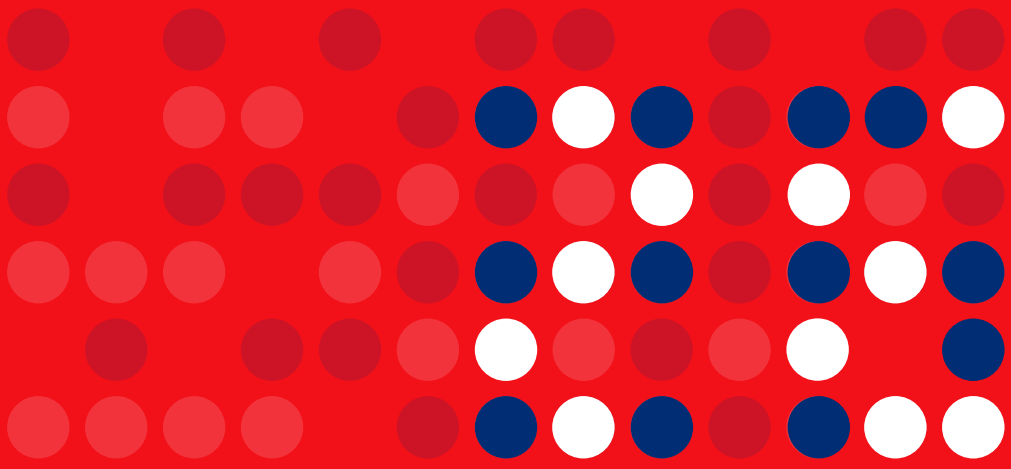
Human Immunodeficiency Virus (HIV)
Infection in the Netherlands

hiv Monitoring

HIV Monitoring Report 2026

Chapter 4: Trends in the costs of HIV therapy and care



4. Trends in costs of HIV therapy and care

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Summary

An HIV diagnosis carries costs for the healthcare system that go beyond the direct costs of HIV care itself. This chapter maps out those costs for the Netherlands: how the direct, HIV-specific healthcare costs have evolved over time and how per-person costs develop in the years after an HIV diagnosis.

In a collaboration between the Amsterdam health & technology institute (ahti) and Stichting hiv monitoring (SHM), this chapter combines person-level SHM data with non-public microdata from Statistics Netherlands (CBS) and Vektis C.V.

We selected everyone registered with SHM who was alive and in HIV care in the Netherlands in a given calendar year and who could be successfully linked to CBS microdata. Between 2016 and 2024, the number of people in our study population grew from 17,930 to 21,000. In that same period the total nominal costs barely moved (from €190 million to €191 million, +0.8%), but after adjusting for inflation they are down 24.6% (from €254 million to €191 million), and down 35.6% if also adjusted for the increasing number of people receiving HIV care. The overall reduction is mainly due to a decrease in costs of antiretroviral treatment. Beyond these overall trends, an HIV diagnosis also has a clear effect on overall healthcare spending: total healthcare costs rise on average by €13,177 (95%-confidence interval (CI): €12,248 - €14,106) per person per year over the first seven years after an HIV diagnosis, of which €10,691 (95%-CI: €10,506 - €10,876) is HIV-specific medical specialist care. The remainder reflects a temporary spike in medical specialist care not registered as HIV-specific, though in practice likely partly HIV-related, around the time of diagnosis. This spike is more than ten times larger for people diagnosed with HIV at a very late stage of HIV infection (average effect size in the year of diagnosis: €12,629 (95%-CI: €9,512 - €15,746)) than for those with a timely diagnosis (€1,237 (95%-CI: €573 - €1,900)).

Together, these findings show that while HIV-specific care has become markedly less expensive per person in care since 2016, a new HIV diagnosis still causes a substantial increase in healthcare spending, an increase that is far larger when HIV is diagnosed at a late stage. They also suggest that monitoring the quality of HIV care and auditing the compliance with national treatment guidelines by the Dutch society of HIV treating physicians (NVHB) not only improves clinical outcomes but can also reduce HIV-related healthcare costs over time.

Aim

The aim of this chapter is to present a full cost perspective on HIV-related healthcare spending in the Netherlands, by (1) quantifying the direct, HIV-specific healthcare costs and how they are composed, (2) separating nominal from real (inflation-adjusted) cost trends between 2016 and 2024, at both the population and per-person level, and (3) isolating the effect of an HIV diagnosis on healthcare costs, including how that effect differs by HIV stage at diagnosis.

