Distributional Consequences of Cost-Sharing in a Universal Healthcare System*

Simon Bensnes† Ingrid Huitfeldt‡ Victoria Marone§

December 2025

Abstract

Patient cost-sharing is used as a tool to limit over-utilization of insured healthcare services in almost all high-income countries. We study its distributional consequences in the context of a publicly-funded universal health insurance system, where consumers (as tax-payers) are residual claimants on insurer spending. We highlight the distinction between consumers' *elasticity* of demand for healthcare services—which moderates how cost-sharing rules affect healthcare utilization—and their baseline *level* of demand—which moderates how cost-sharing rules affect out-of-pocket costs. Using detailed administrative data on the Norwegian national health insurance scheme, we study a 2010 policy change that raised the age threshold for cost-sharing exemption, thereby increasing patient cost-sharing substantially for adolescents. We find that females and native-born Norwegians have higher average utilization and thus have more at stake financially from cost-sharing, but are relatively less responsive to cost-sharing. In contrast, lower-income individuals as well as individuals with a chronic health condition have both higher average healthcare utilization as well as higher responsiveness. Cost-sharing therefore places a larger burden on these groups both in terms of the financial cost of out-of-pocket spending and in terms of reduced quantities of healthcare used.

Keywords: redistribution, single-payer, cost-sharing, moral hazard
JEL Codes: I120, J320

*We are grateful to Zack Cooper, Andrew Goodman-Bacon, Vegard Havik, Marius Ring, Johannes Spinnewijn, Amanda Starc, Bob Town, as well as seminar participants at the 44th Nordic Health Economists' Study Group (NHESG) Meeting, the 2023 CEPR Paris Symposium, Institute for Fiscal Studies, Lund University, Statistics Norway, Ragnar Frisch Centre for Economic Research, and Tinbergen Institute for helpful comments and discussion that greatly benefited this research. This project has received support from the Research Council of Norway (Grant #256678). †Ragnar Frisch Centre for Economic Research. Email: s.s.bensnes@frisch.uio.no. ‡BI Norwegian Business School and Statistics Norway. Email: ingrid.huitfeldt@bi.no. §Department of Economics, Yale University and NBER. Email: victoria.marone@yale.edu.

I Introduction

Almost all health insurance systems worldwide use some form of patient cost-sharing to discourage over-utilization of healthcare services. Though it has been widely shown that cost-sharing does indeed reduce healthcare utilization (see Einav and Finkelstein, 2018, for a recent review), the socially optimal design of cost-sharing remains a matter of substantial debate. On one hand, there is the classic argument that increasing patients' exposure to the true marginal cost of healthcare increases efficiency because patients will better internalize the cost of the care they consume (Pauly, 1968). On the other hand, the value of risk protection provided by reduced uncertainty over healthcare costs or over realized utility (Zeckhauser, 1970; Acquatella and Marone, 2025), or the presence of frictions that prevent consumers from properly optimizing over healthcare utilization (Baicker, Mullainathan and Schwartzstein, 2015), may outweigh excess costs from over-utilization.

A relatively understudied aspect of this debate is the extent to which there are differential effects of a given cost-sharing policy across different demographic or socio-economic groups. If certain groups are more responsive to cost-sharing and/or less likely to fully internalize social benefits of healthcare utilization, these differences might be important to account for.[1] Moreover, beyond potential differences in *responsiveness* to changes in cost-sharing, there is also clearly the potential for demographic patterns in the baseline *level* of healthcare utilized, and therefore in the level of cost-sharing experienced. If the burden of cost-sharing falls disproportionately on certain demographic subgroups, then from behind the veil of ignorance, such dispersion could be interpreted as exposure to risk in a dynamic sense. Any (static) economic efficiency gains from cost-sharing might thus reasonably be weighed against these distributional consequences. It is on precisely these questions that our paper aims to inform.

We study the differential impacts of cost-sharing in the context of the Norwegian national health insurance scheme. As in many countries, children in Norway are exempt from patient cost-sharing.[2] A policy change in January 2010 raised the age threshold at which the child cost-sharing exemption expired from age 12 to age 16. Using a difference-in-differences research design, we exploit this natural experiment to measure differential responsiveness to cost-sharing. At an aggregate level, our results echo decades of prior literature in this area in that we find a large and sustained drop in healthcare utilization as a result of exposure to cost-sharing. Our setting is somewhat unique in that we study the healthcare utilization of children, whose use of care has been speculated to be less responsive to cost-sharing than adults (see, e.g., Manning et al., 1987). Our results suggest that even a modest amount of cost-sharing (on the order of a 160 NOK [15 USD] copayment for a primary care consultation), can alter adolescents' consumption of healthcare in a material way. Our estimates imply that annual outpatient utilization drops by an average of 6

[1] For example, since at least Feldstein (1971), there has been a suggestion that cost-sharing should naturally be linked to patient income. Income-linked cost-sharing exists in many developed health insurance systems, for example, Germany, France, and in the form of Medicaid and Cost-Sharing Reductions on the Affordable Care Act Exchanges in the US.

[2] Presumably, this commonality reveals a widely-held belief that childrens' consumption of healthcare utilization is (on average) either at or strictly below the socially optimal level.

percent, despite the presence of a yearly cap on out-of-pocket payments around 2,000 NOK [240 USD]. Perhaps reassuringly, inpatient utilization is unaffected.[3]

A key advantage of our empirical setting relative to prior work in this area is the availability of population-wide demographic and socio-economic characteristics linked with healthcare utilization at the individual level. We exploit this granularity to estimate heterogeneity across demographic sub-groups in both the level of cost-sharing experienced as well as the responsiveness of healthcare utilization to cost-sharing. The primary dimensions we focus on are income, gender, health status, and whether the individual is part of an immigrant family (has two Norwegian parents, or not). Cost-sharing rules are invariant to these characteristics. Even so, of course, certain groups systematically use more healthcare than others, and thus, experience more cost sharing than others. For example, we find that individuals with a chronic condition (19 percent of individuals in our sample) have average annual out-of-pocket costs than are 60 percent higher than those without. By gender, out-of-pocket costs for females are on average 38 percent higher than males.

Beyond substantial heterogeneity in the level of cost-sharing experienced, we also find that there are large differences in responsiveness to cost-sharing. With respect to income, we find that children with parents in the lowest income tertile reduce their healthcare utilization in response to cost-sharing by substantially more than those with parents in the highest income tertile. This pattern is especially pronounced within the setting of primary care. Here, those in the lowest income tertile reduce their utilization by 8 percent, while those in the highest income tertile reduce their utilization by only 2 percent. We find similarly stark patterns with respect to gender and health status. Males reduce their outpatient utilization substantially more than females (11 percent versus 3 percent), as do individuals with a chronic health condition relative to those without (8 percent versus 5 percent).

Coupling these patterns with baseline levels of healthcare utilization tells an interesting story. Taking income groups, for example, lower-income individuals have—at baseline—14 percent higher healthcare utilization than their higher-income counterparts. As a result, they also have higher out-of-pocket costs for that utilization. Even if healthcare utilization were held fixed, a rise in cost-sharing rates therefore harms lower-income individuals more than higher-income individuals. Considering then the finding that low-income individuals tend to reduce their utilization of care by more in response to cost-sharing, they are left relatively worse off along two dimensions. This pair of patterns—higher baseline out-of-pocket spending plus greater responsiveness of healthcare consumption to cost-sharing—can thus amplify distributional implications that would exist along one dimension alone.

We quantify these implications by considering a counterfactual in which the cost-sharing exemption for children in Norway were extended further, up to age 18.[4] Our estimates imply that on

[3]These findings are consistent with the results of the RAND Health Insurance Experiment, which found that children's use of outpatient services were equally responsive to cost sharing as adults, but that children's use of inpatient services was unaffected by cost-sharing (Manning et al., 1987).

[4]Among OECD countries, 18 is the modal age at which child-specific policies expire (Wager and Cox, 2025).

average, such a policy would increase outpatient healthcare utilization by 114 NOK on average per person per year for individuals at age 16 and 17, and would reduce their out-of-pocket spending by 569 NOK. But as hinted above, these benefits accrue differentially across population subgroups. In terms of healthcare utilization itself, we find that low-income individuals, males, individuals with a chronic health condition, and individuals with at least one non-Norwegian parent (which we will refer to for shorthand as "immigrants") have the most elastic demand for outpatient healthcare in the focal price region, and thus experience the largest increases in healthcare utilization in response to the policy. In terms of experienced cost-sharing, we find that females, individuals with a chronic health condition, and non-immigrants have the highest baseline utilization, and thus stand to gain the most in terms of reduced out-of-pocket spending. The countervailing tax implications of this public spending increase depend of course on the incidence of taxation. Within the progressive income and wealth taxation system present in Norway, greater tax is paid by those with greater income, but there would not be a similar offsetting force along the dimension of health status, gender, or immigrant status.

Compiling these findings into a unitary normative evaluation of the relative merits of one age threshold versus the other, or of optimal levels of cost-sharing generally, is outside the scope of this paper. We view the primary usefulness of our results to be in informing discussions of desirable policy and of quantifying the direction of relative changes between subgroups. An important piece of context for such a discussion is an understanding of what types of healthcare utilization are marginal to incremental cost-sharing, and of course, whether this varies across groups. We investigate this question by studying heterogeneity in the responsiveness to cost sharing by diagnosis group.

Across all demographic groups, we find that the largest absolute decline in utilization occurs within mental healthcare, with an aggregate proportional reductions of 9 percent.[5] Even larger proportional declines are observed in skin-related and musculoskeletal-related encounters (where there was overall a 17 percent and 10 percent reduction in outpatient utilization, respectively). Across demographic groups, we find that low-income individuals have disproportionately greater reductions in mental healthcare, whereas high-income individuals have disproportionately greater reductions in imaging and labs. Females are overrepresented relative to males in reductions related to skin and "abnormal clinical findings," where their most common baseline diagnoses are acne and abdominal/pelvic pain, respectively. In contrast, males are entirely responsible for observed reductions in mental healthcare use and in imaging and lab use. Individuals with a chronic health condition are over-represented in reductions of mental healthcare and respiratory-related care.[6] Immigrants are overrepresented in reductions of musculoskeletal-related and skin-related visits and vastly under-represented in reductions in mental healthcare. Section V provides further details on these patterns.

[5]Mental health utilization also represents the largest baseline share of healthcare utilization in this age group, accounting for 24 percent of age-15 outpatient utilization.

[6]By far the most common chronic diagnoses in this population are allergies and asthma.

Taken together, our results indicate that cost-sharing may have meaningful distributional consequences. The potential normative implications are subtle along a number of dimensions. First, it is clear that being born female or developing a chronic health condition puts one in a position of experiencing higher costs of healthcare use. Such dynamic effects would be dramatically exacerbated in a system with higher exposure to out of pocket costs, such as Medicare in the United States. Second, changing cost-sharing affects utilization of care, and there is the age-old question of whether healthcare utilization that is marginal to cost-sharing represents *under-utilization* or *over-utilization*, in the sense that the care *would* or *would not* have been utilized in a first-best world (Acquatella and Marone, 2025). Our results on heterogeneity in the types of marginal utilization are suggestive that the answer may vary across demographic groups.

Related Literature. This project contributes to the positive literature in health economics on the impacts of cost-sharing policies in health insurance markets. Like a large number of prior papers, we exploit a natural experiment to learn about the causal impact of cost-sharing on healthcare utilization (see Sevilla-Dedieu, Billaudeau and Paraponaris (2020) in the context of France; Chen, Shi and Zhuang (2019) in China; Han, Lien and Yang (2020) in Taiwan; Buitrago et al. (2023) in Colombia; Kang, Kawamura and Noguchi (2019) in Japan; Cirulli, Resce and Ventura (2024) in Italy; Olsen and Melberg (2018) in Norway; Xu and Bittschl (2022) in Germany; and Brot-Goldberg et al. (2017) in the US). These studies and ours corroborate the evidence available from randomized controlled trials: cost-sharing lowers healthcare utilization (see Manning et al. (1987) on the RAND Health Insurance Experiment and Finkelstein et al. (2012) on the Oregon Health Insurance Experiment).

Like a smaller number of prior papers, our experimental setting is sufficiently powered to look for heterogeneity across demographic groups and simultaneously across types of care. Our finding of greater responsiveness to cost-sharing among lower-income individuals is consistent with Nilsson and Paul (2018) (in the context of Sweden) and Haaga et al. (2024) (in Finland).[7] Our results by health status are consistent with Landsem and Magnussen (2018), who study heterogeneity along this dimension using the same natural experiment as we do in Norway. Notable studies of heterogeneity in responsiveness to cost sharing by type of care include Brot-Goldberg et al. (2017) in the context of US employer-sponsored insurance, Einav, Finkelstein and Polyakova (2018) in the context of US Medicare Part D, and the two Health Insurance Experiments. A consistent findings from these studies is that at an aggregate level, utilization is reduced "across the board." Our findings are consistent with this in aggregate, but not across all subgroups.

The primary contributions of our analysis are twofold. First, the size of our experimental sample allows us to look at heterogeneity by type of care *within* demographic subgroups. This reveals

[7]The existing evidence on the relationship between income and responsiveness to cost sharing is somewhat mixed. Kato et al. (2022) find that higher income elderly individuals in Japan are actually more responsive to cost sharing than their lower-income counterparts, consistent with what we find in the context of imaging and lab visits. Hofland, Gaspar and Boone (2025) (in the context of the Netherlands) and Cherkin, Grothaus and Wagner (1989) (in the context of a US Health Maintenance Organization) find no differential responsiveness across income levels, consistent with the results of the RAND Health Insurance Experiment.

patterns that would be masked in aggregate analysis, and which suggest some possible resolutions to mixed empirical results in the literature (cf. footnote 7). Second, we document how differences in baseline levels of healthcare utilization interact with differences in responsiveness to cost-sharing to shape overall distributional consequences.[8] Prior work has typically focused on one dimension or the other. Our framework highlights that these forces can either amplify or offset one another, depending on the demographic group in question.

The paper proceeds as follows. Section II.B discusses our empirical setting and data. Section III presents our analysis of the effects of cost-sharing on utilization. Section IV quantifies distributional implications, and Section V then investigates heterogeneity by diagnosis group. Section VI concludes.

II Empirical Setting and Data

II.A Cost-Sharing in the Norwegian Public Healthcare System

Norway has a universal, single-payer healthcare system. Under the national insurance scheme, most outpatient services are subject to small copayments. For example, the copayment for a standard GP visit in 2016 was 152 NOK (17 USD). Patients' overall financial exposure is limited by an annual cap on out-of-pocket payments. In 2016, the cap was 2,185 NOK (240 USD).[9] The stated purpose of patient cost-sharing up to this annual limit is to "contribute to reducing public expenditure, freeing up resources for other priority uses".[10] Approximately 20 percent of the population reaches the out-of-pocket cap each year (Aftenposten, 2020).

