Supplemental Digital Content 1: Figure

Fits (solid lines) of our model predictions (Eq. (7)) to data (symbols) from patients of plasma HIV-1 RNA levels as a function of time following the onset of treatment. Dashed lines represent the limit of detection (LOD) (150 copies/ml). The patients considered here achieved undetectable viremia by week 12. The numbers indicated identify patients and the corresponding data and fits are color-coded. The resulting best-fit parameter estimates are in Table, Supplemental Digital Content 6.
**Supplemental Digital Content 2: Figure**

Fits (solid lines) of our model predictions (Eq. (7)) to data (symbols) from patients of plasma HIV-1 RNA levels as a function of time following the onset of treatment. Dashed lines represent the limit of detection (LOD) (150 copies/ml). The patients considered here had detectable viremia at week 12. The numbers indicated identify patients and the corresponding data and fits are color-coded. The resulting best-fit parameter estimates are in Table, Supplemental Digital Content 6.
Supplemental Digital Content 3: Figure

Estimates of the lifespans of long-lived infected cells obtained from analysis of viral load data of HIV-1C patients under treatment using our mathematical model (see Figures, Supplemental Digital Content 1 and Supplemental Digital Content 2, and Table, Supplemental Digital Content 6). Symbols represent estimates for individual patients from Supplemental Digital Content 1 (circles) and Supplemental Digital Content 2 (triangles). The horizontal line within the box indicates the median, and the boundaries of the box indicate the first and third quartiles. In four patients (all with viremia undetectable by week 12; PID - 1071, 1302, 1404 and 1421), lifespans of long-lived infected cells exceeded 180 d, and were treated as outliers (not shown).
Basic reproductive ratio, $R_0$

Lifespan of long-lived infected cells (days)
Supplemental Digital Content 4: Figure

Estimates of the basic reproductive ratio obtained from analysis of viral load data of HIV-1C patients under treatment as in Fig. 2 but using different values of the slope of the first phase viral load decline, $\delta$, indicated. Symbols represent estimates for individual patients. The horizontal line within the box indicates the median, the boundaries of the box indicate the first and third quartiles, and the whiskers mark the minimum and maximum values.
Slope of the first phase decline, $\delta (/d)$
Supplemental Digital Content 5: Figure
Estimates of the basic reproductive ratio obtained as the ratio of the CD4+ T cell count in uninfected individuals and that in infected individuals at baseline. Symbols represent estimates for individual patients. The horizontal line within the box indicates the median, the boundaries of the box indicate the first and third quartiles, and the whiskers mark the minimum and maximum values.
Slope of the first phase decline, $\delta \,(/d)$

Basic reproductive ratio, $R_0$
Supplemental Digital Content 6: Table
Parameter estimates for patients with >95% adherence and baseline CD4 count >100 cells/μL (see text for details). (Outliers are indicated by an asterisk (*) next to their PIDs.)
| PID  | \( \delta_M \) (\( \delta \)) | Lifespan (days) | A (best fit) | B (best fit) | \( T_0^* \) (cells/ul) | \( M_0^* \) (cells/ul) | Baseline CD4 (cells/ul) | \( R_0 \) | \( \varepsilon_c \) | \( T_0^*/(T_0^*+M_0^*) \) | Adherence (%) | Cells infected (%) |
|------|-------------------------------|----------------|-------------|-------------|-------------------|-------------------|------------------|------|-----------|-----------------|---------------|------------------|