Methods

The results in this chapter are based on calculations by the Amsterdam health & technology institute (ahti), in collaboration with Stichting hiv monitoring (SHM), combining person-level SHM data with non-public microdata from Statistics Netherlands (CBS) and healthcare claims data from Vektis C.V. CBS is an independent government organization that collects, processes, and publishes statistical data on residents of the Netherlands; the linkage between SHM, Vektis, and CBS data is carried out by CBS itself, within its secure environment, and researchers only access aggregated, non-identifiable output. Moreover, no group of fewer than ten people is ever reported separately.

The analyses include everyone registered with SHM (registration in SHM is voluntary/opt-in) who was alive and in HIV care in the Netherlands in a given calendar year between 2016 and 2024, and who could be successfully linked to CBS microdata. The study population used to map the total costs of HIV grew from n=17,930 in 2016 to n=21,000 in 2024. All costs are adjusted to 2024 price level using the Nederlandse Zorgautoriteit (NZa) price index for medical specialist care[1]. Because claims data in Vektis have a reporting delay, data for 2025 were not yet available at the time of this analysis; therefore, the analysis is based on the period 2016–2024.

Box 1: Methods used to estimate HIV-specific costs and the effect of an HIV-diagnosis

Estimation of ART costs

HIV-related pharmacy costs (mainly ART) cannot be calculated directly, for two reasons: pharmacy costs are only available as an annual total per person, aggregated over all medication use, while medication use itself is only identified by broad medication class (ATC level 3), without costs per class. In addition, hepatitis C is treated with medication from the same ATC3 class as ART, so these costs cannot be separated at the class level. We therefore estimate HIV-related pharmacy costs using a two-step regression of annual pharmacy costs on ≈200 ATC3 medication-use indicators, and a hepatitis C diagnosis indicator. We first estimate a non-HIV baseline cost structure among people without HIV; then we re-estimate this structure within the HIV sample, additionally allowing hepatitis C-related costs to vary with medication use and demographics. The HIV-specific cost assigned to each person-year is then the observed pharmacy cost, minus the cost predicted by the non-HIV baseline structure, minus the hepatitis-related cost component.

Difference-in-differences design

For the causal analyses, each person diagnosed with HIV was matched 1:10 to control individuals without HIV, based on year of birth, sex, migration background, highest level of education attended, and neighborhood code. Outcomes were tracked from five years before to six years after the year of diagnosis (t -5 to t = +6). Cost amounts were adjusted to 2023 price levels using the NZa healthcare price index.

For each year, the gap between the HIV group and the control group was calculated relative to the pre-existing gap at t = -2, isolating the effect attributable to the diagnosis itself. The parallel trends assumption was assessed using the pre-diagnosis period. Unless stated otherwise, the reported total effect size is the average of the year-specific difference-in-difference estimates over years 0-6. Outcomes are additionally stratified by HIV stage at diagnosis, defined as timely presentation (CD4 count at time of diagnosis >350 cells/μL without an AIDS-defining illness), late presentation (CD4 200–350 cells/μL, or >350 cells/μL with an AIDS-defining illness), or very late presentation (CD4 count <200 cells/μL with or without an AIDS-defining illness).

