

Trends in Prescription Drug Use by the Disabled Elderly

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Abstract

We examine trends in pharmaceutical information utilization by analyzing the Medicare Current Beneficiary Survey. Our most important findings are:

- For disabled and non-disabled, elderly and non-elderly, expenditures on prescription drugs as a fraction of total medical expenditures grew sharply between 1992 and 2001. Much of the growth took place between 1996 and 2001.
- The growth in pharmaceutical expenditures was especially great for DI Medicare recipients, who were the fastest growing segment of the Medicare population in the 1990s.
- The DI Medicare population had large increases in expenditures on all drug categories we examined (psychotherapeutic, analgesic, antiarthritic, cardiovascular and all other drugs), with especially large increases for psychotherapeutic drugs. The top 10% of people in this group in terms of pharmaceutical expenditures had an astoundingly large increase in the prevalence of mental illness, with smaller increases in other chronic diseases.
- The elderly Medicare population had increases between 1992 and 2001 in expenditures for cardiovascular, antiarthritic, and all other drugs. Among the top 10% of elderly drug spenders, with and without functional limitations, there were moderate increases in the prevalence of several chronic diseases, including hypertension, arthritis, diabetes, and osteoporosis. Among the top 10% of elderly drug spenders with functional limitations, the prevalence of mental illness also increased sharply.

If the trends indicated by these results continue, then Medicare's financial risk represented by the introduction of the new Part D drug benefit will be substantial, especially if the reduction in cost sharing for prescription drugs induces moral hazard.

These findings also enhance the importance of disability forecasts in predicting future Medicare forecasts. If declines in the elderly population continue to accelerate and the growth in the Medicare DI population stops, the financial risk from the new Medicare drug benefit might be more manageable. If, on the other hand, increases in disability among younger populations reverse the declines in elderly disability in future years, and the Medicare DI population continues to grow, then Medicare faces severe financial risk from the new benefit.

1.0 Introduction

With the implementation of the Medicare Modernization Act in 2006, the Federal government will become responsible for the financing of prescription drugs for all Medicare recipients. Though there have been several attempts to forecast how much financial risk will be borne by the government in future years as a consequence of the introduction of Medicare Part D, no forecast has separately analyzed the effect of disability on Part D spending. This is unfortunate because the disabled elderly are among the groups that might be most affected by pharmaceutical innovations and changes in the way prescription drugs are financed. They use health services heavily, visit physicians more frequently, enter the hospital more often, and use long-term care more heavily than the non-disabled. It is likely that the same is true of their consumption of prescription drugs, although usage of medications has not been studied nearly as extensively as the use of products and services that Medicare traditionally covered. Similarly, there has been little work examining the patterns of pharmaceutical use by individuals under 65 who qualify for Medicare through the Disability Insurance.

In this paper, we use the Medicare Current Beneficiary Survey (MCBS) to analyze trends in the utilization of pharmaceuticals by disabled and non-disabled beneficiaries in the community (non-institutionalized) between 1992 and 2001. We examine both the over-65 population and the population under-65 that qualifies for Medicare by virtue of their disability. We compare the rates of growth of prescription drug use in these two groups, along with changes in the share of medical expenditures attributable to prescription drugs. We examine both overall prescription drug uses and use by class. We then discuss the implications of changing disability rates for drug benefits and for overall health care expenditures.

2.0 Background

Providing medical care for the disabled is expensive, and pharmaceutical products account for a nontrivial fraction of that expense. In recent years, disability prevalence among elderly and near-elderly populations has been changing dramatically, but in opposite directions. In this section, we review these changes, and argue that the implementation of the Medicare drug benefit greatly increases the importance of this debate.

There is broad literature documenting trends in disability in the elderly population. In the past two decades, much support can be found for the hypothesis that active-life span is increasing faster than total life span—see Fries (1980). Contributors to this literature have relied upon different surveys and different definitions of disability, but have consistently found declines, sometimes sharp and accelerating declines in disability among the elderly. Recent work, however, suggests that such declines may not continue into the future. Lakdawalla, Bhattacharya, and Goldman (2004) find evidence of increasing functional limitation rates in the 1990s in younger populations. Why these trends are happening, and whether these trends will continue into the future has important implications for the financing of Medicare, and for

Manton, Corder, and Stallard (1997) use the 1982, '84, '89, and '94 National Long Term Care Surveys (NLTCS) to investigate trends in the prevalence of disability in the elderly population. They find that the age-adjusted prevalence of disability in 1994 decreased by 3.6% from 1982 (from 24.9% to 21.3%). Manton and Gu (2001) update the results of Manton, Corder, and Stallard (1997) using the latest wave of the NLTCS and confirm a continuing decline in disability among the elderly, especially among the oldest age groups. Other authors find similar declines in disability in the 1980s and 1990s using different data sets—Freedman and Martin (1998) find declines between 1984 and 1993 in the Surveys of Income and Program Participation (SIPP); Crimmins, Saito, and Reynolds (1997) find declines in the 1984 to 1990 Longitudinal Study of Aging (LSOA) and the 1982-1993 National Health Interview Survey (NHIS). Crimmins, Saito, and Ingegneri (1989) confirm that disability-free life expectancy increased in the 1980s.

Pardes, Manton, et al. (1999) and Manton (2003) attribute these improvements in elderly disability prevalence to developments in medical technology that enable seniors to delay both disability and death. Manton (2004) suggests that because the future of medical technology is bright, further improvements can be expected, and these improvements will decrease the demand for costly care, such as nursing homes, by future elderly cohorts. Manton and Gu (2001) project that if declines elderly disability continue at current rates, Medicare financial insolvency will be delayed significantly, perhaps indefinitely.

Lakdawalla, Bhattacharya, and Goldman (2004) argue that these conclusions ignore an important fact. Because disability is typically a long lasting health state, an individual who is disabled when near-elderly is likely to be disabled when elderly. Thus, studying disability trends in younger populations is important for forecasting future trends in disability, which none of the above studies do. Lakdawalla, Bhattacharya, and Goldman (2004), using data from the 1984-2000 U.S. National Health Interview Surveys (NHIS) to track changes in disability for this population, find that, while disability rates fell slightly for the near elderly population between 1984 and 1990, they rose dramatically for those under 55 years old between 1990 and 2000. They attribute a substantial portion of these trends to rising obesity rates. Further decline in the prevalence of disability among incoming Medicare cohorts, they argue, is by no means a certain prospect.

Bhattacharya et al. (2003) and Lakdawalla et al. (2003) forecast the implications of cohort-specific disability trends for future Medicare and nursing home expenditures respectively. They find that for the next decade, the documented declines in elderly disability should lead to declines in real per-capita Medicare expenditures, holding all else equal. However, as the younger, more disabled, cohorts age into Medicare, these trends will reverse themselves. This will lead to increasing per-capita Medicare expenditures in the decades that follow.

This debate about future disability trends and their implications for Medicare took place before the passage of Medicare Modernization Act. None of the forecasts account for the effects of the new drug benefit. In addition, with the exception of Moxey et al. (2003), very little work has been done examining how spending by disabled individuals on prescription drugs differs from spending by non-disabled individuals. Moxey et al. (2003), using 1996

data from the Medicare Current Beneficiary Survey, finds that Medicare beneficiaries with “three or more comorbidities and/or difficulty with any [activity of daily living limitations]” spend between \$2,000 and \$3,000 per year on prescription drugs. Beneficiaries with “zero comorbidities, no difficulty with [activity of daily living limitations],” by contrast, spend less than \$700 per year on prescription drugs.¹ These numbers suggest that the passage of the Medicare drug benefit will magnify the effect of changing disability trends on future Medicare financing.

3.0 MCBS Pharmaceutical Data

The MCBS is a longitudinal survey covering a nationally representative sample of around 12,500 Medicare beneficiaries per year. Those under 65 who qualify for Medicare by virtue of their disability are oversampled to permit separate analyses of this population, with a sample size of about 2,000 per year. (Hereafter, we refer to this population as the Disability Insurance, or DI disabled, since such Medicare recipients must first qualify for Social Security’s DI program). While the MCBS samples Medicare beneficiaries in nursing homes, we focus in this paper on the non-institutionalized population because the pharmaceutical data for the two populations are not directly comparable.²

The MCBS has been conducted annually since 1992, and we use the 1992-2001 data here. The MCBS uses a rolling panel design, with individual respondents being followed for four years and then replaced. All of our analyses are weighted to be representative of the underlying population of Medicare beneficiaries in each year.

The MCBS collects detail on health status and health care use and costs. Information on drug usage and expenditures in MCBS resides in two files, one for beneficiaries living in the community, and a second for beneficiaries living in institutions, which we do not use in this

¹ There are some important limitations to the work by Moxey et al. (2003). In particular, they do not separately examine younger disabled individuals who qualify for Medicare through the Social Security Disability Insurance program. Furthermore, they do not look how the prescription drug expenditures have changed over time.

² We also exclude end-stage renal disease Medicare patients from our analysis as well for similar reasons.

paper. The first of these files, the community file (RIC_PME) is a prescription level file. It includes records for all prescriptions consumed by each beneficiary in 2001 while living in the community, based upon self-reports. In preparation for the interview, respondents are asked to keep a detailed log of their prescriptions, including refills. Over-the-counter medications are excluded.

This file also contains transaction price information for those prescriptions. Transaction prices are sometimes taken as the price reported (30% of the records in 2001) to have been paid by a sample respondent. In the remaining cases, transaction prices are computed by starting with the Average Wholesale Prices (AWP) for the pharmaceutical product, and discounting this amount based upon the source paying for the prescription (for example, Medicaid, HMO, VA, Retail, and so on).

AWPs in the RIC_PME (hereafter PME) file are imputed from to the Medicaid Information System (MIS) using information on drug name, form, strength and amount, after these fields are verified and modified to be consistent with drugs descriptions in the First Databank, which is a comprehensive categorization of pharmaceutical products on the market. MCBS matches each prescription record to its corresponding AWP from the PME file by as many of the four fields -- drug name, form, strength, and unit -- as possible. When a PME record does not match all four fields with drug available in MIS, an AWP is simulated from the distribution of scripts in the MIS with as many fields as matched.

4.0 Methods

Our main aim in this paper is to characterize trends in pharmaceutical consumption for disabled and non-disabled Medicare populations for the years $t = 1992 \dots 2001$. The primary outcome variable that we are concerned with is pharmaceutical expenditures for different subpopulations of the Medicare population based upon disability status (say, j), $P(t | j)$, as a fraction of total non-pharmaceutical expenditures, $M(t | j)$, plus pharmaceutical expenditures:

$$(1) \quad f(t|j) = \frac{P(t|j)}{P(t|j) + M(t|j)}$$

As a measure of trends, $f(t|j)$, has the advantage of being invariant to inflation. Hence, we need not make difficult decisions about which deflator—the Consumer Price Index, the Medical Care Price Index, or some other index—to use in comparing expenditures in different years.

In the remainder of the section, we describe our approach to various methodological necessities, including defining disability, classifying pharmaceutical products into therapeutic classes, and the underreporting of prescription drug use by MCBS respondents.

4.1 Defining Disability

Since disability is a primary predictor of Medicare expenditures, we examine trends for people with and without disabilities. Precision in the definition of disability is crucial, and it is particularly important to use a definition that is objective – not subject to manipulation – in order to avoid moral hazard. In this section, we describe our approach to identifying disabled populations in the MCBS.

