



Patient cost-sharing, mental health care and inequalities: A population-based natural experiment at the transition to adulthood

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ABSTRACT

Background: Patient cost-sharing has been increasing around the world, despite the evidence that it reduces both unnecessary and necessary health care utilisation. Financial barriers could compound to poor transitional care into adulthood, when forgoing mental health treatment may have long-term consequences on health and development. We evaluate the impact of increasing deductibles on mental health care use by young adults, and the heterogeneous effects for vulnerable groups.

Methods: We use individual administrative records for 1,541,210 individuals between 17 and 19 years of age, living in the Netherlands. We implement a difference-in-discontinuity design that exploits an increase in the deductible of about 180 euros, between 2009 and 2014, and the deductible exemption for those below 18 years old. Finally, we study subgroup effects by household income, level of mental health care expenditure and medication use for mental disorders.

Results: Our results show that increasing deductibles reduced the probability of mental health care use at the transition to adulthood by 13.6% for females (−13.6%, CI 95%: −22.1%, −5.2%), and by 5.3% for males (−5.3%, CI 95%: −11.8%, 1.2%). The reduction was larger among females in the lowest (−18.9%, CI 95%: −35.4%, −2.3%) and second lowest (−21.3%, CI 95%: −36.7%, −5.9%) income quartiles. Additionally, we find increased treatment cessation in high deductible years to happen across all levels of mental health care need.

Conclusions: Our findings indicate that cost-sharing is compounding to existing disruptions in care at the transition between children/adolescent and adult services. The larger reductions in mental health care use among low-income females uncover the role of the deductible increase in widening mental health care inequalities. Increased treatment cessation even among high-intensity users suggests potential long-term consequences for individuals, the health system, and society.

1. Introduction

Mental disorders are the leading cause of disability among adolescents and young adults in high-income countries (Gore et al., 2011; Erskine et al., 2015). Approximately 75% of adult mental disorders have their onset during adolescence, increasing the risk of recurrent mental disorders and disabling physical conditions in adulthood (Erskine et al., 2015; Kessler et al., 2005). Adolescents from socioeconomically disadvantaged families are two to three times more likely to develop mental health problems, and more likely to have limited access to mental health

services (Dashiff et al., 2009; Reiss, 2013; Weinberg et al., 2019).

Although awareness of the crucial time period of adolescence for mental health has increased in recent years (Patel et al., 2007; Mei et al., 2020), health care systems still fail to address the transition from children and adolescent mental health services (CAMHS) to adult mental health services (AMHS) (Signorini et al., 2018). This transition is often accompanied by disruptions of care due to several factors – policy, service-related, and individual – and can have long-lasting consequences on health and development (Tuomainen et al., 2018; Barr et al., 2017). Health care financing has been mentioned as a potential factor

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contributing to the treatment gap, in particular when there are changes in financial arrangements from minors to adults, such as the introduction of patient cost-sharing (Hendrickx et al., 2020).

Cost-sharing has been introduced widely in response to increasing health care expenditures (Kiil and Houlberg, 2014). By exposing individuals with coverage to a larger proportion of the full prices of services, economic theory predicts a decrease in individual demand (Brot-Goldberg et al., 2017). How much individuals react to cost-sharing depends on the price elasticity of health care demand (Kiil and Houlberg, 2014). At the limit, when demand is price inelastic, cost-sharing only shifts the burden of financing to the user. Theory predicts further that price elasticities depend on the value of care, with less valuable care being more price-elastic (Baicker and Goldman, 2011). However, the RAND Health Insurance Experiment (Newhouse, 1993), the Oregon Health Insurance Experiment (Finkelstein et al., 2012) and more recent quasi-experimental work (Brot-Goldberg et al., 2017; Manning et al., 1987; Baicker et al., 2013) have shown that cost-sharing is a blunt instrument to reduce health care consumption, leading to cuts in appropriate care. The RAND Health Insurance Experiment also found cost-sharing to mostly harm those of low socioeconomic status in poor health (Manning et al., 1987; Brook et al., 1983; Lohr et al., 1986). Such differential effects by income can arise for different reasons: out of pocket payments representing a larger share of the total budget for individuals with low income, higher utility losses due to higher marginal utility of low income, and low income individuals having worse health (Kiil and Houlberg, 2014). Earlier work also confirmed that users of mental health services, as compared to “physical” care, are more responsive to cost-sharing (Frank and Culyer, 2000). Potential explanations include underestimating the importance of mental wellbeing, stigma around the use of mental health services, the perception that mental health services provide low-quality of care, and uncertainty about the effectiveness of some interventions (Frank and Culyer, 2000).

Although forgoing necessary mental health care in adolescence and early adulthood might come at higher future costs for patients, health systems and society (Patel et al., 2007), evidence on patient cost-sharing and mental health care at the transition to adulthood is lacking. In this study, we establish the impact of increased health insurance deductibles on mental health service use during the transition to adulthood. Our quasi-experimental difference-in-discontinuity approach (Grembi et al., 2016; Nilsson and Paul, 2018) exploits that Dutch citizens only start paying annual deductibles in the month following their 18th birthday; and that the deductible amount more than doubled between 2009 and 2014. We further explore heterogeneous effects of cost-sharing during the transition to adulthood on mental health care utilization across socioeconomic groups; and on treatment cessation among patients that differ by the intensity of previous mental health treatment or by the use of medicines for mental health disorders.

Our study contributes to the literature in several forms. First, we leverage the ability of the difference-in-discontinuity study design to disentangle the effect of increased deductibles from the disruption in treatment caused by other reasons, as the transition from CAMHS to AMHS. Other empirical methods, such as a regression discontinuity design (RDD), would not have allowed us to distinguish the impact of financial barriers from other factors. We find that cost sharing acts as a financial barrier among youth, and contributes to the transition gap in mental health care. Second, we measure income at the individual level and obtain estimates of heterogeneous effects across the entire population of young adults. We find that females in low income are more likely to not use mental health care when facing increased deductibles. Third, we show that cost-sharing increases pro-rich inequalities in access to mental health care, in a country with a comprehensive mental health care system and low out of pocket expenditures.

2. Institutional setting

2.1. Deductibles in the Netherlands

According to the Health Insurance Act of 2006, citizens living or working in the Netherlands are mandated to purchase insurance that covers a comprehensive and legally predefined health benefit package, including mental health care. Since 2008, cost-sharing has the form of a one-off annual deductible that applies to all the health care costs covered by the insurance benefit package, with the exception of primary care, maternity care and home nursing care (Kroneman et al., 2016). Growing health expenditure led the government to increase the compulsory deductible from 170 to 350 euros, between 2011 and 2013. This increase prompted concerns over the imposition of access barriers for vulnerable groups like young adults and low-income individuals, that were already more likely to avoid care due to financial reasons (Esch et al., 2015). Table 1 shows the evolution of the deductible between 2009 and 2014, in current and 2015 prices. Our empirical identification strategy exploits that deductibles in 2013 and 2014 (high deductible period) were on average 181 euros (2015 prices) higher than the deductibles in 2009 and 2011 (low deductible period), while the deductible was rather stable within both time periods.

