

# Appendix A

Investment Report Technical Methods  
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## Data Source

All analyses were conducted using the Virginia All-Payer Claims Database (APCD) covering calendar years 2019–2024. The APCD includes enrollment and claims data submitted by participating commercial insurers, Medicaid managed care organizations (MCOs), Medicare Advantage plans, and Medicare fee-for-service (FFS) programs. Medical, professional, institutional, and selected pharmacy claims were available, although pharmacy claims were generally excluded from primary analyses unless otherwise noted.

Claims were linked to enrollment records using member identifiers supplied by the APCD. Enrollment and utilization measures were calculated annually and stratified by payer, age group, geography, clinician type, and care setting where applicable.

Analyses were conducted using SQL queries developed by the Virginia Center for Health Innovation. Analytic code used to generate report measures is available upon request.

## Data Considerations and Limitations

The Virginia APCD does not capture all healthcare spending incurred by Virginia residents. Consistent with APCD reporting requirements, the database generally excludes claims from self-funded employer health plans governed by the Employee Retirement Income Security Act (ERISA), Federal Employee Health Benefit (FEHB) plans, military and TRICARE coverage, uninsured individuals, and services paid entirely out of pocket. As a result, the APCD represents a substantial but incomplete portion of healthcare spending within the Commonwealth.

In addition, the APCD captures claims-based payments only. The database does not include many alternative payment arrangements and non-claims-based payments that may support primary care delivery, including:

- Capitation payments
- Shared savings payments
- Performance incentives and quality bonuses
- Episodic or bundled payments
- Care management fees
- Infrastructure payments
- Salary-based compensation arrangements
- Pharmacy rebates

Accordingly, reported spending estimates should be interpreted as claims-based healthcare expenditures rather than total healthcare expenditures within Virginia.

This report does not adjust spending estimates to account for populations or expenditures not represented in the APCD, nor does it attempt to estimate the value of pharmacy rebates or non-claims-based payments because validated data sources were not available to support such adjustments.

Unless otherwise noted, all spending measures are based on paid claims reported to the APCD. Total healthcare spending reflects the amount paid on submitted claims regardless of underlying contract structure or negotiated payment methodology.

## Inflation Adjustment

All spending estimates were converted to 2024 dollars using the Medical Care component of the Consumer Price Index (CPI) published by the U.S. Bureau of Labor Statistics.

Inflation adjustment was applied only to spending measures. Utilization, continuity, workforce, telehealth, and care-setting measures are reported as counts, rates, or percentages rather than dollar amounts and therefore were not adjusted for inflation.

## Interpretation of Medicare Fee-for-Service Estimates

Medicare fee-for-service results should be interpreted with particular caution. Based on discussions with APCD administrators and data vendors, prescription drug expenditures may be incompletely captured for Medicare fee-for-service beneficiaries, particularly for services administered through Medicare Part D. As a result, total healthcare spending estimates for Medicare fee-for-service may understate actual expenditures and may not be directly comparable to spending estimates reported for Commercial, Medicaid, or Medicare Advantage populations.

In addition to spending estimates, utilization measures for Medicare fee-for-service beneficiaries should be interpreted cautiously because differences in claims capture may influence comparisons with other payer categories.

More broadly, differences in APCD reporting requirements, payer participation, benefit design, and population characteristics may influence comparisons across payer categories.

## Analytic Population

The analytic population consisted of all individuals enrolled in participating APCD health plans for at least one month during a given calendar year.

Enrollment was measured using member months. Average annual enrollment was calculated as total member months divided by 12:

- $\text{Average Annual Enrollment} = \text{Total Member Months} \div 12$

Average annual enrollment was used throughout the report to maintain consistency across spending and utilization measures and to account for enrollment churn occurring during the year. As a result, utilization measures reported in this report are not directly comparable to survey-based estimates of the percentage of residents receiving care.

Members were classified according to the line of business (LOB) reported in APCD enrollment and claims files:

- Commercial
- Medicaid
- Medicare Fee-for-Service
- Medicare Advantage
- Other

Age-specific analyses were conducted using APCD age-band variables and included the following categories:

- 0–18 years
- 19–21 years
- 22–34 years
- 35–54 years
- 55–64 years
- 65–79 years
- 80+ years

## Primary Care Definitions

Consistent with prior Virginia Primary Care Investment Reports and Scorecards, analyses were conducted using both broad and narrow definitions of primary care.