Copayment levels for different healthcare services are set annually by the Norwegian Ministry of Health and Care Services. Inpatient care as well as certain outpatient services (such as vaccinations, contraceptives, and prenatal care) are universally exempt from copayments. In addition, certain groups of people are exempted (such as pregnant women, retired military personnel, and children). The largest of these groups is children. Prior to 2010, the age cutoff for the "child" copayment exemption was 12 years old. After January 2010, the cutoff was raised to 16 years old. As a result, children born in and before 1993 were exempt from copayment only up until age 12, while children born in 1994 and after were exempt from copayment until age 16. Appendix Figure A.1 provides a depiction of this variation. Importantly, we are able to observe some cohorts who experience the same level of cost-sharing from age 12 onward, and some cohorts who experience a

[8] We view our approach as complementary to recent work by Klein, Salm and Upadhyay (2024), who study the distributional consequences of cost-sharing policy in the Netherlands using a structural simulation model of healthcare utilization and costs.

[9] This "out-of-pocket maximum" is updated annually, primarily to reflect inflation. There are some utilization fees (such as for bandages or other medical materials) that do not count towards the out-of-pocket cap and need to be paid by patients even after the cap is reached, but these are generally small. In 2016, these fees accounted for 0.1 percent of total out-of-pocket spending (authors' calculations). Appendix Table A.1 reports the out-of-pocket maximum levels (*egenandelstak*) for each year 2006–2017.

[10] Translated from "Egenbetaling bidrar til å redusere de offentlige utgiftene, og frigjør ressurser til andre prioriterte oppgaver" (Parliament, 2020).

change in exposure to cost-sharing at age 16.

II.B Data

Our data are derived from two main sources. First, we rely on individual-level demographic data from the Norwegian Population Register at Statistics Norway. These data provide information on both fixed and time-varying individual characteristics, and allow us to link individuals to their parents and their parents' demographics. Second, we rely on encounter-level healthcare utilization data from the Norwegian Patient Register and the Control and Payment of Health Reimbursement Database, both of which are maintained by the Norwegian Directorate of Health. These datasets provide information on the universe of patient encounters covered by the national health insurance scheme.[11] The data contain both clinical information on diagnoses and procedures, as well as financial information about provider reimbursements and patient out-of-pocket payments. We have these data from 2006–2017.

Individuals. To isolate variation in exposure to cost-sharing at age 16, we limit our attention to individuals born in years 1992–1993 and 1996-1997. These birth-year cohorts meet three key criteria: (i) we observe their healthcare utilization for 18 months before and after they turn 16, (ii) the January 2010 policy change did not instantaneously change their cost-sharing exemption status while they were within this age range (see Appendix Figure A.1), and (iii) while within this age range, these cohorts were not affected by a fall 2016 policy change relating to high-school students' need to obtain a doctor's note to excuse school absences. Individuals born in 1996 or 1997 were "treated," in that they experienced an increase in cost-sharing when they turned 16. Individuals born during 1992 or 1993 serve as a "control" group, in that they did not. Within these birth-year cohorts, we restrict the sample to individuals that were continuously resident in Norway between the ages of 14 and 17 and who are not missing key demographic information. Appendix Table A.2 provides additional details on sample construction. These restrictions leave us with an analysis sample of 251,279 individuals.

Table 1 presents summary statistics on our analysis sample. The first column describes the 1992–1993 (control) birth cohorts and the second column describes the 1996–1997 (treated) birth cohorts. Panel A reports demographic information. "Immigrants" are defined as individuals whose parents immigrated to Norway or who themselves immigrated to Norway as young children. Parental income represents the sum of annual after-tax income earned by both parents. Higher education is defined as anything greater than a high-school degree. We identify a set of chronic diagnoses that occur in children and typically require recurring care to manage.[12] About a fifth of individuals in our analysis sample were recorded as having one of these diagnoses between age 14 and 17. The number of immigrants, parental education level, and parental income rises between

[11] Though a privately-financed healthcare sector exists and has been growing in Norway, it remains a small fraction of overall healthcare utilization.

[12] Appendix Table A.4 shows the set of diagnosis codes we define as chronic. By far the most prevalent chronic diagnoses are allergies and asthma.

the two birth cohorts, reflecting growth in these variables over time.

Table 1. Summary Statistics

	Birth year cohorts			
	1992–1993 *(Control)*		1996–1997 *(Treated)*	
Panel A. Demographics				
Number of individuals	124,245		127,034	
Pct. female	0.49		0.49	
Pct. immigrant	0.08		0.10	
Pct. with chronic diagnosis	0.18		0.19	
Pct. with a parent with higher education	0.49		0.56	
Parental annual income (000 NOK)	620 (558)		720 (667)	
Panel B. Healthcare utilization				
Age :	15	16	15	16
Visits per year				
Primary care	1.9 (1)	2.3 (1)	2.5 (1)	2.7 (2)
Specialist care	2.6 (1)	2.9 (1)	3.0 (1)	3.2 (1)
Inpatient	0.08 (0)	0.09 (0)	0.08 (0)	0.09 (0)
Total spending per year (NOK)				
Primary care	397 (195)	475 (240)	549 (275)	580 (300)
Specialist care	812 (100)	967 (204)	1,375 (244)	1,479 (298)
Inpatient	742 (0)	844 (0)	897 (0)	1,040 (0)
Out-of-pocket spending per year (NOK)				
Primary care	159 (35)	221 (160)	1 (0)	268 (183)
Specialist care	194 (0)	254 (0)	4 (0)	307 (0)
Inpatient	0 (0)	0 (0)	0 (0)	0 (0)

Notes: The table reports summary statistics on our focal sample of individuals. Demographics are fixed within an individual, corresponding to the year in which they turned 15. The table reports sample means, as well as medians in parentheses where applicable. "Total spending" represents total activity-based-financing and fee-for-service reimbursements received by healthcare providers (inclusive of out-of-pocket payments). For outpatient care, the number of visits represents the unique number of days on which an encounter was recorded. For inpatient care, it represents the number of unique hospital stays.

Healthcare Utilization. Our data span inpatient and outpatient utilization of healthcare services. Pharmaceutical utilization is not included. We have data on inpatient utilization from 2008–2017, and on outpatient utilization from 2006–2017. The inpatient utilization data includes one observation per hospital stay. It reports ICD-10 diagnosis codes and various other information associated with each visit. Norwegian hospitals are partially reimbursed using an activity-based financing system based on Diagnosis Related Groups (DRGs), similar to the system used by Medicare in the US.[13] The outpatient utilization data covers care provided in both hospital and non-hospital settings and includes one observation per procedure performed. It contains information about the diagnoses and procedure codes recorded during the visit, as well as monetary fields recording fee-for-service prices paid for each procedure.[14] Finally, we observe all out-of-pocket

[13]Between 2008 and 2013, 40 percent of hospital budgets came from activity-based financing. This was increased to 50 percent in 2014. The remainder comes from fixed payments based on the population and demographics in the hospital's catchment area. For the purposes of our analysis, we will report spending amounts assuming that 40 percent of hospital reimbursement came via activity-based financing, thereby removing the change from 40 to 50 as a source of variation.

[14]Fee-for-service prices are determined by a national physician fee schedule (*Normaltariffen*) that specifies govern-

payments made by patients from 2006–2017. Appendix A provides additional details about the construction of our analysis dataset.

Our primary measure of individuals' healthcare utilization is the activity-based and fee-for-service-based payments made to healthcare providers, inclusive of any patient out-of-pocket payments. We will call this measure "total spending." Panel B of Table 1 reports summary statistics on healthcare utilization when our focal individuals were age 15 and 16. We partition utilization into three categories: primary care, outpatient specialist care, and inpatient care. For each type of utilization, the table reports the average number of visits per year, total spending per year, and out-of-pocket spending per year. Medians are reported in parentheses. During age 16, the average individual in our sample incurred 2,696 NOK in total spending, of which 526 was paid out-of-pocket. Out-of-pocket spending is on average split roughly evenly between primary and specialist care. Zero cost-sharing for inpatient care is a universal feature of the Norwegian public health insurance plan. The median individual in our sample sees a primary care provider once per year and a specialist provider once per year.[15] Prior to turning 16, individuals born in 1996 or 1997 paid approximately nothing (1 NOK or 4 NOK) out-of-pocket for this care. After turning 16—and losing their cost-sharing exemption—this rose to an average of 268 NOK for primary care and 307 NOK for specialist care.

Two trends are apparent from the table. First, healthcare utilization is increasing in age. Individuals at age 16 have 12 percent higher average total spending than at ages 15. Second, healthcare spending is increasing over time. Individuals in the 1996–1997 birth year cohorts (who were age 15–16 in years 2011–2014) have 39 percent higher average total spending than individuals in the 1992–1993 birth year cohorts (who were age 15–16 in years 2007–2010). This increase over time is due both to rising reimbursement rates as well as true increases in utilization (as seen in the visit counts). Our econometric analysis will account for both of these patterns.

II.C Descriptive Evidence

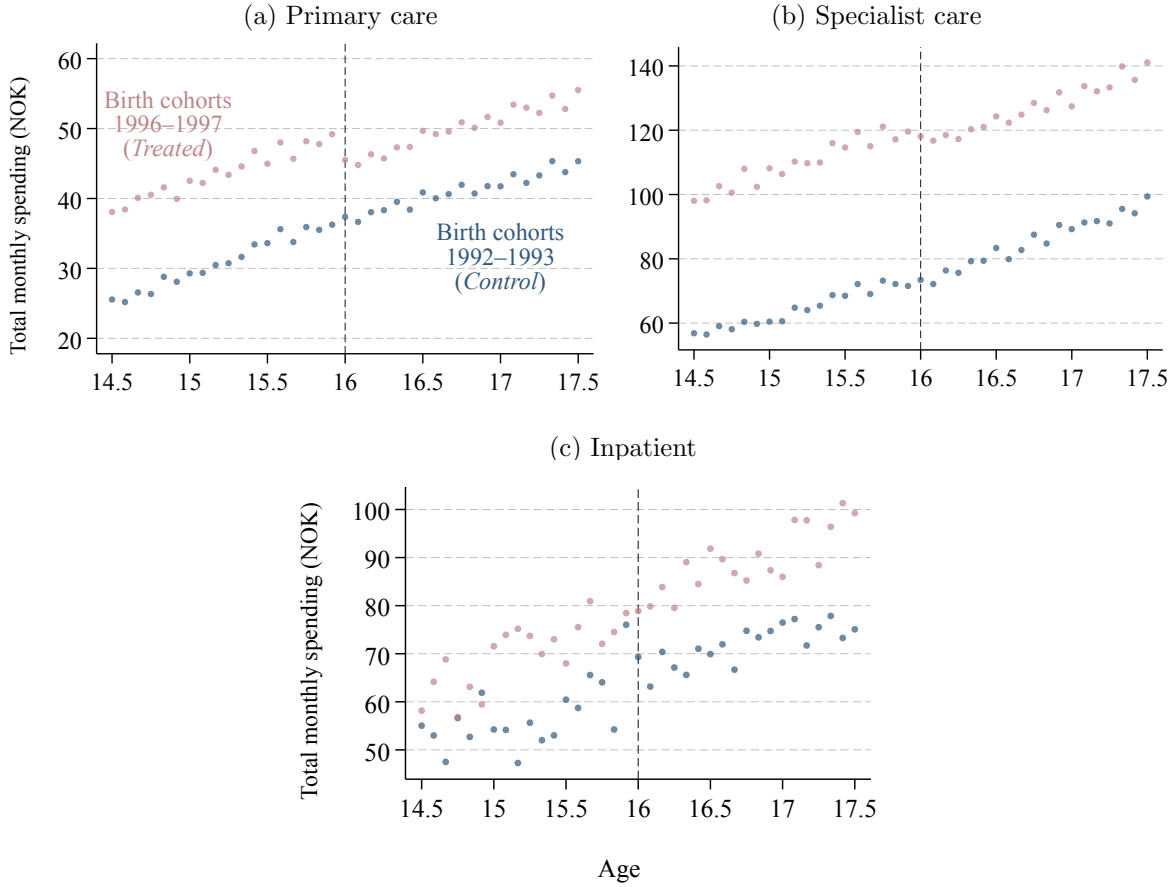
Responsiveness to cost-sharing. Our primary research design for recovering the effect of cost-sharing on healthcare utilization is a difference-in-differences analysis. Within this framework, basic results can be read directly from plots of the raw data. Figure 1 plots average healthcare utilization in the 18 age-months before and after individuals turned 16, separately for our treated

ment reimbursement and patient copayments for each of approximately 1,800 Norwegian procedure codes (*takster*). The fee schedule is negotiated annually among the Norwegian Medical Association, the Norwegian Ministry of Health, and the Norwegian Association of Local and Regional Authorities. Primary care physicians also receive a portion of their revenue (on average, 30 percent) from capitated payments based on the number of patients enrolled on their patient panel.

[15] In our sample, the most common diagnosis coded in primary care is 3-digit ICD-10 code Z03 ("Encounter in which patient's suspected diseases and conditions were ruled out"). The most common diagnosis coded in specialist care is 3-digit ICD-10 code Z00 ("General examination and investigation of persons without symptoms and reported diagnosis").

and control groups.[16] Panel (a) shows total primary care spending. There is a clear trend in both cohorts: utilization is increasing in age. However, there is also a clear break in this trend at age 16 for birth cohorts 1996–1997. At age 16, when they lost their copayment exemption, utilization fell sharply, before continuing to increase. No similar drop is observed at age 16 for the 1992–1993 birth cohorts (who had already lost their copayment exemption at age 12). A similar pattern is observed for specialist care in panel (b). There is no obvious break in trend for inpatient care in panel (c).

Figure 1. Healthcare Utilization by Age and Birth Cohort



Notes: The figure shows average total healthcare spending by age-month, separately for the 1992–1993 and 1996–1997 birth-year cohorts. Panel (a) shows primary care spending, panel (b) shows specialist care spending, and panel (c) shows inpatient spending. The 1992–1993 cohorts faced patient cost sharing throughout this age range, while the 1996–1997 cohorts faced cost sharing only after turning 16.