In addition to the compulsory deductible, individuals can opt for a voluntary deductible. This consists of an amount that ranges between 100 and 500 euros, in exchange for discounts to the premium. The proportion of Dutch adults opting for a voluntary deductible was low (from 6% in 2010 increased to 10% in 2014). (Romp, 2016).

2.2. Dutch mental health care system

Curative mental health services were introduced in the Health Insurance Act in 2008, bringing mental health care under the predefined insurance benefit package and making the compulsory deductible applicable to its costs. Additional information about youth mental health and the transitional boundary between CAMHS and AMHS is provided in appendixes A.1 and A.2. The Dutch curative mental health care sector can be divided in two segments, which were reorganized in 2014 (see appendix A.3 for more details) (Westra et al., 2016). Basic mental health care, previously designated as primary line, is provided in the outpatient setting mostly by psychologists, psychotherapists and geriatric specialists. It aims at treating patients with mild and moderate mental health disorders. Specialist care, previously designated as second line, is both outpatient and inpatient and is provided by clinical psychologists, psychiatrists and multidisciplinary teams, often within large mental health care providers. It focuses on the most severe mental disorders and complex patients, including those that have several diagnoses/comorbidities or pose a risk to themselves/others (Kroneman et al., 2016). Outside of the mental health care sector, general practitioners (GPs) and mental health nurses working in primary care provide short-term support to patients with minor psychological complaints, and act as gatekeepers for mental health services. They refer patients to either basic or specialist mental health care when suspecting of a mental health disorder according to the Diagnostic and Statistical Manual of Mental Disorders (DSM). (Kroneman et al., 2016).

Table 1
Evolution of the annual compulsory deductible between 2009 and 2014.

Year	2009	2010	2011	2012	2013	2014
Deductible (euros)	155	165	170	220	350	360
Deductible (euros, in 2015 prices) ^a	171	180	181	229	356	362

^a Adjusted by the Consumer Price Index with reference to 2015 (CBS, 2020), category all expenditures.

3. Methods

3.1. Data sources and study population

We use de-identified administrative records from Statistics Netherlands covering the entire Dutch population (see [appendix B](#) for details on the datasets). Based on municipal registry datasets we identify individuals born between 1990 and 1997 who lived in the Netherlands during 2009, and observe their year and month of birth, gender, migratory background and home address postcode. For each individual, we link these demographic characteristics with annual data from health insurance claims, between 2009 and 2014. We focus on yearly mental health care expenditures in the calendar years that individuals turn 17, 18 and 19; and define whether each individual used any basic or specialist mental health services during each calendar year. Therefore, the number of (person-year) observations included for each individual depends on the year of birth. For example, an individual born in 1990 will only contribute to the study with one person-year, when 19 years old; while an individual born in 1992 contributes with three person-years, when 17, 18 and 19 years old (see [appendix C](#), [eFig. 1](#)). In order to conduct subgroup analyses, two additional datasets are linked to characterize the study population in the calendar year they turn 17 years old (between 2007 and 2014). Based on tax records data we classify adolescents according to year and month-of-birth specific quartiles of standardized disposable household income (detailed explanation in [appendix B.4](#)). Based on medicines utilization data obtained from health insurance claims we observe whether individuals had any claims of antipsychotics (N05A), anxiolytics (N05B), antidepressants (N06A), or psychostimulants, agents used for attention-deficit/hyperactivity disorder (ADHD) and nootropics (N06B), as defined at the third level of the Anatomical Therapeutic Chemical (ATC) classification. For the subgroup analysis studying the effect of cost-sharing specifically on treatment discontinuation we restrict the overall study population to mental health care users at age 17. Due to lack of data to identify mental health users at 17 for the cohorts of 1990 and 1991, this subgroup analysis focuses on the cohorts from 1992 to 1997.

3.2. Empirical strategy

We use a difference-in-discontinuity approach ([Grembi et al., 2016; Nilsson and Paul, 2018](#)) to estimate the causal impact of increasing health insurance deductibles on mental service utilization during the transition to adulthood. This method exploits two sources of exogenous variation to disentangle the effect of increasing deductibles from disruptions in care use due to other factors. First, variation across individuals due to the exemption from the deductible when individuals are younger than 18. Second, variation in the deductibles over time, in particular the increase between 2011 and 2013. Based on this increase, we classify 2009, 2010 and 2011 as low deductible years (171, 180 and 181 euros in 2015 prices) and 2013 and 2014 as high deductible years (356 and 362 euros in 2015 prices). The deductible in the high deductible period was on average 181 euros higher than that in the low deductible period. We exclude 2012 from the analysis due to a one-year installment of co-payments for adult specialist mental health care ([appendix A.3](#)).

We use ordinary least squares regression to estimate model (1), composed of the deviation between a standard RDD for the high deductible years – $\gamma + k(Age^*_{itm}) + E_{it}[\delta + l(Age^*_{itm})]$ – and an RDD for the low deductible years – $\alpha + f(Age^*_{itm}) + E_{it}[\beta + g(Age^*_{itm})]$:

where Y_{it} is a binary outcome that captures whether individual i uses any basic (outpatient) or specialist (outpatient and inpatient) mental health services in calendar year t , H_d is a binary variable that separates low from high deductible years (taking zero between 2009 and 2011 and one between 2013 and 2014), and E_{it} is a binary variable that identifies the discontinuity at 18 (taking zero when the individual is a minor and thus exempted from the deductible one when the individual has to pay it). Age^*_{itm} corresponds to age in months defined on December 31st of every year. We use the best fitting polynomial for age imposing that the order is similar for all polynomials (i.e. $f(\cdot)$, $g(\cdot)$, $k(\cdot)$, and $l(\cdot)$ are all polynomials of order 1, or all polynomials of order 2, and so on) and a bandwidth of twelve months around the discontinuity thresholds. $Year_t$ (with associated coefficient vector ω) are year dummies, $Controls_{it}$ (with associated coefficient vector κ) include the individual migratory background and household income quartile at age 17 (time-invariant), and dummies of two-digit home address postcode to control for geographical variations in mental health service supply and socioeconomic neighborhood status (time-variant), and ε_{it} is an error term.

