**SUPPLEMENTARY APPENDIX**

**Appendix 1: Description of Attribution Process**

For each calendar year of the study, we assigned patients to a primary HIV care provider (PCP-HIV). To accomplish this, we designed a multi-stage attribution process based off of similar approaches used in the literature[16]. We first assigned a patient to the provider that wrote the plurality of the patent’s ART prescriptions within the year, provided that they had seen the patient for at least one office visit. If a patient did not have a provider who both wrote the plurality of prescriptions and also had seen the patient in the office, then we assigned the patient to the provider with whom they had the most Evaluation & Management (E&M) code visits within the year. If the patient did not have any utilization, or any E&M code office visits within the year, then we considered them un-attributable. In the case of a tie for the most visits among the attribution methods, we assigned the patient to the provider they saw earliest within the calendar year. It is important to note that during the years of this study, universal treatment with ART had not yet been recommended.[40]

MAX data does not contain a practice identifier that can link providers to practices. To assign providers to practices, we used the NPI registry file. While the NPI registry file has a field for site of practice, medical practice names are often spelled inconsistently across providers. To address this ambiguity, we created a custom practice identifier that combined the provider’s 5-digit zip code with the first six digits of their office phone number. Five-digit zip codes helped to identify providers who practiced in the same geographic area. The first 6 digits of the phone number represented the area code, and the first 3 digits of a potential office line. We did not distinguish between free-standing practices in the community versus those based at hospitals. To validate this practice identifier, we took a random qualitative sample of practices created in our sample and looked up the assigned providers on medical practice websites.

**Appendix 2: Summary Attribution Algorithm**

1. Does patient have a match between an ART prescriber and an OT Service provider at any point within a year?
   1. IF YES
      1. Select prescriber responsible for most prescriptions if they
         1. Have an NPI confirmable at an individual provider
         2. Have had at least one E&M code or PCP taxonomy code
         3. If tie, use earliest write date
   2. IF NO
      1. Move to step 2
2. Does the patient have an OT claim with any service provider within a year?
   1. IF YES
      1. Select service provider if they
         1. Have an NPI code confirmable as an individual provider
         2. Have had at least one E&M code or PCP taxonomy code
         3. If Tie:
            1. Provider with most separate claims with E&M codes
            2. Provider with most separate claims if at least one has an E&M code
            3. Provider with the earliest E&M code claim
   2. IF NO: If a patient has no OT utilization within a year, or no utilization with a provider with any E&M or PCP taxonomy codes, then patient cannot be attributed

**Appendix 3: Attribution Flow Chart**

Identifiable HIV Person Years

(376,274)

% Attributable with Matching Prescriber (52.5%)

% Attributable with OT Only (30%)

Total Attributable

(310,507, 82.5%)

Analytic Sample\*

(111,013)

% With Valid NPI (93.1%)

\*Excluding those under 18, over 65+, and duals.

**Appendix 4: Attribution Rates by State and Year**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | state | 2009 | 2010 | 2011 | 2012 |
| ca | n attributed | 8468 | 8526 | 9115 | 8054 |
|  | % attributed | 73% | 68% | 68% | 60% |
| fl | n attributed | 10219 | 11233 | 12089 | 12474 |
|  | % attributed | 93% | 92% | 91% | 91% |
| ga | n attributed | 189 | 2935 | 3306 | 3429 |
|  | % attributed | 6% | 86% | 87% | 90% |
| il | n attributed | 2854 | 2880 | 3035 | 3142 |
|  | % attributed | 69% | 68% | 66% | 70% |
| la | n attributed | 1985 | 2205 | 2433 | 2425 |
|  | % attributed | 98% | 98% | 97% | 94% |
| ma | n attributed | 2854 | 2698 | 3557 | 3980 |
|  | % attributed | 81% | 74% | 74% | 76% |
| md | n attributed | 1618 | 1500 | 885 | 746 |
|  | % attributed | 42% | 36% | 20% | 17% |
| nc | n attributed | 2916 | 3024 | 3083 | 3104 |
|  | % attributed | 96% | 96% | 94% | 94% |
| nj | n attributed | 3275 | 3256 | 3348 | 1716 |
|  | % attributed | 95% | 91% | 79% | 70% |
| ny | n attributed | 29743 | 31811 | 34354 | 34308 |
|  | % attributed | 86% | 87% | 88% | 87% |
| oh | n attributed | 761 | 706 | 1255 | 633 |
|  | % attributed | 73% | 30% | 48% | 23% |
| pa | n attributed | 604 | 611 | 555 | 586 |
|  | % attributed | 90% | 85% | 74% | 73% |
| tx | n attributed | 3786 | 4132 | 4639 | 4543 |
|  | % attributed | 91% | 91% | 88% | 82% |
| va | n attributed | 1132 | 1244 | 1223 | 1325 |
|  | % attributed | 88% | 90% | 80% | 90% |