For the Medicare population, there are (at least) two conceptually distinct definitions of disability, one that applies to the under-65 population, another to the over-65 population. The first definition is an administrative definition. In order for someone under 65 to qualify for Medicare, that individual must first receive Social Security Disability Insurance (SSDI) payments, and then meet the 24 month qualifying period, during which the individual does not work due to the disabling condition. This definition implies that there may be people who are younger than age 65 and disabled, in the common use of the term, yet do not meet the administrative requirements to qualify for Medicare. However, since we are primarily interested here in Medicare expenditures, we do not attempt to examine such people.

The second definition focuses instead on the inability to perform a set of standardized activities (functional limitations), and is assessed in a survey setting like the MCBS by respondent self-reports. Respondents are asked a series of questions regarding their difficulties in doing six different concrete activities of daily living (ADL): bathing or showering, dressing, eating, getting in and out of beds and chairs, walking, and using the toilet. We divide MCBS respondents over 65 into three groups based upon the number of these ADLs respondents have difficulty performing. The first non-disabled group reports no difficulties; the second has problems in either one or two of these tasks exactly; the third has difficulties with three or more tasks. This is a perfectly standard partitioning of the elderly by extent of functional limitation—see Manton and Gu (200x). Many studies have shown that expected health care expenditures (not including pharmaceutical expenditures) in the elderly population are least for the non-disabled, intermediate for those with 1-2 ADL limitations, and highest for those with 3-4 limitations.³ An individual who qualifies initially for Medicare through the SSDI program, and then turns 65, is considered disabled for our purposes only if that individual exhibits functional limitations.

4.2 *Tracking Changes in Health and in the Types of Drugs Used by Medicare Recipients*

Pharmaceutical expenditures for a group of people, such as the disabled, can change for many reasons. Two primary reasons are changes in the set of available prescription medications, and changes in the composition or health of the group. To examine these explanations more closely, we examine what sorts of drugs entail the greatest expenditures for each group.

In the Appendix Table, we reproduce a mutually exclusive and exhaustive list of therapeutic classes to which each drug in the MCBS PME file is assigned. This therapeutic classification system contains 35 separate classes. The large number of categories makes it impractical to present trends in pharmaceutical expenditure for each category. Consequently, we collapse this classification system into a simpler system, still mutually exclusive and exhaustive, but consisting of only five classes: psychotherapeutic agents, analgesic agents, cardiovascular agents, antiarthritic agents, and all other drugs. The first four classes include several of the most commonly prescribed medications for Medicare patients—see Waldron and Poisal

³ See, for example, Bhattacharya et al. (2003).

(1999). The fifth, catch-all category, includes drugs that are unclassified in the broader MCBS 35 class system. These unclassified drugs make up a declining proportion of the “all other drugs” category over time—unclassified drug products made up over 15% of drug spending in 1996 and 1997, before falling off to around 8% in 2000.⁴

Let $P_1(t|j) \dots P_5(t|j)$ represent pharmaceutical expenditures by group j on drugs in the five classes we examine, where $P(t|j) = \sum_{k=1}^5 P_k(t|j)$. In our results, we report trends in $f_1(t|j) \dots f_5(t|j)$, which are defined analogously to (1):

$$(2) \quad f_k(t|j) = \frac{P_k(t|j)}{P(t|j) + M(t|j)} \quad \text{for } k = 1 \dots 5$$

Chronic disease is certainly an important reason for high expenditures on prescription drugs. There is no reason to suppose that the health of disabled and non-disabled populations in Medicare has remained static over the past decade. The MCBS asks respondents a series of detailed questions (“Has your doctor ever told you that you have...?”) about their health status. To track how changes in the Medicare population have induced changes in use of drugs, for each group j , we identify the individuals in the top 10% of the $P(t|j)$ distribution. For these top drug spenders, we plot trends in the prevalence of several of the most common chronic diseases, including hypertension, arthritis, mental illness, diabetes, osteoporosis, and Alzheimer’s Disease.

4.3 MCBS Underreporting of Pharmaceutical Use

To prepare the RIC_PME file, which contains information on prescription drugs for the MCBS, the Center for Medicare and Medicaid Services (CMS) relies mainly on self-reports by survey respondents. Although respondents are asked in advance to keep track of their use of prescribed medications, respondents can forget to report some of the medications

⁴ Among the unclassified drugs include various emollients and creams that are popular among people who use Medicare home health services. The decline in this category presumably reflects the declining use of home health services after the 1997 Balanced Budget Act, which cut Medicare payments for such services.

that they take. To prevent this problem, respondents are asked to collect all prescription drug containers and insurance receipts during the year before the interview, and to present these materials to the interviewer. The self-reports are then confirmed against this objective evidence of pharmaceutical product use. Though there is still a potential for underreporting—for example, respondents may have failed to save containers or receipts—establishing a corroboration between the self-reports and the objective evidence lends credence to the MCBS estimates.

To address these sorts of problems, the CMS Information and Methods Group suggests adjusting MCBS pharmaceutical expenditure data upward by 17%—Poisal (2003). Poisal arrives at this figure by conducting a pharmacy follow-back audit for a subset of the 1999 MCBS respondents. We apply this correction factor for underreporting to our estimates.

There is an additional source of underreporting error in the MCBS pharmaceutical data. In addition to the RIC_PME file, which contains detailed the information described above on each prescription, the MCBS reports total expenditures on prescription drugs, as well as other medical care expenditures, in a person-level summary file. We use the RIC_PME file to construct our estimates of the numerator in our $f(t|j)$ measures— $P(t|j)$ —while, we use the person-level summary file to construct our estimates of the denominators— $M(t|j) + P(t|j)$.

While the MCBS documentation suggests that the total pharmaceutical expenditure numbers from these two files should match, we find in practice that this is not always the case. In nearly every year, between 5-6% of the people in the person-level summary file who have positive drug expenditures do not appear in the PME file, though they should. This will tend to understate the numerator in our $f(t|j)$ measures.⁵ Conversely, between 1-2% of the people in the PME file who have prescription expenditures in a given year do not appear to have any in the in the summary file, though they should. This will tend to understate the

⁵ In 1996, this figure is anomalously high—36% of the people in the person-level summary file who have positive drug expenditures do not appear in the PME file. We were unable to determine why this is the case. The pharmaceutical expenditure numbers developed using the 1996 MCBS should thus be seen as severe underestimates.

denominators in our $f(t|j)$ measures. While these two effects tend to offset each other, our calculations suggest that the net effect is an underestimate of the true value of $f(t|j)$, assuming that anyone reporting pharmaceutical expenditures in the RIC_PME file should be reporting them in the person-level summary file, and vice-versa. Our estimates of pharmaceutical expenditure trends should thus be seen as underestimates.

5.0 Results

In this section, our goal is to characterize how role that the different types and extent of disability play in determining expenditures on prescription drugs in the Medicare population.

5.1 *Changes in the Size and Composition of the Medicare Population*

We start by examining growth in the population of disabled and non-disabled Medicare recipients— $Population(t|j)$. Table 1 shows these numbers for 1992-2000, based upon the MCBS population sample weights. The two biggest net sources of growth in the Medicare population over the decade were the Medicare DI population, which added over 1.7 million people, and the non-disabled elderly population, which added over 2.4 million people. By contrast, the number of elderly disabled fell slightly over the period. There were nearly 600,000 fewer elderly with 1-2 ADL limitations in 2000 than there were in 1992, and about 130,000 fewer with 3 or more ADL limitations. These numbers confirm trends reported elsewhere in the literature of burgeoning younger disabled populations— Autor and Duggan (2001) and Lakdawalla, Bhattacharya, and Goldman (2004)—and declining disability among elderly populations—Manton and Gu (2001).

Table 2 explores the Medicare DI population in more detail. It shows the DI population by primary cause of DI eligibility, as reported in the MCBS. Mental illness is the modal identified cause of DI reciprocity (15% of all DI recipients). With an average age of 44, these patients are also among the youngest recipients. Patients with mental retardation (7.6% of DI recipients) are even younger (40.8 years old). Disability resulting from chronic diseases and severe acute events such as strokes (5.3% of DI recipients) and cardiovascular disease (10.3% of DI recipients) are nearly as common as mental illness and retardation as causes of

DI reciprocity. However, these patients tend to be older (55 years old in the case of cardiovascular conditions and 50 years in the case of stroke). Similarly, patients with arthritis (7.1% of DI recipients) and with back, spine, or disc injuries (11.3% of DI recipients) are on average older than 50 years. Given these patterns in the Medicare DI population, we should expect that use of psychiatric, pain, and anti-arthritic medications are the among the most popular drugs used by this group.

5.2 Trends in Pharmaceutical Expenditures

Figure 1 shows trends in per-capita nominal pharmaceutical expenditures for disabled and non-disabled Medicare populations. That is, it shows trends in $\pi(t|j) = \frac{P(t|j)}{\text{Population}(t|j)}$

for $j =$ DI disabled, elderly with 0 ADL limitations, elderly with 1-2 ADL limitations, and elderly with 3 or more ADL limitations. There is a striking growth in per-capita pharmaceutical expenditures for all of these groups between 1992 and 2001. For example, elderly non-disabled populations spent about \$400 per-capita in 1992, and more than \$1,100 per-capita in 2001. This group consists of some of the least intensive spenders of prescription drugs. For the elderly with 1-2 ADL limitations, pharmaceutical expenditures per-capita grew from about \$600 in 1992 to almost \$1,700 in 2001. In 1992, the elderly with 3 or more ADL limitations spent the most on pharmaceutical products—nearly \$750 per person. As was the case for the other groups, this figure grew substantially to about \$1,950 in 2001. The DI disabled per-capita pharmaceutical expenditures grew similarly, but more. In 1992, per-capita expenditures were under \$700, and rose to over \$2,000 in 2001. The DI disabled now spends the most of all these groups on prescription drugs.

Figure 2 shows total nominal expenditures on prescription drugs for the groups. As a group, elderly non-disabled spend the most in total on prescription drugs. This is not surprising since this is the largest group of Medicare beneficiaries (see Table 1). Define

$$\Delta P_j \equiv P(2001|j) - P(1992|j), \quad \Delta \text{Pop}_j \equiv \text{Population}(2001|j) - \text{Population}(1992|j),$$

and $\Delta \pi_j \equiv \pi(2001|j) - \pi(1992|j)$. Then:

$$(3) \quad \Delta P_j = \pi(1992 | j) \Delta Pop_j + Population(1992 | j) \Delta \pi_j.$$

Since $Population(1992 | \text{non-disabled})$ is the largest among the groups, and $\Delta Pop_{\text{non-disabled}}$ is also largest, a \$1 growth in per-capita expenditures for the non-disabled translates to the largest growth in total expenditures. Although the elderly with 3 or more ADL limitations spend more per capita than the elderly with 1-2 ADL limitations, the greater size of the latter group means it spends more in total. For both groups, even though population size declined between 1992 and 2001, total expenditures on prescription drugs as a group rose. Total pharmaceutical expenditures by the DI disabled grew sharply, since that group saw both a large increase in population and per-capita expenditure.