From this model, β represents the RDD estimate of turning 18 in the low deductible period and δ is the coefficient of interest which equals the deviation between the RDD estimate for the low and high deductible periods. This comparison allows disentangling the impact of changes in the deductible from other potential disruptions at age 18. Such discontinuities might be related to changes in the individual life that influence youth mental health care consumption, such as leaving parents' house or getting a job; or can be the consequence of the transition from CAMHS to AMHS, where a considerable proportion of patients is no longer followed-up ([Gerritsen et al., 2019](#)). Contrary to a standard RDD, a difference-in-discontinuity approach allows for discontinuous changes in confounding factors at the threshold, under the assumption that other discontinuities at 18 and any manipulation of the running variable are time-invariant for the study period.

Age^*_{itm} is defined in months on December 31st of every year. This means that months 204–215 correspond to individuals that turned 17 in a given calendar year (215 turning 17 in January and 204 turning 17 in December), months 216–227 to those that turned 18, and 228–239 to those turning 19. We exclude the observations corresponding to months 217–227 from our model, because they represent youth that pay only partial deductibles in the year they turn 18. These individuals are exempted from the deductible from January till the month of their birthday, and then face deductible amounts that are proportional to the number of months left after turning 18 (i.e. between eleven - birth-month January, and one month - birth-month November). Given the annual data on mental health care use, disentangling the age-trends associated with partial deductibles would imply making additional assumptions on the share of annual care utilisation to be assigned to the months leading up to 18, and the share to the months thereafter, when the proportional deductible applies. This, in practice, implies imposing how individuals adjust their mental health care use in the months before and after facing the deductible within the same calendar year, when our yearly binary outcome captures only the extensive margin of consumption. Instead, our approach of excluding observations with partial deductibles avoids such assumptions, by comparing those paying the full deductible in the calendar year of their 18th birthday (228 months) with those paying no deductible at all in the previous calendar year (216 months). This set-up implies that our estimation strategy uses up to two observations for individuals born in January to November – one for the year she turns 17 and another for the year she turns 19 – and one additional observation for individuals born in December – which pay no deductible (yet) in the year they turn 18.

$$(1) Y_{it} = \alpha + f(Age^*_{itm}) + E_{it}[\beta + g(Age^*_{itm})] + H_d\{\gamma + k(Age^*_{itm}) + E_{it}[\delta + l(Age^*_{itm})]\} + Year'_t\omega + Controls'_{it}\kappa + \varepsilon_{it}$$

While our main model in (1) presents effect estimates of the deductible increase in absolute terms, i.e. in percentage point (pp) changes, we also calculate relative effect sizes by dividing $\hat{\delta}$ by the average mental health care use at 228 months - the first full deductible observation. Age^*_{im} is centered at 228 months. We estimate all models separately by gender to account for different age and time trends in mental health services utilisation. All models present clustered standard errors at the individual level.

We conduct three analyses to explore potential violations of the identifying assumption that confounding discontinuities at 18 and any manipulation of the running variable are time-invariant. First, we focus on two potential major discontinuities at the age of 18: living situation and personal income. We find no indication that the proportion of individuals living with their parents (eFig. 2.A. in appendix D) or the average income (eFig. 2.B. in appendix D) evolved dissimilarly in the low and high deductible periods. Additionally, and following Grembi et al. (2016), eFigure 3 shows no evidence of time-varying annual RDD of mental health care use at age 18 in the low deductible period (2009, 2010 and 2011). Finally, while age cannot be manipulated, adolescents might anticipate the deductible introduction in the last months/year of the exemption; and therefore change their mental health care consumption already before turning 18. While this violates the identifying assumptions of the standard RDD framework, difference-in-discontinuity can overcome such anticipatory behaviour provided it is time-invariant. Our estimates in eTable 1 provide supportive evidence of time-invariant anticipatory behaviour in the low versus high deductible periods, indicating that differences in this behaviour over time are not driving our results.

3.3. Subgroup and sensitivity analyses

We also conduct subgroup analyses of the effects of increasing deductibles on mental health care use (Y_{it}) following two different approaches. First, we study heterogeneous effects by income. We interact month of age polynomials, intercepts and discontinuities in model (1) with quartiles of standardized disposable household income at age 17. Second, we focus only on the subpopulation of mental health care users at the age of 17. This subgroup analysis sheds light on the impact of the deductible increase on treatment cessation vs. treatment initiation, distinguishing the two effects captured in main results: patients that stop care from individuals that do not start treatment but would do so in absence of the deductible increase. Our main objective with this analysis is to understand who are the patients that stop care the most, by studying different subgroups of previous users. It uses the special case of model (1) where all individuals to the left of the age 18 discontinuity are service users (i.e. essentially only using variation in mental health care use from month 228 onwards). In addition to estimates of treatment cessation for all mental health patients at the age of 17, we evaluate subgroup effects of treatment cessation by treatment intensity and medicines used at the same age. For this, we interact age polynomials, intercepts and discontinuities with (a) mental health care intensity – quartiles of expenditure, (b) number of psychotropic drug classes used, and (c) type of psychotropic drug class for those using only one class, all at age 17.

Finally, we conduct an additional series of sensitivity analyses to further verify the robustness of our results. We use alternative bandwidths for age, perform a placebo difference-in-discontinuity at age 16, use non-linear models, include postcode-year fixed effects to allow for geographical patterns changing over the study years, and exclude all controls. All analyses are performed using STATA (StataCorp, 2017) and STROBE guidelines for reporting observational studies are followed.

Table 2

Characterization of the study population for the calendar year of the 17th birthday.

	Female (n = 755,078; 49.0%)	Male (n = 786,132; 51.0%)
Migratory background, % (n) ^a		
Netherlands	78.7 (594,464)	78.6 (618,230)
Turkey	3.5 (26,553)	3.6 (28,193)
Morocco	3.2 (23,989)	3.2 (24,919)
Suriname	2.7 (19,993)	2.6 (20,451)
Dutch Antilles	1.1 (8285)	1.1 (8676)
Other	10.9 (81,794)	10.8 (85,663)
Household income in euros, median (IQR) ^b		
1st quartile	15,358 (12,854–17,303)	15,311 (12,837–17,290)
2nd quartile	21,963 (20,495–23,493)	21,967 (20,511–23,500)
3rd quartile	28,028 (26,364–29,965)	28,030 (26,349–29,969)
4th quartile	38,841 (34,784–47,239)	38,864 (34,784–47,229)
Mental health care use, % (n) ^c		
Any care	8.8 (49,386)	7.3 (42,909)
Specialist care	6.4 (35,950)	6.2 (36,266)
Basic care	2.8 (15,955)	1.4 (8180)
Psychotropic medicines use, % (n)		
1 drug class	3.4 (25,322)	5.3 (41,658)
Antipsychotics	0.3 (1926)	0.5 (4075)
Anxiolytics	0.6 (4595)	0.3 (2601)
Antidepressants	1.0 (7780)	0.4 (3098)
Agents for	1.5 (11,021)	4.1 (31,884)
ADHD ^d		
2 + drug classes	0.4 (3257)	0.6 (4349)

IQR – interquartile range.