| 1003 | 0.0213                        | 46.9           | 469714      | 894         | 0.216             | 0.019             | 113              | 9.2  | 0.89      | 0.92            | 98.1          | 0.191            |
| 1005 | 0.0205                        | 48.8           | 159042      | 832         | 0.073             | 0.019             | 165              | 6.3  | 0.84      | 0.8             | 99.2          | 0.044            |
| 1010 | 0.0406                        | 24.6           | 558222      | 4519        | 0.257             | 0.051             | 232              | 4.5  | 0.78      | 0.83            | 98.73         | 0.111            |
| 1011 | 0.0107                        | 93             | 149911      | 368         | 0.069             | 0.016             | 161              | 6.5  | 0.85      | 0.81            | 96.63         | 0.043            |
| 1013 | 0.0172                        | 58.2           | 172995      | 631         | 0.08              | 0.017             | 269              | 3.9  | 0.74      | 0.82            | 97.57         | 0.03             |
| 1014 | 0.0291                        | 34.4           | 99138       | 1713        | 0.046             | 0.027             | 122              | 8.5  | 0.88      | 0.63            | 100           | 0.038            |
| 1015 | 0.0469                        | 21.3           | 634126      | 20528       | 0.292             | 0.201             | 215              | 4.8  | 0.79      | 0.59            | 98.17         | 0.136            |
| 1017 | 0.0376                        | 26.6           | 590258      | 3512        | 0.272             | 0.043             | 124              | 8.4  | 0.88      | 0.86            | 99.6          | 0.219            |
| 1018 | 0.0147                        | 68.1           | 70453       | 1055        | 0.032             | 0.033             | 215              | 4.8  | 0.79      | 0.5             | 99.17         | 0.015            |
| 1020 | 0.0146                        | 68.6           | 270973      | 507         | 0.125             | 0.016             | 123              | 8.5  | 0.88      | 0.89            | 98.37         | 0.102            |
| 1024 | 0.0109                        | 91.4           | 53585       | 727         | 0.025             | 0.031             | 199              | 5.2  | 0.81      | 0.45            | 96.98         | 0.013            |
| 1025 | 0.0197                        | 50.7           | 310301      | 1206        | 0.143             | 0.028             | 163              | 6.4  | 0.84      | 0.84            | 100           | 0.088            |
| 1027 | 0.0313                        | 31.9           | 306052      | 3320        | 0.141             | 0.049             | 218              | 4.8  | 0.79      | 0.74            | 100           | 0.065            |
| 1032 | 0.0209                        | 47.9           | 124427      | 3477        | 0.057             | 0.077             | 113              | 9.2  | 0.89      | 0.43            | 97.9          | 0.05             |
| 1037 | 0.029                         | 34.5           | 29644       | 1706        | 0.014             | 0.027             | 195              | 5.3  | 0.81      | 0.34            | 100           | 0.007            |
| 1038 | 0.0307                        | 32.6           | 262010      | 1962        | 0.121             | 0.029             | 202              | 5.1  | 0.81      | 0.8             | 100           | 0.06             |
| 1040 | 0.0146                        | 68.6           | 659776      | 1453        | 0.303             | 0.046             | 150              | 6.9  | 0.86      | 0.87            | 99.22         | 0.202            |
| 1048 | 0.0386                        | 25.9           | 294383      | 3827        | 0.135             | 0.046             | 134              | 7.8  | 0.87      | 0.75            | 100           | 0.101            |