Since Figures 1 and 2 present pharmaceutical expenditures in nominal dollars, some of the growth in expenditures shown there is due to inflation. Figure 3, which presents trends in $f(t | j)$ does not have this problem, since both numerator and denominator are measured in nominal dollars. The results from Figure 3 are striking. For all four groups, pharmaceutical expenditures as a percent of total medical expenditures were largely flat until 1997, after which, $f(t | j)$ increased sharply.⁶ The largest increases in pharmaceutical expenditures were for the DI Medicare population. For this group, prescription drugs rose between 1992 and 2001 from about 12.5% of total medical expenditures to just under 25%. The elderly also saw a steep growth in these numbers over this period, though not quite as steep. The non-disabled elderly went from 11% to about 19%; the elderly with 1-2 ADL limitations went from about 9.5% to 15%; and the elderly with 3 or more ADL limitations went from under 7% to 11%. These last two elderly groups depend more heavily upon inpatient and outpatient medical care than do the non-disabled elderly and the DI Medicare populations, and this is reflected in their lower positions on the graph. The main point, though, is that all groups are relying much more heavily on prescription drugs for their care than they were just a few years ago.

⁶ The biggest changes to Medicare in 1997 came with the passage of the 1997 Balanced Budget Amendment (BBA). Analyzing the effects of the BBA on pharmaceutical expenditures by the Medicare population is beyond the scope of this paper, but is a topic worthy of study.

5.3 *Trends in the Composition of Prescribed Drugs*

Figure 4 shows the growth in expenditures on prescription drugs in different therapeutic classes. There are five panels, corresponding to each class in our simplified therapeutic class scheme.

Panel 4a shows trends in expenditures on psychotherapeutic agents as a fraction of total medical care expenditures. The DI population is the big story in this panel—its expenditures on these drugs expanded from 2% of total expenditures to 4%. Given the prominence of mental illness as a primary cause of DI eligibility, the high level of expenditures on psychotherapeutic drugs by this group should not come as a surprise, though the increase over the decade is still striking. Meanwhile, elderly expenditures on these drugs, regardless of the number of ADL limitations, stayed low (about 0.5% of total expenditures) and flat over the period.

Panel 4b tells a similar story for analgesic agents. These rose from about 0.5% of total expenditures to over 1.5% between 1992 and 2001 for the DI population, but stayed flat for the elderly population at roughly 0.1%-0.4% of total expenditures.

Panel 4c shows that expenditures on cardiovascular drugs have risen for all groups, DI disabled and elderly alike, unlike analgesics and psychotherapeutic drugs. The sharpest growth has been among non-disabled elderly, where expenditures on these drugs grew from 1.9% of total expenditures to 5.4% between 1992 and 2001. This proportion grew for other groups as well, but not quite as sharply.

Similarly, panel 4d shows expenditure growth between 1992 and 2001 for antiarthritic drugs. This time, the change in use of these drugs seems similar for the four groups. For both cardiovascular and antiarthritic drugs, much of the increase in $f(t|j)$ took place after 1996—before then, expenditures on cardiovascular and antiarthritic drugs were flat or declining. One hypothesis is that the rise in expenditures after 1996 reflects the release into the market of some new and expensive cardiovascular and antiarthritic drugs, including (the now

infamous) COX-2 inhibitors, angiotensin receptor blockers, and disease modifying antirheumatic drugs, though exploring this hypothesis further is beyond our scope.⁷

Finally, panel 4e shows changes in $f(t|j)$ for all other drugs between 1992 and 2001. These drugs make up roughly half of the pharmaceutical expenditures (that is psychotherapeutic, analgesic, cardiovascular, and antiarthritic drugs together make up about half of pharmaceutical expenditures), though this fraction varies from year to year and for the different groups. All of the groups show a similar pattern in their expenditures on this catch all category of drugs. After declines between 1992 and 1996, there are sharp increases in expenditures for all other drugs between 1997 and 2001, though the increases are sharpest for the DI disabled.

5.4 *Changes in the Disease Prevalence Among the Top 10% of Drug Spenders*

Figure 5 plots trends in the self-reported health status of the highest 10% of drug spenders in the four groups. Table 3 summarizes these graphs by reporting changes between 1992 and 2001 in the prevalence of these conditions among these high drug spenders. Panels 5a through 5g tracks changes in the prevalence of hypertension, arthritis, mental illness, diabetes, osteoporosis, and Alzheimer's Disease, respectively, for these high drug spending four groups. We select these conditions to examine either because they are costly to treat, or because there have been new pharmaceutical therapies developed to treat them in the 1990s. The panels are arranged in declining order of average disease prevalence in the population. Since we are examining only the non-institutionalized population, the prevalence of some of these diseases (especially Alzheimer's disease) appears low.

The most important finding of Figure 5 and Table 3 is that the most intensive users of prescription drugs in the non-institutionalized Medicare population have become significantly less healthy between 1992 and 2001. The prevalence of all of these conditions have risen, sometimes sharply, for the disabled and non-disabled alike. These prevalence increases were not evenly divided across groups, though.

⁷ In part, the anomalously low expenditures on pharmaceuticals in 1996 can be explained by mismeasurement, for reasons described in footnote 5 above.

Among the high spending DI population, there has been a remarkably large and steady increase in the prevalence of mental illness—an increase of 42 cases per 100 population in just 10 years time. This increase reflects both changes in the composition of the Medicare DI population over this time period, as well as the introduction and dissemination of effective medications to treat certain psychiatric conditions, like depression and bipolar disorder. The only other change of any size for this population is in the prevalence of osteoporosis, which rose by 7 cases per 100 people.

Among the high spending non-disabled elderly population, the prevalence of several diseases has substantially increased over this period. Osteoporosis prevalence grew by 18 cases per 100, arthritis prevalence grew by 14 cases per 100, diabetes prevalence grew by 13 cases per 100, and mental disorders grew by 12 cases per 100. These diseases suggest that prescription medications have become more important in the early (that is, before the development of any functional limitation) treatment of chronic diseases.

High spending elderly with ADL limitations have also had substantial increases in the prevalence of chronic conditions, including osteoporosis, arthritis, and hypertension. Unlike the non-disabled elderly, though these groups have not had a large increase in diabetes prevalence. While the non-disabled elderly had a large increase in the prevalence of mental disorders, the increase among these elderly disabled groups has been larger still—25 cases per 100 for those with 1-2 ADL, and 31 cases per 100 for those with 3+ ADLs. Again this increase reflects both real changes in the health of these groups, and the development of new medications. The increase in Alzheimer's disease prevalence among these groups has not been as large as the increases in some other conditions.⁸

⁸ One important determinant of the community prevalence of Alzheimer's disease is the probability of entering a nursing home conditional on having the disease. In recent years, this probability has been falling—see Lakdawalla et al (2003). The changes in Alzheimer's disease prevalence in the non-institutionalized population is thus an overestimate in the change in disease prevalence in the overall population.

6.0 Conclusions

Though there are many nuances in our results, our most important findings can be summarized simply:

- For disabled and non-disabled, elderly and non-elderly, expenditures on prescription drugs as a fraction of total medical expenditures grew sharply between 1992 and 2001. Much of the growth took place between 1996 and 2001.
- The growth in pharmaceutical expenditures was especially great for DI Medicare recipients, who were the fastest growing segment of the Medicare population in the 1990s.
- The DI Medicare population had large increases in expenditures on all drug categories we examined (psychotherapeutic, analgesic, antiarthritic, cardiovascular and all other drugs), with especially large increases for psychotherapeutic drugs. The top 10% of people in this group in terms of pharmaceutical expenditures had an astoundingly large increase in the prevalence of mental illness, with smaller increases in other chronic diseases.
- The elderly Medicare population had increases between 1992 and 2001 in expenditures for cardiovascular, antiarthritic, and all other drugs. Among the top 10% of elderly drug spenders, with and without functional limitations, there were moderate increases in the prevalence of several chronic diseases, including hypertension, arthritis, diabetes, and osteoporosis. Among the top 10% of elderly drug spenders with functional limitations, the prevalence of mental illness also increased sharply.

These findings have important implications for future Medicare financing and policy. We briefly explore two related implications here, though there are certainly others. The first implication relates to the costs of the new Medicare drug benefit. Our results come from the 1990s, long before the implementation of Medicare Part D. During that period, many Medicare recipients had little or no insurance coverage for their prescription drugs, and hence faced significant out-of-pocket payments for them. To the extent that the new drug

benefit reduces the out-of-pocket price paid by Medicare enrollees, it will further increase demand for prescription drugs. Hence, all else equal, the increasing trend in prescription drug expenditures we present here underestimate the financial exposure faced by Medicare under the prescription drug plan. Reductions in cost sharing for drugs should accelerate these trends by increasing moral hazard. Estimating carefully the effect of Part D cost sharing on the demand for pharmaceutical is thus a vital topic for further research.⁹

Finally, these findings reinforce the importance of forecasting disability rates accurately. If disability prevalence among the elderly continues to decline sharply, then the addition of Part D to Medicare might be financially manageable. If, on the other hand, the increasingly disabled near-elderly age into Medicare in a disabled state, and the set of DI Medicare enrollees continue to grow, Medicare faces a substantial additional financial risk from the introduction of Part D. Any attempt to forecast future pharmaceutical expenditure growth without including the disabled population will result in an underestimate of future growth of pharmaceutical expenditures.

⁹ A complete forecast would also incorporate the effect of increased use of pharmaceuticals on the demand for other types of medical care, as well as on mortality and morbidity rates.

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Table 1: Trends in Non-Institutionalized Medicare Population

Year	DI Disabled	Elderly, difficulty with 0 ADLs	Elderly, difficulty with 1-2 ADLs	Elderly, difficulty with 3 or more ADLs
1992	3,285,364	21,647,427	6,281,249	2,932,333
1993	3,536,864	22,479,300	5,914,561	2,848,153
1994	3,776,145	22,849,250	5,781,001	2,876,014
1995	4,002,487	23,269,384	5,612,604	2,844,031
1996	4,107,449	24,162,911	5,440,830	2,649,575
1997	4,386,421	24,069,791	5,583,173	2,652,202
1998	4,641,815	24,314,895	5,597,334	2,534,695
1999	4,827,507	23,851,277	5,976,560	2,755,146
2000	4,994,876	24,113,225	5,706,425	2,802,296
Change 1992-2000	1,709,512	2,465,798	-574,824	-130,037
% change 1992-2000	52%	11.3%	-9.2%	-4.4%