^a First generation migrants are classified according to their country of birth. Second generation migrants are classified according the country of birth of their mother – if that is the Netherlands the country of birth of the father is considered.

^b Adjusted by the Consumer Price Index with reference to 2015 (CBS, 2020). First quartile corresponds to the lowest income group.

^c Due to availability of expenditure data from 2009 onwards, the proportion of mental health care users at 17 is measured for birth cohorts 1992–1997, from a population of 561,724 female and 585,768 male individuals.

^d The complete designation of the class is psychostimulants, agents used for ADHD and nootropics.

4. Results

4.1. Demographics

Our main study population consists of 1,541,210 individuals. Table 2 shows that the study population is characterized by slightly more males (51.0%) and one fifth of first- or second-generation migrants. The proportion of adolescents that used mental health services at 17 is higher for females than males (8.8% vs 7.3%). Specialist care was more frequently received than basic care, and the latter was more frequent for females (2.8% comparing to 1.4%). Gender differences are also observed in the proportion of adolescents using any psychotropic medicine (3.4% for females and 5.3% for males) and the type of drug classes used. From those using only one class of psychotropic drugs, males were almost three times more likely to use ADHD agents, while anxiolytics and antidepressants are twice more common among females. The characterization of the subpopulation of mental health care users at 17 is provided in eTable 2 in appendix E.

4.2. Mental health care use in the overall population

Fig. 1 shows the share of annual mental health care use by age in months, separately for low and high deductible years. Trends for adolescents and young adults vary by gender. The proportion of males using mental health services decreases with age before reaching adulthood and plateaus at 19 years-old. The proportion of females using of mental health services increases before the transition to adulthood, decreases in

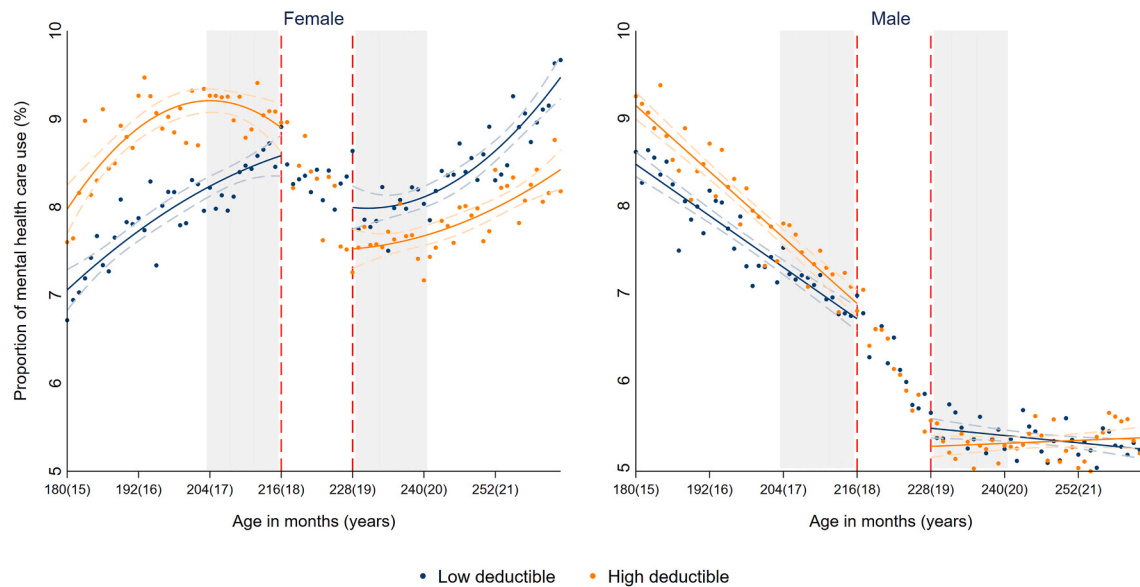


Fig. 1. Trends in mental health care use by age in months for the low and high deductible periods.

Notes: Each dot corresponds to a cohort of individuals born in January, February, March, etc. and represents the average of mental health care use (binary indicator) for that cohort, estimated from the raw data. The figure is obtained from the population born between 1988 and 1999, observed for the years of the 15th to 21st birthday (2,862,771 female and 2,973,588 male individuals). Depending on their birth cohort individuals might be represented in 1–6 of the dots (Appendix C). Quadratic age polynomials for female and linear age-trends for male. Only observations 204–216 and 228–239 (grey shaded areas) are used in the main analysis. Year-by-year age trends are available in Appendix F, eFig. 4.

Table 3

Difference in mental health care use at the transition to adulthood between high and low deductible periods, overall and by household income subgroups.

Age 18 x High deductible (pp)			Baseline use		Relative change		Observations
Panel A: Overall use							
Female	−1.1	(−1.8, −0.4)***	8.1%	−13.6%	(−22.1%, −5.2%)***		981,814
Male	−0.3	(−0.7, 0.1)	5.6%	−5.3%	(−11.8%, 1.2%)		1,022,663
Panel B:Income quartiles ^a							
Female							
1st	−1.7	(−3.1, −0.2)**	8.8%	−18.9%	(−35.4%, −2.3%)**		244,767
2nd	−1.9	(−3.3, −0.5)***	9.0%	−21.3%	(−36.7%, −5.9%)***		246,632
3rd	−0.2	(−1.5, 1.1)	7.7%	−2.9%	(−20.0%, 14.1%)		246,093
4th	−0.6	(−1.9, 0.7)	6.9%	−8.9%	(−28.0%, 10.2%)		244,322
Male							
1st	−0.3	(−1.2, 0.5)	6.8%	−5.0%	(−17.0%, 7.1%)		253,763
2nd	−0.4	(−1.2, 0.3)	5.3%	−8.4%	(−22.3%, 5.5%)		256,682
3rd	−0.4	(−1.1, 0.3)	5.4%	−7.2%	(−20.2%, 5.8%)		256,333
4th	0.0	(−0.7, 0.6)	4.9%	−0.7%	(−14.3%, 12.9%)		255,885

pp – percentage points, *p-value<0.05, **p-value<0.01, ***p-value<0.001, (Confidence Intervals at 95% level).

Notes: Baseline use refers to the average mental health care use across study years at 228 months of age, corresponding to the first moment in which young adults pay the full-year deductible. Best fitting age polynomial is quadratic for female and linear for male. Estimates for income display main coefficients for each quartile, obtained by repeating the estimation of the interacted model with each quartile as reference category. Hence, statistical significance reported in the table concerns differences of the main term from zero. Within each model the interaction terms for the remaining quartiles are not significantly different from the main term (p-value for the interaction coefficient >0.05). All models include year dummies and control for migratory background and postcode. The baseline model (row Male and Female) also controls for income quartiles at the year of the 17th birthday. Observations are in person-years.