Appendix 5: Sensitivity of Intraclass Correlation Coefficients to Practice Size





**Appendix 6**: Specialty Classification

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Taxonomy Code** | **Taxonomy Class** | **Taxonomy Specialty** | **Classification** | **Count of Patient-Years Attributed** |
| 207RI0200X | Internal Medicine | Infectious Disease | Infectious Disease | 45226 |
| 207R00000X | Internal Medicine |  | Generalist | 21142 |
| 207Q00000X | Family Medicine |  | Generalist | 8425 |
| 207RG0100X | Internal Medicine | Gastroenterology | Other Specialty | 2631 |
| 2080P0208X | Pediatrics | Pediatric Infectious Diseases | Infectious Disease | 2230 |
| 207V00000X | Obstetrics & Gynecology | | Other Specialty | 1249 |
| 207RC0000X | Internal Medicine | Cardiovascular Disease | Other Specialty | 853 |
| 208D00000X | General Practice |  | Generalist | 780 |
| 207VM0101X | Obstetrics & Gynecology | Maternal & Fetal Medicine | Other Specialty | 682 |
| 208M00000X | Hospitalist |  | Generalist | 629 |
| 207RH0003X | Internal Medicine | Hematology & Oncology | Other Specialty | 599 |
| 207QA0505X | Family Medicine | Adult Medicine | Generalist | 352 |
| 2080P0201X | Pediatrics | Pediatric Allergy/Immunology | Other Specialty | 273 |
| 2084P0800X | Psychiatry & Neurology | Psychiatry | Other Specialty | 234 |
| 208600000X | Surgery |  | Other Specialty | 217 |
| 207RI0008X | Internal Medicine | Hepatology | Other Specialty | 216 |
| 207RR0500X | Internal Medicine | Rheumatology | Other Specialty | 205 |
| 207RP1001X | Internal Medicine | Pulmonary Disease | Other Specialty | 197 |
| 208800000X | Urology |  | Other Specialty | 184 |
| 207RX0202X | Internal Medicine | Medical Oncology | Other Specialty | 181 |
| 207N00000X | Dermatology |  | Other Specialty | 174 |
| 207X00000X | Orthopedic Surgery | | Other Specialty | 159 |
| 207RN0300X | Internal Medicine | Nephrology | Other Specialty | 158 |
| 207RG0300X | Internal Medicine | Geriatric Medicine | Generalist | 155 |
| 207K00000X | Allergy & Immunology | | Other Specialty | 153 |
| 213ES0103X | Podiatrist | Foot & Ankle Surgery | Other Specialty | 151 |
| 207P00000X | Emergency Medicine | | Other Specialty | 122 |
| 207RA0000X | Internal Medicine | Adolescent Medicine | Generalist | 118 |
| 207W00000X | Ophthalmology |  | Other Specialty | 95 |
| 207ZC0500X | Pathology | Cytopathology | Other Specialty | 95 |
| 2085R0202X | Radiology | Diagnostic Radiology | Other Specialty | 92 |
| 2080A0000X | Pediatrics | Adolescent Medicine | Other Specialty | 86 |
| 2084N0400X | Psychiatry & Neurology | Neurology | Other Specialty | 86 |
| 208100000X | Physical Medicine & Rehabilitation | | Other Specialty | 83 |
| 152W00000X | Optometrist |  | Other Specialty | 82 |
| 207RE0101X | Internal Medicine | Endocrinology, Diabetes & Metabolism | Other Specialty | 81 |
| 208C00000X | Colon & Rectal Surgery | | Other Specialty | 75 |
| 2083P0901X | Preventive Medicine | Public Health & General Preventive Medicine | Other Specialty | 72 |
| 207VG0400X | Obstetrics & Gynecology | Gynecology | Other Specialty | 71 |
| 213E00000X | Podiatrist |  | Other Specialty | 67 |
| 207Y00000X | Otolaryngology |  | Other Specialty | 61 |
| 207RT0003X | Internal Medicine | Transplant Hepatology | Other Specialty | 47 |
| 207VX0000X | Obstetrics & Gynecology | Obstetrics | Other Specialty | 47 |
| 207VX0201X | Obstetrics & Gynecology | Gynecologic Oncology | Other Specialty | 47 |
| 207ZP0105X | Pathology | Clinical Pathology/Laboratory Medicine | Other Specialty | 44 |
| 207QH0002X | Family Medicine | Hospice and Palliative Medicine | Other Specialty | 42 |
