outcomes at MIDUS 2 and 3. Sensitivity analyses comparing complete case analysis with imputed data showed similar patterns, though effect sizes differed. All analyses were conducted using R version 4.2.1, with 2-sided hypothesis tests and significance at $\alpha = 0.05$.

RESULTS

Sample Demographics and Clinical Information

A total of 3297 participants were included in the analysis (Table 1). Most participants identified as female (54.47%), White (90.99%), and had some college education or higher-level degree (69.97%). At baseline (MIDUS 2), the average age was 54 years old (SD = 11.36), the mean number of chronic conditions was 1.94 (2.28), and participants reported a mean number of medications of 1.44 (1.58). The average HbA1c was 5.95% (0.88), systolic blood pressure was 131.63 (17.73), and low-density lipoprotein–cholesterol was 106.66 mg/L (34.67).

TABLE 1. Participant Characteristics at Baseline (MIDUS 2: 2004–2009)

Variables	N (%)
Age, mean (SD); range	54.06 (11.36); 30.00–84.00
Sex	
Male	1501 (45.53)
Female	1796 (54.47)
Race	
Asian or Pacific Islander	26 (0.79)
Black and/or African American	97 (2.94)
Native American or Aleutian American	118 (3.58)
Other	56 (1.70)
White	3000 (90.99)
Marital status	
Married	2435 (73.86)
Unmarried	862 (26.14)
Education	
Some grade school to some high school	156 (4.73)
GED to graduated high school	834 (25.30)
Some college or higher	2307 (69.97)
Health insurance	
Medicaid	17 (0.52)
Medicare	192 (5.82)
No Insurance	598 (18.14)
Other	88 (2.67)
Private	2402 (72.85)
Family on welfare or aid to dependent children	
Yes	166 (5.03)
No	3131 (94.97)
Parental highest education	
Some grade school to some high school	750 (22.75)
GED to graduated high school	1189 (36.06)
Some college or higher	1358 (41.19)
Financial level growing up	
Better off	995 (30.18)
Same as average family	1367 (41.46)
Worse off	935 (28.36)
No. chronic conditions (Mean (SD) [Range])	1.94 (2.28); 0.00–29.00
Total no. medications taken in last 30 d, mean (SD); range	1.44 (1.58); 0.00–12.00
No. night(s) hospitalized in the last 12 mo, mean (SD); range	6.34 (4.94); 2.00–33.00
Hemoglobin A1c % , mean (SD); range	5.95 (0.88); 3.80–15.20
Average SBP blood pressure, mean (SD); range	130.63 (17.73); 83.00–191.00
Blood LDL-C (mg/dL), mean (SD); range	106.66 (34.67); 16.00–283.00

n = 3297.

GED indicates General Education Development; LDL-C, low-density lipoprotein–cholesterol; MIDUS, Midlife in the United States; SBP, systolic blood pressure.

Perceived Financial Control Over Time

Table 2 reports generalized linear mixed effect models of baseline chronic disease burden and associations between future perceptions of financial control: resource adequacy and bill payment capability. Living with more chronic conditions [adjusted odds ratio (AOR) = 1.22; 95% CI: 1.07–1.38; $P = 0.001$], and taking more medication (AOR = 1.29; 95% CI: 1.13–1.46; $P = 0.001$) at baseline was associated with a significantly higher likelihood of lack of resource adequacy. No baseline factors were associated with bill payment capability.

Table 3 reports linear mixed models of baseline chronic disease burden and associations with future perceptions of financial control: perception of current financial situation, control over the financial situation, and future outlook of financial situation. Participants who had more chronic conditions at baseline reported feeling less in control of their financial situation (AOR: 0.85; 95% CI: 0.78–0.93; $P < 0.001$) and had a more pessimistic outlook about their future finances (AOR: 0.87; 95% CI: 0.79–0.97; $P < 0.01$). Those taking more medications at baseline also reported a more negative outlook about their future financial situation (AOR: 0.89; 95% CI: 0.79–0.99; $P = 0.03$).