^a First quartile corresponds to the lowest income group.

the year of the 18th birthday and increases again from 19 onwards. The vertical red lines identify the deductible introduction, with individuals below 216 months being exempt and those from 228 months onwards paying full-year deductibles. For both genders, mental health care use in high deductible years was higher before reaching the exemption threshold and lower when paying the full deductible, compared to low deductible years. Observations in the range 217–227 months correspond to individuals partially exposed to the deductible in the year they turn 18. Appendix F, eFig. 4 shows these discontinuities by year.

Table 3 provides estimates for our baseline model (1). We find that a deductible increase of about 180 euros between the low and high deductible periods reduced mental health care use by 1.1 pp (–1.1, CI

95%: –1.8, –0.4) for females, corresponding to –13.6% (CI 95%: –22.1%, –5.2%) mental health care use. We find a small and negative but imprecisely estimated coefficient for males (–0.3, CI 95%: –0.7, 0.1), corresponding to –5.3% (CI 95%: –11.8%, 1.2%) in relative terms (panel A of Table 3). Our subgroup analysis by socioeconomic status shows that the impact is concentrated among lower income females, with –18.9% (CI 95%: –35.4%, –2.3%) use for the lowest income quartile and –21.3% (CI 95%: –36.7%, –5.9%) for the second lowest quartile, compared to smaller and imprecise negative coefficients for higher quartiles (panel B of Table 3).

Table 4

Differences in mental health care cessation between low and high deductible periods (panel A) by subgroups defined according to previous treatment intensity (panel B), number (panel C) and type (panel D) of psychotropic drug classes used.

High deductible (pp)			Baseline use		Relative change		Observations
Panel A: Overall cessation							
Female	−5.6	(−8.1, −3.2)***	28.3%	−19.9%	(−28.5%, −11.3%)*		24,972
Male	−7.1	(−9.6, −4.6)***	26.7%	−26.5%	(−35.9%, −17.1%)*		21,996
Panel B: Treatment intensity (quartile of expenditure) ^a							
Female							
1st	−5.0	(−9.3, −0.7)**	18.9%	−26.5%	(−49.1%, −3.8%)*		6,296
2nd	−6.3	(−11.0, −1.7)***	24.7%	−25.7%	(−44.6%, −6.8%)*		6,281
3rd	−5.0	(−9.9, −0.1)**	28.8%	−17.5%	(−34.4%, −0.5%)*		6,239
4th	−5.4	(−10.6, −0.2)**	41.8%	−12.9%	(−25.4%, −0.4%)*		6,156
Male							
1st	−5.3	(−9.7, −1.0)**	16.8%	−31.8%	(−57.9%, −5.7%)*		5,553
2nd	−9.1	(−13.8, −4.4)***	22.7%	−40.1%	(−60.6%, −19.5%)*		5,519
3rd	−6.1	(−11.1, −1.0)**	28.0%	−21.7%	(−39.7%, −3.7%)*		5,503
4th	−9.3	(−14.9, −3.7)***	40.2%	−23.1%	(−37.0%, −9.2%)*		5,421
Panel C: Number of drug classes							
Female							
0	−5.2	(−7.9, −2.6)***	24.8%	−21.1%	(−31.6%, −10.6%)*		19,549
1	−8.7	(−15.1, −2.4)***	41.0%	−21.3%	(−36.8%, −5.8%)*		4,569
2 or more	−10.8	(−25.0, 3.4)	52.5%	−20.6%	(−47.7%, 6.4%)		854
Male							
0	−5.1	(−8.0, −2.3)***	22.2%	−23.0%	(−35.8%, −10.2%)*		14,038
1	−14.7	(−19.8, −9.6)***	31.6%	−46.4%	(−62.5%, −30.3%)*		6,838
2 or more	−11.9	(−24.8, 0.9)*	49.5%	−24.1%	(−50.1%, 1.9%)*		1,120
Panel D: Type of drug classes (adolescents using 1 drug class only)							
Female							
Antipsychotics	−5.9	(−22.3, 10.5)	62.0%	−9.5%	(−35.9%, 16.9%)		527
Anxiolytics	7.4	(−19.7, 34.5)	..	..	..		194
Antidepressants	−4.6	(−15.6, 6.3)	49.4%	−9.4%	(−31.5%, 12.7%)		1,616
Agents ADHD*	−10.1	(−19.4, −0.7)**	31.6%	−31.9%	(−61.5%, −2.3%)*		2232
Male							
Antipsychotics	−9.6	(−22.9, 3.6)	52.3%	−18.4%	(−43.8%, 6.9%)		957
Anxiolytics	−11.9	(−48.5, 24.7)	..	..	..		110
Antidepressants	−11.6	(−29.7, 6.4)	40.8%	−28.5%	(−72.9%, 15.8%)		697
Agents ADHD*	−15.1	(−20.9, −9.3)***	26.9%	−56.1%	(−77.7%, −34.5%)*		5,074

pp - percentage points, *p-value<0.05, **p-value<0.01, ***p-value<0.001, (Confidence Intervals at 95% level).

Notes: Baseline use refers to the average mental health care use across study years at 228 months of age, corresponding to the first moment in which young adults pay the full-year deductible. The best fitting age polynomial is linear for both genders. Model estimated based on birth cohorts 1992 to 1992 and study years from 2011 to 2014. Estimates display main coefficients for each quartile/subgroup, obtained by repeating the estimation of the interacted model with each quartile/subgroup as reference category. Hence, statistical significance reported in the table concerns differences of the main term from zero. Within each model the interaction terms for the remaining quartiles are not significantly different from the main term (p-value for the coefficient >0.05). All models control for migratory background, postcode and income quartiles at the year of 17th birthday. Relative size is not estimated for anxiolytics due to the small number of observation available to estimate the baseline use. Observations are in person-years.

^a First quartile corresponds to the lowest mental health care expenditure group.

4.3. Treatment cessation among mental health care users at 17

The subgroup analysis of treatment cessation focuses on the subpopulation of adolescent users instead of the overall population. Both genders were more likely to stop treatment in the high deductible period (females: -19.9% , CI 95%: -28.5% , -11.3% ; males: -26.5% , CI 95%: -35.9% , -17.1% ; panel A of Table 4). Increased treatment cessation in the high deductible period occurred regardless of treatment intensity or use of medicines for mental health disorders. Panel B of Table 4 suggests that young adults receiving treatment of low and medium intensity had a higher cessation in relative terms (around -26% for females and between -32% and -40% for males). Nevertheless, we also find a sizeable higher discontinuation for those treated above the median intensity (-13% to -18% for females and around -22% to -23% for males).