Source: 1992-2000 Medicare Current Beneficiary Survey

Table 2: Primary Cause for SSDI Eligibility

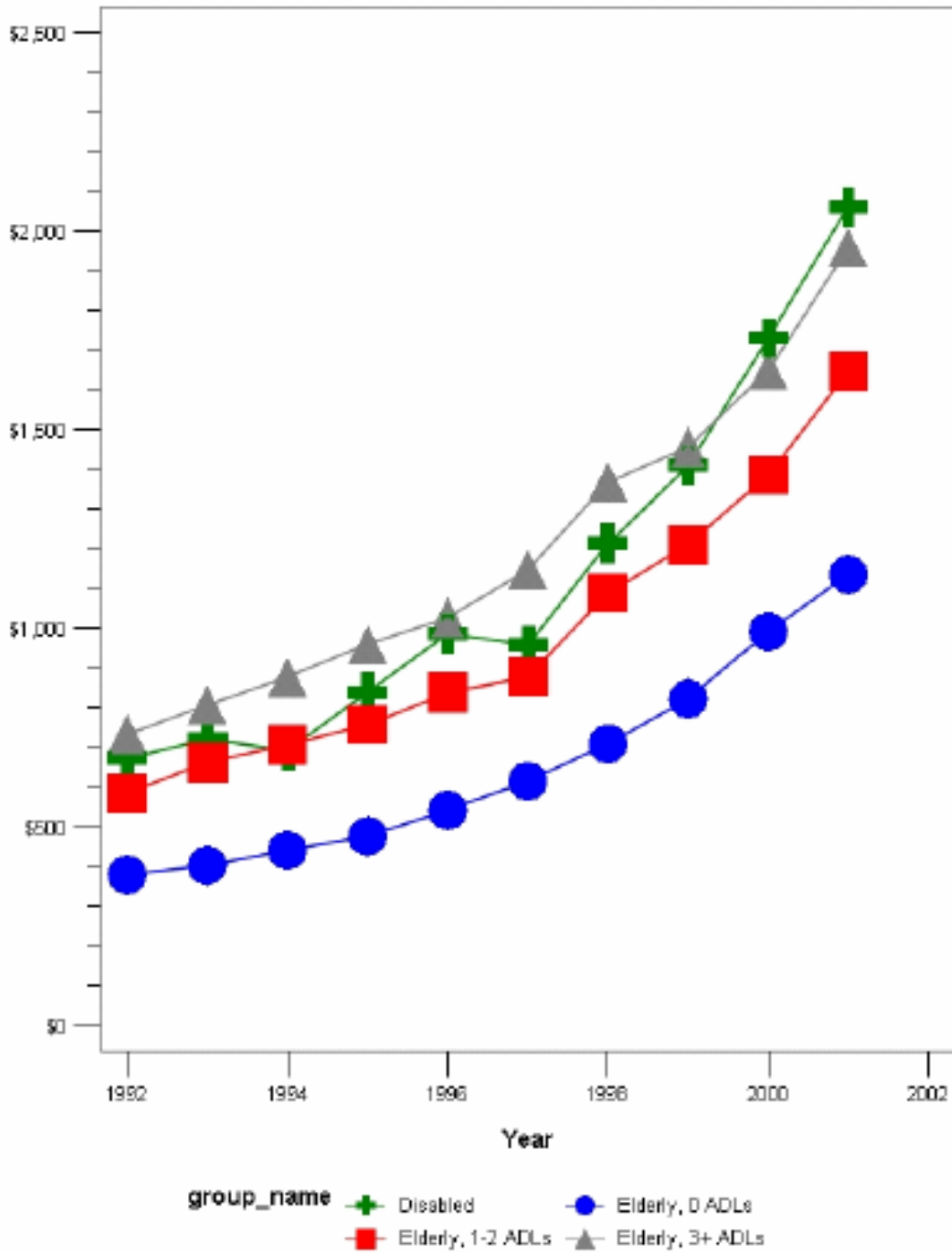
CAUSE	PERCENT	WITHIN CAUSE	
		Mean Age	Male
Back/spine/disc	11.3%	52.3	66.0%
Poor eyesight	3.9%	49.8	49.9%
Poor hearing	1.0%	45.2	53.4%
Kidney disease	0.6%	48.0	56.6%
Stroke/Seizure disorder	5.3%	50.0	61.3%
Car/bicycle/train accident	2.6%	48.3	68.8%
Multiple sclerosis	1.8%	49.4	29.4%
Muscular dystrophy	0.4%	47.8	54.7%
Cerebral palsy	0.6%	45.9	45.3%
Broken bones/hip	1.3%	53.5	77.9%
Cardiovascular conditions	10.3%	55.0	65.1%
Cancer	2.5%	51.7	49.7%
Diabetes	1.7%	55.2	63.0%
Arthritis	7.1%	53.3	51.9%
Mental retardation	7.6%	40.8	59.2%
Alzheimer's disease	0.1%	55.8	83.5%
Mental Illness	14.9%	44.1	59.3%
Osteoporosis	0.3%	52.9	32.6%
Parkinson's disease	0.1%	47.5	59.2%
Emphysema/asthma	1.9%	54.8	87.4%
Partial paralysis	3.0%	55.1	55.3%
Loss of limb	0.3%	47.6	75.4%
Other cause	20.5%	50.4	81.3%

Source: 1992-1998 MCBS

Table 3: 1992-2001 Change in Disease Prevalence Among Top 10% of Drug Spenders (Cases in group per 100 non-institutionalized population)

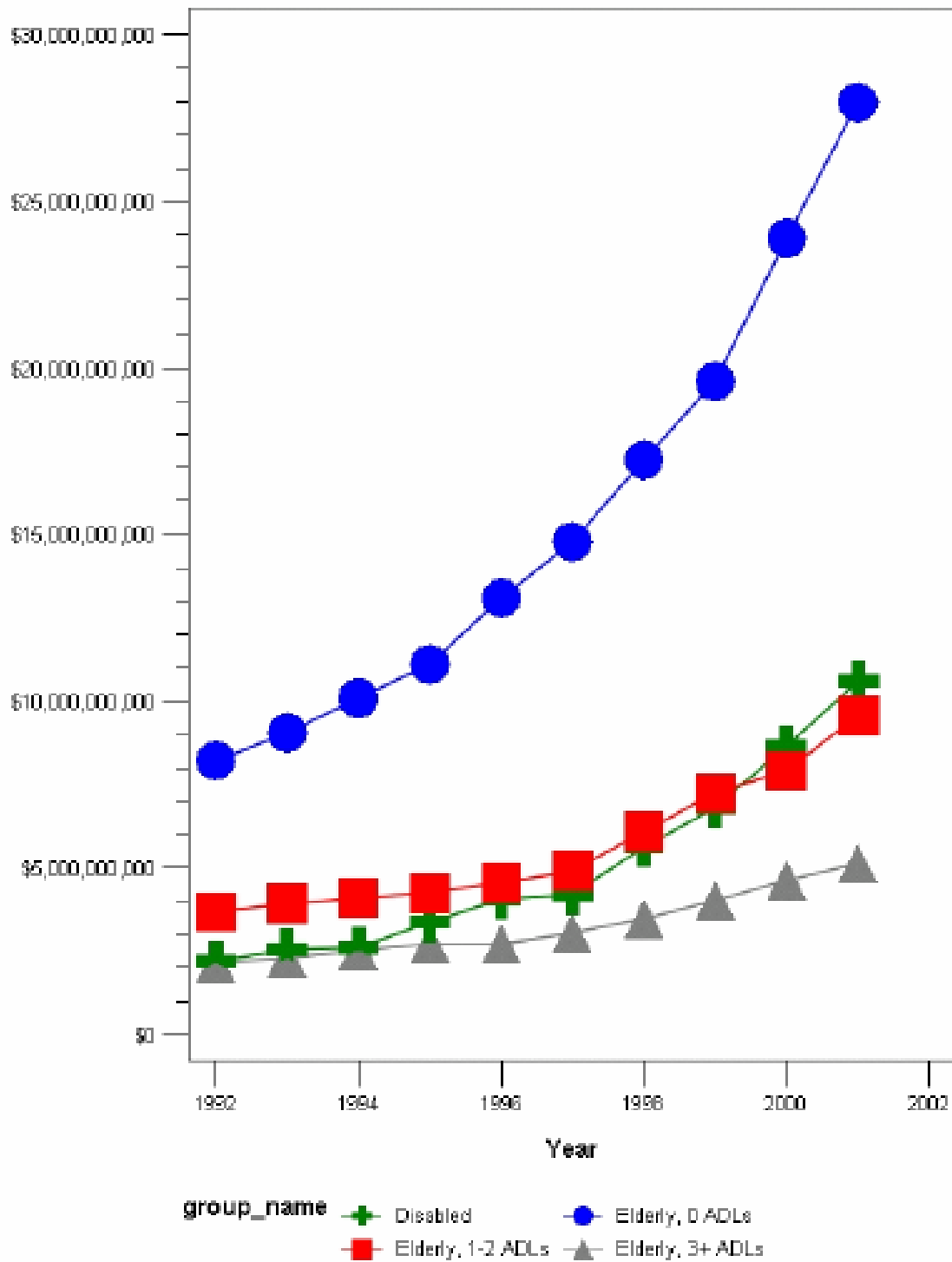
	DI Disabled	Elderly, 0 ADL	Elderly, 1-2 ADL	Elderly, 3+ ADL
Hypertension	+1	+6	+11	+6
Arthritis	+1	+14	+11	+6
Mental Disorders	+42	+12	+25	+31
Diabetes	+2	+13	+4	+2
Osteoporosis	+7	+18	+10	+6
Alzheimer's Disease	+1	+1	+4	+7