Higher cholesterol levels at baseline showed a mixed relationship with financial perceptions. While participants with higher cholesterol reported better perceptions of their current financial situation (AOR: 1.36; 95% CI: 1.22–1.51; $P = 0.001$), they felt less in control of their finances

TABLE 2. Generalized Linear Mixed Effects Models of Baseline Chronic Disease Burden Associated With Future Perceptions of Financial Control: Resource Adequacy and Bill Payment Capability*

	Perceived financial control outcomes at MIDUS 3 (N = 3297)			
	Resource adequacy		Bill payment capability	
Predictors	AOR (95% CI)	*P*	AOR (95% CI)	*P*
No. chronic conditions	1.22 (1.07, 1.38)	0.001	1.14 (0.97, 1.35)	0.12
No. medications taken in the last 30 d	1.29 (1.13, 1.46)	0.001	1.07 (0.91, 1.27)	0.41
No. night(s) hospitalized	1.08 (0.79, 1.48)	0.62	1.16 (0.86, 1.66)	0.42
Hemoglobin A1c %	1.15 (0.92, 1.43)	0.23	1.08 (0.93, 1.36)	0.48
Average SBP	0.91 (0.75, 1.10)	0.32	0.90 (1.10, 1.23)	0.52
Blood LDL-C (mg/dL)	0.90 (0.78, 1.04)	0.18	1.02 (0.98, 1.17)	0.8

*Models were adjusted for: time, age, race, sex, education, marital status, family on welfare or Aid to Dependent Children, and health insurance status.

AOR indicates adjusted odds ratio; LDL-C, low-density lipoprotein–cholesterol; MIDUS, Midlife in the United States; SBP, systolic blood pressure.

(AOR: 0.86; 95% CI: 0.78–0.95; $P < 0.001$) and had a more pessimistic outlook about their future financial situation (AOR: 0.69; 95% CI: 0.62–0.77; $P < 0.001$).

DISCUSSION

We found that baseline chronic disease burden, including the number of conditions, medications, and cholesterol levels, was associated with more negative financial perceptions ~9 years later among U.S. midlife adults. These findings suggest that chronic disease burden may have lasting implications for individuals' perceived financial well-being, operating through multiple potential pathways.

Our results align with studies demonstrating the stepwise relationship between the number of chronic diseases and financial burden.[7,14,15] Previous research has primarily focused on immediate financial impacts, whereas our study adds to the literature by demonstrating how disease burden may influence longer-term financial perceptions. These enduring effects could reflect both actual costs and psychological factors, as individuals with chronic conditions may maintain persistent concerns about future health care expenses and potential complications.

The mixed relationship we observed with cholesterol levels—where higher levels were associated with better current financial perceptions but worse future outlooks—may reflect complex temporal dynamics. While elevated cholesterol might not immediately impact financial well-being due to relatively accessible and affordable treatment options, individuals may anticipate future cardiovascular complications[16] and associated costs, leading to more pessimistic long-term financial outlooks.

Previous research has demonstrated a relationship between health care utilization and both nonmedical (eg, worry about financial needs and bills) and medical (eg, delayed care due to cost) financial burden,[17,18] including emergency department visits and inpatient hospitalizations. This study did not find an association between hospitalizations and future financial perceptions, possibly due to the relatively low hospitalization rates in our sample.

These findings suggest several potential mechanisms linking chronic disease to financial perceptions. Beyond direct health care costs, chronic conditions may affect the financial outlook through anticipated future medical expenses and complications. The impact of chronic disease on work capacity or early retirement concerns represents another important pathway. The potential need for future caregiving or functional assistance may also influence financial perceptions, as may the broader impact on long-term financial planning and saving ability. The psychological burden of ongoing health care management represents an additional mechanism through which chronic disease may affect the financial outlook.

Future research should examine these potential mediating pathways and their relative contributions to financial perceptions. Studies could also explore how specific disease combinations, insurance types, and treatment regimens influence long-term financial well-being. In addition, research should investigate how changes in disease control over time relate to evolving financial perceptions, and whether improvements in disease management lead to more optimistic financial outlooks.