Panel C of Table 4 presents the treatment cessation by the number of psychotropic drug classes used at age 17. Males using one psychotropic drug class were most likely to discontinue care in the high versus low deductible period (-46.5% , CI 95%: -62.5% , -30.3%) with similar discontinuation of care in relative terms for the remaining subgroups of both genders. When restricting to single drug class users (panel D of Table 4), we find the largest discontinuation of services for those using agents for ADHD at age 17. In contrast to the baseline results for the overall population, this subgroup analysis finds equivalent reductions for females and males. We attribute this fact to the different trends (and composition) of mental health care service use by gender in youth (Fig. 1). On the one hand, male service use peaks in the early teens and decreases later in adolescence (Erskine et al., 2015). Hence, cost-sharing will mostly reflect additional treatment cessation of male patients. On the other hand, use of mental health care by females peaks later in adolescence, and thus cost-sharing might act more as a barrier to those that would start treatment at this time.

4.4. Sensitivity analyses

The sensitivity analyses in Appendix G confirm the robustness of our estimates, both in terms of direction and size. We find consistent results when using larger age bandwidths, with estimates for males becoming more precise, and small and imprecise placebo discontinuities at age 16 (eTable 3.). Estimates obtained from a logistic model lead to similar conclusions, as well as those allowing for postcode-year variation or not accounting for any of the controls (eTable 4.).

5. Discussion

In this study we use an innovative quasi-experimental design to show that increasing health care deductibles led young adults in the Netherlands – mostly low-income females – to reduce the use of mental health services at the transition to adulthood. We find smaller and imprecisely estimated effects for males, which might be explained by several factors. First, male and female subpopulations have distinct mental health needs. Differences in the type of youth mental health disorders by gender are well-documented in observational studies (Erskine et al., 2015; Verhulst et al., 1997), and are supported by the gender differences in psychotropic class consumption we observe. Second, young males disconnect more regularly from health care services during adolescence and are more often underserved (Rice et al., 2018; Bijl et al., 2003). Reasonably, if factors as self-stigma, shame and masculinity (Rice et al., 2018) would already lead males to use treatment less ahead of the deductible increase, they might respond less to the deductible change. Our results are further in line with literature showing a larger impact of co-payments in Dutch adult females using mental health care (Lambregts and van Vliet, 2018), and in Swedish 20-year old females using primary care (Johansson et al., 2019), compared to their male counterparts.

We find effects to be concentrated among females of low-income groups. This might be a direct consequence of low income, due to

liquidity and budget constraints to pay for higher deductibles. Additionally, this might also result from other mechanisms associated with low socioeconomic status that influence the way individuals perceive mental health needs and the value of treatment (Sareen et al., 2007), for example low (parental) education.

While our main findings relate to overall care utilisation in the population, the role of the deductible increase on treatment discontinuation is especially relevant in the context of poor transitional care. Our results concerning care cessation show higher likelihoods of stopping in high deductible years across the entire spectrum of mental health care needs. This suggests a reduction even for high-intensity users, for whom the transition gap is more likely to result in relapse or recurrence and subsequent functional disability. In terms of medication, we find patients using agents for ADHD to discontinue care the most in the high deductible period. These findings are in line with international studies showing that patients with ADHD experience more pronounced transition difficulties, in particular in a context of sparse ADHD adult services (Singh and Tuomainen, 2015). Altogether, our results highlight financial barriers as a key – but often underrated – contributor to the disruption of care at the transition between CAMHS and AMHS.

Our study contributes to the current literature gap by exploring variation in national-level policy to provide quasi-experimental estimates of cost-sharing on mental health care use at the transition to adulthood. This is a narrow but particularly critical period of the life course, which overlaps with a weakness in the configuration of current mental health care systems (Patel et al., 2007; Signorini et al., 2018). Our approach separates the policy of increasing deductibles from other time-invariant individual or system discontinuities at the age of 18, while the use of high-quality administrative records allows studying the entire Dutch population, and conduct a number of subgroup analyses. In terms of heterogeneous impact by socioeconomic status, and although differential effects of cost-sharing by income are supported by theory, our study provides additional contributions to what most studies can measure. First, we use administrative income records rather than relying on self-reported income or area-based measures, which can result in considerable differences in both classification and findings (Demissie et al., 2000; Toivakka et al., 2018). Second, we are able to directly compare across income groups for the complete population, instead of focusing only on selected subgroups or indirect comparisons (Nilsson and Paul, 2018; Johansson et al., 2019).

Our results are aligned with the patient cost-sharing literature on health care use for other age groups, that finds negative impacts of co-payments and co-insurance on the use of mental health services (Lambregts and van Vliet, 2018; Keeler et al., 1988; Ravesteijn et al., 2017; van der Lee et al., 2019), and of deductibles on “physical” and mental health care (Brot-Goldberg et al., 2017; Remmerswaal et al., 2019). We also find larger impacts of increased deductibles on low-income groups. While existing studies report mixed evidence of the effects of cost-sharing across income (Nilsson and Paul, 2018; Lambregts and van Vliet, 2018; Johansson et al., 2019; Ravesteijn et al., 2017; Remmerswaal et al., 2019; Kato et al., 2021), our results are in line with other studies in the Dutch context. Remmerswaal and colleagues, report that adults living in low-income areas reduce their consumption of “physical” health care more when facing a deductible versus a rebate, but no difference is seen in high-income areas (Remmerswaal et al., 2019). Ravesteijn et al. studied the introduction of co-payments for specialist mental health treatment and finds a greater reduction in demand for Dutch adults living in low-income neighbourhoods (Ravesteijn et al., 2017). Such differential impact was not identified by Lambregts and van Vliet when studying the same reform but measuring socioeconomic status with an aggregated score based on neighborhood characteristics in terms of income, education and employment (Lambregts and van Vliet, 2018). Our findings instead rely on individual-level measures of income, and are in line with two studies observing equivalent measures for Swedish young adults around the age of 20. These studies found that removing co-payments led to an increase in the number of outpatient

medical appointments (Johansson et al., 2019), while modest co-payments decreased the number of primary care visits (Nilsson and Paul, 2018). In both cases, effects were substantially larger for low-income groups, and in the later also for females.