Figure 1: Per-Capita Pharmaceutical Expenditures by Disability Category



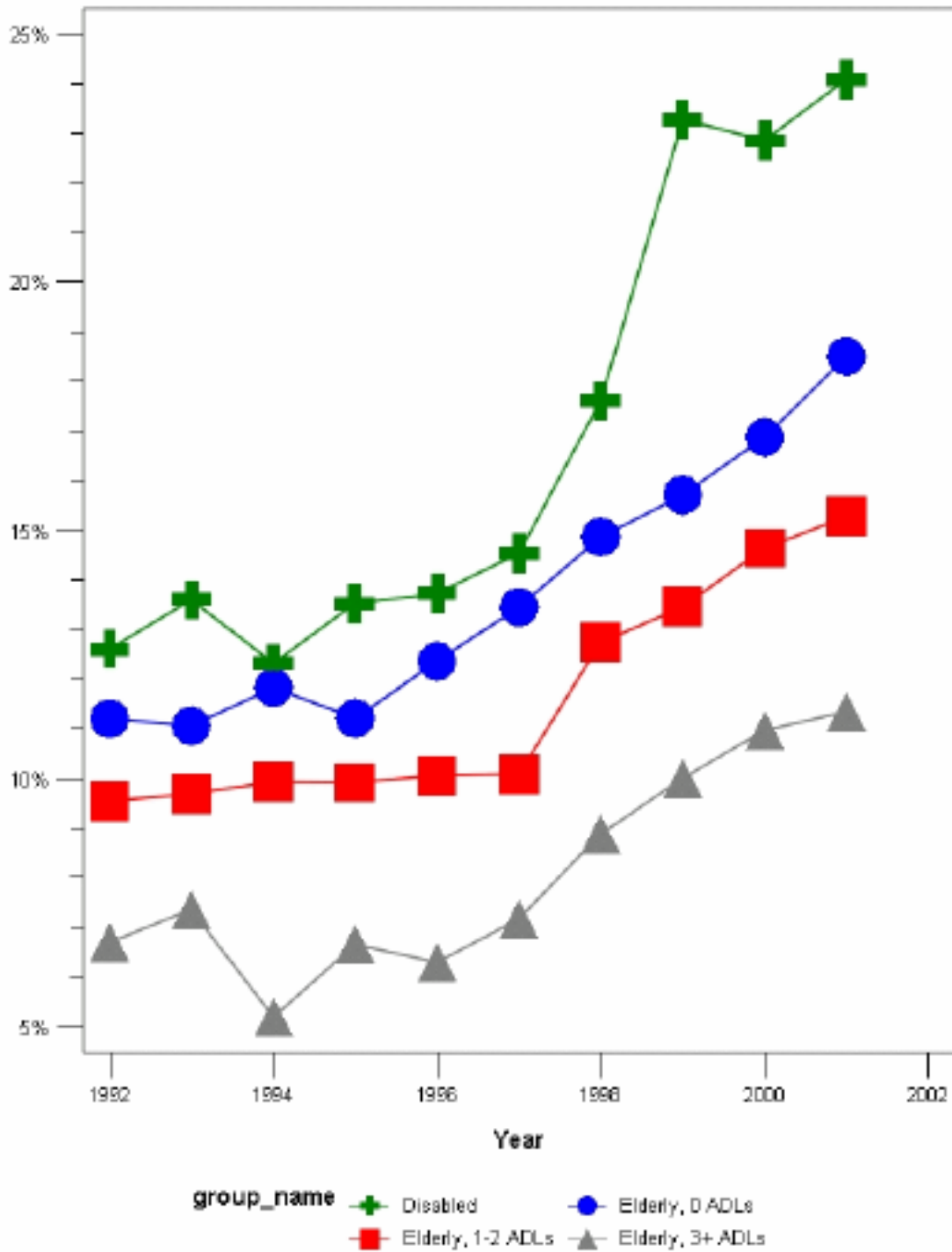
Source: MCBS 1992-2001

Figure 2: Total Nominal Pharmaceutical Expenditures by Disability Category



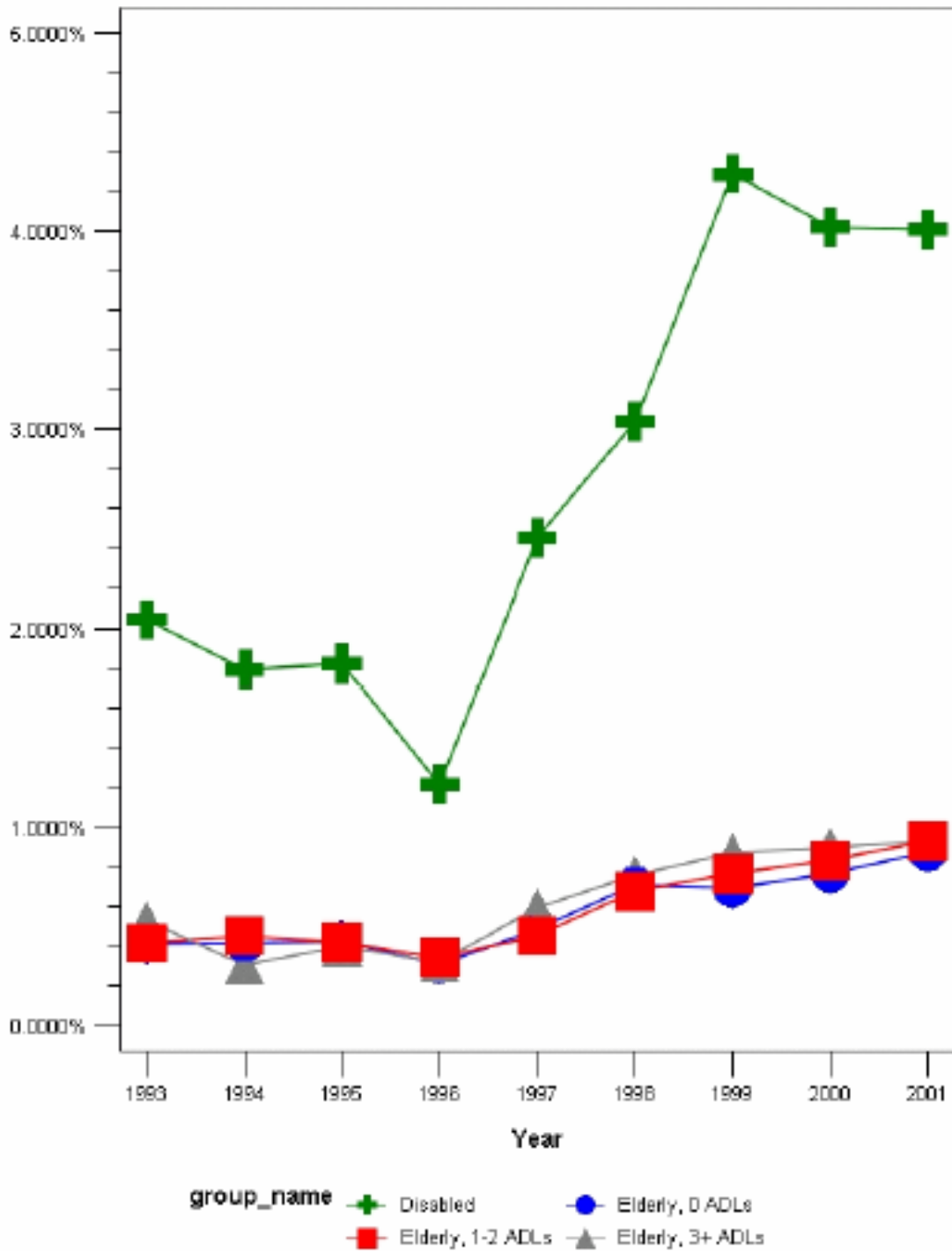
Source: MCBS 1992-2001

Figure 3: Pharmaceutical Expenditure as a Fraction of Total Expenditure (Including Drugs)



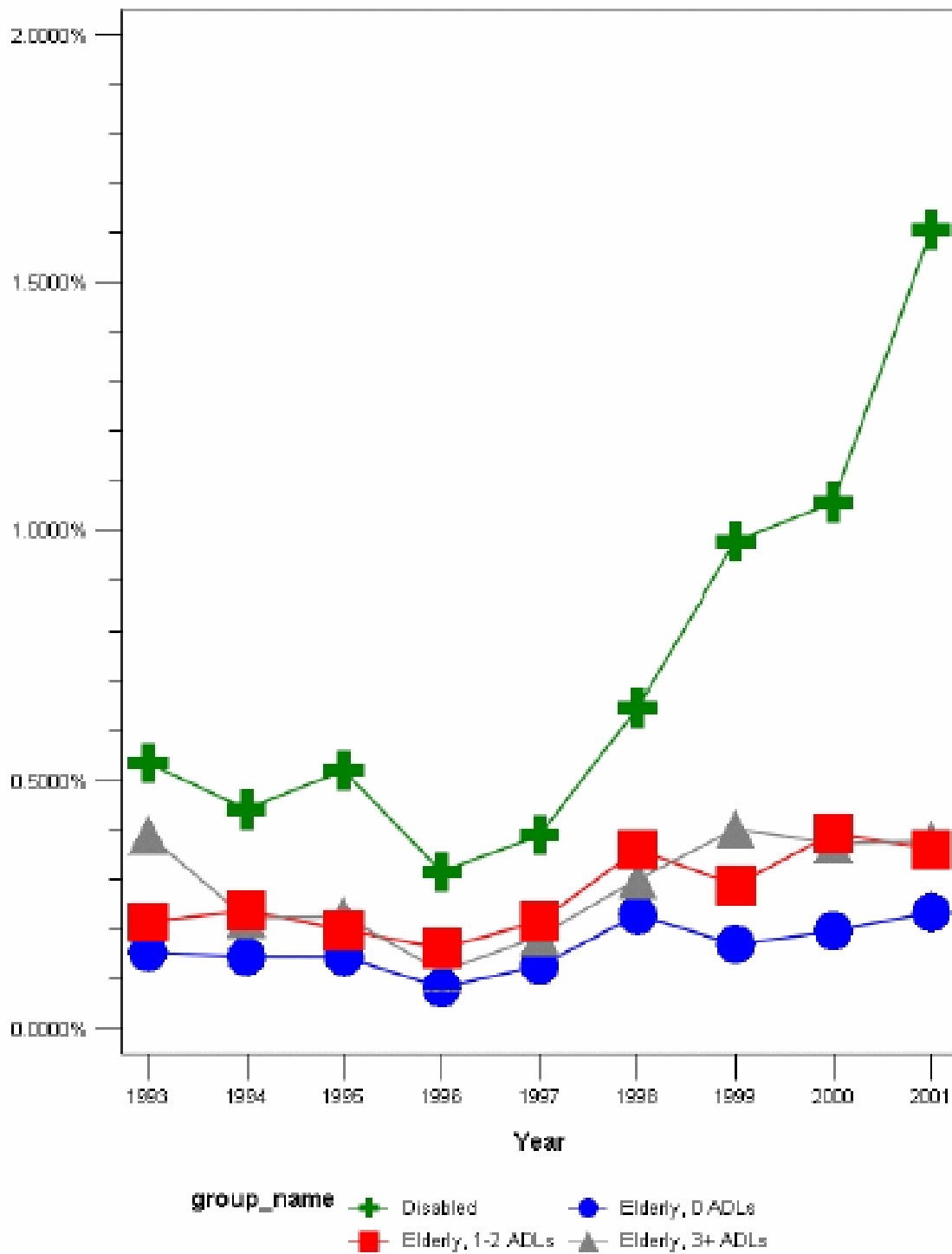
Source: MCBS 1992-2001

Figure 4a: Expenditures on Psychotherapeutic Agents as a Fraction of Total Expenditure (Including Drugs)



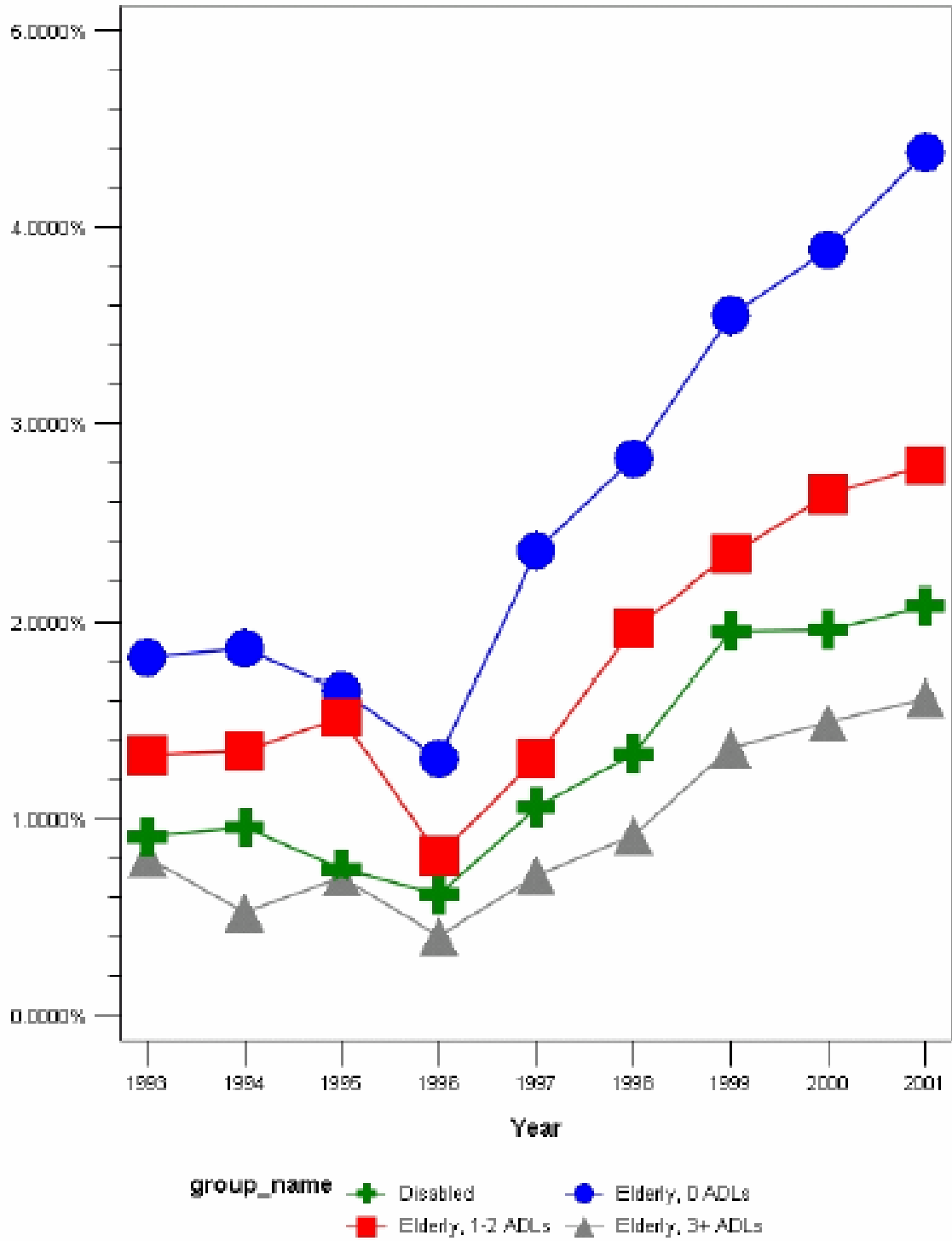
Source: MCBS 1992-2001

Figure 4b: Expenditures on Analgesic Agents as a Fraction of Total Expenditure (Including Drugs)