Limitations

As with all research, this study has limitations. Coefficient estimates for imputed variables with a high level of missingness (eg hospitalizations) should be interpreted with caution despite sensitivity analyses confirming similarities with the main analysis. The MIDUS sample does not represent the racial and ethnic diversity of the U.S. population, therefore, future research should expand this work with a racially and ethnically diverse sample and across various baseline socioeconomic levels. Further, there is vast heterogeneity across and within chronic disease types that influence health-seeking behavior and financial burden. Studies should provide more granular analyses on the type of chronic diseases and insurance types that may predict future perceptions of financial control to assist with more focused interventions and policy advocacy.

While our study examined associations between baseline health status and subsequent financial perceptions, we acknowledge that both health and financial circumstances can change over time. Our measures of financial perceptions at MIDUS 3 reflect participants' assessment of their circumstances at that time point, which may be influenced by both their baseline health status and subsequent changes in health and financial situations. Future research with more frequent measurements could help disentangle these temporal relationships.

Our analyses suggest that healthier, more socioeconomically advantaged participants were more likely to be retained. This selection bias likely results in conservative estimates of financial strain's health impacts, as those who dropped out showed both poorer health and socioeconomic indicators.

This study has important implications for multi-level strategies to reduce financial burden among people living with chronic diseases. Health care institutions should continue integrating social needs screening and inter-

TABLE 3. Generalized Linear Mixed Models of Baseline Chronic Disease Burden Associated With Future Perceptions of Financial Control: Perception of Current Financial Situation, Control Over Financial Situation, and Future Outlook of Financial Situation*

	Perceived financial control outcomes at MIDUS 3 (N = 3297)					
	Perception of current financial situation		Control over financial situation		Future outlook of financial situation	
Predictors	AOR (95% CI)	*P*	AOR (95% CI)	*P*	AOR (95% CI)	*P*
No. chronic conditions	1.00 (0.90, 1.11)	0.98	0.85 (0.78, 0.93)	0.001	0.87 (0.79, 0.97)	0.01
No. medications taken in last 30 d	0.93 (0.82, 1.05)	0.24	0.92 (0.83, 1.01)	0.07	0.89 (0.79, 0.99)	0.03
No. night(s) hospitalized	1.17 (0.95, 1.45)	0.16	1.05 (0.78, 1.42)	0.76	0.85 (0.66, 1.10)	0.25
Hemoglobin A1c %	0.90 (0.74, 1.08)	0.27	1.01 (0.89, 1.15)	0.9	1.02 (0.83, 1.25)	0.88
Average SBP	1.02 (0.81, 1.29)	0.84	0.90 (0.76, 1.07)	0.24	1.07 (0.91, 1.26)	0.41
Blood LDL-C (mg/dL)	1.36 (1.22, 1.51)	0.001	0.86 (0.78, 0.95)	0.001	0.69 (0.62, 0.77)	0.001

*Models were adjusted for: time, age, race, sex, education, marital status, family on welfare or Aid to Dependent Children, and health insurance status.
AOR indicates adjusted odds ratio; LDL-C, low-density lipoprotein–cholesterol; MIDUS, Midlife in the United States; SBP, systolic blood pressure.

ventions to address financial burdens in a patient-centered and sensitive manner. Systematic communication about social needs with patients can promote transparency about out-of-pocket costs and facilitate multiple treatment options based on insurance coverage. In addition, our findings support continued policy efforts to address the high cost of medicines and health care services for a growing population managing multiple chronic diseases, with particular attention to conditions with persistently high treatment costs.

CONCLUSION

Our study found that chronic disease burden and medication use are associated with poor future perceptions of financial control, likely operating through multiple pathways including direct costs, anticipated future expenses, and impacts on work capacity. This work has important implications for multilevel strategies to reduce the financial burden of chronic diseases, including improved social needs screening, financial navigation support, cost transparency, and continued health policy efforts. Such efforts have the potential to improve adherence to necessary chronic disease treatments and medications, quality of life, and health outcomes.

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