

Title: Hard Times: The Effects of Financial Strain on Home Care Services Use and Participant Outcomes in Michigan

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ABSTRACT

Background: When government funding for long-term care is reduced, participant outcomes may be adversely affected. We investigated the effect of program resources on individuals enrolled in the Michigan Home- and Community-Based Services waiver program for elderly and disabled adults.

Methods: Using dates of major policy and budget changes, we defined four distinct time periods between October 2001 and December 2005. Minimum Data Set for Home Care assessment records for HCBS participants (n=112,182) were used to examine temporal trends in formal care hours and six outcomes: ER use, hospitalization, caregiver burden, death, nursing facility (NF) use and permanent NF placement. Controlling for demographics, functional status, and cognitive status, adjusted odds of outcomes were obtained using discrete-time survival analysis.

Results: As resources diminished, mean formal care hours decreased, declining most for persons with moderate functional or cognitive impairment, for up to a ~30% decrease. In the most financially-restricted period, three adverse outcomes increased relative to baseline: hospitalization (OR= 1.10 [1.03, 1.18]), ER use (1.13 [1.03, 1.24]), and permanent NF placement (1.20 [1.00, 1.42]).

Conclusion: Reductions in resources for home care were associated with increased probability of adverse outcomes. Cutting funds to home care programs can increase utilization of other more costly services, thus offsetting potential health care savings. Policymakers must consider all ways in which budget reductions and policy changes can affect participants.

Key words: Home care, financial cutback, reduced budget, long-term care

INTRODUCTION

Medicaid Home and Community-Based Service (HCBS) programs, funded jointly by states and the federal government, are intended to help participants who meet functional and financial eligibility criteria to remain in their homes by coordinating needed care and providing personal assistance services. Because HCBS are typically provided on a long-term basis, these programs act as an alternative to permanent nursing facility placement for individuals who choose to remain in the community.

After a long period of expansion during 1992-2000, the growth in HCBS programs began to slow in the early 2000s (Kitchener, Ng, Miller, & Harrington, 2005). In fiscal year (FY) 2004, several states proposed or enacted reductions in HCBS benefits and fewer states proposed expansions compared to FY 2002 (Williams, 2003). For instance, in some states, HCBS budget reductions resulted in restrictions in eligibility requirements, in number of participants enrolled, and in HCBS reimbursement levels (Kitchener, Ng, & Harrington, 2004). The reduced growth of HCBS appeared to continue through FY 2005, when national Medicaid HCBS expenditures for the aged/disabled grew only 4% relative to FY 2004, in contrast to the 15.2% growth between FY 2000 and 2001 (Eiken, Burwell & Selig, 2006). However, in FY 2007 and 2008, an increasing number of states have proposed expansions of HCBS waiver programs and/or benefits, despite reports that states continue being pushed to contain Medicaid costs (Smith, Gifford, Ellis, Rudowitz, O'Malley, & Marks, 2007). All of these changes have the potential to impact participant outcomes, but, to date, research has focused on macro-level effects of these policy and program shifts rather than the impact of such decisions on participant outcomes or service utilization.

The effects of financial restriction on individual outcomes have been examined in other home care programs. After the Medicare home health program transitioned from a fee-for-service to a prospective payment system (PPS), utilization of home health services decreased (McCall, Moore, Petersons, & Korb, 2003; Murtaugh, McCall, Moore, & Meadow, 2003; Zhu, 2004). Beneficiary health status and utilization of other health services were both adversely affected (McCall, Korb, Petersons, & Moore, 2002; Schlenker, Powell, & Goodrich, 2005); for example, beneficiaries in the post-PPS period were less likely to improve in urinary continence as well as behavioral outcomes (Schlenker et al., 2005). In addition, post-PPS, beneficiaries were significantly more likely to be admitted into a nursing facility (McCall et al., 2002). On the other hand, rates of hospitalization and emergent care use were not as clearly affected. When the interim payment system was in effect, hospitalizations and emergent care use increased; but when the PPS was fully in place, utilization rates were lower than in the pre-PPS period, suggesting increased efficiency. Overall, decreases in federal spending on post-acute home health resulted in reductions in home health services and in increased risk of certain, but not all, of the adverse outcomes examined.

Adverse effects from cutbacks in home hospitalization services have also been documented. Following closure of a home hospitalization program in Israel (Jacobs et al., 2007; Jacobs, 2006), hospitalization rates increased, leading to a \$US 6.2 million increase in overall expenditures (approximately \$US 138 per participant). This undesirable response to reduced funding is particularly relevant, since home hospitalization programs, like HCBS, provide services in the community that are otherwise provided in an institutional setting.

Controlling costs through service reductions may create unmet need, which can also lead to negative consequences. For instance, analyses of the 1994 National Health Interview Survey found that subjects who reported unmet need were more likely to experience weight loss, dehydration, falls, and burns (Laplante, Kaye, Kang, & Harrington, 2004; Desai, Lentzner, & Weeks, 2001). In a study of participants of the Program for All Inclusive Care (PACE), older persons who experienced unmet need were also more likely to be admitted to a hospital. There was also evidence that this risk of hospital admissions disappeared once participants' needs were met (Sands, Wang, McCabe, Jennings, Eng & Covinsky, 2006).

These earlier studies suggest that budget declines experienced by Medicaid HCBS programs can create unmet need, which in turn results in worse participant outcomes and increases in overall health expenditures as services shift into more costly settings. However, the experiences of the Medicare home health program and the Israeli home hospitalization program may not be similar to state Medicaid HCBS programs, which may have different participant populations and financial requirements.

Because increasing demands for HCBS long term care continue to exert pressure on state budgets, it is important to develop evidence of the effects of resource scarcity on individual outcomes. This study examines the effect of budgetary changes on participants enrolled in one Michigan HCBS program over a four-year period. We examine possible changes in the amount of formal services provided, other health services utilization (hospitalization, emergency room use, nursing facility use and permanent nursing facility placement), and adverse outcomes (death, caregiver burden).