Primary care classifications were based on indicator variables developed and maintained by Milliman and the Virginia Health Information (VHI) APCD team. Broad and narrow primary care flags were supplied within the APCD analytic files and reflect the methodology previously adopted by the Virginia Task Force on Primary Care (VTFPC).

The VCHI team did not independently recreate the broad and narrow primary care classification algorithms. Instead, analyses relied on standardized primary care indicator variables supplied within the APCD analytic files. For narrow primary care analyses, claims were additionally required to meet a qualifying service definition based on APCD procedure code classifications. The definitions described below are provided to facilitate interpretation of these classifications.

### Broad Definition

The broad definition was designed to capture the full range of clinicians and settings involved in delivering primary care services in Virginia. This definition includes expenditures and utilization associated with all professional and outpatient services provided by the following clinician types and facilities:

#### Eligible Clinician Specialties

- Family Medicine
- Pediatrics
- Geriatric Medicine
- Adolescent Medicine
- Palliative Care
- Internal Medicine providers with at least 10 wellness visits during the calendar year
- Obstetrics/Gynecology providers with at least 10 wellness visits during the calendar year
- All Nurse Practitioners (regardless of specialty designation)
- All Physician Assistants<sup>1</sup>/Associates (regardless of specialty designation)

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<sup>1</sup> Throughout this report, the term physician assistant (PA) is used to align with terminology contained in APCD source data and workforce datasets, although some professional organizations now use the term physician associate.

## Eligible Facilities and Community-Based Settings

- Federally Qualified Health Centers (FQHCs)
- Rural Health Clinics (RHCs)
- School Health Clinics

## Eligible Care Settings

Professional and outpatient services meeting the above criteria were included regardless of place of service. Accordingly, broad primary care may include services delivered in physician offices, hospital outpatient departments, urgent care centers, community health centers, nursing facilities, home settings, and other outpatient locations.

- Urgent care services were included when delivered by an eligible primary care clinician or facility identified under the broad definition.
- Although emergency department visits were not classified as primary care services, POS 23 was included within the broader hospital-based category when summarizing locations where primary care clinicians delivered services.
- Home-based visits were identified using place-of-service code 12 (Home). During analysis, unusually high rates of POS 12 claims were observed among some Medicare populations. Although these claims may represent home-based primary care services, they may also reflect payer-specific billing or coding practices that are not fully understood. Therefore, findings related to home-based care should be interpreted cautiously, particularly for older adults and Medicare beneficiaries.

The broad definition is intended to reflect the modern primary care delivery system and captures care provided by physicians, advanced practice providers, community health centers, and other outpatient settings involved in primary care delivery.

## Narrow Definition

The narrow definition was designed to align more closely with traditional physician-led primary care investment measures and national benchmarking efforts.

Under this definition, claims were required to meet both a **clinician-based criterion** and a **service-based criterion**.

Services were included only when provided by physicians in the following specialties:

- Family Medicine
- Pediatrics
- Geriatric Medicine
- Adolescent Medicine (where available)
- Palliative Care
- Internal Medicine providers with at least 10 wellness visits during the calendar year

In addition, claims were required to be classified as a qualifying narrow primary care service using procedure code classifications developed and maintained by Milliman and the Virginia Health Information (VHI) APCD team. Qualifying services generally included:

- Primary care office visits

- Immunizations
- Annual physical examinations
- Well-child and preventive visits
- Other qualifying preventive services

The narrow definition excludes nurse practitioners, physician assistants, community health centers, school health clinics, Rural Health Clinics, Obstetrics/Gynecology providers, urgent care visits, and other nontraditional primary care settings.

Accordingly, the narrow definition represents a more restrictive measure of physician-led preventive and office-based primary care than the broad definition.

### Rationale for Dual Definitions

No single definition fully captures the scope of primary care delivery. The narrow definition emphasizes traditional physician-led preventive and office-based primary care and facilitates comparison with national primary care investment benchmarks. The broad definition reflects the increasingly multidisciplinary nature of primary care delivery in Virginia by incorporating advanced practice providers, community-based clinics, and a wider range of outpatient services and settings.