5.1. Limitations

The difference-in-discontinuity approach relies on the assumption that the effect of the deductible increase at age 18 can be isolated from other discontinuous changes at the same age, provided the latter are constant over the study period. While it is a limitation that this assumption is in principle untestable, several features of our modelling strategy and sensitivity analyses confirm the robustness of our findings. We found no indication of time-varying anticipation or time-varying confounding in terms of moving out of the parental house, personal income, or confounding trends in mental health care use during the low deductible period. Furthermore, the combination of year dummies with the difference-in-discontinuity design allows for changes in the mental health care sector that influence levels of care used by both adolescents and young adults (Appendix A.3). Waiting times for specialist AMHS were also stable during our study period (NZa Marktscan, 2015). Secondly, we cannot distinguish between over- and underutilisation of services since we lack a detailed measure of mental health need. If the increase of the deductible only reduced non-essential mental health care use, effects on mental health may have been limited. However, overuse of mental health services by youth is unlikely as there is often stigma around using mental health care (Rice et al., 2018), and since we find considerable discontinuation for those labelled as high-intensity users. Third, our data does not record information on support provided by GPs and mental health nurses in primary care. We cannot exclude increased substitution between mental health services and GPs support in high deductible years, especially given the increasing numbers of mental health nurses in primary care (Beurs et al., 2016) and the deductible exemption for this type of care. Although substitution can be clinically appropriate in some cases, financially driven substitution is a concern given the limited scope of primary care to treat mental disorders in youth. Last, we mostly interpret our estimates as patient, and less as provider responses, as the binary outcome of care utilization is mostly decided by patients. On the other hand, providers could have a larger influence on how much care patients use. While providers' revenues could be indirectly affected by the increase of the deductible, we hypothesize that they had limited incentives and means to react to this change, because the deductible amount does not directly impact their payment, and is charged to patients by insurers.

6. Conclusion

Our results indicate that financial barriers contribute to the transition gap identified in the mental health sector. We find a disproportional impact of the deductible increase on the most vulnerable groups, who are likely to have greater needs of mental health treatment. This suggests that cost-sharing might be widening inequalities in mental health from the early age of 18. Such disproportional effect of cost-sharing was identified in a country with universal health care coverage and relatively low levels of out-of-pocket expenditure. This positions our findings for the Netherlands as a possible lower bound among other high-income countries, raising concerns for countries where deductibles are a prominent feature of insurance plans, or where financial arrangements change at the transition to adulthood. Our results show that blunt forms of cost-sharing are detrimental for vulnerable groups, suggesting that policy-makers should look to value-based insurance design and establish patient cost-sharing structures that consider patients benefiting the most. Complementary strategies include increasing the perceived value of mental health treatment during the transition to adulthood and among young adults; and raising awareness of the financial barriers among clinicians and researchers working on the CAMHS-AMHS

transition.

Contributors

Francisca Vargas Lopes (FVL) did conceptualization, data curation, methodology, formal analysis and wrote the original draft. Carlos J Riumallo Herl (CRH), Johan P Mackenbach (JPM) and Tom Van Ourti (TVO) contributed to the conceptualization and interpretation of the analysis. CRH and TVO contributed to the methodology. CRH assisted in drafting and revising the original manuscript and JPM and TVO reviewed and edited it. All authors approved the final version of the manuscript.

Ethical approval

No formal ethical review is necessary according to the Dutch Act on Medical research involving human subjects (Wet medisch-wetenschappelijk onderzoek met mensen). The study complies with the data agreement for the use of non-public microdata provided by Statistics Netherlands.

Data sharing

This study used non-public microdata provided by Statistics Netherlands via a Remote Access facility. As stipulated in the data agreement, Statistics Netherlands pre-viewed the findings of this study prior to publication to ensure that privacy sensitive, individual-specific information is not revealed. The data from this study can only be applied for through a government data sharing portal of Statistics Netherlands (<https://www.cbs.nl/en-gb/our-services/customised-services-microdata/microdata-conducting-your-own-research>). Under certain conditions, these microdata are accessible for statistical and scientific research. For further information: microdata@cbs.nl.

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Declaration of competing interest

We declare no competing interests.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2022.114741>.

References

- Baicker, K., Goldman, D., 2011. Patient cost-sharing and healthcare spending growth. *J. Econ. Perspect.* 25 (2), 47–68.
- Baicker, K., Taubman, S.L., Allen, H.L., et al., 2013. The Oregon experiment — effects of Medicaid on clinical outcomes. *N. Engl. J. Med.* 368 (18), 1713–1722.
- Barr, N.G., Longo, C.J., Embrett, M.G., Mulvale, G.M., Nguyen, T., Randall, G.E., 2017. The transition from youth to adult mental health services and the economic impact on youth and their families. *Healthc. Manag. Forum* 30 (6), 283–288.
- Beurs, Dd, Magnée, T., Bakker, D. de, Verhaak, P., 2016. Analyse van de inzet van de POH-GGZ in de huisartsenpraktijk over de periode 2010-2015. <https://nivel.nl/site>