DESIGN AND METHODS

Background: MI Choice, the State of Michigan's §1915c Medicaid waiver program for elderly and disabled adults, provides access to a range of in-home services including personal care, respite, homemaker, adult day care, and environmental modifications, as well as to nurse/social worker care management teams who monitor participants' health status and arrange/coordinate care provided by other payment sources (e.g., Medicare, Older Americans Act funds, and local millage funds). Participants must meet income/asset and medical eligibility criteria in order to receive assistance. Statewide, 22 agencies (known as "waiver agents") employ care managers directly and contract with other service providers to

deliver waiver services. Annual contracts specify a maximum funding ceiling that is based on the expected average length of stay and the number of enrollees. There is no cap on the amount or duration of services an individual participant may receive; however, each waiver agent must ensure that its annualized per day expenditures do not exceed statewide average per day amounts for either care management/operations or direct services costs.

Financial resources and policy direction for the MI Choice waiver have fluctuated widely since its expansion statewide in FY 1999. Over three years, both the statewide waiver budget and enrollments grew substantially, from \$68.3M and 10,317 enrollees in FY 1999 to \$146.5M and 14,607 enrollees in FY 2001. Expansion stopped abruptly in early FY 2002 when waiver agents, responding to anticipated state budget shortfalls, voluntarily ceased intake of new participants. In mid-FY 2002, the program was officially closed to new enrollment for fourteen months. As previously mentioned, since the state funds programs based on the program's census, the intake closure reduced MI Choice waiver resources. Beginning in FY 2003, the statewide waiver budget was capped at \$100M, and as a result, the funding streams for care management/operations and direct services were both substantially diminished. Although the waiver reopened in mid-FY 2003, by the end of the fiscal year, the statewide census had dropped by 5609 persons (38.4%) to 8,998, causing many care managers to be laid off. Statewide funding remained stagnant for FYs 2004 and 2005 while inflationary cost increases, particularly for care managers, direct care workers, and transportation, further diminished the program's purchasing power. In early FY 2005, new policy that increased the medical eligibility threshold for waiver enrollees was enacted, further reducing the effective level of program resources. By FY 2005, the MI Choice waiver had access to about 17% fewer dollars per participant relative to FY 2002 (Figure 1), adjusting for inflation and participant acuity.

Data Sources: On behalf of the state, the University of Michigan Institute of Gerontology maintains a data archive that includes longitudinal assessment information for all individuals enrolled in the MI Choice waiver. Participant data is gathered using a comprehensive assessment instrument, the Minimum Data Set—Home Care (MDS-HC[®]) that has been described elsewhere (Morris et al., 1997). Assessments are generally required at 90-day intervals and record many participant characteristics, including functional and cognitive status, availability of informal support, formal services use, hospital admissions, and emergency room visits. The data archive also contains administrative records about participant status changes, including death and permanent nursing facility placement. For this study, we used participant assessments and associated administrative records between October 2001 and June 2006. Use of the data was approved by the University of Michigan Institutional Review Board-Health.

Defining Time Periods: Before undertaking any analyses, we first examined the historical changes in MI Choice budget levels, program operation, and policy over the time span of interest. We

identified four distinctly different policy ‘environments.’ These environments did not coincide with state fiscal years, nor were they of equal duration. Key budget and program data are summarized by fiscal year and by the policy timeframes in Figure 2. Relative to later FYs (2003-2005), early FY 2002 had the highest funding with no significant policy changes, thus it was considered our baseline time period. We hypothesized that the closure of the waiver program in mid-FY 2002 would impact the way the program allocated resources due to decreased enrollment and the uncertainty of the program, thus this time period was labeled ‘Uncertain Times.’ The reopening of the program with lower funds marked the beginning of the ‘Hard Times.’ The following time period was defined as the ‘Worse Times,’ because we hypothesized that the increase in medical eligibility threshold and continued budget cap would effectively reduce the amount of resources. Altogether, these considerations resulted in four time periods that we labeled ‘Baseline,’ ‘Uncertain Times,’ ‘Hard Times,’ and ‘Worse Times’ to reflect the increasingly difficult policy environments in which the waiver program operated. These policy-budget environments negatively impacted resources, which may have reduced program staffing and formal care hours, ultimately leading to adverse outcomes for the participant (Figure 3).

Outcome Measures: Several outcomes were examined: the type and amount of formal services received, hospitalization, emergency room use, nursing facility use, permanent nursing facility placement and death. All outcome measures were taken from each MI Choice participant assessment or administrative records

Formal services. In order to examine whether formal service changed as a function of participant characteristics and time period, total formal service time was calculated by summing all recorded formal services time provided by various types of paid caregivers in the 14 days preceding the assessment. Initial assessments were excluded from analyses of formal services, because the formal services are retrospectively reported and may not reflect the services received under the Michigan Waiver Program. To adjust for differences in acuity, we divided the total formal service time by a measure of individual resource usage, the Case Mix Index (CMI), which is associated with the individual’s RUG-III/HC group (Bjorkgren, Fries, & Shugarman, 2000). The RUG-III/HC case-mix system is the home care analog of the Resource Utilization Group (RUG-III) case-mix system used by the Federal Medicare Prospective Payment System and many state Medicaid agencies to classify and reimburse nursing facilities. In the home care arena, RUG-III/HC has been shown to be predictive of formal and informal home care service cost. All formal care hours reported in this study have been case-mix adjusted.

To examine possible shifts in types of home care services received, the formal service time was categorized into seven types based on provider designation: personal care, private duty nursing, skilled therapies (occupational, speech, and physical therapies, and social worker in home), adult day care,

homemaker services, meals, and volunteer services. The proportion of total formal services time used for each type of service was calculated.

Recurrent Outcomes. Four recurrent outcomes were coded for each assessment: hospitalizations, emergency room use, nursing facility use, and caregiver burden. The MDS-HC identifies the number of times over the prior 90 days (or since the last assessment) that an individual has been admitted to hospital with an overnight stay or visited the ER (emergency room) without an overnight stay. As these two utilization measures are coded looking backward in time, we linked participants' service use and characteristics on one MDS-HC assessment with the hospital and ER use coded on an MDS-HC performed 60-120 days later. If no assessment occurred within this time frame, it was assumed that neither emergency room nor hospital use occurred. To keep the outcome time frames consistent, admission to a nursing facility for a limited stay (without discharge from the waiver program) was coded from administrative records when this occurred within 60-120 days of the assessment. Caregiver burden was defined as indication on either of two variables from the target MDS-HC: 'primary caregiver expresses feelings of distress, anger or depression' or 'a caregiver is unable to continue in caretaking activities.'