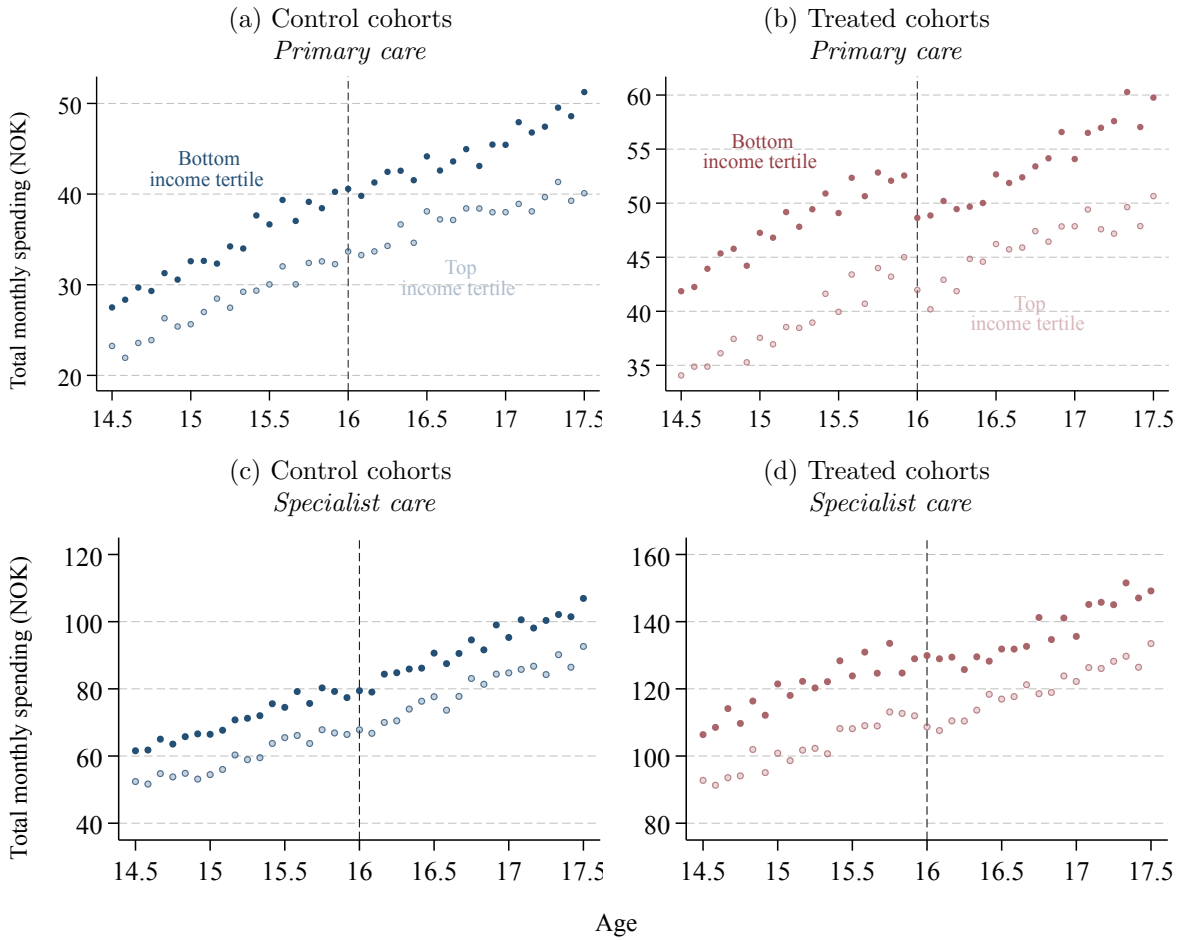
We next look at heterogeneity in these series across socioeconomic and demographic groups. We begin by dividing our sample of individuals into tertiles based on parental income. Income tertiles are calculated separately within the 1992–1993 and 1996–1997 birth-year cohorts, so the sample is simply split into thirds within each group. Annual parental income in the highest income tertiles is on average 977 thousand NOK, while in the lowest it is 420 thousand NOK.

Figure 2 shows healthcare spending over time for individuals in the top and bottom of the income distribution, separately for the treated and control birth cohorts. Panels on the left shows utiliza-

[16] Age-month is age measured in months. For an individual born on date d, we calculate their age-month on future date t as: $floor((t-d)/(365.25/12))$.

tion for the 1992–1993 (control) cohorts, while panels on the right show the 1996–1997 (treated) cohorts. The first row of panels shows primary care spending. The second row shows specialist spending. In each panel, the darker colored data correspond to the lower income individuals.

Figure 2. Healthcare Utilization by Top/Bottom Income Tertile



Notes: The figure shows average total healthcare spending by age-month, separately for the 1992–1993 (control) and 1996–1997 (treated) birth year cohorts. The figure reports spending separately for individuals in the top and bottom third of the income distribution (the middle third is omitted for readability). In each panel, the highest income individuals are displayed in a light color, and the lowest-income individuals are displayed in a dark color. Panels (a) and (b) show primary care. Panels (c) and (d) show specialist care.

Figure 2 reveals two interesting patterns. First, the magnitude of the response to the introduction of cost-sharing appears to differ across income groups. Within both primary and specialist care, there is a clear break in trend among both income groups for the treated cohorts, but the break in trend appears larger in the lower income tertile. No break in trend is observed for the control cohorts in either part of the income distribution. The second clear pattern is that there are differences in the overall *level* of healthcare utilization across income groups. Lower income individuals have substantially higher utilization than higher income individuals. In the treated cohorts, primary care spending was 15 percent higher in the lowest relative to highest income tertile, and specialist care spending was 13 percent higher. Appendix Table A.5 reveals that this pattern is consistent across the middle of the income distribution. As a result, regardless of any potential difference in *response* to cost-sharing, the existence of substantial *level* differences in

healthcare utilization has important implications for the relative impact of cost-sharing.

Appendix Figure A.2 reports total outpatient spending (combining both primary and specialist care) separately by gender, whether the individual has a chronic health condition, and whether the individual is part of an immigrant family. An immediate drop in utilization is observed among the treated cohorts in all demographic subgroups, where no such drop is observed in the corresponding control groups. These responses appear larger among males (relative to females), among those with a chronic condition (relative to those without), and among those who are part of an immigrant family (relative to not). In terms of *levels* of healthcare utilization, outpatient spending is somewhat higher among non-immigrants (relative to immigrants), substantially higher among females (relative to males), and unsurprisingly, substantially higher among individuals with a chronic condition. Appendix Figure A.3 reports the analogous data for inpatient spending across income, gender, and the presence of a chronic condition. There is no visual evidence of a break in trend in any subgroup within the treated cohorts (nor the control cohorts).

Experienced cost-sharing. Table 2 reports healthcare utilization statistics and out-of-pocket spending across our four focal dimensions of socio-economic heterogeneity. To keep the time frame and cost-sharing coverage consistent for this comparison, we limit to the experience of the 1996–1997 birth year cohorts during the year they were 16 years old (and had thus lost their child cost-sharing exemption). As we saw above, overall healthcare utilization, measured both by total spending and by number of visits, is higher in lower income groups. Consistent with the graphic evidence in Appendix Figure A.2, it is also higher among females relative to males, among non-immigrants relative to immigrants, and naturally, among those with a chronic condition relative to those without. In all cases, this higher utilization translates, to varying degrees, into higher experienced cost-sharing. Individuals with a chronic health condition experienced on average 62 percent higher costs out-of-pocket than those without. Females experienced 38 percent higher average costs than males. Even absent any effect of cost-sharing on healthcare *utilization*, changes in cost-sharing rules can thus still have large effects on the relative healthcare *costs* experienced by these groups.

Table 2. Utilization Statistics by Demographic Group

	Total spending (NOK)			OOP spending (NOK)		Number of visits		
Demographic group	Primary	Specialist	Inpatient	Primary	Specialist	Primary	Specialist	Inpatient
Overall	580	1,479	1,040	268	307	2.7	3.2	0.09
Income tertile								
1 (Lowest)	619	1,586	1,084	275	306	2.8	3.5	0.10
2	582	1,452	1,077	272	312	2.7	3.2	0.10
3 (Highest)	539	1,400	957	256	304	2.5	3.0	0.09
Gender								
Male	427	1,187	974	198	287	2.0	2.4	0.08
Female	741	1,788	1,110	341	329	3.4	4.1	0.11
Chronic condition								
No	516	1,255	824	245	270	2.3	2.9	0.08
Yes	853	2,438	1,968	365	470	4.1	4.7	0.17
Immigrant								
No	594	1,519	1,069	273	314	2.7	3.3	0.10
Yes	451	1,127	785	221	252	2.0	2.3	0.07

Notes: The table reports average annual utilization statistics among demographic sub-groups within the 1996–1997 (treated) birth cohorts, during the year in which they were 16 years old. Out-of-pocket (OOP) spending is always zero for inpatient care, so the column is omitted. For outpatient care, the number of visits represents the unique number of days on which an encounter was recorded. For inpatient care, it represents the number of unique hospital stays.

III Effects of Cost Sharing on Healthcare Utilization

III.A Empirical Specification

Our analysis of the effect of cost sharing on healthcare utilization will be based on an event study research design exploiting the 2010 change in the age cutoff for copayment exemption. Our treatment group is the 1996–1997 birth year cohorts, who became exposed to cost-sharing starting at age 16. Our control group is the 1992–1993 birth year cohorts, who experienced cost-sharing over the full age range we study (since they had previously lost exemption at age 12). As our counterfactuals will consider the distributional impacts of cost sharing over a period of time, we are interested in the short-run impact of cost sharing on utilization, as opposed to the "on-impact" response to cost-sharing immediately at age 16. Our main analysis relies on an 18 month period before and after these individuals turn 16 years old, but our results are not sensitive to varying this time window.

Discussion of empirical approach. Before laying out our primary econometric specification, it is worth first discussing the need for a control group in our analysis. Visual inspection of Figures 1, 2, and A.2 suggest that within several cuts of the data, there is no detectable break in trend in healthcare utilization for the control cohorts at age 16. A reasonable approach to estimating the impact of cost sharing on utilization for the treated cohorts might therefore be simply a first-difference (FD) estimator, comparing pre- and post-age 16 utilization within that group. Critically, however, the descriptive figures also reveal a substantial utilization trend in age, which one would need to adjust for. One approach to this adjustment would be to simply control for a linear (or otherwise parametric) relationship between utilization and age, calibrated based

on the treated group's pre-16 utilization. While potentially reasonable, an important concern with this approach is that the relationship between utilization and age while under 16 is not a good counterfactual for that relationship when over 16.

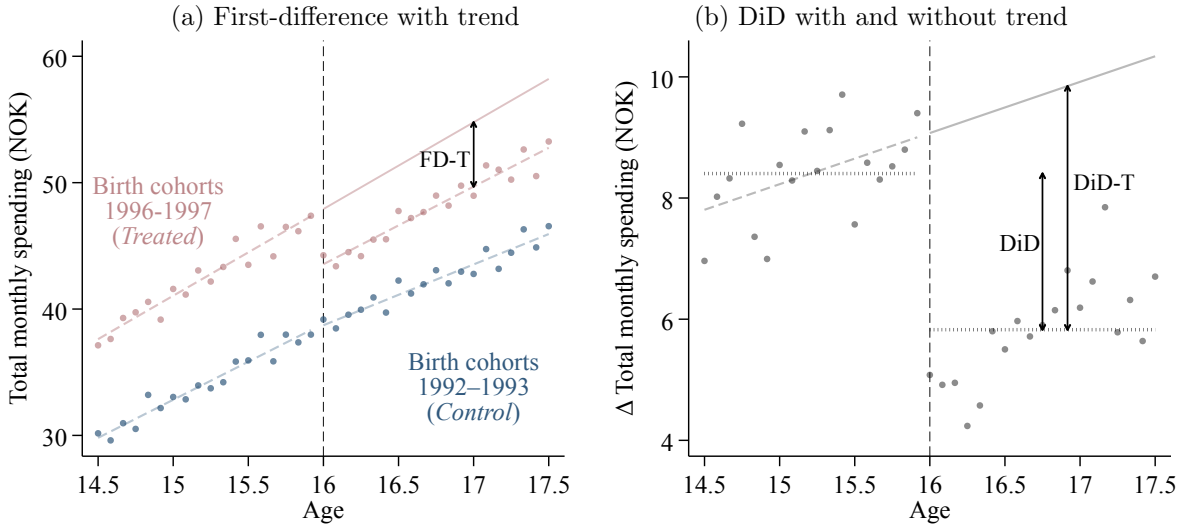
A natural way to address the concern that the age-path of utilization could differ pre- and post-16 would be to use the experience of the control group——rather than the pre-period of the treatment group——to learn about the counterfactual relationship between healthcare utilization and age during the post-16 age range. This approach could be implemented with a nonparametric event study analysis, and summarized with a standard difference-in-differences estimator (DiD). While natural, this approach also raises some potential concerns in our setting. In particular, individuals in our treatment group are observed at a later point in calendar time than our control group. The treatment group is observed between 2010 and 2015, while the control group is observed between 2006 and 2011 (see Appendix Figure A.1). Changes over time in the national fee schedules used to reimburse providers therefore introduce variation in total healthcare spending that is not directly reflective of changes in consumer behavior. To neutralize this source of variation, we normalize total healthcare spending using the average provider reimbursement rates that prevailed during 2006–2015. This procedure produces a measure of healthcare utilization that is independent of any temporal variation in reimbursement rates. Even with this normalization, however, the progression of calendar time could still pose a challenge if there are overall trends in healthcare utilization occurring over this period. Indeed, Table 1 indicates that the average number of primary care visits per year increased from 1.9 to 2.5 between the calendar time at which our control cohorts and treatment cohorts were 15 years old. If this trend occurred non-linearly over time, it could introduce non-parallel trends between healthcare utilization in our treatment and control groups prior to age 16.

Figure 3 presents a visual comparison of these approaches. Panel (a) shows average primary care spending by age-month, separately for the treatment and control cohorts (replicating the data presented in panel (a) of Figure 1). We now also overlay linear lines of best fit for the data, separately for pre- and post-16 for each group (shown with short-dashed lines), as well as an extrapolation of the pre-16 age trend for the treated group (shown with a solid line). The average vertical distance between this extrapolation and the observed post-16 data for the treated group would correspond to a first-difference estimator adjusted for a linear age trend (FD-T).

Panel (b) plots the difference between average spending in the treatment and control cohorts at each age-month. Again, the short-dashed lines show the best linear fit of the data separately in the pre- and post-16 periods, while the solid line shows the extrapolation of the pre-16 trend. The dotted lines in this panel represent the means of the pre-16 and post-16 data, representing the mean difference between treated and control group spending separately for pre- and post-16. The vertical difference between the dotted lines would correspond to a standard difference-in-differences (DiD) estimator.