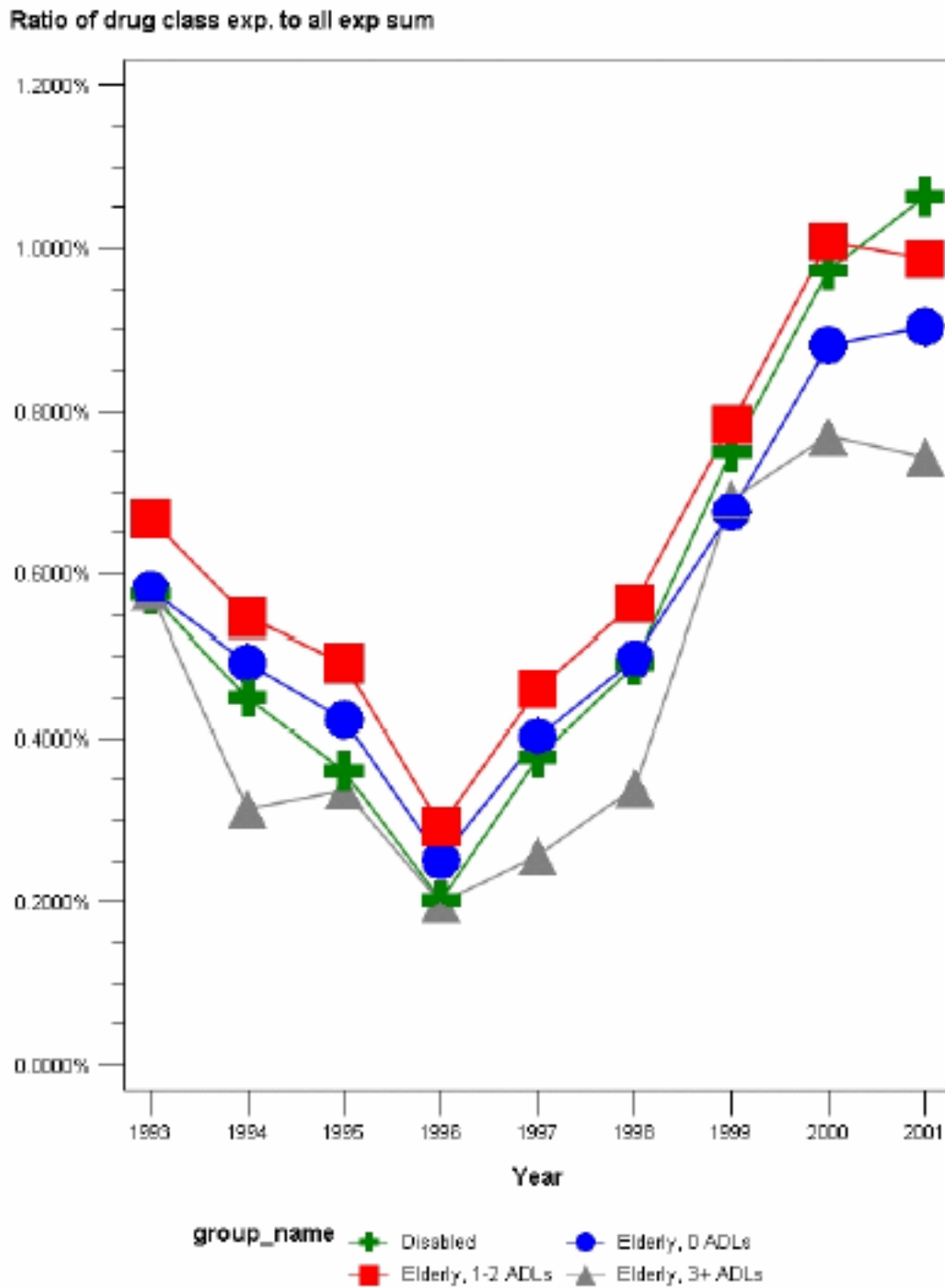
Source: MCBS 1992-2001

Figure 4c: Expenditures on Cardiovascular Agents as a Fraction of Total Expenditure (Including Drugs)



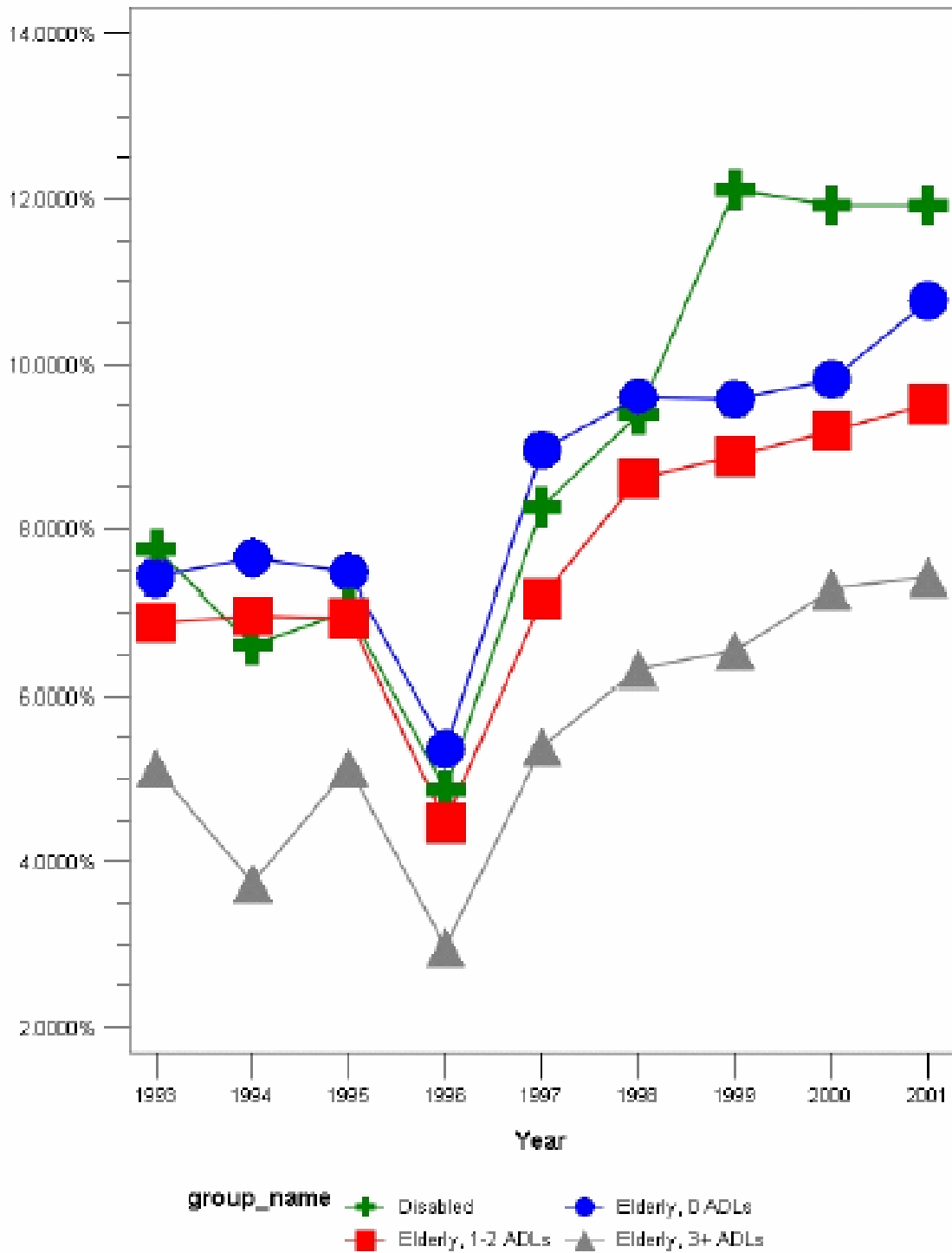
Source: MCBS 1992-2001

Figure 4d: Expenditures on Antiarthritic Agents as a Fraction of Total Expenditure (Including Drugs)