### Spending Measures

Total healthcare spending was calculated as the sum of paid amounts across all eligible medical claims during a calendar year.

Annual per- average member spending was calculated as:

- $\text{Total Healthcare Spending} \div \text{Average Annual Enrollment}$

### Primary Care Spending

Broad and narrow primary care spending were calculated using the corresponding primary care definitions described above.

Annual per-average member spending was calculated separately for each definition:

- $\text{Primary Care Spending} \div \text{Average Annual Enrollment}$

### Primary Care Share of Total Spending

Primary care investment was calculated as:

- $\text{Primary Care Spending} \div \text{Total Healthcare Spending}$

and reported as a percentage.

### Primary Care Utilization

Broad primary care utilization analyses identified members and visits using the APCD broad primary care classification. Narrow primary care utilization analyses required both a qualifying

narrow primary care clinician and a qualifying narrow primary care service based on APCD procedure code classifications.

For visit-based analyses, multiple claim lines associated with the same member, rendering clinician, and date of service were collapsed into a single encounter to reduce double-counting.

## Percent Receiving Primary Care

The numerator consisted of unique members with at least one qualifying broad primary care encounter during the calendar year.

The denominator consisted of average annual enrollment.

- Percent Receiving Primary Care =  $\frac{\text{Average Members with } \geq 1 \text{ Broad Primary Care Visit}}{\text{Average Annual Enrollment}}$

Because the numerator represents unique members and the denominator represents average annual enrollment (member months  $\div$  12), estimates should be interpreted as utilization rates among average enrolled members rather than the percentage of covered lives receiving care during the year.

The APCD includes members with little or no healthcare utilization during a given year. Accordingly, these measures should not be interpreted as the proportion of Virginians who have access to primary care, but rather the proportion of enrolled members with a documented primary care claim during the measurement year.

## Visits Per Member

Broad primary care visits were identified using claims meeting the broad primary care definition.

Multiple records associated with the same member, provider, and date of service were combined when appropriate to reduce double-counting. For visit-based analyses, multiple claim lines associated with the same member, rendering clinician, and date of service were collapsed into a single encounter.

Visits per member were calculated as:

- $\frac{\text{Total Broad Primary Care Visits}}{\text{Average Annual Enrollment}}$

Age-specific utilization estimates were generated using the same methodology within age strata.

## Workforce Analyses

Provider specialty was assigned using APCD provider specialty fields.

Clinicians were categorized as:

- Family Practice
- Internal Medicine
- Pediatrics
- General Practice
- Geriatric Medicine

- Obstetrics/Gynecology
- Nurse Practitioner
- Physician Assistant

Advanced Practice Providers (APPs) were defined as nurse practitioners and physician assistants.

Workforce analyses examined both:

- Share of broad primary care visits delivered by clinician type.
- Share of broad primary care spending attributable to clinician type.

Percentages were calculated relative to total broad primary care visits or spending within each calendar year.

## Continuity of Care

Continuity was operationalized using a clinician-level adaptation of the Usual Provider Continuity (UPC) Index.

For each member receiving primary care during a calendar year:

1. All broad primary care visits were identified.
2. Visits were grouped by rendering clinician National Provider Identifier (NPI).
3. The clinician providing the largest number of visits was identified.
4. The proportion of visits delivered by that clinician was calculated.

Members were classified as having high continuity if at least 75% of annual primary care visits were delivered by the same clinician. The 75% threshold was selected to identify members whose primary care was predominantly concentrated with a single clinician during the measurement year.

Statewide continuity was calculated as:

- $\text{Members Meeting Continuity Threshold} \div \text{Members Receiving Primary Care}$

Members with only one primary care visit automatically met the threshold.

Accordingly, continuity estimates should be interpreted as a measure of concentration of care within a calendar year rather than a direct measure of longitudinal patient-clinician relationships.

## Care Delivery Settings Analysis

Primary care visits were classified using APCD place-of-service (POS) codes reported on professional and outpatient claims.