| 1049 | 0.0632                        | 15.8           | 9299935     | 32608       | 4.278             | 0.238             | 129              | 8.3  | 0.88      | 0.95            | 95.07         | 3.316            |
| 1050 | 0.0437                        | 22.9           | 364350      | 10814       | 0.168             | 0.114             | 199              | 5.2  | 0.81      | 0.6             | 100           | 0.084            |
| 1053 | 0.0467                        | 21.4           | 2183518     | 7537        | 1.004             | 0.074             | 195              | 5.4  | 0.81      | 0.93            | 98.83         | 0.515            |
| 1054 | 0.0311                        | 32.1           | 754841      | 8403        | 0.347             | 0.124             | 265              | 3.9  | 0.75      | 0.74            | 99.43         | 0.131            |
| 1055 | 0.0182                        | 55             | 7363366     | 1857        | 3.387             | 0.047             | 113              | 9.5  | 0.89      | 0.99            | 99.03         | 2.997            |
| 1056 | 0.0589                        | 17             | 2147443     | 27950       | 0.988             | 0.218             | 181              | 5.8  | 0.83      | 0.82            | 99.35         | 0.546            |
| 1057 | 0.0239                        | 41.8           | 151766      | 4592        | 0.07              | 0.088             | 129              | 8.1  | 0.88      | 0.44            | 99.45         | 0.054            |
| 1058 | 0.0383                        | 26.1           | 3010658     | 15240       | 1.385             | 0.183             | 244              | 4.3  | 0.77      | 0.88            | 99.7          | 0.568            |
|      |       |      |       |      |      |      |      |      |      |      |
|------|-------|------|-------|------|------|------|------|------|------|------|
| 1059 | 0.0482| 20.7 | 424470| 8575 | 0.195| 0.082| 115  | 9.1  | 0.89 | 0.7  | 99.5 |
| 1061 | 0.0322| 31   | 1000199|2334 | 0.46 | 0.032| 161  | 6.5  | 0.85 | 0.94 | 99.57|
| 1062 | 0.0351| 28.5 | 353958| 2831 | 0.163| 0.037| 177  | 5.9  | 0.83 | 0.81 | 100  |
| 1063 | 0.0248| 40.3 | 384887| 1198 | 0.177| 0.022| 153  | 6.8  | 0.85 | 0.89 | 100  |
| 1067 | 0.0383| 26.1 | 720880| 4982 | 0.332| 0.06 | 369  | 2.8  | 0.65 | 0.85 | 96.4 |
| 1071*| 0.0029| 348.2| 287513|190  | 0.132| 0.03 | 174  | 6    | 0.83 | 0.81 | 98.87|
| 1072 | 0.0274| 36.5 | 1596313|13159| 0.734| 0.221| 191  | 5.5  | 0.82 | 0.77 | 99.5 |
| 1073 | 0.0374| 26.7 | 2712865|4329 | 1.248| 0.053| 208  | 5    | 0.8  | 0.96 | 97.85|
| 1076 | 0.0481| 20.8 | 5677924|10934| 2.612| 0.105| 206  | 5.1  | 0.8  | 0.96 | 97.07|
| 1078 | 0.0382| 26.2 | 9972053|27948| 4.587| 0.337| 139  | 7.7  | 0.87 | 0.93 | 99.82|
| 1079 | 0.0159| 63   | 1655367|959  | 0.761| 0.028| 218  | 4.8  | 0.79 | 0.96 | 96.3 |
| 1082 | 0.021 | 47.6 | 2347861|6153 | 1.08 | 0.135| 255  | 4.1  | 0.76 | 0.89 | 95.18|
| 1083 | 0.0288| 34.7 | 999078 |3355 | 0.46 | 0.054| 191  | 5.5  | 0.82 | 0.9  | 96.52|
| 1087 | 0.042 | 23.8 | 2654278|5062 | 1.221| 0.055| 188  | 5.6  | 0.82 | 0.96 | 97.67|
| 1088 | 0.0193| 51.7 | 484611 |4602 | 0.223| 0.109| 182  | 5.7  | 0.83 | 0.67 | 98.83|
| 1089 | 0.0171| 58.6 | 312302 |1266 | 0.144| 0.034| 247  | 4.2  | 0.76 | 0.81 | 96.33|
| 1093 | 0.0266| 37.6 | 325968 |1392 | 0.15 | 0.024| 232  | 4.5  | 0.78 | 0.86 | 99.6 |
| 1095 | 0.0384| 26   | 875063 |5936 | 0.403| 0.071| 219  | 4.8  | 0.79 | 0.85 | 95.78|
| 1099 | 0.0499| 20   | 333348 |15845| 0.153| 0.146| 146  | 7.1  | 0.86 | 0.51 | 98.38|
| 1101 | 0.0545| 18.4 | 670426 |19886| 0.308| 0.168| 217  | 4.8  | 0.79 | 0.65 | 98.38|