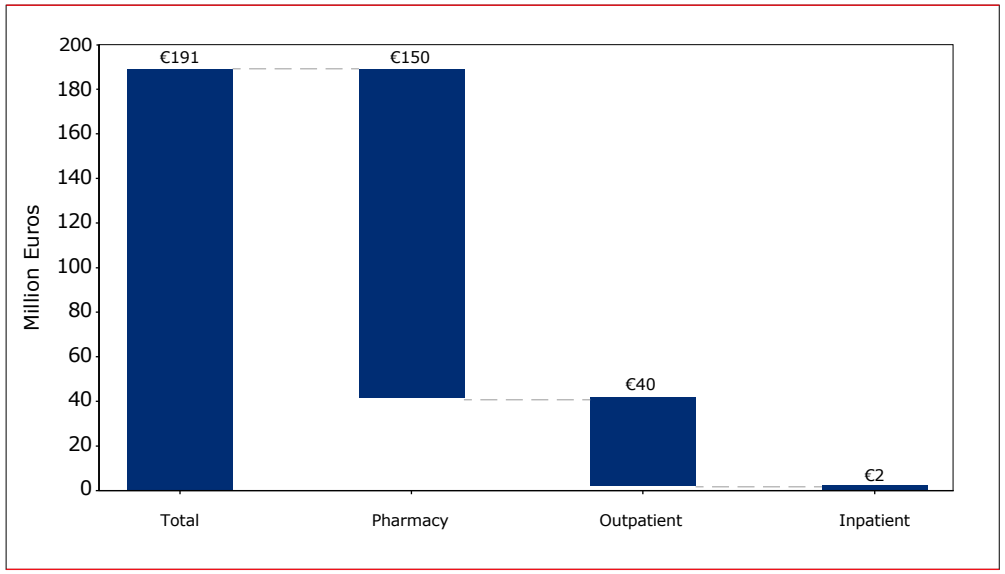
Outcomes

Variable	Description
Total HIV-specific costs	Estimated costs directly attributable to HIV: HIV-related pharmacy costs (mainly ART), HIV-specific outpatient hospital care, and HIV-specific inpatient hospital care.
ART / HIV-related pharmacy costs	Estimated using a two-step regression approach (see methods: Estimation of ART costs): observed pharmacy costs in the HIV sample, minus the cost predicted by a non-HIV baseline cost structure and minus a hepatitis-related cost component.
HIV-specific outpatient hospital care	Hospital outpatient costs (excl. pharmacy) registered under an HIV-specific treatment code (DBC/DOT), i.e. outpatient specialist care billed as HIV care. Care related to HIV but registered under other specialties or diagnosis codes – for example, an admission for what later proves to be an HIV-related condition – is not included here and is captured under non-HIV medical specialist care.
HIV-specific inpatient hospital care	Hospital admission costs registered under an HIV-specific treatment code (DBC/DOT).
Total Zvw healthcare costs	All healthcare costs reimbursed under the Health Insurance Act (Zorgverzekeringswet), i.e. total healthcare consumption, not limited to HIV-specific care.
Non-HIV specialist medical care	Costs of medical specialist care not classified as HIV-specific care.

Results

HIV-specific healthcare costs in the Netherlands totaled €191.3 million in 2024 (n=21,000 people with HIV). Pharmacy costs, mainly ART, accounted for 78% of this total (€149.9 million), with outpatient hospital care contributing 21% (€39.5 million) and inpatient care around 1% (€1.9 million).

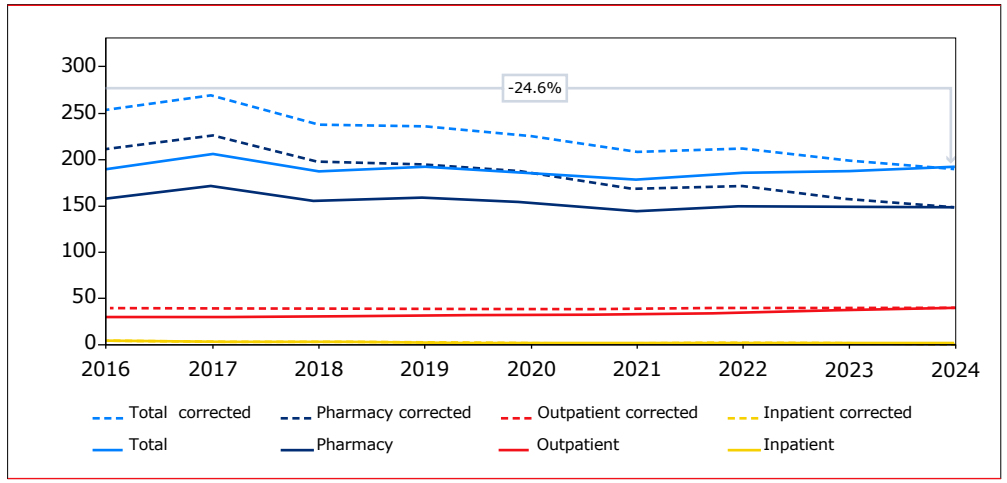
Figure 4.1: Composition of HIV-specific healthcare costs in the Netherlands in 2024, in million euros.