| 207QG0300X | Family Medicine | Geriatric Medicine | Generalist | 38 |
| 207RA0401X | Internal Medicine | Addiction Medicine | Other Specialty | 35 |
| 208VP0000X | Pain Medicine | Pain Medicine | Other Specialty | 35 |
| 207RH0002X | Internal Medicine | Hospice and Palliative Medicine | Other Specialty | 34 |
| 207ZP0102X | Pathology | Anatomic Pathology & Clinical Pathology | Other Specialty | 33 |
| 2080N0001X | Pediatrics | Neonatal-Perinatal Medicine | Other Specialty | 33 |
| 204F00000X | Transplant Surgery |  | Other Specialty | 32 |
| 2085R0001X | Radiology | Radiation Oncology | Other Specialty | 32 |
| 208VP0014X | Pain Medicine | Interventional Pain Medicine | Other Specialty | 32 |
| 2085R0204X | Radiology | Vascular & Interventional Radiology | Other Specialty | 27 |
| 207RC0200X | Internal Medicine | Critical Care Medicine | Other Specialty | 24 |
| 2085D0003X | Radiology | Diagnostic Neuroimaging | Other Specialty | 23 |
| 207XS0106X | Orthopaedic Surgery | Hand Surgery | Other Specialty | 22 |
| 2086S0129X | Surgery | Vascular Surgery | Other Specialty | 22 |
| 207RH0000X | Internal Medicine | Hematology | Other Specialty | 20 |
| 2080P0216X | Pediatrics | Pediatric Rheumatology | Other Specialty | 20 |
| 207L00000X | Anesthesiology |  | Other Specialty | 19 |
| 207LP2900X | Anesthesiology | Pain Medicine | Other Specialty | 18 |
| 207XX0005X | Orthopaedic Surgery | Sports Medicine | Other Specialty | 18 |
| 213ES0131X | Podiatrist | Foot Surgery | Other Specialty | 18 |
| 1223G0001X | Dentist | General Practice | Other Specialty | 17 |
| 207RI0011X | Internal Medicine | Interventional Cardiology | Other Specialty | 17 |
| 207XX0004X | Orthopaedic Surgery | Foot and Ankle Surgery | Other Specialty | 17 |
| 207RS0012X | Internal Medicine | Sleep Medicine | Other Specialty | 16 |
| 2080P0204X | Pediatrics | Pediatric Emergency Medicine | Other Specialty | 16 |
| 207VE0102X | Obstetrics & Gynecology | Reproductive Endocrinology | Other Specialty | 15 |
| 2084A0401X | Psychiatry & Neurology | Addiction Medicine | Other Specialty | 14 |
| 207PE0004X | Emergency Medicine | Emergency Medical Services | Other Specialty | 13 |
| 2080P0206X | Pediatrics | Pediatric Gastroenterology | Other Specialty | 12 |
| 2084P0804X | Psychiatry & Neurology | Child & Adolescent Psychiatry | Other Specialty | 12 |
| 2085B0100X | Radiology | Body Imaging | Other Specialty | 12 |
| 213EP1101X | Podiatrist | Primary Podiatric Medicine | Other Specialty | 12 |
| 207NI0002X | Dermatology | Clinical & Laboratory Dermatological Immunology | Other Specialty | 11 |
| 207XX0801X | Orthopaedic Surgery | Orthopaedic Trauma | Other Specialty | 11 |
| 2086X0206X | Surgery | Surgical Oncology | Other Specialty | 11 |
| 207XS0114X | Orthopaedic Surgery | Adult Reconstructive Orthopaedic Surgery | Other Specialty | 8 |
| 2081P2900X | Physical Medicine & Rehabilitation | Pain Medicine | Other Specialty | 8 |
| 2081S0010X | Physical Medicine & Rehabilitation | Sports Medicine | Other Specialty | 8 |
| 2084P0805X | Psychiatry & Neurology | Geriatric Psychiatry | Other Specialty | 8 |
| 122300000X | Dentist |  | Other Specialty | 7 |
| 207KA0200X | Allergy & Immunology | Allergy | Other Specialty | 7 |
| 2086S0102X | Surgery | Surgical Critical Care | Other Specialty | 7 |
| 207QA0000X | Family Medicine | Adolescent Medicine | Generalist | 6 |
| 207RA0201X | Internal Medicine | Allergy & Immunology | Other Specialty | 6 |
| 2086S0105X | Surgery | Surgery of the Hand | Other Specialty | 6 |
| 207NS0135X | Dermatology | Procedural Dermatology | Other Specialty | 5 |
| 207ZP0101X | Pathology | Anatomic Pathology | Other Specialty | 5 |