Non-recurrent outcomes. Two non-recurring outcomes were coded for the last assessment available: death and permanent nursing facility placement. Both were coded from administrative records concurrent with or following the last final assessment. If these outcomes were not recorded, neither outcome was coded. Administrative records were available for 6 months after the study time frame.

Covariates: Four MDS-HC-based measures were used to examine participants' health status: one measure of physical function (Activities of Daily Living (ADL) Index (Fries, Schneider, Doley, Gavazzi, Burke, & Cornelius, 1994)); one measure of cognitive function (Cognitive Performance Scale (CPS) (Morris et al, 1994)); and two measures of resource utilization (RUG III/HC group and CMI).

The ADL Index was rescaled from a 12-point scale, ranging from 4 (least impaired) to 15 (most impaired), to a 6-category scale by combining adjacent categories. The CPS is a 7-point scale ranging from 0 (intact) to 6 (very severely impaired). These two measures are used in the RUG-III/HC system.

RUG III/HC, a hierarchical classification system, consists of 23 groups. Associated with each group is a case-mix index (CMI), which is a ratio of care time for each RUG group to an index group and therefore a relative measure of resource use. Both measures were used to examine linear (CMI-continuous variable) and nonlinear relationships (RUG-III/HC group-categorical variable). As previously mentioned, since RUG III/HC uses ADL and CPS to classify participants, and were thus are highly correlated, collinearity among these variables is common and expected.

Several demographics from the MDS-HC— age (in October 2001), gender, marital status, and race/ethnicity—were included in the analyses to adjust for varying participant characteristics.

Statistical methods: Unadjusted associations between time period and participant characteristics or service utilization were examined using chi-square tests for categorical variables and ANOVA for continuous variables. To test for trend in associations, we used the Cochran-Armitage tests for categorical variables and ANOVA for continuous variables, with time periods modeled as a single continuous variable. For the Cochran-Armitage test, if categorical variables had more than two levels, each level was compared to all other levels.

To examine possible shifts across time periods among types of services provided, we used logistic regression to compare the proportion of total formal service time used for each type of service. Time period was indicated by dummy variables when testing for differences among the four time periods and by a continuous indication when testing for trends.

We also examined whether health status indicators (ADL, CPS, RUG-III/HC, CMI) predicted changes in formal service hours. Formal service time was highly skewed, thus we used a natural logarithm transform to meet normal distribution assumptions before testing for significant differences then back-transformed into formal hours for ease of interpretation. We tested for differences among periods in the provision of formal services using a two-way ANOVA model with an interaction term between impairment level and time period. Pairwise tests of means were also conducted and p-values were corrected for multiple comparisons using the Bonferroni adjustment.

To examine changes in the risk of participant health outcomes and service utilization across budget periods while controlling for covariates, we employed discrete-time survival analysis (procedurally equivalent to pooled logistic regressions)—one for each of five outcomes (too few temporary nursing facility stays occurred to estimate a fully-controlled model) (Allison, 1995, 1982). Time periods were indicated by dummy variables, where the Baseline time period was the reference. Differences from Baseline were tested using the Wald test.

For recurrent outcomes (e.g., ER use, hospitalizations and caregiver burden), generalized estimating equations (GEE) were used to account for multiple assessments per participant, because the event occurrence would influence the event occurrence of the following assessment.^{1,2} For nonrecurrent outcomes (death and nursing facility placement), using GEE to account for multiple assessments was not necessary² (Singer & Willett, 1993).

¹ An exchangeable correlation was used. The use of GEE may be considered preferable to a random coefficient analysis, which is another method that adjusts for multiple assessments for a person, but can result in unstable odds estimates (Twisk, Smidt, & de Vente, 2005).

² Use of these pooled logistic models is equivalent to discrete-time proportional odds survival analysis with time-varying covariates and differing times of entry into the dataset (Allison, 1995, 1982).

Analyses were conducted in SAS, version 9.1.3 (SAS Institute, 2004) and $\alpha = 0.05$ was required for significance in all statistical tests, except in cases where multiple comparisons were performed, where a stricter significance level was used.

RESULTS

Participant Characteristics: 122,725 assessments were available and approximately 8% of these assessments had incomplete data on the formal services provided. As analyses including and excluding these assessments were not significantly or qualitatively different, these incomplete assessments were excluded from analyses reported here, resulting in an analysis sample of 112,182 assessments, representing 15,301 participants. Table 1 displays averages by time period of measured variables for all included assessments.

On average, participants' demographic characteristics did not change substantially over the course of the study, although the very large number of assessments resulted in many statistically significant differences. In all time periods, the mean age was approximately 72 years and 72-73% of assessments were for women (Table 1). On the other hand, participant functional and cognitive impairment increased over time, as observed in increases in the CMI, ADL Index, and CPS.

Changes in formal services use: After excluding initial assessments, 108,914 assessments were available. Provision of total formal services decreased significantly across time periods; an overall reduction of 1.2 hours per week (11%) was observed over the course of the study (Table 1). Despite the decrease in total formal service time, the average proportion of formal services time devoted to each type of service remained substantially the same (Table 2).