Cost trends in HIV care between 2016 and 2024

In nominal terms, total HIV-specific costs barely changed between 2016 and 2024 (+0.8%, Figure 4.2). Once corrected for healthcare-specific price inflation (NZa index), however, the same costs fell by 24.6%, driven mainly by the decline in pharmacy costs (-29.0%). Outpatient costs showed the opposite pattern: they rose 35.2% in nominal terms but were flat once corrected for inflation (+1.2%). Inpatient costs fell the most of all three care types, both nominally (-28.1%) and in real terms (-46.2%).

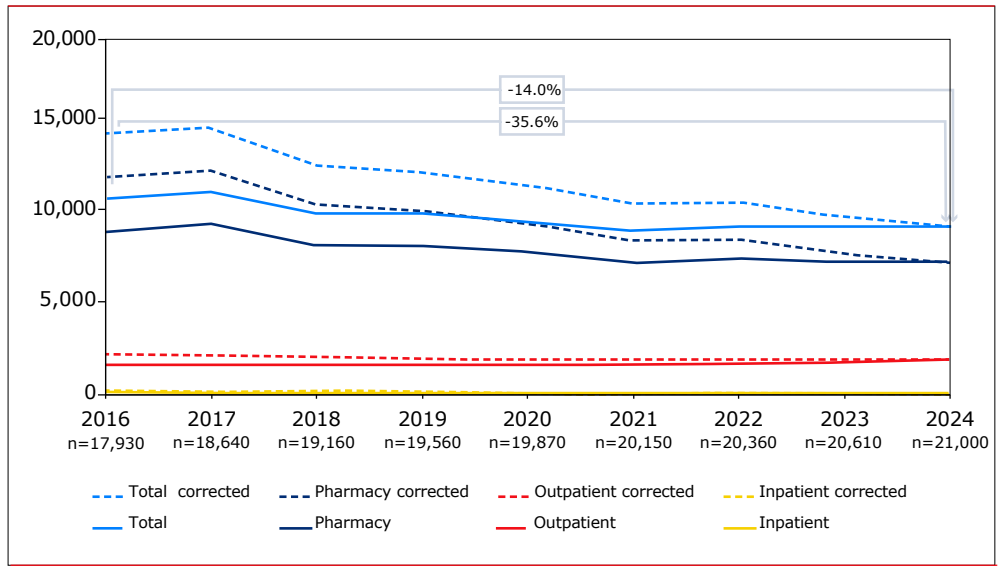
Figure 4.2: Total HIV-specific healthcare costs, ART costs, outpatient costs and inpatient costs nominal (solid lines) versus real (dashed lines) in million euros (2024 price level, corrected with NZa inflation index), 2016-2024.



Costs per person with HIV

Because the population of people with HIV grew throughout this period, the population-level trend understates the change in cost per person. In real terms, the average cost per person with HIV fell by 35.6% between 2016 and 2024, to €9,108 (a nominal decline of 14.0%); the nominal ART cost per person fell by 19.0% over the same period and this decline in real terms was 39.4%. Outpatient costs per person showed the same divergence seen at the population level: up 15.5% nominally, but down 13.6% once corrected for inflation. Inpatient costs per person fell the most of any category, both nominally (-38.6%) and in real terms (-54.0%) (*Figure 4.3*).

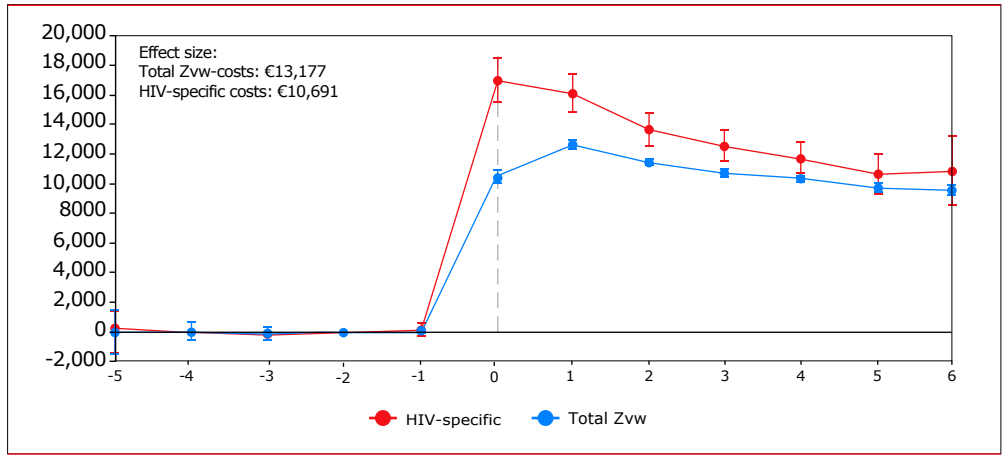
Figure 4.3: HIV-specific healthcare cost per person with HIV receiving care in a given year, nominal (solid lines) versus real (dashed lines) (2024 price level, corrected with NZa inflation index), 2016-2024.