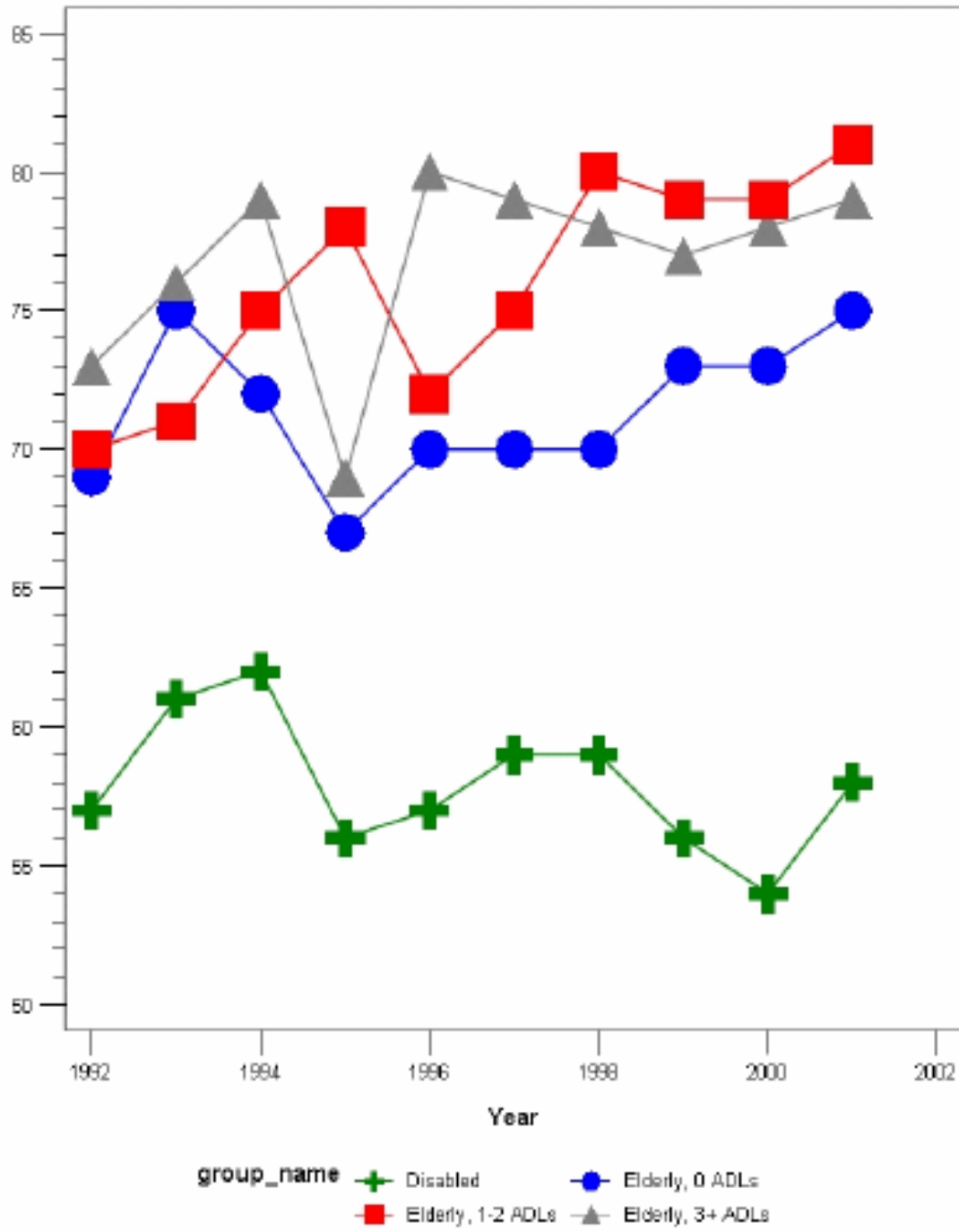
Source: MCBS 1992-2001

Figure 4e: Expenditures on All Other Therapeutic Agents as a Fraction of Total Expenditure (Including Drugs)