The magnitude of the change in formal service time across budget periods was related to participant functional and cognitive status. In Figure 4, we display the mean formal service time for each level of physical function (i.e., range of ADL Index), as a percentage change from the Baseline period and, similarly, in Figure 5, we display changes across the levels of cognitive function. On average, participants who had moderate or moderately severe levels of functional and cognitive impairment received about the same formal service time during the Uncertain Times as during the Baseline period and then progressively lesser amounts in the Hard and Worse Times. Thus, for example, on average, individuals who had moderate levels of functional impairment (ADL Index = 8-9) received slightly less formal service time during the Uncertain Times than similarly impaired individuals in the Baseline period (16.1 versus 16.7 hours per week ($p=1.0$); however, by the Hard Times, service time had dropped 12% (to 14.4 hours per week, $p=0.02$). The largest decrease was observed for individuals who had an ADL Index of 10-11; by the Worse Times, this group received 23% less total formal service time (16.1 as compared to the Baseline value of 12.4 hours per week, $p=.001$). Similarly, the largest decline in services was

among individuals who were severely impaired (CPS score = 5) in cognitive function, who during the Worse Times, received 20.5 hours of services, a drop of 29% compared to 28.9 hours per week for similarly impaired participants during the Baseline period ($p < 0.001$). A different pattern was observed for both physical and cognitive function, at both extremes –better-functioning and extremely dependent individuals– where there were relatively smaller changes in total formal services time compared to the Baseline period.

Recurrent Outcomes: For most recurrent outcomes, the proportion of assessments associated with an adverse outcome increased over time (Table 1). From Baseline to the end of the study, the percent of assessments reporting emergency room use increased from 7.3% to 8.2%, hospitalizations from 11.9% to 12.6%, and caregiver burden from 16.5% to 19.6%. These changes in outcome frequency represent increases of at least 6% of the Baseline period frequency and nearly 19% for caregiver burden. Very few participants entered a nursing facility on a temporary basis in any period (in total, 25 nursing facility visits, or 0.02% of all assessments), so we did not analyze this measure further.

Most of these findings remained after accounting for participant characteristics (ADL, CPS, and demographic variables-Table 3). Since the RUG-III/HC (and associated CMI) uses ADL and CPS to classify participants, these measures were considered as alternative specification. Including either RUG-III/HC group (categorical variable) or CMI (continuous variable) with ADL and CPS did not alter the pattern of estimates for time periods, but did cause the coefficients for ADL to be unstable, an indication of multicollinearity. Given the choice between specifications and the closer association of formal services with ADL and CPS, we decided to use these measures to control for participant health status rather than RUGS-III/HC or CMI. After controlling for participant health status using ADL, CPS and demographics, hospitalizations and emergency room use still increased significantly over the course of the study, but caregiver burden did not. In the Worse Times period, participants were about 10% more likely to be hospitalized [OR=1.10 95% CI: (1.03, 1.18)] or use the ER [1.13 (1.03, 1.24)] compared to the Baseline period. The non-significant increase in probability of hospitalization and ER use in the Uncertain and Hard Times contributed to a significant rise in hospitalization and ER use across time periods (p for linear trend $< .001$ for both outcomes). Caregiver burden did not change with time period, after adjustment for participant characteristics.

Non-recurrent outcomes: The proportion of participants who died did not markedly change across the budget periods (Table 1). In contrast, in the Worse Times period, permanent nursing facility placement increased 0.2% from the Baseline period, a small absolute increase, but an increase of 15% over the Baseline rate.

After including demographic variables, ADL, and CPS (Table 3), the probability of death still did not differ by period, but the probability of nursing facility placement increased over the course of the

study (p for trend <.001). By the Worse Times, participants had a 20% higher probability of being placed in a nursing facility, as compared to Baseline [OR: 1.20; 95%CI: (1.00, 1.42)]. The increased probability of permanent nursing facility placement in the Uncertain and Hard Times were not statistically significant, relative to the Baseline Period. Not surprisingly, increasing age, functional impairment, cognitive impairment, (and, for death, male sex) were all positively associated with both outcomes.

DISCUSSION

During a four-year period, the resources of the MI Choice waiver program shrank through budget reductions, enrollment freezes, cost inflation, and changes in medical eligibility. These reduced resources were associated with an average decrease of 11% in formal services for participants. Reduced contact time was paralleled by reduced formal services expenditures per participant. Our results showed that these changes were associated with fewer formal services for moderately impaired participants and significant increases in adverse outcomes for the most financially constrained period, relative to Baseline.

Although we did not study the specific operational responses to financial strain within the MI Choice waiver program, it is clear that lower levels of resources were associated with lesser amounts of formal services. Drops in formal services were associated with ADL and cognitive impairment, with greater drops in formal services among participants with moderate physical or cognitive impairment than less or greater impairment. We hypothesize that less impaired participants were initially receiving so very little formal services that it was difficult to reduce them further, while the most impaired participants may have had the greatest need. So, moderately impaired participants were perhaps most vulnerable to reductions. While this formal services distribution may have resulted from attempts to maximize scarce resources, more evidence is needed to determine whether this allocation succeeded in minimizing adverse outcomes.

As well as reduced formal services, strained financial resources were associated with increases in adverse outcomes: emergency room visits, hospitalization, and permanent nursing facility placement. Increased adverse outcomes suggest an increase in unmet need, possibly as a result of reduced services, that participants could not be maintained in their homes and community, and that they required greater use of health services. Although the present study did not specifically measure unmet need on an individual level, the population-level increase in resources usually required by a given medical, functional, and cognitive status, as indicated by the Case Mix Index (CMI), and the population-level decrease in formal services time, suggest growing gaps in access to needed care. Furthermore, a preliminary model of formal care hours, time period, and demographic and health indicators, suggested that less formal care time was significantly associated with greater odds of hospitalization, caregiver burden, and nursing facility placement. However, in the Worse time period, constrained resources may affect participants through mechanisms other than reduced formal care (e.g., reduced number of care

managers), as indicated by, the increase in adverse outcomes in the Worse Times period. This exploratory analysis did not take into several complexities (e.g., variable interactions), and these results should be interpreted with caution.

Although limits or reductions in services most clearly and directly affect participants, funding changes can also indirectly affect participants through contextual factors, e.g., changes in program staffing. In Michigan, the waiver agents' response to a limited HCBS budget was to reduce the number of care managers. Onder et al (2007) have shown that a HCBS program with care management significantly reduced the risk of nursing facility placement. Thus, although we did not have access to detailed information on care management staffing levels, given the growing cost pressures on the program across the study time frame, it is likely that such staff reductions also contributed to the increase in adverse outcomes.