The effect of an HIV diagnosis on healthcare costs

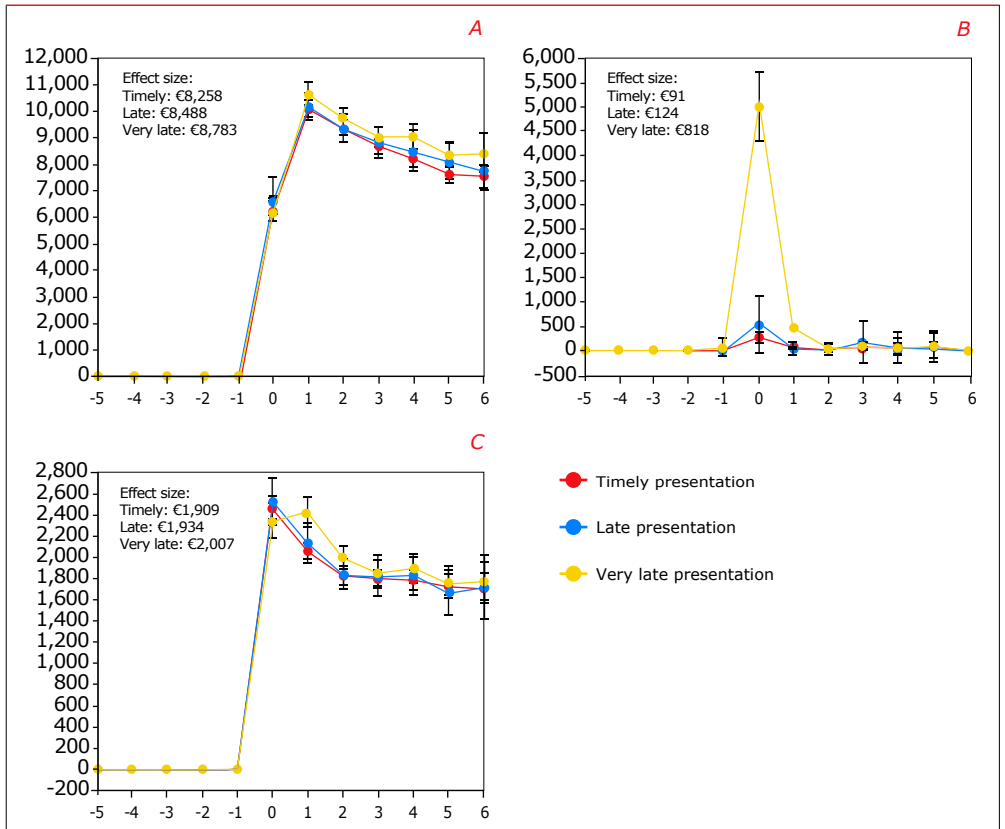
The cost trends described above show how healthcare spending has evolved over time, but not to what extent that spending is caused by an HIV diagnosis, as opposed to broader trends that would have occurred regardless. To isolate this effect, we compare the matched cohort of people newly diagnosed with HIV between 2015 and 2023. In this period, 3,400 people were newly diagnosed with HIV in the Netherlands and linked to Vektis and CBS microdata (2,900 men (85%), 500 women (15%)). These individuals were matched to 30,200 individuals from the general population (25,840 men (86%), 4,360 women (14%)). Of the people with HIV, 1,150 (34%) men and women had a first-generation migration background and 370 (11%) had a second-generation migration background. Furthermore, 2,380 (70%) people with HIV had not attained higher education, and 1,420 (42%) were aged 45 years or older.

Figure 4.4: Difference-in-differences effect of an HIV diagnosis on total Zvw healthcare costs and HIV-specific healthcare costs, relative to matched controls without HIV, shown for each year from t = -5 to t = +6 since diagnosis. The reported "effect size" in the graph is the average of these year-by-year difference-in-difference estimates over years 0-6 after HIV diagnosis.