It is clear from panel (b), however, that there is a differential pre-16 age trend between the

Figure 3. Comparison of Econometric Approaches (Primary Care)



Notes: The figure illustrates the three econometric approaches discussed in this section. Panel (a) shows average primary care spending by age-month, separately for the treated and control cohorts. The short-dashed lines show the best linear fit of the data separately by treatment group and pre- and post-16, while the solid line shows the extrapolation of the pre-16 trend in the treated group. Panel (b) plots the vertical difference between the treatment and control groups at each age-month. The short-dashed lines show the best linear fit separately by pre- and post-16, while the solid line shows the extrapolation of the pre-16 trend. The dotted lines show the means of the data in the pre- and post-16 periods.

treatment and control cohorts. The pre-16 age-path of primary care utilization in the treated group is steeper than that for the control group, consistent with an increase in the use of primary care over calendar time. A common approach to this situation in the literature has been to control for a differential linear pre-trend between the treatment and control groups (e.g., Dobkin et al., 2018; Gruber, Jensen and Kleven, 2021). This approach in effect applies a linear extrapolation of the pre-16 age trend *within* the treatment group (as in the FD-T approach), while still controlling for any higher-order relationship between utilization and age that is observed in the control group (in addition to any break in trend age at age-16 that might be observed in the control group). If there is no non-linearity in the age-path of utilization in the control group, nor any break in trend at age 16, this approach should yield nearly identical results to the FD-T estimator. The differences-in-differences estimator with differential pre-16 age trend (DiD-T) is also illustrated in panel (b). Based on unweighted raw means alone, the estimated effect would be 3.6 NOK per month, while FD-T implies 4.9 NOK per month, and DiD implies 1.8 NOK per month.

In sum, we find that among our full sample of individuals, using a FD-T estimator (first-differences with a linear control for pre-16 age) or a DiD-T estimator (difference-in-differences with a linear control for pre-16 age) will likely produce fairly similar results. Our formal econometric analysis in Section III.B will confirm this. That said, the focus of this paper is on heterogeneity across demographic and socioeconomic subgroups. While non-linearity in age and a break in trend at age 16 do not appear among the control group in aggregate, it is possible they could appear within subgroups. Because the DiD-T estimator will appropriately control for these factors should they appear, this will be our preferred specification.

Econometric model. We implement our analysis using the following regression:

$$Y_{ia} = \beta_a \cdot TRT_i + \delta_a + \gamma_{b(i)} + \varepsilon_{ia}, \tag{1}$$

where Y_{ia} is the outcome for individual i at age-month a, TRT_i is a dummy variable equal to 1 for individuals in birth cohorts 1996–1997, δ_a is a full set of age-month fixed effects, and $\gamma_{b(i)}$ is a set of birth-year-month fixed effects. Our age-month fixed effects flexibly control for general trends in age, while our birth-year-month fixed effects control for time-invariant differences across birth-year-month cohorts (including seasonality in month of birth).

The coefficients β_a represent the average difference in the outcome of interest between the treatment and control cohorts at every age-month, after removing birth-year-month-level means. We omit the coefficient on age-month 15 years and 1 month, so that the difference between groups is normalized to zero one year prior to turning 16. Without the birth-year-month fixed effects, the coefficients β_a would simply correspond to the differences between the raw means for each cohort in each age-month (as shown in panel (b) of Figure 3).

Equation 1 represents an unadjusted event study specification. Wherever event study estimates are presented graphically, we will present these unadjusted coefficients. When summarizing our estimates in terms of an average treatment effect, our preferred specifications will remove a differential linear pre-16 age trend between the treatment and control groups (corresponding to the DiD-T estimator discussed above). To do this, we estimate a group-specific linear trend using pre-16 data, and residualize the outcome variable based on the estimated trend. Specifically, we first regress the outcome Y_{ia}^g on a linear age trend $\theta^g \cdot a$ and the full set of birth-year-month dummies using data from pre-16 age-months, separately for the treated and control groups g. We then estimate Equation 1 on the full age range using the residualized outcomes $Y_{ia}^g - \hat{\theta}^g \cdot a$.

We calculate the average treatment effect on the treated (ATT) as the difference between the average post-period event study estimate and the average pre-period event study estimate:

$$\text{ATT} = \frac{1}{18}\left(\sum_{a \in \mathcal{A}^{post}} \beta_a \; - \sum_{a \in \mathcal{A}^{pre}} \beta_a\right), \tag{2}$$

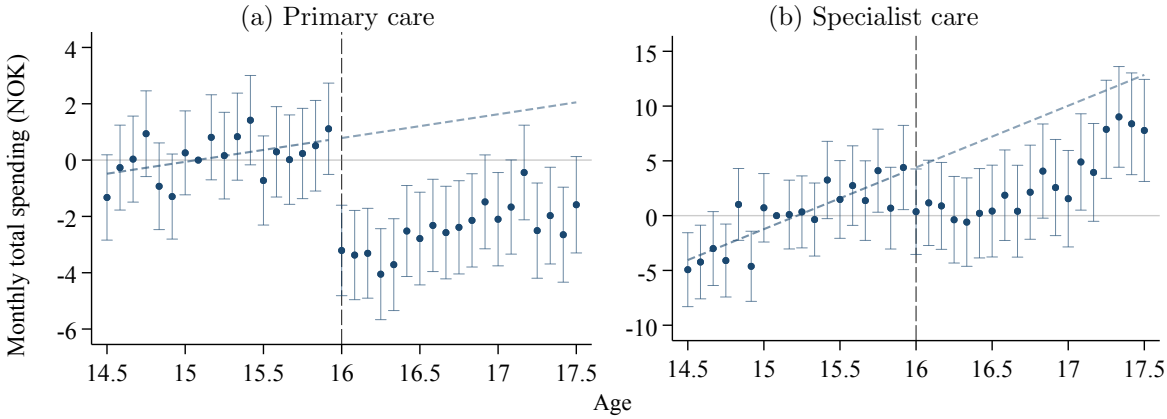
where $\mathcal{A}^{pre}$ is the set of 18 pre-16 age-months, and $\mathcal{A}^{post}$ is the set of 18 post-16 age-months. This resembles the standard difference-in-difference estimand.

III.B Aggregate Effects

Figure 4 presents estimates from Equation 1 in our full sample of individuals. Panel (a) shows estimates for primary care utilization, while panel (b) shows specialist care. For each outcome, we plot the unadjusted event study coefficients, as well as the implied differential linear pre-16 age-trend. The event study analysis echoes what was evident from the raw data in Figure 1. In both categories of outpatient care, there is a drop in healthcare utilization upon exposure to

cost-sharing, leading to lower utilization throughout the post period.

Figure 4. Outpatient Healthcare Utilization by Age and Care Category



Notes: The figure plots the unadjusted event study coefficients from Equation 1 for monthly total spending in (a) primary care and (b) specialist care. The drop lines represent the 95 percent confidence intervals. Standard errors are clustered at the individual level. The coefficient on age 15 years and 1 month is normalized to zero. The dashed lines are lines of best fit based on the pre-16 event study coefficients, representing the differential pre-16 age trend between the treatment and control groups.

The corresponding average treatment effects (adjusted for the differential pre-16 age trends) are summarized in Table 3. Total monthly primary care spending drops by on average 3.9 NOK. Among the treated group, total monthly primary care spending during age 15 was on average 44.3 NOK. Relative to this benchmark, the average impact of cost-sharing was to reduce primary care utilization by 8.8 percent. Specialist care spending, in turn, fell by on average 5.6 NOK per month, corresponding to a 5.1 percent reduction in utilization. Consistent with the visual evidence from the raw data and event study plots, we find no effect on inpatient utilization.

Table 3. Effect of Cost-Sharing on Healthcare Utilization

	Monthly total spending (NOK)		
	Primary care	Specialist care	Inpatient care
ATT	−3.880***	−5.648***	0.292
	(0.258)	(0.963)	(2.739)
Treated age-15 mean	44.3	111.5	72.0
ATT / Treated age-15 mean	-0.088	-0.051	0.004
# Observations	9,293,610	9,293,610	8,392,979

Notes: This table presents our ATT estimates, calculated as in Equation 2, using event study coefficients adjusted for a differential linear pre-16 age trend between the treated and control groups (corresponding to the DiD-T estimator discussed in Section III.A). The table also reports the mean of the dependent variable among the treated group during the year they were 15, as well as the treatment effect as a fraction of this amount. All specifications include birth-year-month fixed effects and age-month fixed effect. Standard errors are clustered at the individual level.

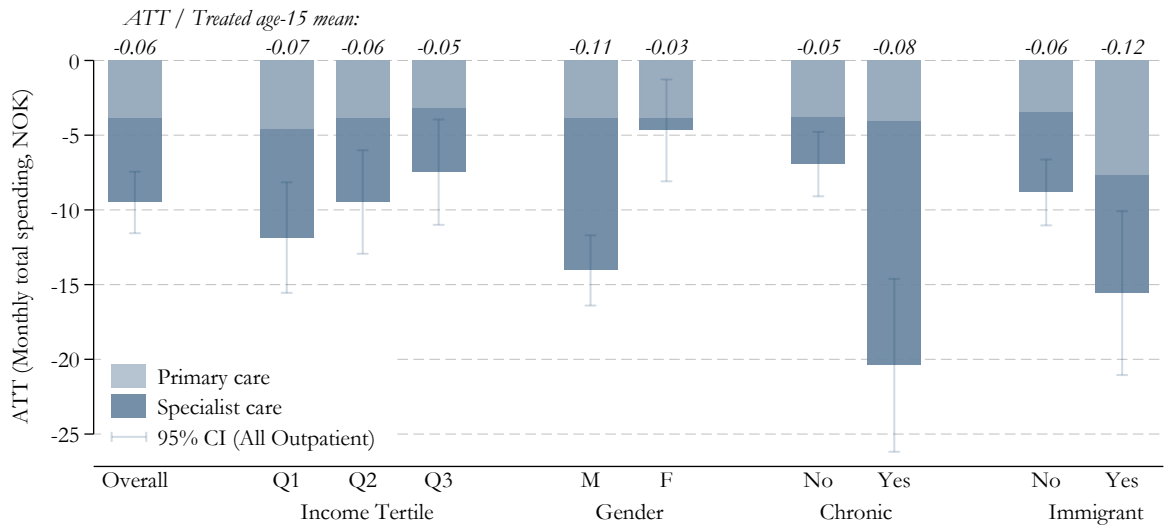
Appendix Table A.6 reports corresponding estimates using a first-difference estimator within the treated group (FD-T), as discussed in Section III.A. The results are similar to those reported in Table 3. Appendix Table A.7 reports the results from a number of alternative specifications, including (i) reducing the sample to include only 12 months before and after turning 16 (ages

15–16); (ii) expanding the sample to include 24 months before and after turning 16 (ages 14–17); (iii) defining the 1997 and 1998 birth-year cohorts (rather than 1996 and 1997) as the treated cohorts; and (iv) including individual fixed effects (rather than birth-year-month fixed effects) in our regressions. In all cases, our results are qualitatively unchanged.

III.C Heterogeneity Across Demographic Groups

Figure 5 summarizes the extent of heterogeneity in the response to cost-sharing by parental income, gender, whether the individual has a chronic condition, and whether the individual is part of an immigrant family. Appendix Table A.8 reports the full set of corresponding estimates. We find that there is considerable heterogeneity in treatment effects. By parental income, we find that the reduction in outpatient utilization is largest among the lowest-income group, with a point estimate of 12 NOK per month. The reduction in the top third of the income distribution is 7 NOK per month. There are similar gradients across gender and immigrant status. We estimate that males reduce their utilization by almost three times more than females, and that individuals from immigrant families reduce their utilization by almost twice as much as individuals from non-immigrant families. The largest gradient we estimate is by health status. Individuals with a chronic condition reduce their utilization by 20 NOK per month (8 percent of the age-15 mean in the treated group), while individuals without a chronic condition reduce their utilization by only 7 NOK (5 percent of baseline mean).

Figure 5. Heterogeneity in Effect of Cost-Sharing on Outpatient Utilization



Notes: The figures shows ATT estimates, calculated as in Equation 2, overall and in sub-populations. The point estimates on All Outpatient care are split by primary and specialist care. The drop-lines represent the 95 percent confidence interval on the estimate for All Outpatient care. All specifications include birth-year-month fixed effects and age-month fixed effect. Standard errors are clustered at the individual level. Results in table form are reported in Appendix Table A.8.

IV Distributional Implications

Our results so far indicate that the introduction of cost-sharing at age 16 does materially affect the amount of healthcare utilized by young adults in Norway. Moreover, they suggest that the impact of cost-sharing differs across demographic groups, both due to differential utilization responses, as well as due simply to differences in the levels of out-of-pocket spending experienced by different groups. To form an understanding of how these combined forces impact the distributional implications of cost-sharing, we now consider the effects of a counterfactual policy in which the age threshold for the child copayment exemption were raised to age 18. Such a policy has been considered in Norway, and there is ongoing debate about age cutoffs in a number of other OCED countries.[17] We quantify the effects of such a policy for individuals in birth year cohorts 1996–1997. With the copayment exemption extended, these individuals would have benefited from lower out-of-pocket costs and, according to our estimates, greater healthcare utilization, while they were age 16 and 17. The cost, in turn, would be paid by taxpayers.

IV.A Framework

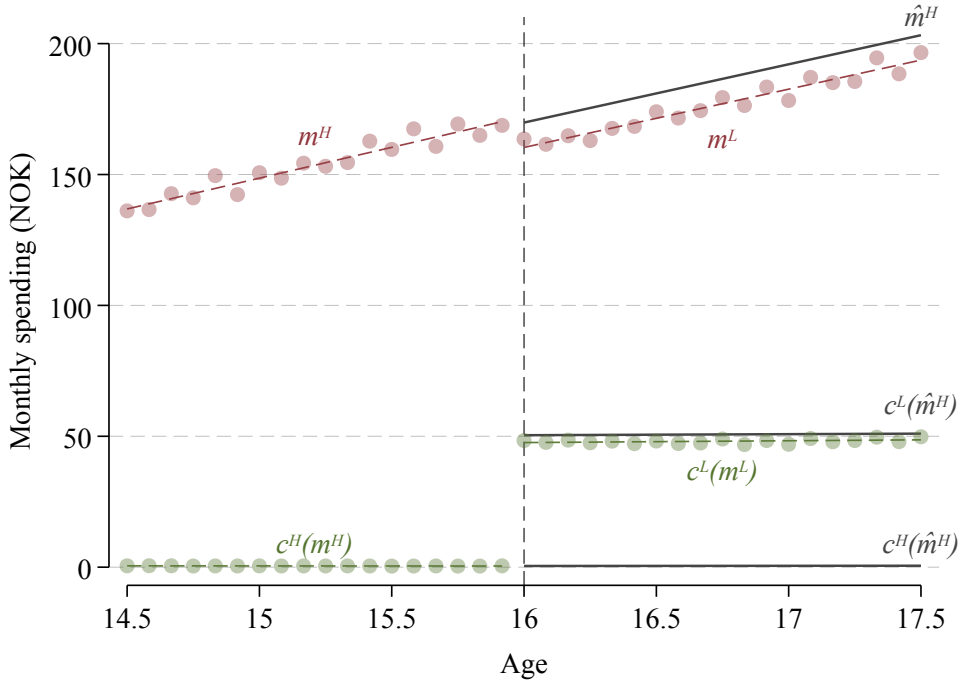
To fix ideas, we proceed within the following framework. Say that standard Norwegian public health insurance represents a low-coverage health insurance contract x^L, while the standard coverage *plus* the child copayment exemption represents a high-coverage health insurance contract x^H. Suppose these contracts can be summarized by a uni-dimensional out-of-pocket cost function that maps total healthcare spending into patient out-of-pocket cost. Denote the out-of-pocket cost functions associated with the two contracts as $c^L(\cdot)$ and $c^H(\cdot)$, respectively. Denote individuals' latent choice of healthcare utilization under the low-coverage contract as m^L, and that under the high-coverage contract as m^H. The out-of-pocket costs associated with those choices would then be given by $c^L(m^L)$ and $c^H(m^H)$. Supposing that more generous coverage increases utilization and lowers out-of-pocket costs, one would expect $m^H > m^L$ and $c^H(m^H) < c^L(m^L)$.