The consequences of limiting resources for home and community-based programs have important implications for individuals enrolled in state HCBS waiver programs. Increased emergency room use, hospitalization, and permanent nursing facility placement associated with decreases in formal care time suggest that, for some participants, lower levels of formal care time may have directly affected their health status and their choices to remain in the community. Because the observed higher rates of hospitalization, ER use, and permanent nursing facility placement are associated with the periods of lowest financial resources, the State of Michigan may have been able to achieve better long term care outcomes by increasing resources for in-home services to potentially avoid greater costs incurred from other, more costly services, especially NF stays. This speculation requires support through further examination of cost and billing data to confirm overall costs of health care utilization to the waiver program.

Strengths: Our study design benefited from access to a standardized data base that permitted us to analyze multiple measures of participant status and service use and to control for a major alternative explanation: change in individual characteristics. Also a census of program participants, a large number of participants and a longitudinal sampling scheme with adequate frequency provided increased statistical power and the ability to analyze multiple outcomes over time while controlling for many covariates. Furthermore, longitudinal data enabled us more validly to associate outcomes with participant characteristics than would a cross-sectional analysis. Finally, by analyzing several outcomes, we demonstrated that funding cutbacks do not narrowly influence a single outcome, but instead have broader effects on many related outcomes.

Limitations: Our conclusions are limited by some aspects of our study. First, the time periods were based on effective dates of policies and budget changes, but program behaviors typically do not coincide precisely with policy changes. For instance, MI Choice officially closed to new participants in

mid-FY 2002, but case managers were already reacting, thus diluting evidence for our hypothesized effects.

Second, our results should be interpreted as a contrast of relatively higher and relatively lower resource periods, and not an evaluation of the adequacy of any particular funding level. The Baseline period was the least financially restrictive time only relative to the following time periods. Based on the program's history, MI Choice was already experiencing difficulties prior to our Baseline time period; assessment data from this time frame was not included because the State's information system was not fully operational.

Also, this analysis only establishes an association between program resources and adverse outcomes, and could not identify specific mechanisms through which participants were affected. Although the relationship between unmet need and/or funding changes with adverse outcomes has been shown previously (Laplante et al, 1994; McCall, et al, 2002; Schlenker et al, 2005; Sands et al, 2006), it is not certain that the funding changes and associated decline in formal services are solely responsible for the adverse outcomes. Past studies have indicated that HCBS program funding and its effect on adverse outcomes is complex. Mitchell and colleagues (2006) compared five HCBS programs in Florida and found that funding levels did not always explain the differential effects on inpatient and nursing facility days. This suggests that the effects of funding and formal service provision are mediated by other factors, such as informal services and state policies.

Another limitation of our analysis is the estimation of formal services time from the MDS-HC record, based on participant/caregiver report. We did not have actual billing or service time data, both of which would be more accurate and could have provide added insight into how services were used and financed (e.g., whether participants used their own funds or tapped other funding sources). Outcomes were also measured from the MDS-HC record, so we may have underestimated the true frequency of emergency room use and hospitalizations, especially in cases when no assessment was available within 60-120 days after the target assessment.

Our results could also be limited because the differences in the response of individual waiver agencies to budgetary stringency were not taken into account. Agencies could have made differing decisions regarding use of increasingly strained resources. Thus, it is possible that the results presented could be driven by a few large agencies and do not apply to all agencies. We also did not examine the effect of agency characteristics, such as fundraising capacity, that can modify the impact of reduced state-provided financial resources. Identifying such factors could be useful in assessing effects of reduced financial resources.

Finally, this is an observational study of the Michigan HCBS waiver program. Differences among states' funding levels, participant populations, specific waiver program policies, and other factors make it

difficult to conclude that this association between hard financial times and adverse outcomes necessarily will occur elsewhere. Also, although we have adjusted for major competing explanations (e.g., participant health status, demographic factors), a weakness of a time-based observational study design such as this is the possibility of residual or unmeasured confounding of environmental changes with time. For instance, changes in the medical care environment could affect participants' health and risk of adverse outcomes. We have accounted for many of major effects and other factors are likely to have at most minimal impact on our results. All of these limitations may reduce the scope of our conclusions, but do not invalidate our findings.

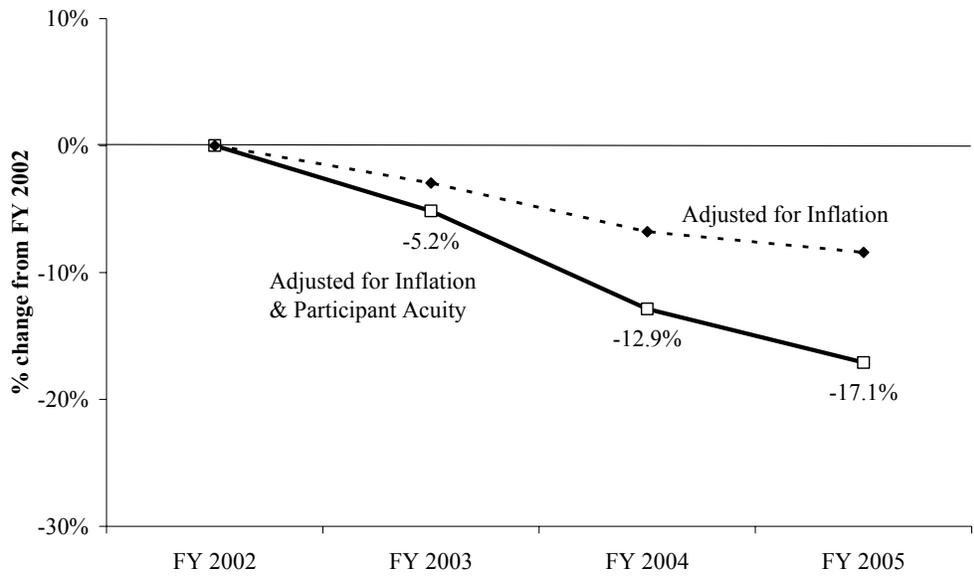
CONCLUSION

In this study, we examined the effects of constrained budgetary growth in the MI Choice waiver. Our results show that an effective funding decline was associated with significantly increased probability of multiple adverse outcomes. Furthermore, compared to participants with more extreme levels of impairment, participants with mid-range levels of cognitive or functional impairment experienced greater reductions in their formal care services.