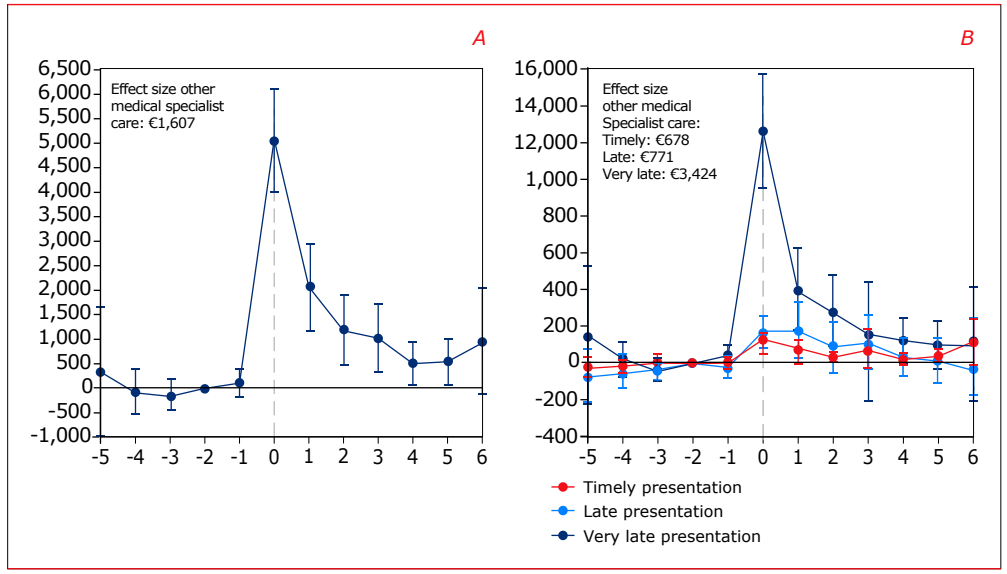
Total Zvw healthcare costs (all reimbursed healthcare use, not limited to HIV-specific care) track closely with the control group before HIV diagnosis and diverge sharply at t = 0. Averaged over years 0-6, an HIV diagnosis increases total Zvw healthcare costs by €13,177 (95%-CI: €12,248 - €14,106) per person per year, of which €10,691 (95%-CI: €10,506 - €10,876) is directly HIV-specific (*Figure 4.4*). The remaining gap reflects a temporary increase in healthcare use not registered as HIV-specific around diagnosis, part of which is likely HIV-related in practice.

Figure 4.5: *Year-by-year difference-in-difference effect of an HIV diagnosis on HIV-specific healthcare costs, relative to matched controls, stratified by HIV stage at time of diagnosis (years -5 to +6): pharmacy (panel A), inpatient (panel B), and outpatient (panel C) costs. The "effect sizes" reported in each panel are the average of the year-by-year estimates over years 0-6.*



The HIV-specific cost effect differs by HIV stage at diagnosis, and the pattern varies across its three components (*Figure 4.5*). Pharmacy costs (mainly ART) show a sustained increase from the year of diagnosis onwards that persists through year 6 and is broadly similar across stages (means over years 0-6 - timely: €8,258 (95%-CI: €8,055 - €8,462); late: €8,488 (95%-CI: €8,134 - €8,843); very late: €8,783 (95%-CI: €8,497 - €9,069), Figure 4.5, panel A). Inpatient costs, by contrast, show a sharp one-off spike concentrated almost entirely in the diagnosis year, which is far larger for people diagnosed very late (€5,000, 95%-CI: €4,287 - €5,712) than for those diagnosed on time or late (€264 (95%-CI: €147 - €380) and €535 (95%-CI: -€42 - €1,111) respectively; *Figure 4.5*, panel B), reflecting the higher likelihood of hospital admission when HIV is discovered at an advanced stage. After the first year, inpatient costs decline to nearly zero for all groups. Outpatient costs rise at diagnosis and then decline gradually over the following years, again similarly across stages (mean effect size over years 0-6 - timely: €1,909 (95%-CI: €1,851 - €1,966); late: €1,934 (95%-CI: €1,818 - €2,050); very late: €2,007 (95%-CI: €1,929 - €2,086); *Figure 4.5*, panel C) consistent with more intensive monitoring shortly after diagnosis that eases as patients stabilize on treatment.