In reality, individuals born in years 1996–1997 did face cost-sharing at ages 16 and 17 (i.e., were enrolled in the low-coverage contract x^L). The data for this group during this age range therefore contain information only on m^L and $c^L(m^L)$. For outpatient spending (primary and specialist care combined), m^L was on average 2,059 NOK per year at age 16, and $c^L(m^L)$ was 575 NOK per year (cf. Table 1). Figure 6 shows this data graphically at a monthly level. Total spending m is shown in red, and out-of-pocket spending $c(m)$ is shown in green. Prior to turning 16, these individuals still enjoyed the copayment exemption (i.e., were enrolled in contract x^H). The pre-16 data therefore contain information about m^H and $c^H(m^H)$.

Estimating counterfactual total spending $\hat{m}^H$ is a straightforward application of our event study analysis. As shown in Table 3, our estimates imply that moving the 1996–1997 cohorts from the

[17] For example, The Norwegian Labor Party (*Arbeidepartiet*) has promised to remove cost-sharing for primary care for 16 and 17 year-olds (Aftenposten, 2016)

Figure 6. Counterfactual Outpatient Care Utilization (Birth Cohorts 1996–1997)



Notes: The figure shows actual (m) and counterfactual ($\hat{m}$) monthly outpatient spending for birth-year cohorts 1996–1997 under contract x^L (the standard Norwegian health insurance contract) and contract x^H (the standard contract plus the child copayment exemption). The figure also reports the corresponding out-of-pocket costs associated with those levels of utilization, both actual ($c(m)$) and counterfactual ($c(\hat{m})$).

high-coverage contract to the low-coverage contract at age 16 reduced their average outpatient spending by 9.5 NOK per month, or 114 NOK per year. Given that the observed level of spending was 2,059 NOK per year, our estimates imply that $\hat{m}^H$ would have been on average 2,173 NOK per year had these cohorts retained the copayment exemption through age 17.

We can then calculate the out-of-pocket cost $c^H(\hat{m}^H)$ that would have been associated with this higher level of spending had the copayment exemption been extended, as well as the out-of-pocket cost $c^L(\hat{m}^H)$ that would have been associated with this higher level of utilization under the observed (low-coverage) contract. We calculate these objects by assuming local linearity in the out-of-pocket cost functions around the observed levels of utilization. The actuarial value of contract x^L for outpatient spending in this population was 0.730, while the actuarial value of contract x^H was 0.997.[18] For contract x^L, we therefore estimate that counterfactual out-of-pocket spending $c^L(\hat{m}^H)$ would have been on average 31 NOK ((1−0.730)*114) higher than $c^L(m^L)$ per year.[19] For contract x^H, we estimate that counterfactual out-of-pocket costs $c^H(\hat{m}^H)$ would have

[18] Actuarial value (AV) is calculated as the average ratio of insured spending to total spending among all individuals in the population. For the low-coverage plan x^L, we calculate AV using the observed age-16 data. For the high-coverage plan x^H, we calculate AV using the observed age-15 data.

[19] Of course, this is an approximation. The out-of-pocket cost functions of these contracts are highly nonlinear, and due to the presence of copayments, they are not even surjective functions. Modeling this complexity is outside the scope of the present analysis. However, we note that so long as the out-of-pocket cost function is assumed to be weakly increasing and concave, $c^L(\hat{m}^H) - c^L(m^L)$ is at least zero and at most $\hat{m}^H - m^L$. That is, increasing total healthcare utilization will weakly raise out-of-pocket spending, but not by more than the increase in total spending. The reality is somewhere in between. Our baseline approach is to assume that the ratio of out-of-pocket

remained approximately zero, just as in the pre-16 period. Figure 6 depicts the counterfactual predictions for out-of-pocket spending in gray.

IV.B Costs and Benefits

Taking stock, it is now straightforward to estimate the aggregate financial implications of extending the child cost-sharing exemption to age 18. On a per-person per-year basis, outpatient care healthcare utilization would increase by 114 NOK, and out-of-pocket spending on outpatient care would decrease by 569 NOK. Government spending would thus increase by 683 NOK. Depending on the incidence of taxation, large heterogeneity across demographic groups means there are clear financial winners and losers.[20] Panel (a) of Figure 7 summarizes these implications for out-of-pocket spending across groups.

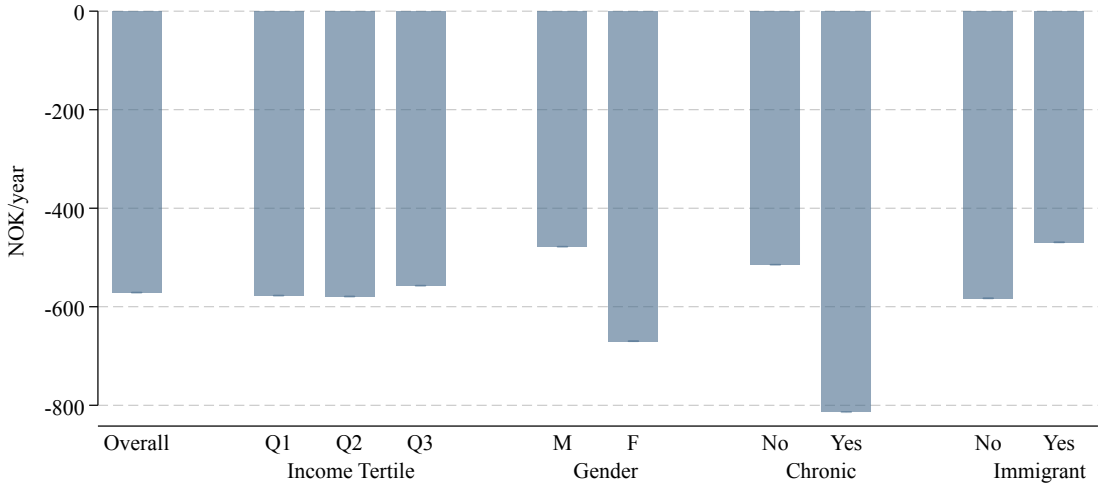
Naturally, these monetary amounts do not tell the whole story, from either a private or social perspective. Increased coverage may provide benefits in (at least) three clear ways. First, there is a textbook increase in risk protection derived from decreased individual uncertainty in out-of-pocket spending (Zeckhauser, 1970). Second, incremental healthcare utilization may itself be valuable, either in an ex ante sense (to a degree possible exceeding its cost; Acquatella and Marone, 2025) or in an ex post sense (to a degree that will fall below its cost; Pauly, 1968). Third, there may be positive internalities or externalities associated with healthcare utilization, for example in terms of lower probability of future illness (Baicker, Mullainathan and Schwartzstein, 2015; Frick and Chernew, 2009). An important piece of information for interpreting the relative important of these potential benefits is thus the types of care that are marginal to changes in cost-sharing.

cost to total spending is constant over utilization levels between m^L and $\hat{m}^H$.

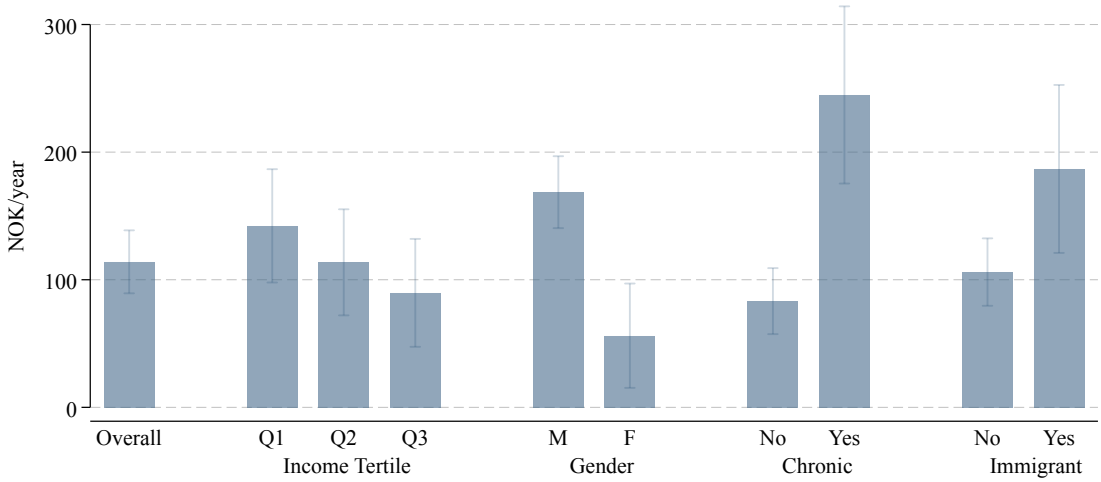
[20] Income taxes do vary by income and can thus be thought to fall disproportionately on the higher income relative to the lowest income households. That said, in this specific context the taxes would be distributed across a broader base than only those benefiting (in an immediate sense) from the policy.

Figure 7. Distributional Implications of Eliminating Cost-Sharing (NOK/year)

(a) Change in Out-of-pocket Spending



(b) Change in Outpatient Healthcare Utilization



Notes: The figures shows counterfactual changes in annual out-of-pocket spending (Panel a) and total outpatient utilization (Panel b) across socio-demographic groups if cost sharing were eliminated for children aged 16-18.

V Heterogeneity Across Types of Care

We turn next to investigating what specific types of care are marginal to cost sharing in this setting, and of course, whether these margins vary across population groups. We evaluate heterogeneity by type of care using the diagnosis codes recorded on each patient encounter.[21] Based on these codes, healthcare utilization can be categorized by the 21 chapters of the International Classification of Disease (ICD) system. We then further aggregate over chapters representing less than 3 percent of age-15 utilization, leaving us with 9 categories. Because this analysis relies crucially on the diagnosis coded on each healthcare encounter, it is particularly vulnerable to temporal variation

[21] Primary care encounters are coded using the ICPC-2 system while specialist care and inpatient encounters are coded using the ICD-10 system. For the purpose of this analysis, we translate ICPC-2 to ICD-10 using the crosswalk provided by the Norwegian Directorate of Health (Norwegian directorate of health, 2022). Imaging and lab encounters are not required to have a diagnosis code recorded, so we group these services into their own category.

in coding practices or the coding system. Indeed, there was a change in coding practices in 2009, before which diagnosis codes were not required to be provided on outpatient hospital encounters (whereas afterwards, they were required). As a result, we conduct this analysis using our first-differences (FD-T) specification, thus relying only on a single calendar time period.[22]

Figure 8 summarizes the response to cost-sharing by diagnosis category. As above, the estimates are decomposed between primary and specialist care, and the confidence interval on their sum (all outpatient spending) is depicted with drop lines. We find that in absolute terms, visits related to mental health account for the largest portion of the overall decline in utilization. That said, mental health visits also account for the largest portion of outpatient healthcare utilization at baseline (24 percent of age-15 total spending).[23] When considering the proportional reduction (*ATT / Treated age-15 mean*, shown on the right side of the plot) mental health utilization declined by about 9 percent. While this is still above-average across diagnosis categories, it is not so high of a proportional reduction as is observed in skin-related or musculoskeletal-related encounters (where there was a 17 percent and 10 percent reduction in utilization, respectively).[24]

Figure 9 splits the responses by income groups. We find that mental health is also among the biggest contributors to the *differential* effect of cost sharing across groups. In the lowest income tertile, mental health utilization drops by 12 percent of baseline mean. In the top tertile, the point estimate is not statistically distinguishable from zero. There are similarly pronounced income gradients within skin-related, respiratory-related, and musculoskeletal-related diagnoses. Interestingly, there are *opposite* income gradients in a few categories: Abnormal clinic findings and Imaging and lab.[25] In these categories, higher-income individuals reduced their utilization by more than lower-income individuals, suggesting potentially differential patterns for over- versus under-utilization across diagnosis groups.

Appendix Figures A.4, A.5, and A.6 present the corresponding plots by gender, immigrant status, and health status. By gender, we find that the overall pattern (evident in Figure 5) of

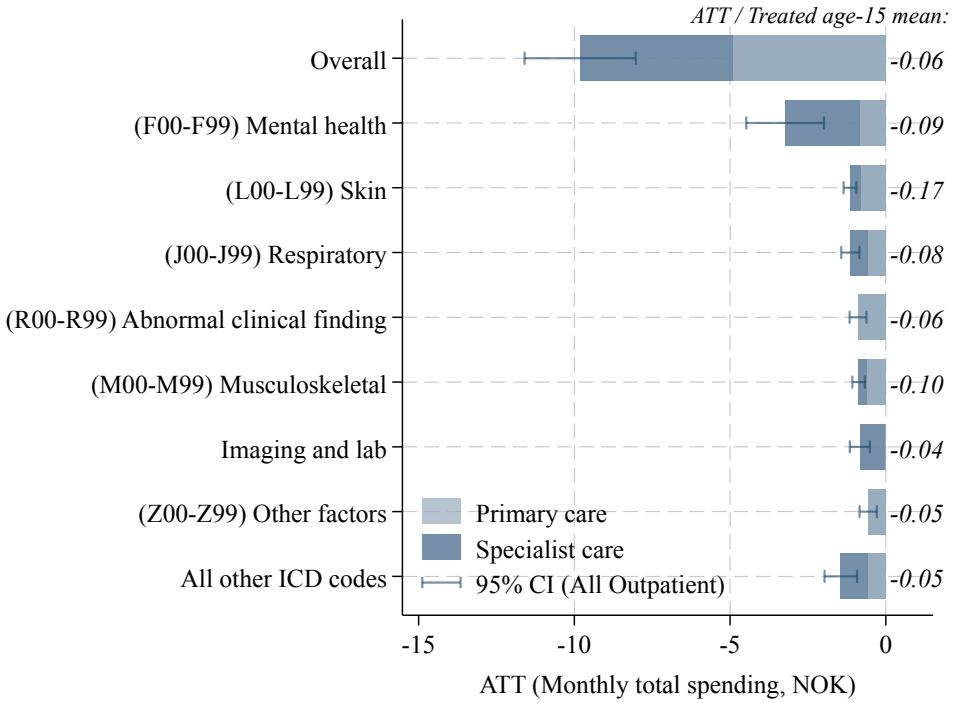
[22] We exclude ICD Chapter 19 ("Injury, Poisoning, and Certain Other Consequences of External Causes") from this analysis because we observe jumps in the frequency of these visits directly at age 16, both the treatment and control groups. These jumps are likely related to individual freedoms gained at age 16, such as the ability to get a moped license. This type of pattern motivates the use of the control group in our main difference-in-differences analysis, but confounds the analysis here based on first-differences alone.