| 2086S0122X | Surgery | Plastic and Reconstructive Surgery | Other Specialty | 5 |
| 207ND0900X | Dermatology | Dermatopathology | Other Specialty | 4 |
| 207ZD0900X | Pathology | Dermatopathology | Other Specialty | 4 |
| 2085N0700X | Radiology | Neuroradiology | Other Specialty | 4 |
| 2086S0127X | Surgery | Trauma Surgery | Other Specialty | 4 |
| 207PT0002X | Emergency Medicine | Medical Toxicology | Other Specialty | 3 |
| 207RI0001X | Internal Medicine | Clinical & Laboratory Immunology | Other Specialty | 3 |
| 207RS0010X | Internal Medicine | Sports Medicine | Other Specialty | 3 |
| 207UN0901X | Nuclear Medicine | Nuclear Cardiology | Other Specialty | 3 |
| 207VF0040X | Obstetrics & Gynecology | Female Pelvic Medicine and Reconstructive Surgery | Other Specialty | 3 |
| 207VH0002X | Obstetrics & Gynecology | Hospice and Palliative Medicine | Other Specialty | 3 |
| 207ZH0000X | Pathology | Hematology | Other Specialty | 3 |
| 208200000X | Plastic Surgery |  | Other Specialty | 3 |
| 2084N0600X | Psychiatry & Neurology | Clinical Neurophysiology | Other Specialty | 3 |
| 2085U0001X | Radiology | Diagnostic Ultrasound | Other Specialty | 3 |
| 2086S0120X | Surgery | Pediatric Surgery | Other Specialty | 3 |
| 204D00000X | Neuromusculoskeletal Medicine & OMM | | Other Specialty | 2 |
| 207NP0225X | Dermatology | Pediatric Dermatology | Other Specialty | 2 |
| 207RC0001X | Internal Medicine | Clinical Cardiac Electrophysiology | Other Specialty | 2 |
| 207T00000X | Neurological Surgery | | Other Specialty | 2 |
| 207U00000X | Nuclear Medicine |  | Other Specialty | 2 |
| 207ZB0001X | Pathology | Blood Banking & Transfusion Medicine | Other Specialty | 2 |
| 2080I0007X | Pediatrics | Clinical & Laboratory Immunology | Other Specialty | 2 |
| 2080P0210X | Pediatrics | Pediatric Nephrology | Other Specialty | 2 |
| 2081P0010X | Physical Medicine & Rehabilitation | Pediatric Rehabilitation Medicine | Other Specialty | 2 |
| 2084P2900X | Psychiatry & Neurology | Pain Medicine | Other Specialty | 2 |
| 2085N0904X | Radiology | Nuclear Radiology | Other Specialty | 2 |
| 204R00000X | Electrodiagnostic Medicine | | Other Specialty | 1 |
| 207ND0101X | Dermatology | MOHS-Micrographic Surgery | Other Specialty | 1 |
| 207PE0005X | Emergency Medicine | Undersea and Hyperbaric Medicine | Other Specialty | 1 |
| 207QA0401X | Family Medicine | Addiction Medicine | Other Specialty | 1 |
| 207QS0010X | Family Medicine | Sports Medicine | Other Specialty | 1 |
| 207SG0201X | Medical Genetics | Clinical Genetics (M.D.) | Other Specialty | 1 |
| 207XS0117X | Orthopaedic Surgery | Orthopaedic Surgery of the Spine | Other Specialty | 1 |
| 207YX0901X | Otolaryngology | Otology & Neurotology | Other Specialty | 1 |
| 207YX0905X | Otolaryngology | Otolaryngology/Facial Plastic Surgery | Other Specialty | 1 |
| 2080P0202X | Pediatrics | Pediatric Cardiology | Other Specialty | 1 |
| 2080P0203X | Pediatrics | Pediatric Critical Care Medicine | Other Specialty | 1 |
| 2081H0002X | Physical Medicine & Rehabilitation | Hospice and Palliative Medicine | Other Specialty | 1 |
| 2081P0004X | Physical Medicine & Rehabilitation | Spinal Cord Injury Medicine | Other Specialty | 1 |
| 2083P0011X | Preventive Medicine | Undersea and Hyperbaric Medicine | Other Specialty | 1 |
| 2084D0003X | Psychiatry & Neurology | Diagnostic Neuroimaging | Other Specialty | 1 |
| 2084S0012X | Psychiatry & Neurology | Sleep Medicine | Other Specialty | 1 |
| 2085P0229X | Radiology | Pediatric Radiology | Other Specialty | 1 |
| 2085R0205X | Radiology | Radiological Physics | Other Specialty | 1 |
| 213ES0000X | Podiatrist | Sports Medicine | Other Specialty | 1 |