Figure 4.6: *Year-by-year difference-in-difference effect of an HIV diagnosis on costs of medical specialist care not registered as HIV-specific, relative to matched controls: total population (panel A, years -5 to +6) and stratified by HIV stage at diagnosis (panel B, years -5 to +6). The "effect sizes" reported in each panel are the average of the year-by-year estimates over years 0-6.*



Part of the cost increase around diagnosis, however, falls outside HIV-specific care altogether. Diagnosis also triggers a temporary spike in other medical specialist care, for example diagnostic work-up, referrals or treatment of conditions related to the new diagnosis but not registered as HIV-specific care. Averaged across the total population, this effect is €1,607 (95%-CI: €1,218 - €1,996) per year (years 0-6), concentrated almost entirely in the diagnosis year itself (€5,044 (95%-CI: €3,989 - €6,099), *Figure 4.6*, panel A). This spike in the year of diagnosis differs sharply by

HIV stage at diagnosis: from €1,237 (95%-CI: €573 - €1,900) for a timely diagnosis, to €1,682 (95%-CI: €454 - €2,910) for a late diagnosis, up to €12,629 (95%-CI: €9,512 - €15,746), more than ten times higher than the timely-diagnosis effect, for a very late diagnosis (*Figure 4.6*, panel B). Note that this category includes care for conditions that may in fact be HIV-related but were not registered under an HIV-specific treatment code.

Conclusions

HIV-specific healthcare costs in the Netherlands totaled €191 million in 2024, nearly 80% of which was pharmacy expenditure (mainly ART). While total nominal costs have barely changed since 2016, real costs have fallen substantially, both at the population level (-24.6%) and per person with HIV (-35.6%, to €9,108 in 2024), reflecting a growing population combined with falling treatment costs per person, most likely driven by increasing availability of less expensive ART options, including generic substitution[2].

Beyond these overall cost trends, a new HIV diagnosis has a clear effect on healthcare spending: total Zvw healthcare costs rise by €13,177 per person per year on average over the first seven years after diagnosis, of which €10,691 is directly HIV-specific. Much of this reflects a sustained, lifelong increase in pharmacy (ART) costs that begins immediately after diagnosis and is broadly similar regardless of how advanced the disease was at diagnosis, consistent with Dutch HIV treatment guidelines. At the same time, the real cost of that lifelong treatment has been falling: increasingly efficient treatment guidelines, together with growing generic substitution of ART, have steadily reduced the per-person cost of this increase since 2016, even as the underlying effect of a diagnosis on healthcare spending has remained substantial. The remaining share of the cost increase falls outside the pre-defined HIV-specific cost categories but is likely still substantially attributable to the diagnosis itself: it is concentrated in a temporary spike in other medical specialist care around the time of diagnosis, registered under other specialisms or diagnosis codes, for example the treatment of opportunistic infections and other comorbidities that follow directly from a new HIV diagnosis[3]. This spike is far more pronounced for people diagnosed late: a very late diagnosis drives an increase in this "other" medical specialist care more than ten times as large (€12,629 in the year of diagnosis) as a timely one (€1,237 in the year of diagnosis), consistent with more extensive comorbidity treatment required when HIV is diagnosed at an advanced stage.

Taken together, these findings suggest that the total cost of an HIV diagnosis is not fixed and point to three distinct ways of containing it. The most direct way is prevention: since the lifelong step-up in pharmacy costs begins only once someone is diagnosed, preventing new HIV infections altogether avoids the full cost documented in this chapter, including that of lifelong treatment. Among people who are diagnosed, the cost of other medical specialist care is highly sensitive to timing: in the year of diagnosis, it is more than ten times larger for a very late diagnosis than for a timely one, meaning that earlier testing and diagnosis can substantially reduce the avoidable share of the cost, even where prevention is not possible or does not succeed. Finally, even the lifelong cost of pharmacy treatment itself is not fixed: the real cost per person of this treatment has fallen substantially since 2016, most likely driven by increasingly efficient treatment guidelines and mandatory audits of the quality of HIV care by the Dutch society of HIV treating physicians (NVHB). These data show that monitoring the quality of HIV care and compliance with national treatment guidelines not only improves clinical outcomes (chapter 1) but can also reduce the costs of HIV care over time.

References

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