[23] The most common mental health related diagnosis at age 15 is F90 (Attention-deficit/hyperactivity disorder), accounting for 23 percent of encounters and 19 percent of total spending.

[24] Within skin-related diagnoses, the most common diagnosis is L70 (Acne), representing 38 percent of encounters and 30 percent of spending. In the musculoskeletal chapter, M25 (Other joint disorders, not elsewhere classified) is most common by encounter count (31 percent), while M41 (Scoliosis) accounts for the largest share of spending (16 percent). Among respiratory-related diagnoses, the top three codes are J06 (Acute upper respiratory infections of multiple and unspecified sites), J30 (Vasomotor and allergic rhinitis), and J45 (Asthma), together accounting for 63 percent of encounters and 55 percent of spending.

[25] The most common diagnoses within the chapter for Abnormal clinic findings are R10 (Abdominal and pelvic pain) and R53 (Malaise and fatigue), together accounting for 26 percent of encounters and 28 percent of spending. Among imaging and lab encounters, "Imaging diagnostics: X-ray, ultrasound performed in a specialist department, and nuclear medicine imaging" is the most common billing code with 52 percent of encounters and 53 percent of spending. The second most common is "Direct quantification of alcohols, hormones, pharmaceuticals, vitamins, or other organic compounds using RIA/EIA or gas-/liquid-chromatography." with 16 percent of encounters and 15 percent of spending.

Figure 8. Effect of Cost-Sharing on Utilization by Diagnosis Group



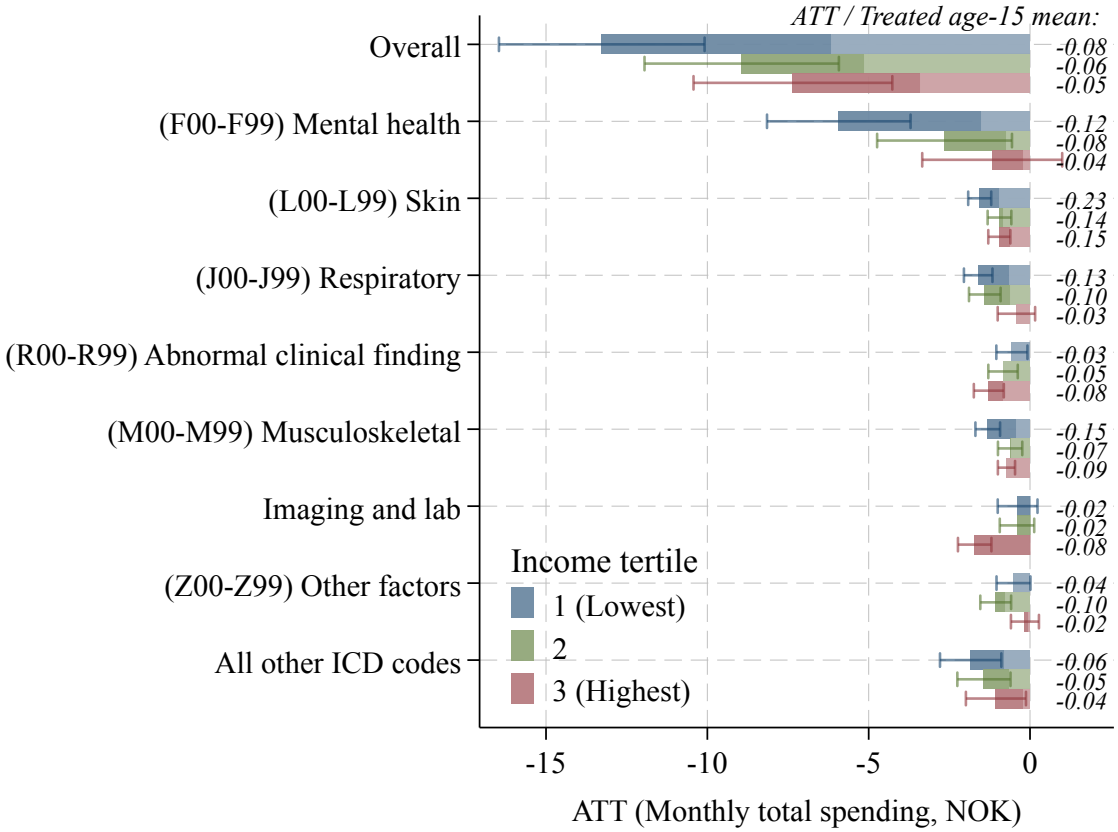
Notes: This figure shows ATT estimates by diagnosis group, using the FD-T estimator discussed in Section III.A, within the 1996–1997 birth year cohorts. The point estimates on All Outpatient care are split by primary care (light) and specialist care (dark color). The drop-lines represent the 95 percent confidence interval on the estimate for All Outpatient care. All specifications include birth-year-month fixed effects and age-month fixed effect. Standard errors are clustered at the individual level.

males reducing their utilization to a far greater degree than females holds true almost across the board by diagnosis group. In particular, the reduction in mental healthcare utilization and imaging/lab utilization are driven entirely by males (females responses are not distinguishable from zero). The one exception to this pattern is within Abnormal clinic findings, where females are represented to a far greater extent than males.[26] By immigrant status, we find that while immigrants reduce their outpatient utilization by far more than non-immigrants on average, these effects are driven by all diagnosis groups *except* mental health and imaging/lab. In these categories, immigrant reduction in utilization is not statistically distinguishable from zero.[27] Finally, by health status, we find that individuals with a chronic health condition are entirely responsible for the utilization responses within respiratory-related and "other factors"-related encounters. In contrast, individuals *without* a chronic condition are entirely responsible for the responses within skin-related encounters. Individuals with a chronic condition are also over-represented in reductions of mental healthcare utilization.

[26]The most common age-15 diagnosis within Abnormal clinic findings for both males and females is R10 (Abdominal and pelvic pain).

[27]Interestingly, immigrants are unique among demographic subgroups in that a large part of their reduction in utilization is driven by the small diagnosis groups ("All other ICD codes"). The most common diagnosis code in this category for immigrants at age 15 was Z03 (Encounter for medical observation and evaluation for suspected diseases and conditions, ruled out).

Figure 9. Effect of Cost-sharing on Utilization by Diagnosis Group and Income



Notes: This figure shows ATT estimates by diagnosis group, using the FD-T estimator discussed in Section III.A, separately by income tertile within the 1996–1997 birth year cohorts. The point estimates on All Outpatient care are split by primary care (light color) and specialist care (dark color). The drop-lines represent the 95 percent confidence interval on the estimate for All Outpatient care. All specifications include birth-year-month fixed effects and age-month fixed effect. Standard errors are clustered at the individual level.

VI Discussion and Conclusion

Our results suggest that extending the child cost-sharing exemption in Norway up to age 18 would have a number of simultaneous and heterogeneous effects. Males, immigrants, individuals with a chronic health condition, and lower-income individuals would see especially large increases in healthcare utilization, concentrated in mental healthcare, encounters for general medical evaluation, respiratory care, and skin-related care. Females, non-immigrants, and again individuals with a chronic health condition and those with lower income, would experience an especially large decrease in their out-of-pocket healthcare spending. Were there a proportionate increase in (progressive) taxation to fund the cost-sharing change, higher income individuals would experience a disproportionate tax increase. Along the distribution of income, lower cost-sharing would thus appear to unambiguously benefit lower income groups.

Taken together, our results suggest that cost-sharing may have meaningful distributional consequences, even within a universal healthcare system with relatively modest patient exposure to out-of-pocket costs. They also underscore an important tension inherent in the design of cost-

sharing policy. Cost-sharing is often motivated as a tool to reduce over-utilization of healthcare and thus to improve allocative efficiency. Yet the groups most responsive to cost-sharing are plausibly those for whom marginal healthcare utilization is least likely to represent pure over-consumption. For example, if one were to categorize mental healthcare as "high value" and imaging and lab visits as "low value" care, it might appear that cost-sharing inefficiently discourage high-value care among some groups while having less bite on lower-value care among others.

Our analysis has several limitations. We study a relatively narrow age range, and the types of healthcare utilization relevant for adolescents may differ from those relevant for older populations. Our setting features modest levels of cost-sharing relative to many other contexts, and responses could be non-linear at higher price levels. Despite these limitations, we believe our results offer useful input for policy discussions about the design of cost-sharing in universal healthcare systems. The fact that cost-sharing has heterogeneous effects—both in terms of financial burden and in terms of behavioral response—suggests that uniform cost-sharing rules may have unintended distributional consequences. Whether and how to address these consequences depends on judgments about the relative social value of different types of care across different populations, as well as on the feasibility of implementing more tailored cost-sharing policies. Our findings provide some of the empirical foundation on which such judgments might be based.

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Appendix A Construction of Analysis Dataset

The data for this study are derived from the Norwegian Patient Registry (NPR), maintained by the Norwegian Directorate of Health; the Control and Payment of Health Reimbursements Database (KUHR), maintained by the Norwegian Health Economics Administration (HELFO); and basic demographic information contained in the administrative registries at Statistics Norway (SSB). All individuals have a unique identifier, which can be merged across these datasets. Our baseline sample of individuals is derived from the Norwegian Population Register (2017 extract), where we limit to individuals born in our years of interest. Since the population register contains individuals who immigrated to Norway as adults, we limit at the outset to individuals who were resident in Norway in at least one year prior to age 14. We subsequently limit to individuals that were continually resident in Norway from ages 14–17 and (for Norwegian-born individuals) to those who are not missing key demographic information. Appendix Table A.2 summarizes these sample restrictions.

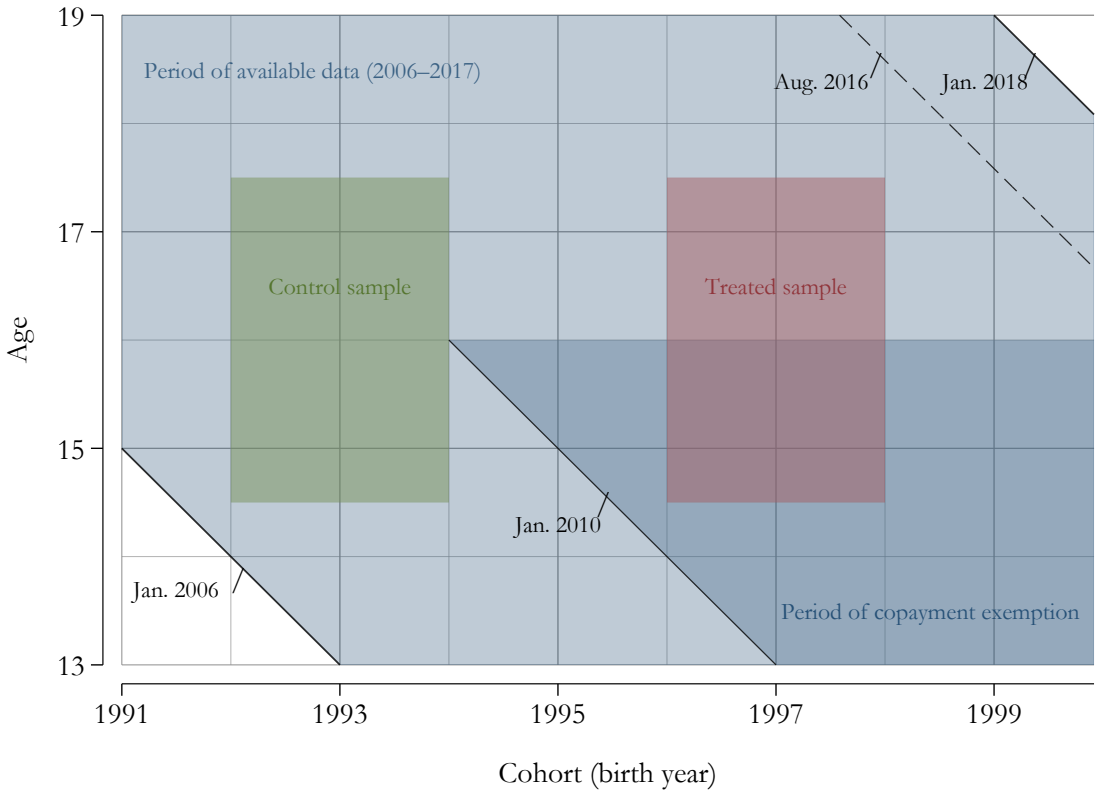
Once we have a focal set of individuals, we construct an analysis dataset at the individual-*agemonth* level, where *agemonth* is age measured in months. Using the individual's birth date combined with the date of the healthcare encounter, we assign an *agemonth* to all encounters in the KUHR and NPR healthcare utilization data.[28] We then sum utilization up to the individual-*agemonth* level. Our primary outcome is total healthcare spending, which includes both out-of-pocket payments (*egenandel*) and activity-based government reimbursements to providers. Some analyses also consider encounter counts within different service line or diagnosis categories. When

[28]For inpatient admissions, we use the date of admission.

calculating encounter counts, we limit to a maximum of one encounter per day per category of care.

We classify healthcare utilization into three mutually exclusive and exhaustive service line categories, based on the categorizations provided in the raw data: primary care, outpatient specialist care, and inpatient care. Appendix Table A.3 presents these categorizations and provides their definitions. Our final analysis sample contains birth year cohorts 1992, 1993, 1996, and 1997 during the 36 *agemonths* that they were between 14.5 and 17.5 years old. Within each service line category, we drop observations where total spending is above the 99.9th percentile among non-zero observations.

Figure A.1. Depiction of Analysis Sample and Cost-Sharing Variation



Notes: The figure shows the area from which we draw our analysis sample in terms of age range and birth-year cohort. The light blue shaded area represents the calendar time period over which we have data (2006–2017). The dark blue shaded area represents the period during which these individuals had a copayment exemption. In January 2010, the age-cutoff for child copayment exemption was raised from age 12 to age 16. The green shaded area represents our control sample (birth-year cohorts 1992–1993 over ages 14.5–17.5), while the red shaded area represents our treated sample (birth-year cohorts 1996–1997 over ages 14.5–17.5). This figure is referenced in section II.A.