**Appendix 7**: Fixed Effect Model

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Outcome: Percent of Year Adherence | Coef. | Std. Err. | P>z | [95% Conf. | Interval] |
| **Provider Characteristics** |  |  |  |  |  |
| Provider Female | 0.006408 | 0.001923 | 0.001 | 0.002639 | 0.010177 |
| Provider has MD/DO | 0.022695 | 0.003414 | 0 | 0.016004 | 0.029386 |
| +10 Patients attributed to provider | 4.46E-05 | 2.22E-05 | 0.044 | 1.10E-06 | 8.81E-05 |
| +10 Patients attributed to Practice | -8.22E-06 | 4.37E-06 | 0.06 | -1.7E-05 | 3.53E-07 |
| Provider Specialty (Ref=Infectious Disease) |  |  |  |  |  |
| Generalist | 0.007473 | 0.002258 | 0.001 | 3.05E-03 | 0.011899 |
| Other Specialty | 0.035788 | 0.003156 | 0 | 0.029602 | 0.041974 |
| **Patient Characteristics** |  |  |  |  |  |
| Female | -0.01088 | 0.001849 | 0 | -0.0145 | -0.00725 |
| Race/Ethnicity (ref=white) |  |  |  |  |  |
| Black | -0.02451 | 0.002401 | 0 | -0.02922 | -0.0198 |
| Hispanic | -1.33E-03 | 2.71E-03 | 0.623 | -0.00663 | 3.97E-03 |
| Asian | 0.022785 | 0.005667 | 0 | 0.011677 | 0.033893 |
| Age | 0.004651 | 0.000108 | 0 | 0.00444 | 0.004862 |
| Years with same provider | 0.058534 | 0.000835 | 0 | 0.056897 | 0.060171 |
| Year (ref=2009) |  |  |  |  |  |
| 2010 | 0.011448 | 0.002504 | 0 | 0.00654 | 0.016356 |
| 2011 | 0.027658 | 0.002972 | 0 | 0.021834 | 0.033483 |
| 2012 | 0.013224 | 0.002505 | 0 | 0.008315 | 0.018132 |
| Count of Chronic Conditions | 0.003459 | 0.000374 | 0 | 0.002727 | 0.004192 |
| Disability as Basis of Eligibility | 0.027786 | 0.002444 | 0 | 0.022995 | 0.032577 |
| Any Drug Abuse Diagnosis | -0.01112 | 0.002555 | 0 | -0.01613 | -0.00611 |
| Any Alcohol Abuse Diagnosis | -0.01194 | 0.002568 | 0 | -0.01697 | -0.0069 |
| Regimen (ref=NRTI based) |  |  |  |  |  |
| NNRTI based | 0.11503 | 0.005021 | 0 | 0.105189 | 0.124871 |
| Boosted PI based | 0.100784 | 0.00496 | 0 | 0.091062 | 0.110506 |
| Integrase based | 0.071553 | 0.006273 | 0 | 0.059259 | 0.083847 |
| PI based | 0.076579 | 0.006298 | 0 | 0.064234 | 0.088924 |
| multiple/others | 0.091519 | 0.005374 | 0 | 0.080985 | 0.102052 |
| Constant | 0.185302 | 0.008528 | 0 | 0.168588 | 0.202017 |

Notes: This model includes zip-code fixed effects and robust standard errors.