The associations between adverse outcomes and increasing financial strain make clear that expected savings from budget reductions can be offset if participants experience more adverse outcomes. In this instance, efforts to decrease Medicaid HCBS spending appear to have triggered downstream increases in permanent nursing facility placement and greater utilization of acute care services, typically funded by Medicare. Integrated funding models (e.g., PACE, Wisconsin Partnership Program, and the Massachusetts Senior Care Options Program) hold promise as a way to address the issues arising from different payers. Given that funding changes in HCBS have led to a variety of responses (Kitchener et al, 2004; Williams, 2003), it is critically important that policymakers give more consideration to the overall, cross-program effects of budget reductions on access to preferred care settings and health outcomes.

TABLES AND FIGURES

Figure 1. Percent Change in MI Choice expenditures (per participant)³

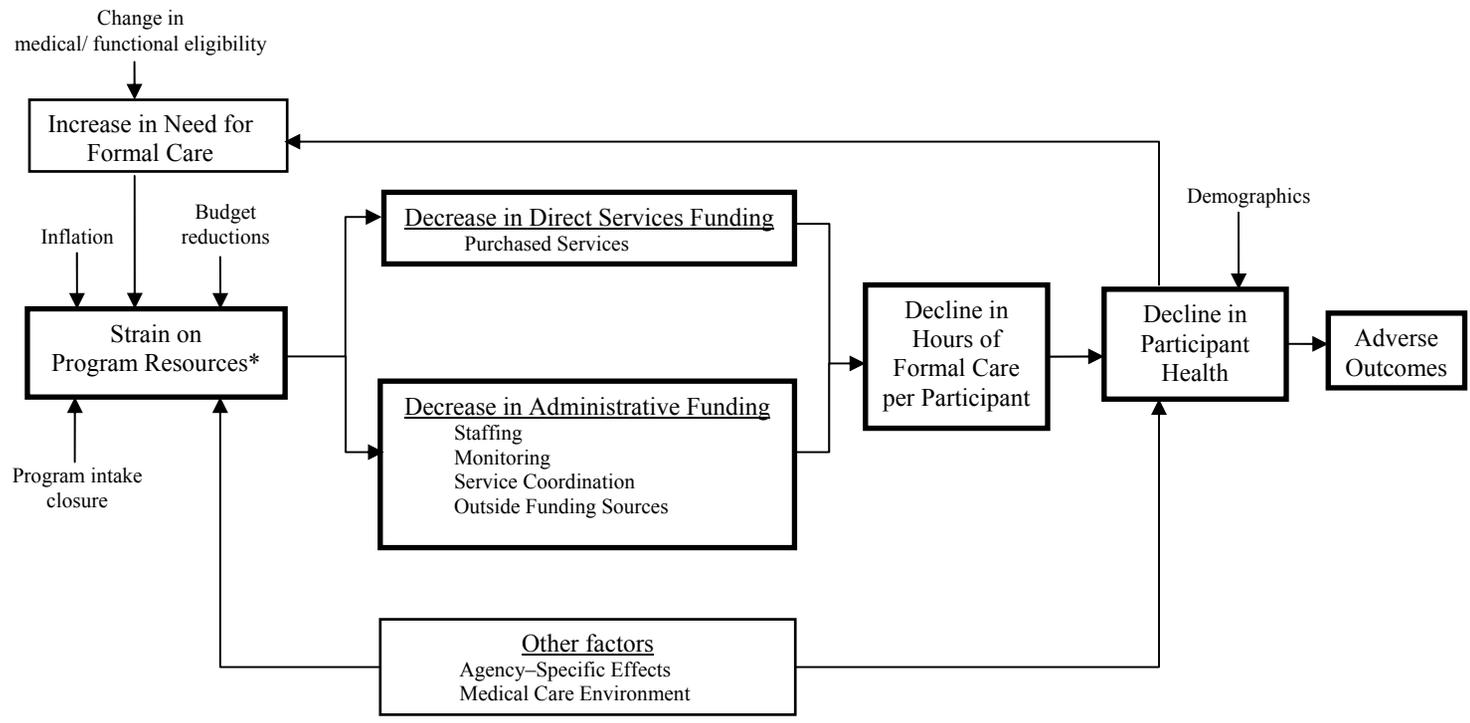


³ : To estimate per participant inflation- and acuity-adjusted expenditures, we divided the approximate fiscal year waiver program budgets by: 1) the quarterly skilled nursing facility (SNF) input price index, a measure of cost inflation (CMS, 2007); 2) quarterly average case-mix index (CMI) (Bjorkgren et al., 2000), a measure of participant acuity; and 3) the fiscal year statewide total of participants served. Note that using only the compensation and wage components of the SNF input price index resulted in no substantial change in the results.

Figure 2. Description of Time Periods

	<u>Baseline</u>	<u>Uncertain</u>	<u>Hard</u>	<u>Worse</u>
Study Time Periods				
Waiver program status	--	Closed to new enrollment	Open to new enrollment	--
Policy change	--	--	--	Medical eligibility threshold increased
	Oct 2001	Oct 2002	Oct 2003	Oct 2004
				Oct 2005
				Jan 2006
Fiscal Year				
Timeline	FY 2002	FY 2003	FY 2004	FY 2005
Funding	\$124,822,424	\$97,301,099	\$98,202,203	\$98,129,302
N participants	11,011	8,998	9,540	9,562
Total Days	3,321,420	2,575,329	2,625,938	2,568,729
Inflation Factor	1.00	1.04	1.07	1.11
				FY 2006
				NA

Figure 3. Conceptual Framework



* Program resources are enrollment-based

Table 1. Descriptive statistics by time period (% assessments)