Table A.1. Cap on Out-of-pocket Spending and GP Visit Copay by Year

Year	Out-of-pocket max. (NOK)	Standard copayment for GP visit (NOK)
2006	1,615	125
2007	1,660	130
2008	1,740	130
2009	1,780	132
2010	1,840	136
2011	1,880	136
2012	1,980	136
2013	2,040	140
2014	2,105	141
2015	2,185	141
2016	2,185	152
2017	2,205	152

Notes: The second column shows the level of the annual cap on out-of-pocket spending (*egenandeltak 1*) under the Norwegian national health insurance plan. The third column shows the out-of-pocket cost for a standard consultation with a GP as of Jan 1 each year. *Sources*: Forskrift om egenandelstak 1 (1997) and *Fastlege Normaltariffen* 2006–2017. This table is referenced in footnote 9.

Table A.2. Sample Construction by Birth Year

	1992	1993	1996	1997
Individuals in population register	64,944	64,207	66,596	65,749
Died before age 18	184	157	176	162
Not continually resident age 14–17	2,307	2,200	2,396	2,539
Non-immigrant and missing parental income	27	31	16	22
Final total	62,426	61,819	64,008	63,026

Notes: The table shows the number of individuals in each birth-year cohort dropped due to each sample selection criterion (in the order in which drops were made). This table is referenced in Section II.B and Appendix A.

Table A.3. Service Line Category Definitions

Category	Definition and source	Years available
Primary care	`praksis` containing "Fastlege," "Fastlønnet", or "Helsestasjon" in KUHR	2006–2017
Specialist care	`praksis` containing "Spesialist," "Legevakt," or "Poliklinikk" in KUHR; `omsorgsnivaa` = 3 in NPR	2006–2017
Inpatient	`omsorgsnivaa` in {1, 2} in NPR	2008–2017

Notes: The table shows the definition of each of our service line categories. The field `praksis` in the KUHR (physician) data refers to the type of the billing provider. The field `omsorgsnivaa` in the NPR (facility) data refers to the type of care occurring in a hospital setting. [`omsorgsnivaa`=3] refers to outpatient (*poliklinikk*) care. Inpatient care encompasses visits during which the patient was admitted to the hospital (this can include both overnight [`omsorgsnivaa`=1] and non-overnight [`omsorgsnivaa`=2] stays). This table is referenced in Appendix Section A.

Table A.4. Share of Chronic Patients by Diagnosis

Diagnosis code	Code system	Description	Pct. of individuals
R97	ICPC-2	Allergic rhinitis	0.47
R96	ICPC-2	Asthma	0.40
F71	ICPC-2	Conjunctivitis allergic	0.17
N88	ICPC-2	Epilepsy	0.05
T86	ICPC-2	Hypothyroidism/myxoedema	0.03
N99	ICPC-2	Neurological disease, other	0.03
T90	ICPC-2	Diabetes	0.02
T89	ICPC-2	Diabetes	0.02
L88	ICPC-2	Rheumatoid/seropositive arthritis	0.01
D94	ICPC-2	Chronic enteritis/ulcerative colitis	0.01
J47	ICD-10	Bronchiectasis	<0.01
J46	ICD-10	Status asthmaticus	<0.01
C64	ICD-10	Malignant neoplasm of kidney	<0.01
J40	ICD-10	Bronchitis, not specified	<0.01
J42	ICD-10	Unspecified chronic bronchitis	<0.01
C73	ICD-10	Malignant neoplasm of thyroid gland	<0.01
C56	ICD-10	Malignant neoplasm of ovary	<0.01
B24	ICD-10	Unspecified HIV disease	<0.01
J45	ICD-10	Asthma	<0.01
C07	ICD-10	Malignant neoplasm of parotid gland	<0.01
C20	ICD-10	Malignant neoplasm of rectum	<0.01
E10	ICD-10	Type 1 diabetes mellitus	<0.01
C80	ICD-10	Malignant neoplasm unspecified	<0.01
C01	ICD-10	Malignant neoplasm of base of tongue	<0.01

Notes: The table shows the set of International Classification of Primary Care (ICPC-2) and International Classification of Disease (ICD-10) codes we classify as severe chronic diagnoses. Our definition capture diagnoses for which most people require repeated visits to a physician for ongoing care. To qualify as a severe chronic diagnosis, we require that (among the 1992–1998 birth year cohorts) the average person with this diagnosis has an outpatient visit associated with this diagnosis in at least 2 years between the ages of 14 and 17. This table is referenced in footnote 12.

Table A.5. Summary Statistics by Income Tertile

	Birth cohorts 1992–1993			Birth cohorts 1996–1997		
Income tertile :	1	2	3	1	2	3
Number of individuals	41,389	41,388	41,388	42,304	42,304	42,303
Demographics						
Pct. female	0.48	0.49	0.49	0.48	0.49	0.49
Pct. immigrant	0.18	0.04	0.02	0.23	0.05	0.02
Pct. with chronic diagnosis	0.18	0.18	0.17	0.19	0.20	0.18
Pct. with a parent with higher education	0.24	0.41	0.66	0.27	0.47	0.72
Parental annual income (000 NOK)	385	559	915	454	668	1,036
Travel time to GP in minutes	11	9	8	10	8	7
Pct. urban	0.36	0.33	0.50	0.38	0.33	0.50
Visits per year						
Primary care	2.5	2.4	2.1	2.8	2.7	2.5
Specialist care	3.2	2.8	2.6	3.5	3.2	3.0
Inpatient care	0.10	0.09	0.08	0.10	0.10	0.09
Total healthcare spending (NOK)						
Primary care	514	477	435	619	582	539
Specialist care	1,054	938	908	1,586	1,452	1,400
Inpatient care	936	828	767	1,084	1,077	957
Out-of-pocket healthcare spending (NOK)						
Primary care	224	225	216	275	272	256
Specialist care	250	254	258	306	312	304
Inpatient care	0	0	0	0	0	0

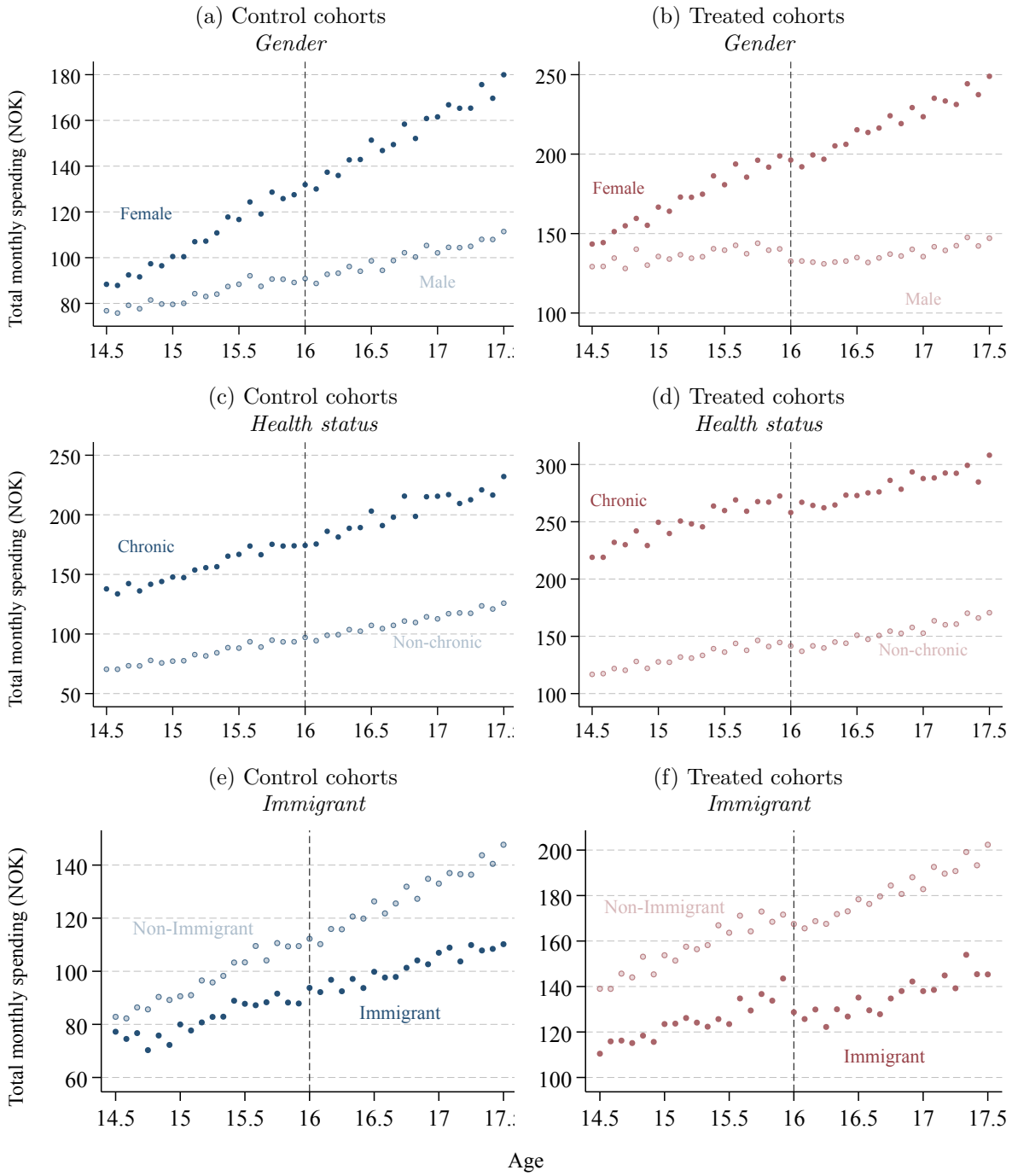
Notes: The table reports sample means by income tertile, separately between the 1992–1993 (control) and 1996–1997 (treated) birth cohorts. Tertile 1 is the lowest income, and tertile 3 is the highest. Income tertiles are calculated separately within each birth-year cohort. Demographics are fixed within an individual, corresponding to the year in which they turned 15. Utilization statistics are based on the year in which the individuals were age 16. This table is referenced in Section II.C.

Table A.6. Effect of Cost-Sharing on Utilization, First-Difference Estimator

	Monthly total spending (NOK)		
	Primary care	Specialist care	Inpatient care
ATT	-4.908^{***}	-4.949^{***}	0.290
	(0.191)	(0.851)	(1.743)
Treated age-15 mean	44.3	111.5	72.0
ATT / Treated age-15 mean	-0.111	-0.044	0.004
# Observations	4,697,531	4,697,531	4,697,531

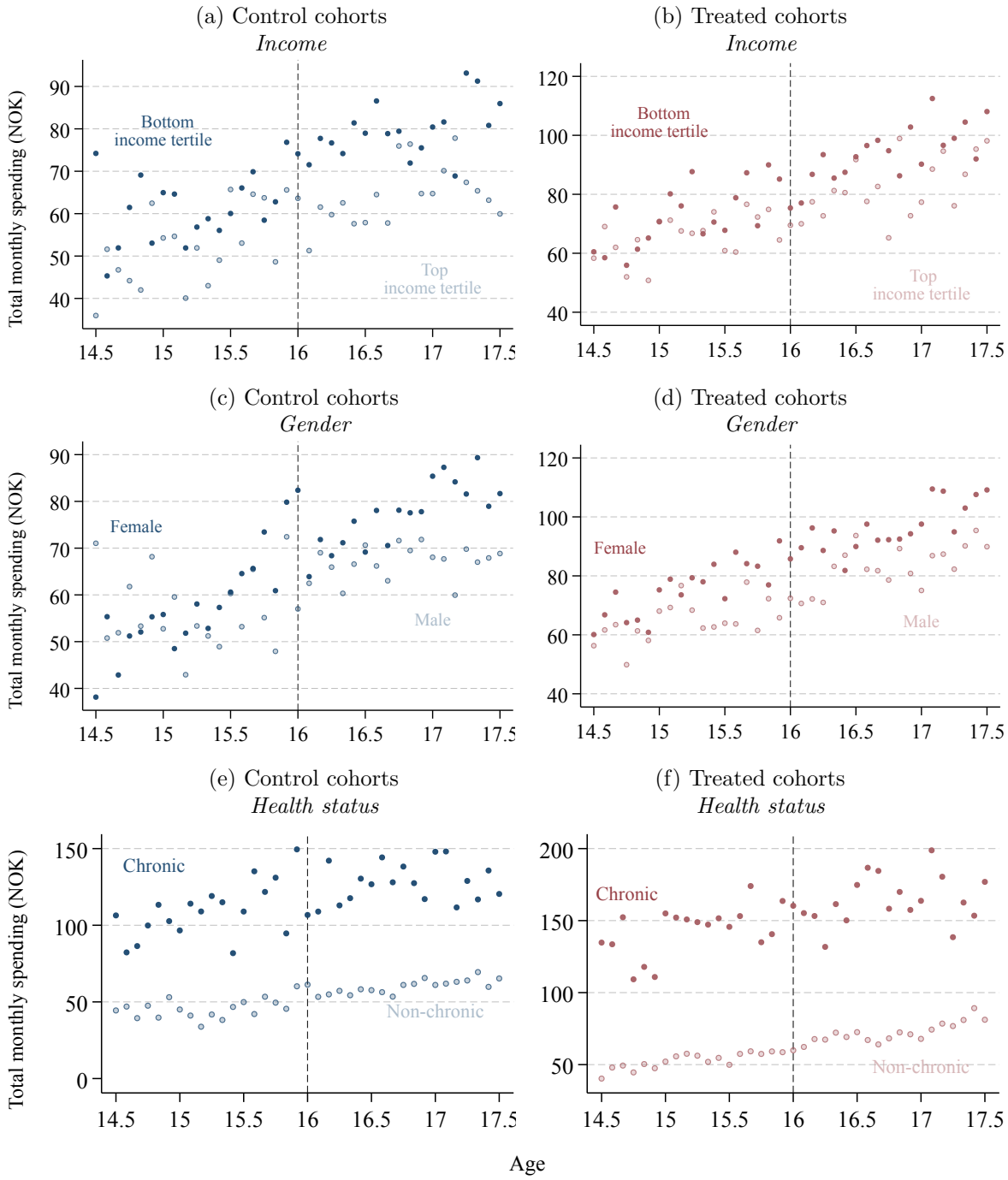
Notes: This table presents ATT estimates of the effect of cost-sharing on utilization of primary care, specialist care and inpatient care, using a first-difference with a linear age trend (FD-T) estimator as discussed in Section III.A. The table also reports the mean of the dependent variable among the treated group during the year they were 15, as well as the treatment effect as a fraction of this amount. All specifications include birth-year-month fixed effects and age-month fixed effect. Standard errors are clustered at the individual level. This table is referenced in Section III.B.

Figure A.2. Total Outpatient Utilization by Demographic Characteristics



Notes: The figure shows average total outpatient spending by age-month, separately for the 1992–1993 (control) and 1996–1997 (treated) birth year cohorts. Panels (a) and (b) report spending by gender; panels (c) and (d) by whether an individual has a chronic condition; and panels (e) and (f) by whether the individual is part of an immigrant family. This figure is referenced in Section II.C.