- s/default/files/bestanden/factsheet_analyse_van-de_inzet_van_de%20_POH-GGZ_in_huisartsenpraktijk_2010_2015.pdf. (Accessed 30 October 2020).
- Bijl, R.V., de Graaf, R., Hiripi, E., et al., 2003. The prevalence of treated and untreated mental disorders in five countries. *Health Aff.* 22 (3), 122–133.
- Brook, R.H., Ware Jr., J.E., Rogers, W.H., et al., 1983. Does free care improve adults' health? Results from a randomized controlled trial. *N. Engl. J. Med.* 309 (23), 1426–1434.
- Brot-Goldberg, Zarek C., Chandra, Amitabh, Handel, Benjamin R., Kolstad, Jonathan T., 2017. What does a deductible do? The impact of cost-sharing on health care prices, quantities, and spending dynamics. *Q. J. Econ.* 132 (3).
- Dashiff, C., DiMicco, W., Myers, B., Sheppard, K., 2009. Poverty and adolescent mental health. *J. Child Adolesc. Psychiatr. Nurs.* 22 (1), 23–32.
- Demissie, K., Hanley, J.A., Menzies, D., Joseph, L., Ernst, P., 2000. Agreement in measuring socio-economic status: area-based versus individual measures. *Chron. Dis. Can.* 21 (1), 1–7.
- Erskine, H.E., Moffitt, T.E., Copeland, W.E., et al., 2015. A heavy burden on young minds: the global burden of mental and substance use disorders in children and youth. *Psychol. Med.* 45 (7), 1551–1563.
- Finkelstein, A., Taubman, S., Wright, B., et al., 2012. The Oregon health insurance experiment: evidence from the first year. *Q. J. Econ.* 127 (3), 1057–1106.
- Frank, R.G.M.T., 2000. Economics and mental health. In: Culyer, A.N.J. (Ed.), *Handbook of Health Economics*, vol. 1. Elsevier Science B, Amsterdam.
- Gerritsen, S.E., Dieleman, G.C., Beltman, M.A.C., et al., 2019. Transitional psychiatry in The Netherlands: experiences and views of mental health professionals. *Early Interv Psychiatry*.
- Gore, F.M., Bloem, P.J., Patton, G.C., et al., 2011. Global burden of disease in young people aged 10–24 years: a systematic analysis. *Lancet* 377 (9783), 2093–2102.
- Grembi, V., Nannicini, T., Troiano, U., 2016. Do fiscal rules matter? *Am. Econ. J. Appl. Econ.* 8 (3), 1–30.
- Hendrickx, G., De Roecq, V., Maras, A., et al., 2020. Challenges during the transition from child and adolescent mental health services to adult mental health services. *BJPsych Bull.* 1–6.
- Johansson, N., Jakobsson, N., Svensson, M., 2019. Effects of primary care cost-sharing among young adults: varying impact across income groups and gender. *Eur. J. Health Econ.* 20 (8), 1271–1280.
- Kato, H., Goto, R., Tsuji, T., Kondo, K., 2021. The effects of patient cost-sharing on health expenditure and health among older people: heterogeneity across income groups. *Eur. J. Health Econ.*
- Keeler, E.B., Manning, W.G., Wells, K.B., 1988. The demand for episodes of mental health services. *J. Health Econ.* 7 (4), 369–392.
- Kessler, R.C., Berglund, P., Demler, O., Jin, R., Merikangas, K.R., Walters, E.E., 2005. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Arch. Gen. Psychiatr.* 62 (6), 593–602.
- Kiil, A., Houlberg, K., 2014. How does copayment for health care services affect demand, health and redistribution? A systematic review of the empirical evidence from 1990 to 2011. *Eur. J. Health Econ.* 15 (8), 813–828.
- Kroneman, M., Boerma, W., van den Berg, M., Groenewegen, P., de Jong, J., van Ginneken, E., 2016. Netherlands: health system review. *Health Syst. Transit.* 18 (2), 1–240.
- Lambregts, T.R., van Vliet, R., 2018. The impact of copayments on mental healthcare utilization: a natural experiment. *Eur. J. Health Econ.* 19 (6), 775–784.
- Lohr, K.N., Brook, R.H., Kamberg, C., et al., 1986. Use of Medical Care in the RAND Health Insurance Experiment: Diagnosis- and Service-specific Analyses in a Randomized Controlled Trial. RAND Corporation, Santa Monica, CA.
- Manning, W.G., Newhouse, J.P., Duan, N., Keeler, E.B., Leibowitz, A., 1987. Health insurance and the demand for medical care: evidence from a randomized experiment. *Am. Econ. Rev.* 77 (3), 251–277.
- Marktscan, NZa. Ggz 2015 - DEEL a 2015. <https://www.zorgkennis.net/wp-content/uploads/2019/09/ZK-kennisbank-Marktscan-GGZ-2015-deel-A-3936.pdf>. (Accessed 30 October 2020).
- Mei, C., Fitzsimons, J., Allen, N., et al., 2020. Global research priorities for youth mental health. *Early Interv Psychiatry* 14 (1), 3–13.
- Newhouse, J.P.I.E.G., 1993. *Free for All? Lessons from the RAND Health Insurance Experiment*. Harvard University Press, Cambridge, MA.
- Nilsson, A., Paul, A., 2018. Patient cost-sharing, socioeconomic status, and children's health care utilization. *J. Health Econ.* 59, 109–124.
- Patel, V., Flisher, A.J., Hetrick, S., McGorry, P., 2007. Mental health of young people: a global public-health challenge. *Lancet* 369 (9569), 1302–1313.
- Ravesteijn, B., Schachar, E.B., Beekman, A.T.F., Janssen, R., Jeurissen, P.P.T., 2017. Association of cost sharing with mental health care use, involuntary commitment, and acute care. *JAMA Psychiatr.* 74 (9), 932–939.
- Reiss, F., 2013. Socioeconomic inequalities and mental health problems in children and adolescents: a systematic review. *Soc. Sci. Med.* 90, 24–31.
- Remmerswaal, M., Boone, J., Bijlsma, M., Douven, R., 2019. Cost-sharing design matters: a comparison of the rebate and deductible in healthcare. *J. Publ. Econ.* 170, 83–97.
- Rice, S.M., Purcell, R., McGorry, P.D., 2018. Adolescent and young adult male mental health: transforming system failures into proactive models of engagement. *J. Adolesc. Health* 62 (3, Suppl. ment), S9–S17.
- Romp, M.G.N., 2016. MPPAB. *Zorgthermometer*. <https://www.vektis.nl/uploads/Publicaties/Zorgthermometer/Verzekerden%20in%20beeld%202016.pdf>. (Accessed 30 October 2020).
- Sareen, J., Jagdeo, A., Cox, B.J., et al., 2007. Perceived barriers to mental health service utilization in the United States, Ontario, and The Netherlands. *Psychiatr. Serv.* 58 (3), 357–364.
- Signorini, G., Singh, S.P., Marsanic, V.B., et al., 2018. The interface between child/adolescent and adult mental health services: results from a European 28-country survey. *Eur. Child Adolesc. Psychiatr.* 27 (4), 501–511.
- Singh, S.P., Tuomaiainen, H., 2015. Transition from child to adult mental health services: needs, barriers, experiences and new models of care. *World Psychiatr.* 14 (3), 358–361.
- Toivakka, M., Pihlapuro, A., Tykkyläinen, M., Mehtälä, L., Laatikainen, T., 2018. The usefulness of small-area-based socioeconomic characteristics in assessing the treatment outcomes of type 2 diabetes patients: a register-based mixed-effect study. *BMC Publ. Health* 18 (1), 1258.
- Tuomaiainen, H., Schulze, U., Warwick, J., et al., 2018. Managing the link and strengthening transition from child to adult mental health care in Europe (MILESTONE): background, rationale and methodology. *BMC Psychiatr.* 18 (1), 167.
- Tv, Esch, Brabers, A.E.M., Dijk, C. van, Groenewegen, P.P., Jong, J.D. de, 2015. *Inzicht in zorgmijden*. Aard, omvang, redenen en achtergrondkenmerken. NIVEL. <https://nivel.nl/sites/default/files/bestanden/Inzicht-zorgmijden.pdf>. (Accessed 30 October 2020).
- van der Lee, A.P.M., de Haan, L., Beekman, A.T.F., 2019. Rising co-payments coincide with unwanted effects on continuity of healthcare for patients with schizophrenia in The Netherlands. *PLoS One* 14 (9), e0222046 e0222046.
- Verhulst, F.C., van der Ende, J., Ferdinand, R.F., Kasius, M.C., 1997. The prevalence of DSM-III-R diagnoses in a national sample of Dutch adolescents. *Arch. Gen. Psychiatr.* 54 (4), 329–336.
- Weinberg, D., Stevens, G., Duinhof, E.L., Finkenauer, C., 2019. Adolescent socioeconomic status and mental health inequalities in The Netherlands, 2001–2017. *Int. J. Environ. Res. Publ. Health* 16 (19).
- Westra, D., Wilbers, G., Angeli, F., 2016. Stuck in the middle?: a perspective on ongoing pro-competitive reforms in Dutch mental health care. *Health Pol.* 120 (4), 345–349.