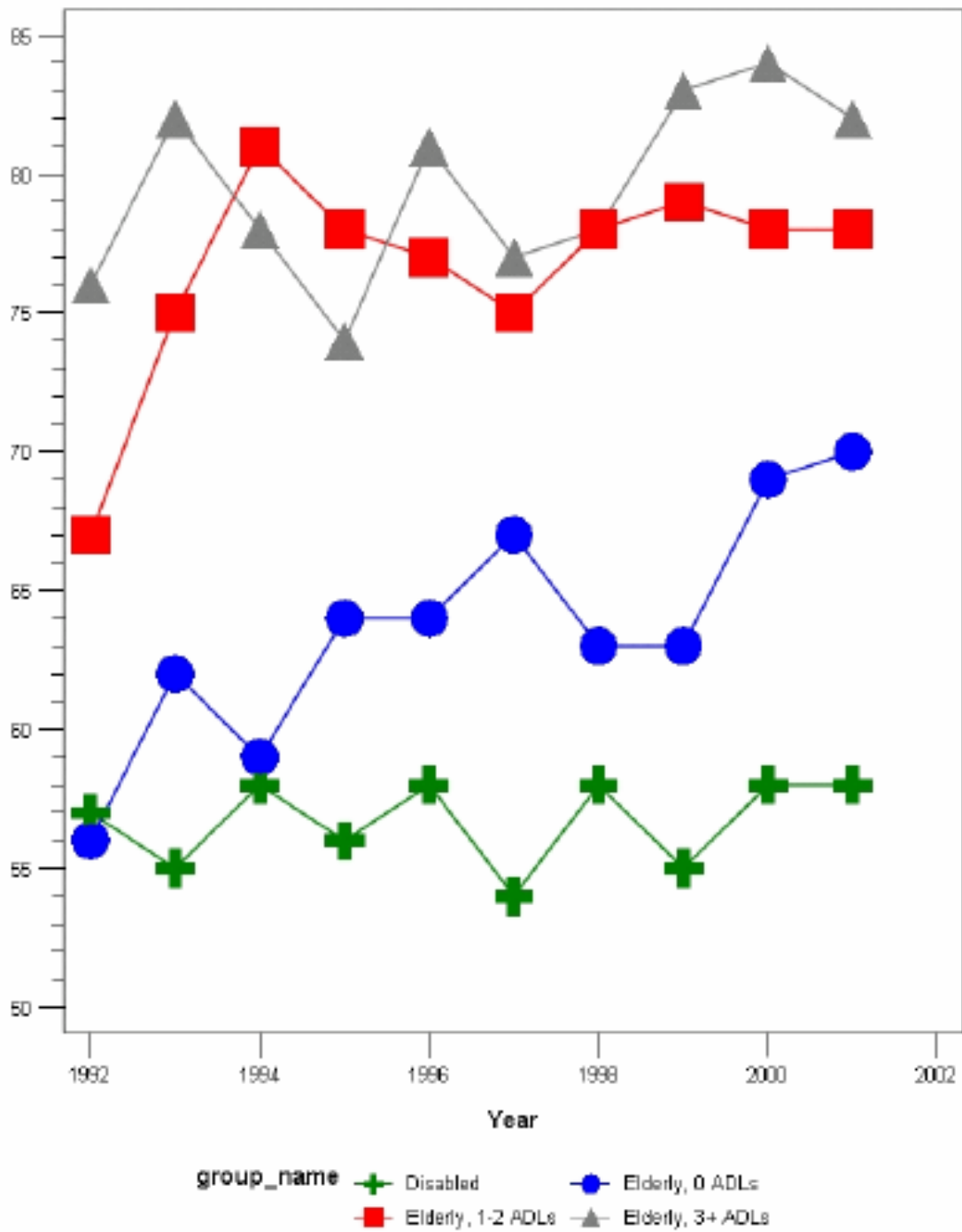
Source: MCBS 1992-2001

Figure 5a: Prevalence of Hypertension Among Top 10% of Drug Spenders



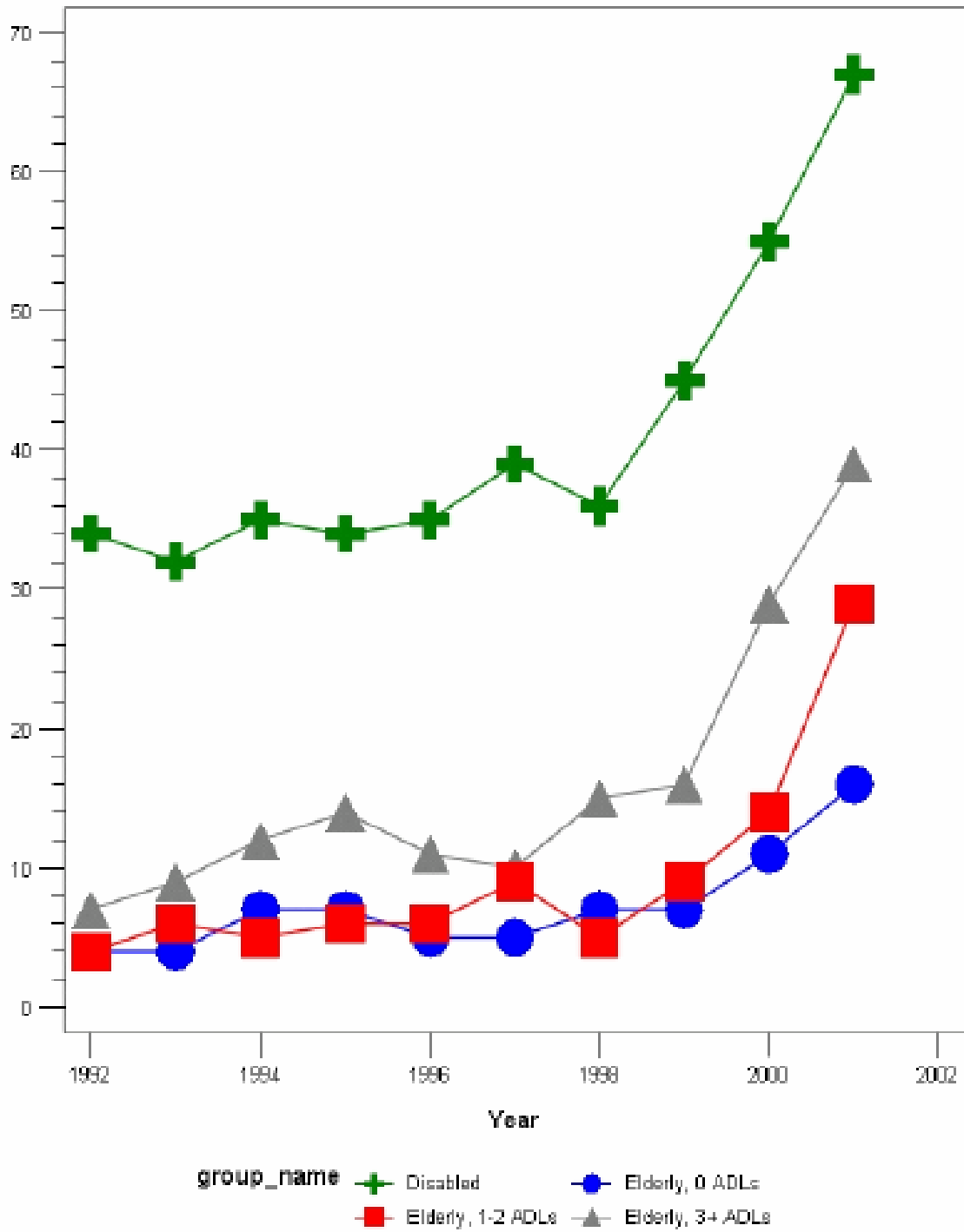
Source: MCBS 1992-2001

Figure 5b: Prevalence of Arthritis Among Top 10% of Drug Spenders



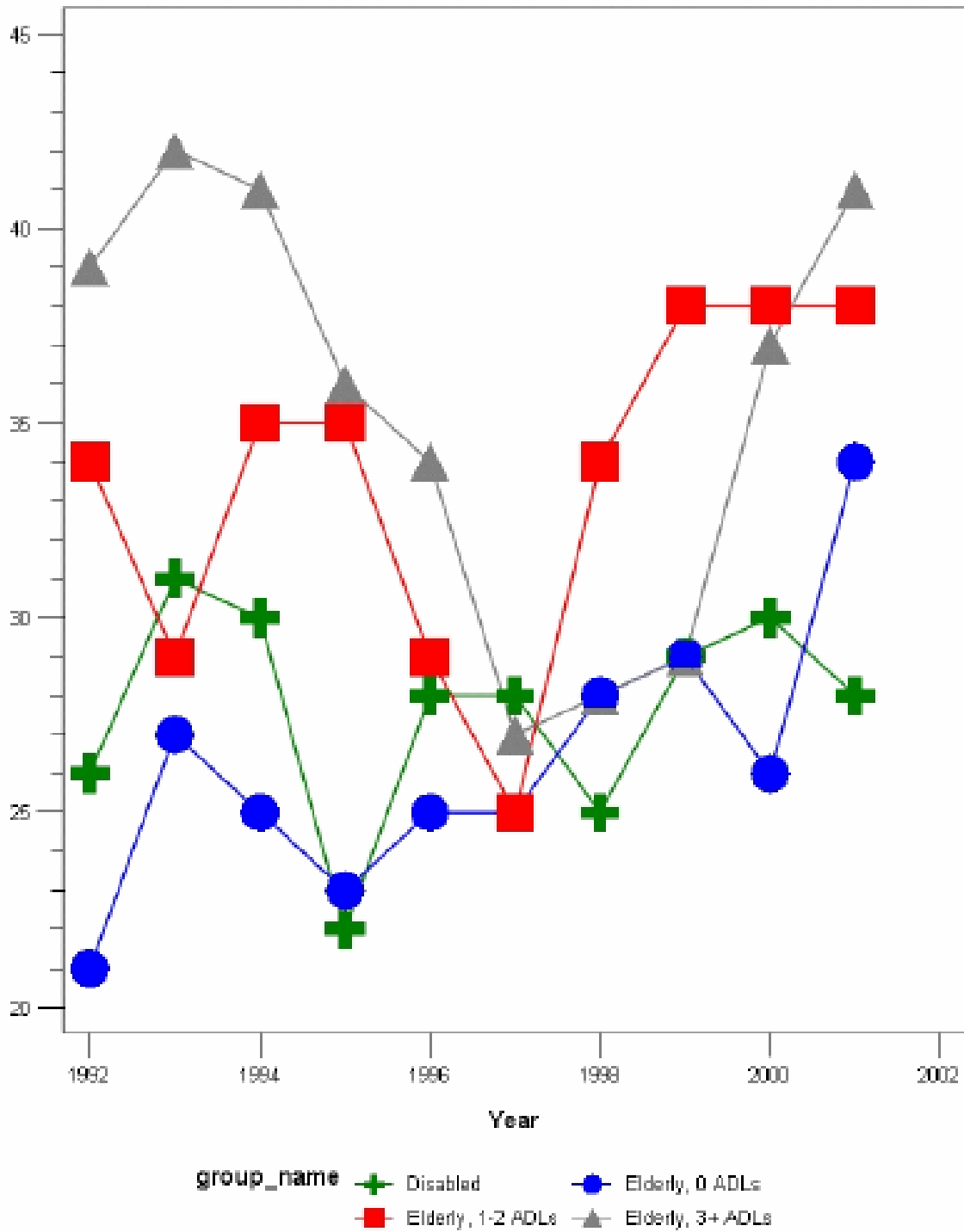
Source: MCBS 1992-2001

Figure 5c: Prevalence of Mental Illness Among Top 10% of Drug Spenders



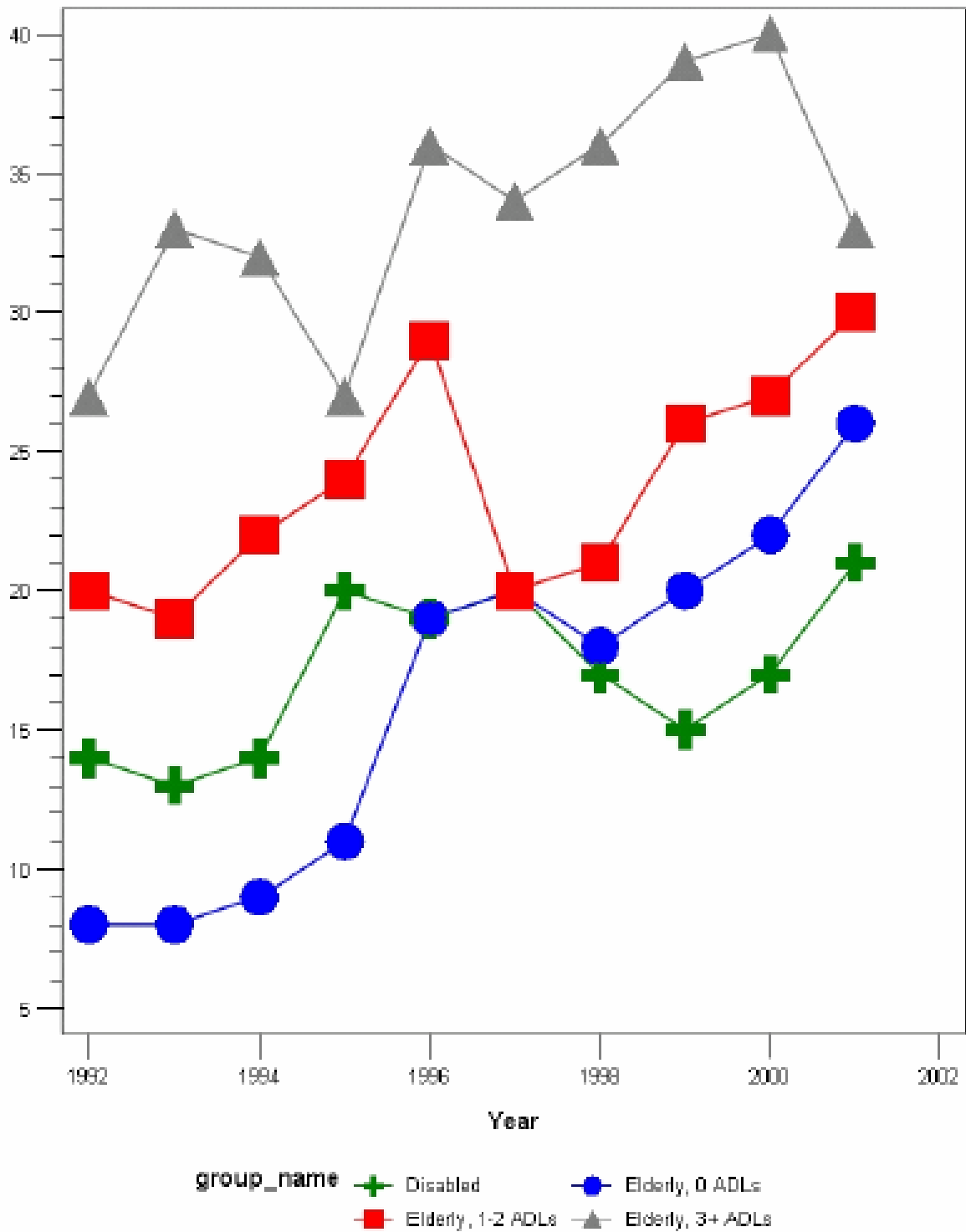
Source: MCBS 1992-2001

Figure 5e: Prevalence of Diabetes Among Top 10% of Drug Spenders



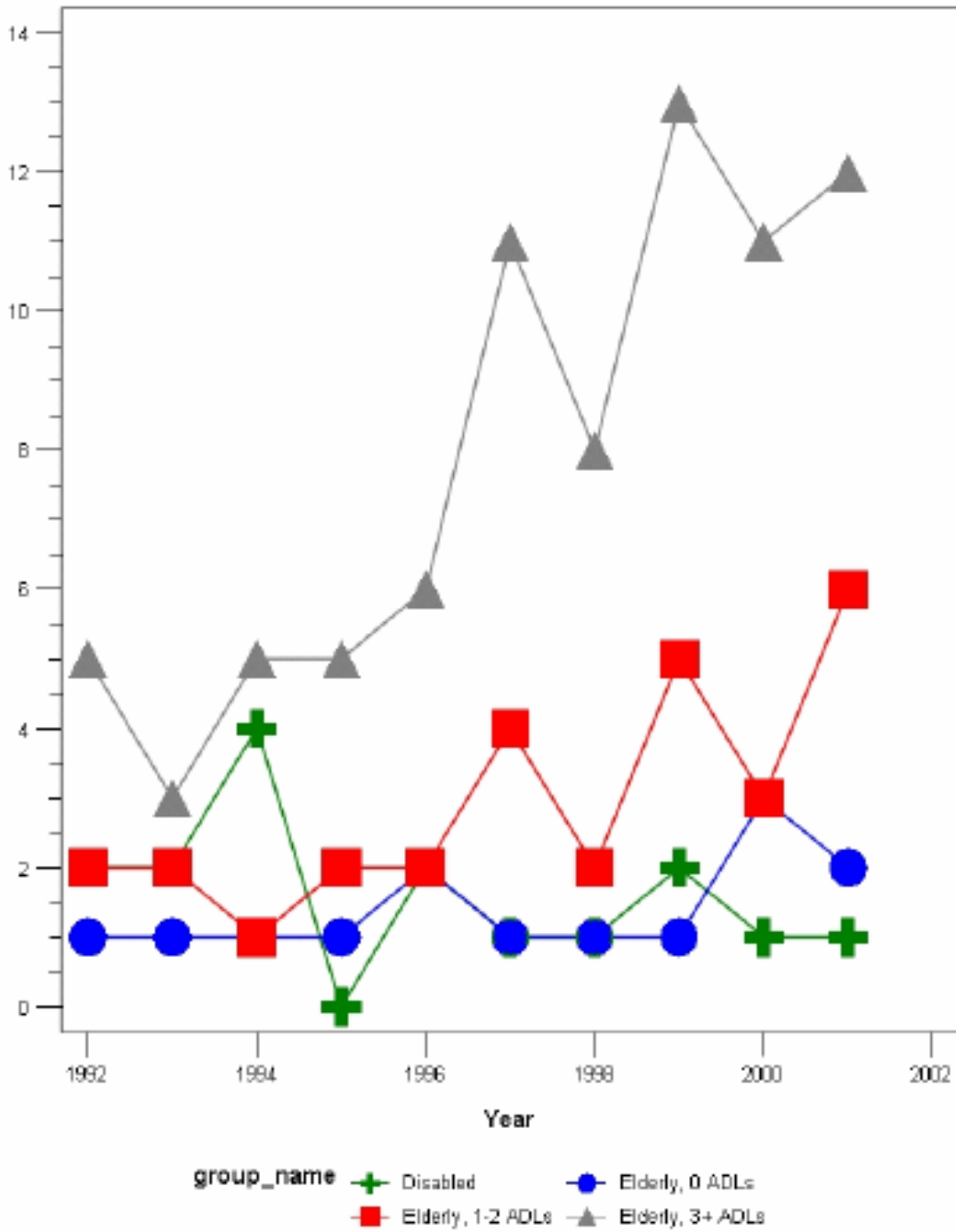
Source: MCBS 1992-2001

Figure 5f: Prevalence of Osteoporosis Among Top 10% of Drug Spenders



Source: MCBS 1992-2001

Figure 5g: Prevalence of Alzheimer's Disease Among Top 10% of Drug Spenders



Source: MCBS 1992-2001

Appendix Table: FDB Pharmaceutical Therapeutic Class

<i>Therapeutic Class</i>
Analgesics
Anesthetics
Anti-Obesity Drugs
Antiarthritics
Antiasthmatics
Antihistamines
Antiinfectives
Antiinfectives, Miscellaneous
Antineoplastics
Antiparkinson Drugs
Autonomic Drugs
Blood
Cardiac Drugs
Cardiovascular
Central Nervous System (CNS) Drugs
Contraceptives
Cough and Cold Preparations
Diagnostic
Diuretics
Electrolyte, Caloric & Fluid Replacement
Ear, Eyes, Nose, and Throat (EENT) Preparations
Gastrointestinal Preparations
Hormones
Hypoglycemics
Miscellaneous Medical Supplies, Devices & Other
Muscle Relaxants
Psychotherapeutic Drugs
Sedative And Hypnotics
Skin Preparations
Thyroid Preps
Biologicals
Pre-Natal Vitamins
Vitamins, All Others
Psychotherapeutic Drugs
Unclassified Drug Products