Figure A.3. Inpatient Utilization by Demographic Group



Notes: The figure shows average total inpatient spending by age-month, separately for the 1992–1993 (control) and 1996–1997 (treated) birth cohorts. Panels (a) and (b) report spending by income tertile (omitting the middle tertile); panels (c) and (d) by gender; and panels (e) and (f) by whether an individual has a chronic condition. This figure is referenced in Section II.C.

Table A.7. Effect of Cost-Sharing on Utilization, Robustness

	Monthly total spending (NOK)		
	All Outpatient	Primary care	Specialist care
Panel A. *Main estimates*			
ATT	−9.504***	−3.880***	−5.648***
	(1.049)	(0.258)	(0.963)
ATT / Treated age-15 mean	-0.061	-0.088	-0.051
# Observations	9,293,610	9,293,610	9,293,610
Panel B. *Longer age window (14–17)*			
ATT	−10.555***	−3.681***	−6.887***
	(1.041)	(0.242)	(0.955)
ATT / Treated age-15 mean	-0.068	-0.083	-0.062
# Observations	12,056,563	12,056,563	12,056,563
Panel C. *Shorter age window (15–16)*			
ATT	−7.571***	−3.462***	−4.137***
	(1.064)	(0.292)	(0.972)
ATT / Treated age-15 mean	-0.049	-0.078	-0.037
# Observations	6,028,344	6,028,344	6,028,344
Panel D. *Change treated cohorts to '97–'98*			
ATT	−6.257***	−2.404***	−3.870***
	(1.043)	(0.248)	(0.960)
ATT / Treated age-15 mean	-0.039	-0.055	-0.033
# Observations	9,202,206	9,202,206	9,202,206
Panel E. *Use individual fixed effects*			
ATT	−9.277***	−3.866***	−5.436***
	(1.063)	(0.260)	(0.976)
ATT / Treated age-15 mean	-0.060	-0.087	-0.049
# Observations	9,293,610	9,293,610	9,293,610

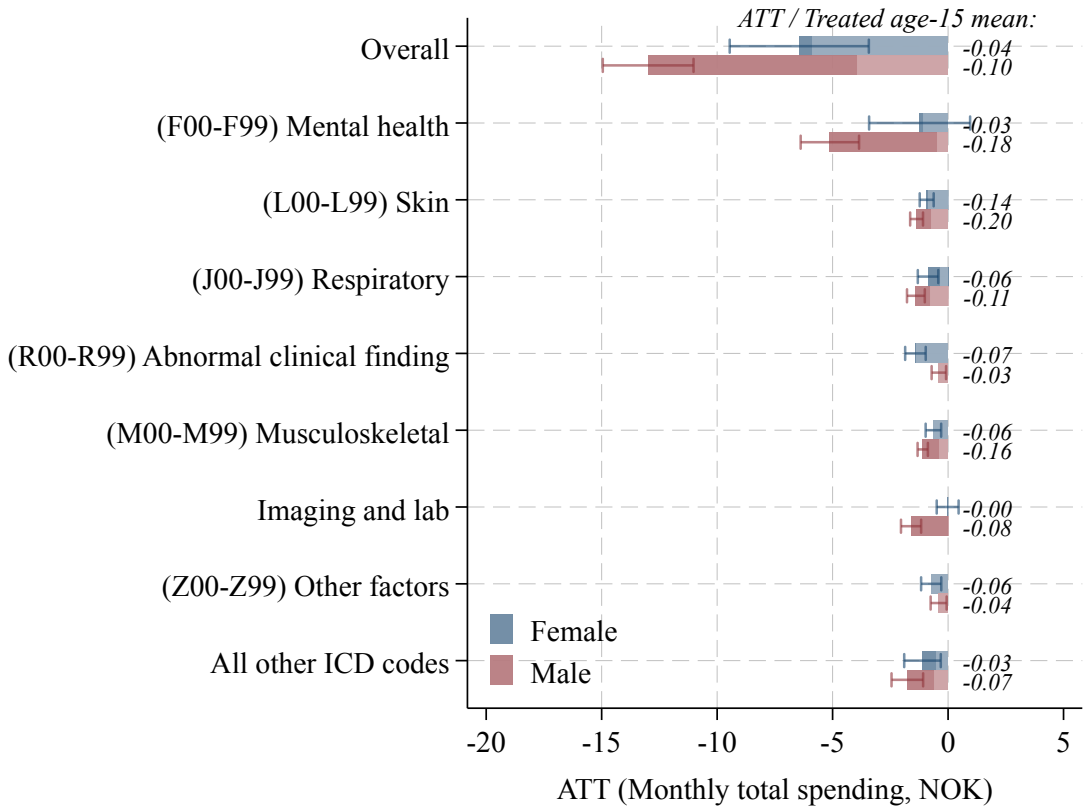
Notes: This table presents ATT estimates of the effect of cost-sharing on utilization of all outpatient care (primary care plus specialist care), as well as on each service line separately. Panel A reports estimate from our primary analysis sample and specification (replicating estimates reported in Table 3). Panel B reports estimates when we extend the focal age window to include 24 months on either side of age 16 (ages 14–17, as opposed to 14.5–16.5 in our main estimates); Panel C reports estimates when we narrow the focal age window to include only 12 months on either side of age 16 (ages 15–16); Panel D reports estimates when the treated cohorts are shifted to be those born in 1997 and 1998 (versus 1996 and 1997); and Panel E reports estimates when using individual fixed-effects (as opposed to birth-year-month fixed effects). Standard errors are clustered at the individual level. This table is referenced in Section III.B.

Table A.8. Effect of Cost-Sharing on Utilization, Heterogeneity

	Monthly total spending (NOK)		
	All outpatient	Primary care	Specialist care
Overall	−9.504***	−3.880***	−5.648***
	(1.049)	(0.258)	(0.963)
ATT / Treated age-15 mean	−0.061	−0.088	−0.051
Income tertile			
1 (Lowest)	−11.852***	−4.596***	−7.281***
	(1.888)	(0.489)	(1.719)
ATT / Treated age-15 mean	−0.069	−0.094	−0.059
2	−9.470***	−3.881***	−5.614***
	(1.767)	(0.437)	(1.617)
ATT / Treated age-15 mean	−0.062	−0.087	−0.052
3 (Highest)	−7.476***	−3.184***	−4.314***
	(1.798)	(0.414)	(1.668)
ATT / Treated age-15 mean	−0.052	−0.081	−0.041
Chronic condition			
No	−6.937***	−3.794***	−3.182***
	(1.099)	(0.264)	(1.012)
ATT / Treated age-15 mean	−0.052	−0.098	−0.033
Yes	−20.402***	−4.062***	−16.297***
	(2.952)	(0.776)	(2.687)
ATT / Treated age-15 mean	−0.081	−0.059	−0.089
Gender			
Male	−14.052***	−3.878***	−10.169***
	(1.198)	(0.315)	(1.096)
ATT / Treated age-15 mean	−0.105	−0.108	−0.104
Female	−4.679***	−3.879***	−0.857
	(1.738)	(0.412)	(1.601)
ATT / Treated age-15 mean	−0.026	−0.073	−0.007
Immigrant			
No	−8.834***	−3.487***	−5.366***
	(1.124)	(0.274)	(1.033)
ATT / Treated age-15 mean	−0.055	−0.078	−0.047
Yes	−15.570***	−7.668***	−7.971***
	(2.798)	(0.781)	(2.522)
ATT / Treated age-15 mean	−0.125	−0.197	−0.093

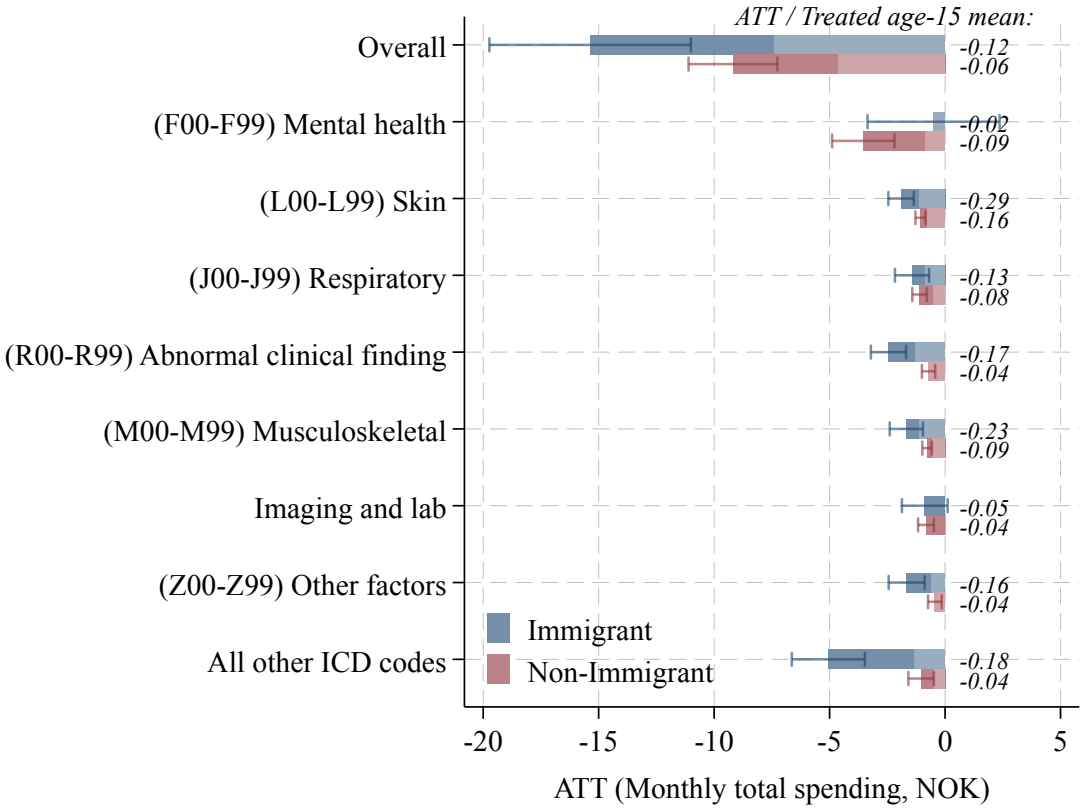
Notes: This table presents ATT estimates of the effect of cost-sharing on utilization of all outpatient care (primary care plus specialist care), as well as on each service line separately, separately within sub-populations. All specifications include birth-year-month fixed effects and age-month fixed effect. Standard errors are clustered at the individual level. This table is referenced in Section III.C.

Figure A.4. Effect of Cost-sharing on Utilization by Diagnosis Group and Gender



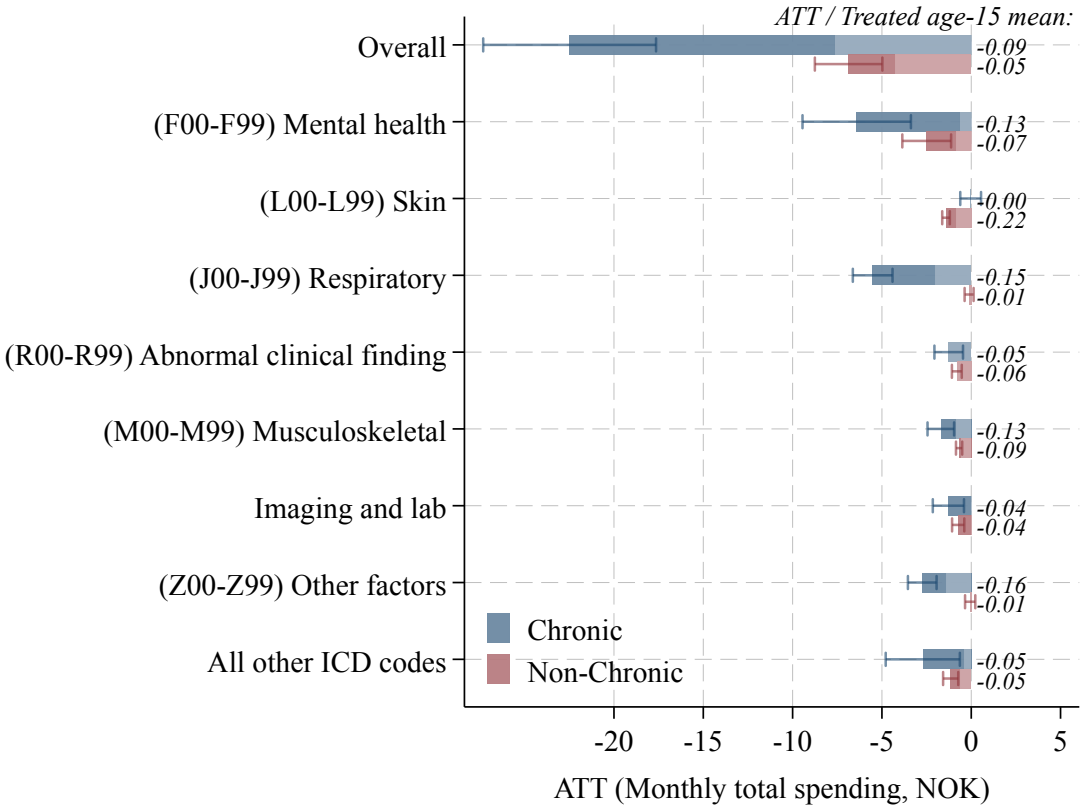
Notes: This figure shows ATT estimates by diagnosis group, using the FD-T estimator discussed in Section III.A, separately by gender within the 1996–1997 birth year cohorts. The point estimates on All Outpatient care are split by primary care (light color) and specialist care (dark color). The drop-lines represent the 95 percent confidence interval on the estimate for All Outpatient care. All specifications include birth-year-month fixed effects and age-month fixed effect. Standard errors are clustered at the individual level. This figure is referenced in Section V.

Figure A.5. Effect of Cost-sharing on Utilization by Diagnosis Group and Immigrant Status



Notes: This figure shows ATT estimates by diagnosis group, using the FD-T estimator discussed in Section III.A, separately by immigrant status within the 1996–1997 birth year cohorts. The point estimates on All Outpatient care are split by primary care (light color) and specialist care (dark color). The drop-lines represent the 95 percent confidence interval on the estimate for All Outpatient care. All specifications include birth-year-month fixed effects and age-month fixed effect. Standard errors are clustered at the individual level. This figure is referenced in Section V.

Figure A.6. Effect of Cost-sharing on Utilization by Diagnosis Group and Health Status



Notes: This figure shows ATT estimates by diagnosis group, using the FD-T estimator discussed in Section III.A, separately by health status within the 1996–1997 birth year cohorts. The point estimates on All Outpatient care are split by primary care (light color) and specialist care (dark color). The drop-lines represent the 95 percent confidence interval on the estimate for All Outpatient care. All specifications include birth-year-month fixed effects and age-month fixed effect. Standard errors are clustered at the individual level. This figure is referenced in Section V.