Variable	Baseline Oct 2001- Mar 2002	Uncertain Times Apr 2002- May 2003	Hard Times June 2003- Oct 2004	Worse Times Nov 2004- Dec 2005
Number of Assessments	15,550	32,835	36,360	27,437
Participants	9,037	8,422	9,039	8,594
Age (years) [*]	72.9	72.7	72.5	72.2
Gender (% female) ^a	72.9	73.1	72.5	72.1
Race/ethnicity [*]				
White	75.7	75.6	75.6	76.3
Black ^a	23.6	23.6	23.6	22.6
Asian/ Pacific Islander	0.2	0.2	0.2	0.3
American Indian/ Eskimo/Aleut ^a	0.5	0.6	0.7	0.7
Marital Status [*]				
Never married/single ^a	8.4	9.2	9.7	9.9
Married	26.3	25.6	25.5	25.5
Widowed ^a	46.6	45.7	44.8	43.7
Separated	1.8	1.9	1.9	1.9
Divorced ^a	16.7	17.5	17.9	18.8
Other	0.2	0.1	0.2	0.2
Mean ADL Index ^{*a}	6.1	6.2	6.6	7.1
Mean Cognitive Performance Scale ^{*a}	1.2	1.2	1.3	1.5
Mean RUG-III Case Mix Index (normalized to baseline) ^{*a}	1.00	1.00	1.06	1.10
Mean formal services- (hours/week) ^{*ab}	11.4	11.4	10.5	10.1
% assessments indicating				
Emergency room use in last 90 days ^{*a}	7.3	7.1	7.4	8.2
Hospitalizations in last 90 days ^{*a}	11.9	11.1	11.5	12.6
Nursing facility use in last 90 days	0.1	0.0	0.0	0.0
Caregiver burden ^{*a}	16.5	14.7	17.1	19.6
Death	3.3	3.0	3.3	3.2
Nursing facility placement ^{*a}	1.3	1.1	1.4	1.5

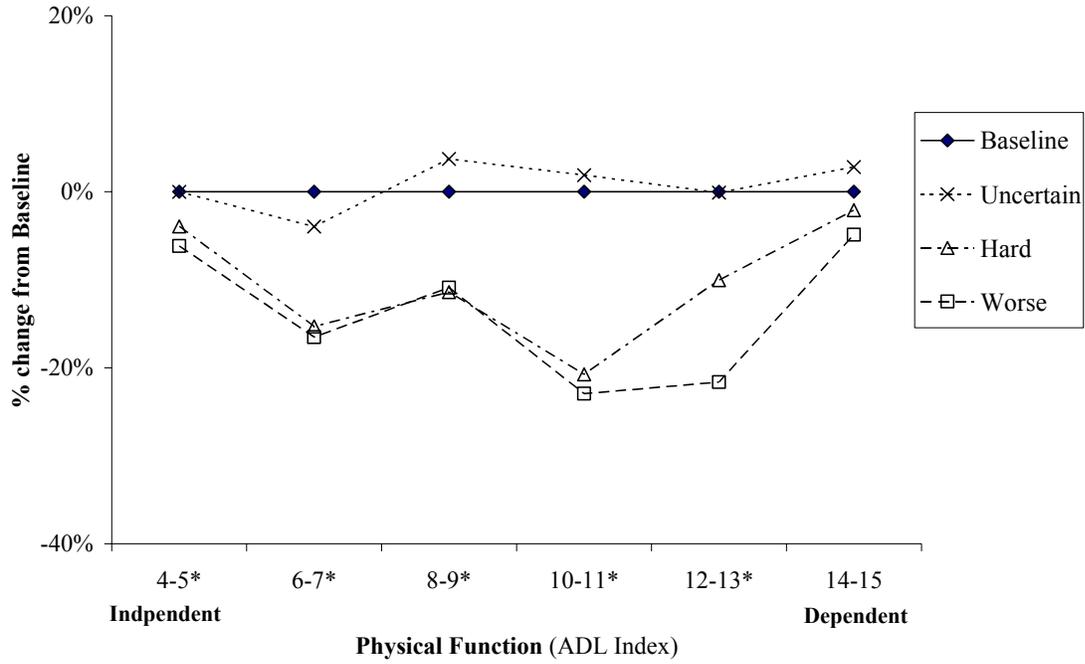
^{*} Significant (p<0.05) association with time period; ^a Significant linear trend; ^b Without initial assessments, Number of assessments = 108,914

Table 2. Types of formal care services used by time period

	Baseline	Uncertain	Hard	Worse
Personal Care*	48.2%	47.1%	46.3%	45.5%
Homemaker*	23.1%	24.8%	25.1%	25.3%
Meals*	16.4%	16.2%	16.5%	17.2%
Adult Day Care	4.9%	4.7%	4.7%	4.8%
Private Duty Nursing*	4.5%	4.5%	4.7%	4.6%
Skilled Therapies (Occupational/ Speech/ Physical/ Social Work)*	2.5%	2.2%	2.3%	2.4%
Volunteer*	1.7%	1.5%	1.3%	1.2%
Total	100.0%	100.0%	100.0%	100.0%

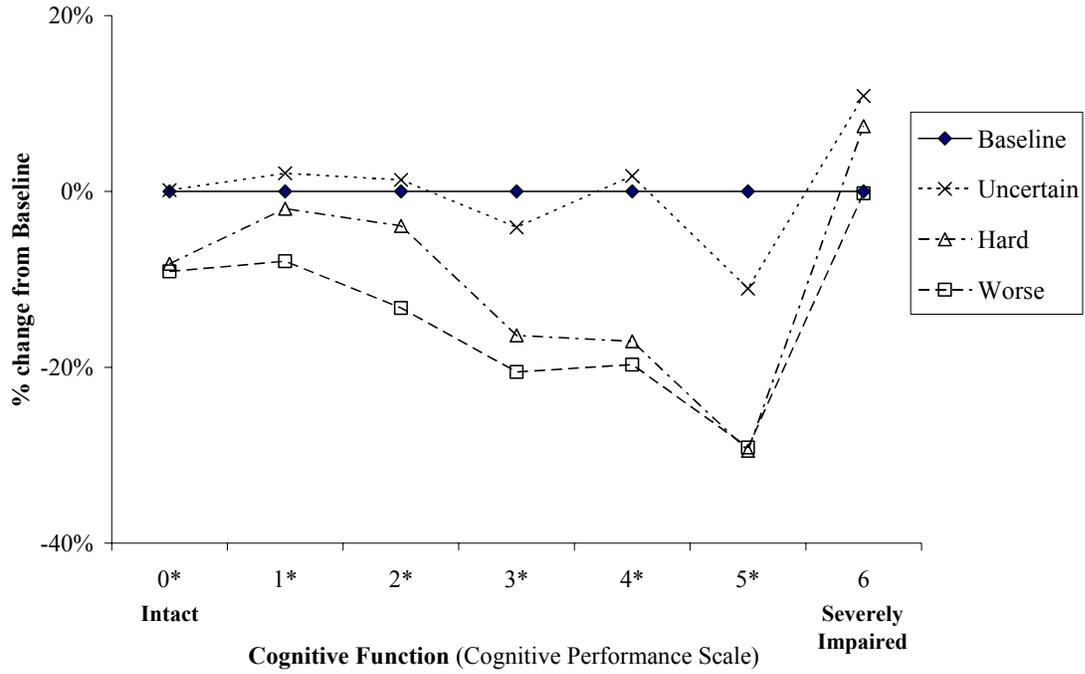
*significant association with time periods