Office-Based Care

- POS 11 – Office

Home-Based Care

- POS 12 – Home

## Urgent Care

- POS 20 – Urgent Care Facility

## Hospital-Based Outpatient Care

- POS 19 – Off-Campus Outpatient Hospital
- POS 22 – On-Campus Outpatient Hospital

## Emergency Department

- POS 23 – Emergency Room – Hospital

Although emergency department visits were not classified as primary care services, POS 23 was included within the broader hospital-based category when summarizing locations where primary care clinicians delivered services.

## Nursing Facilities

- POS 31 – Skilled Nursing Facility
- POS 32 – Nursing Facility

## Community Health Centers

- POS 50 – Federally Qualified Health Center (FQHC)
- POS 72 – Rural Health Clinic (RHC)

## Other Settings

All remaining eligible outpatient and professional service settings were grouped into an "Other Settings" category. Examples include retail clinics, public health clinics, residential treatment facilities, mobile units, and other less frequently used outpatient care settings.

For reporting purposes, the percentage distribution of primary care visits across settings was calculated as:

- $\text{Visits in Setting} \div \text{Total Broad Primary Care Visits}$

and reported as a percentage.

Home-based visits represent services billed as occurring in a patient's residence and generally reflect in-person home-based primary care rather than telehealth encounters. Accordingly, the large proportion of home-based visits observed among older adults should not be interpreted as telehealth utilization.

## Telehealth Identification

Telehealth visits were identified using either:

1. APCD telehealth indicator fields; or
2. Telehealth-specific place-of-service codes:
  - a. POS 02 – Telehealth Provided Other Than in Patient's Home
  - b. POS 10 – Telehealth Provided in Patient's Home

Telehealth utilization was calculated as:

- $\text{Telehealth Primary Care Visits} \div \text{Total Broad Primary Care Visits}$

and reported as a percentage.

Telehealth coding practices changed substantially during the COVID-19 pandemic due to evolving federal guidance, payer reporting requirements, and billing practices. As a result, telehealth estimates for 2020 and 2021 should be interpreted cautiously. Reporting became considerably more consistent after 2022, and estimates from 2023–2024 are likely more reliable than those observed during the early pandemic period.

Because telehealth may be identified using multiple coding mechanisms, estimates should be interpreted as a reasonable approximation of telehealth utilization rather than a definitive count of all virtual encounters. Telehealth status and place-of-service were measured independently. Accordingly, telehealth encounters may occur within multiple reported care settings and should not be interpreted as a mutually exclusive care-delivery category.

## Geographic Analyses

County-level measures were assigned using the member's county of residence recorded in APCD enrollment files. Unless otherwise noted, geographic analyses reflect the member's county of residence rather than the county in which services were delivered.

County-specific estimates were generated for:

- Primary care spending
- Primary care utilization
- Continuity of care
- Workforce composition
- Care delivery settings
- Telehealth utilization

All geographic analyses applied the same definitions and denominators used for statewide estimates.

## Limitations

Several limitations should be considered when interpreting findings:

1. APCD coverage is incomplete and does not fully capture all Virginia residents.
2. Spending estimates do not include non-claims-based payments, pharmacy rebates, or other alternative payment arrangements.
3. Medicare fee-for-service expenditures may be understated because of incomplete prescription drug data.
4. Medicare fee-for-service utilization and spending estimates may not be fully comparable to other payer categories because of known limitations in APCD capture of certain Medicare claims and prescription drug expenditures.

5. Claims data measure billed services rather than unmet need, patient experience, clinical quality, or health outcomes.
6. Provider specialty classification relies on payer-reported specialty information and may be subject to misclassification.
7. Telehealth coding practices changed substantially during and after the COVID-19 pandemic.
8. Continuity estimates reflect concentration of care within a calendar year and do not capture longitudinal patient-clinician relationships across years.
9. County-level estimates may be influenced by local differences in payer participation, coding practices, and healthcare delivery systems.

## Strengths

Despite these limitations, the Virginia APCD remains one of the most comprehensive data sources available for evaluating healthcare spending, utilization, workforce patterns, and primary care delivery across the Commonwealth. The APCD allows for consistent longitudinal measurement across multiple payer categories, geographic regions, clinician types, and care settings using a standardized analytic framework. These features make the APCD uniquely valuable for monitoring primary care investment and delivery over time.