Figure 4. Percent change in total formal services, by physical function



* indicates significant difference in between Baseline and Worse Times.

Figure 5. Percent change in total formal services, by cognitive status



* indicates significant difference in between Baseline and Worse Times.

Table 3. Odds Ratios and 95% CI

Parameter	Hospitalization		Emergency Room Use		Caregiver Burden		Death		Nursing Facility Placement	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Time period (reference = Baseline Period)										
Uncertain	0.96	0.91, 1.03	0.99	0.91, 1.07	0.91	0.88, 0.95	0.92	0.83, 1.03	0.89	0.75, 1.07
Hard Times	1.02	0.96, 1.09	1.04	0.95, 1.13	0.95	0.90, 1.00	0.97	0.87, 1.08	1.14	0.96, 1.35
Worse Times	1.10	1.03, 1.18	1.13	1.03, 1.24	0.95	0.89, 1.01	0.93	0.83, 1.04	1.20	1.00, 1.42
Test for linear trend (p value)	<.001		.003		.462		.504		<.001	
ADL Index (reference = 4-5, Not impaired)										
6-7	1.13	1.04, 1.22	1.01	0.92, 1.11	1.12	1.04, 1.20	1.37	1.22, 1.53	1.19	1.02, 1.39
8-9	1.12	1.03, 1.23	1.02	0.91, 1.14	1.20	1.11, 1.31	1.64	1.45, 1.86	1.32	1.11, 1.57
10-11	1.24	1.12, 1.37	0.98	0.86, 1.11	1.33	1.21, 1.46	2.28	2.03, 2.57	1.35	1.12, 1.64
12-13	1.20	1.07, 1.33	1.00	0.87, 1.15	1.43	1.28, 1.61	2.64	2.35, 2.97	1.52	1.25, 1.84
14-15	1.06	0.93, 1.21	0.79	0.68, 0.93	1.39	1.21, 1.60	3.27	2.88, 3.70	1.21	0.95, 1.53
Cognitive Performance Scale (reference = 0, Intact)										
Borderline Intact (1)	1.07	1.00, 1.14	1.04	0.96, 1.13	1.22	1.14, 1.31	1.14	1.03, 1.25	1.38	1.17, 1.62
Mild Impairment (2)	0.98	0.91, 1.06	1.08	0.98, 1.18	1.31	1.20, 1.43	1.02	0.92, 1.12	1.82	1.56, 2.12
Moderate Impairment (3)	0.82	0.75, 0.90	0.99	0.88, 1.11	1.83	1.64, 2.04	1.12	1.00, 1.26	2.74	2.33, 3.21
Moderately Severe Impairment (4)	0.87	0.71, 1.07	0.81	0.62, 1.04	1.75	1.44, 2.14	1.20	0.97, 1.49	2.42	1.74, 3.36
Severe Impairment (5)	0.73	0.62, 0.87	0.94	0.77, 1.15	2.20	1.89, 2.56	1.22	1.04, 1.42	2.73	2.18, 3.41
Very Severe Impairment (6)	0.86	0.68, 1.10	1.14	0.84, 1.56	1.82	1.45, 2.28	1.69	1.41, 2.03	0.91	0.55, 1.49
Race/Ethnicity (reference = White)										
Black	1.16	1.08, 1.25	0.93	0.85, 1.02	0.80	0.73, 0.88	0.93	0.86, 1.01	0.75	0.66, 0.85
Asian/Pacific Islander	0.47	0.21, 1.08	0.28	0.13, 0.58	1.25	0.65, 2.44	0.34	0.13, 0.92	0.70	0.22, 2.19
American Indian	1.21	0.79, 1.85	1.02	0.67, 1.55	1.32	0.89, 1.97	1.01	0.65, 1.56	0.62	0.27, 1.38
Gender (reference = Male)										
Female	0.94	0.87, 1.01	1.05	0.96, 1.15	0.86	0.79, 0.94	0.66	0.61, 0.72	0.94	0.82, 1.06
Marital Status (reference = Never married)										
Married	1.43	1.25, 1.63	1.28	1.10, 1.48	2.12	1.79, 2.53	1.40	1.19, 1.65	0.94	0.72, 1.23
Widowed	1.48	1.28, 1.71	1.35	1.15, 1.59	0.97	0.80, 1.16	1.48	1.25, 1.76	1.08	0.83, 1.41
Separated	1.34	1.06, 1.71	1.20	0.93, 1.56	0.88	0.63, 1.23	1.41	1.02, 1.95	0.98	0.56, 1.72
Divorced	1.48	1.29, 1.70	1.35	1.16, 1.58	0.90	0.74, 1.09	1.43	1.20, 1.70	1.32	1.00, 1.73
Other	2.15	0.93, 4.98	1.32	0.57, 3.05	1.68	0.79, 3.56	2.60	1.34, 5.04	1.53	0.47, 4.95
Age (in years)										
Age at Baseline	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00

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