| 1103 | 0.0485| 20.6 | 443330 |8761 | 0.204| 0.083| 170  | 6.1  | 0.84 | 0.71 | 98.73|
| 1107 | 0.0321| 31.1 | 52255  |2212 | 0.024| 0.032| 233  | 4.5  | 0.78 | 0.43 | 100  |
| 1110 | 0.0258| 38.7 | 301215 |1305 | 0.139| 0.023| 228  | 4.6  | 0.78 | 0.86 | 100  |
| 1113 | 0.0547| 18.3 | 1451467|14691| 0.668| 0.124| 204  | 5.1  | 0.8  | 0.84 | 99.03|
| 1115 | 0.009 | 110.8| 90326 | 318  | 0.042| 0.016| 235  | 4.4  | 0.77 | 0.72 | 100  |
| 1116 | 0.0198| 50.5 | 528595 |787  | 0.243| 0.018| 149  | 7    | 0.86 | 0.93 | 100  |
| 1117 | 0.039 | 25.7 | 649697 |6805 | 0.299| 0.08 | 134  | 7.8  | 0.87 | 0.79 | 98.28|
| 1119 | 0.0274| 36.5 | 3090241|1485 | 1.422| 0.025| 252  | 4.1  | 0.76 | 0.98 | 98.9 |
| 1120 | 0.0597| 16.8 | 8017148|68012| 3.688| 0.524| 381  | 2.8  | 0.64 | 0.88 | 99.76|
| 1124 | 0.0331| 30.2 | 523187 |2410 | 0.241| 0.033| 250  | 4.2  | 0.76 | 0.88 | 100  |
| 1128 | 0.04  | 25   | 239655 |4287 | 0.11 | 0.049| 111  | 9.4  | 0.89 | 0.69 | 95.47|
|   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1131 | 0.0282 | 35.5 | 328124 | 1593 | 0.151 | 0.026 | 157 | 6.6 | 0.85 | 0.85 | 100 | 0.096 |
| 1134 | 0.0228 | 43.9 | 261074 | 1011 | 0.12 | 0.02 | 226 | 4.6 | 0.78 | 0.85 | 100 | 0.053 |
| 1136 | 0.0328 | 30.5 | 805979 | 2350 | 0.371 | 0.033 | 195 | 5.3 | 0.81 | 0.92 | 100 | 0.19 |
| 1137 | 0.029 | 34.5 | 3616951 | 3342 | 1.664 | 0.053 | 171 | 6.1 | 0.84 | 0.97 | 95.57 | 0.973 |
| 1139 | 0.0111 | 90.3 | 139025 | 378 | 0.064 | 0.016 | 231 | 4.5 | 0.78 | 0.8 | 99.4 | 0.028 |
| 1143 | 0.0211 | 47.3 | 1090780 | 1706 | 0.502 | 0.037 | 260 | 4 | 0.75 | 0.93 | 99.63 | 0.193 |
| 1145 | 0.0376 | 26.6 | 601355 | 3521 | 0.277 | 0.043 | 246 | 4.2 | 0.76 | 0.87 | 99.43 | 0.113 |
| 1146 | 0.0456 | 21.9 | 141166 | 8685 | 0.065 | 0.069 | 129 | 8.1 | 0.88 | 0.48 | 100 | 0.05 |
| 1147 | 0.0242 | 41.2 | 351525 | 1848 | 0.162 | 0.035 | 174 | 6 | 0.83 | 0.82 | 97.02 | 0.093 |
| 1148 | 0.0375 | 26.7 | 2735558 | 3482 | 1.258 | 0.043 | 164 | 6.4 | 0.84 | 0.97 | 96.9 | 0.767 |
| 1149 | 0.0659 | 15.2 | 2321887 | 55745 | 1.068 | 0.389 | 120 | 8.7 | 0.89 | 0.73 | 100 | 0.89 |
| 1152 | 0.0369 | 27.1 | 696801 | 3300 | 0.321 | 0.041 | 261 | 4 | 0.75 | 0.89 | 100 | 0.123 |
| 1155 | 0.0279 | 35.9 | 358915 | 1550 | 0.165 | 0.026 | 185 | 5.6 | 0.82 | 0.87 | 100 | 0.089 |
| 1157 | 0.0201 | 49.9 | 200298 | 803 | 0.092 | 0.018 | 106 | 9.8 | 0.9 | 0.83 | 100 | 0.087 |
| 1158 | 0.0257 | 39 | 992357 | 1286 | 0.456 | 0.023 | 303 | 3.4 | 0.71 | 0.95 | 100 | 0.15 |
| 1159 | 0.0154 | 65 | 89595 | 546 | 0.041 | 0.016 | 268 | 3.9 | 0.74 | 0.72 | 97.25 | 0.015 |
| 1160 | 0.0285 | 35.1 | 415449 | 1636 | 0.191 | 0.026 | 245 | 4.2 | 0.76 | 0.88 | 97.9 | 0.078 |
| 1162 | 0.011 | 91.1 | 1297742 | 3778 | 0.597 | 0.158 | 266 | 3.9 | 0.74 | 0.79 | 98.18 | 0.224 |
| 1302* | 0.0029 | 348.2 | 352703 | 190 | 0.162 | 0.03 | 219 | 4.7 | 0.79 | 0.84 | 97.53 | 0.074 |
| 1303 | 0.0252 | 39.7 | 354333 | 1237 | 0.163 | 0.023 | 250 | 4.2 | 0.76 | 0.88 | 95.13 | 0.065 |
| 1310 | 0.0412 | 24.3 | 2882144 | 14752 | 1.326 | 0.165 | 142 | 7.4 | 0.86 | 0.89 | 99.12 | 0.934 |
| 1315 | 0.0611 | 16.4 | 2977961 | 30602 | 1.37 | 0.23 | 167 | 6.3 | 0.84 | 0.86 | 98.15 | 0.82 |
| 1325 | 0.0116 | 86.3 | 2083349 | 394 | 0.958 | 0.016 | 250 | 4.2 | 0.76 | 0.98 | 99.13 | 0.383 |
| 1329 | 0.0223 | 44.9 | 419829 | 966 | 0.193 | 0.02 | 252 | 4.1 | 0.76 | 0.91 | 97.73 | 0.077 |
| 1340 | 0.0308 | 32.4 | 279594 | 1984 | 0.129 | 0.03 | 247 | 4.2 | 0.76 | 0.81 | 95.93 | 0.052 |
| 1356 | 0.0564 | 17.7 | 1964616 | 17072 | 0.904 | 0.139 | 230 | 4.5 | 0.78 | 0.87 | 98.8 | 0.393 |
| 1358 | 0.0331 | 30.2 | 456215 | 2410 | 0.21 | 0.033 | 241 | 4.3 | 0.77 | 0.86 | 99.4 | 0.087 |
| 1361 | 0.0365 | 27.4 | 590583 | 3187 | 0.272 | 0.04 | 151 | 6.9 | 0.85 | 0.87 | 96.17 | 0.18 |
| 1364 | 0.0448 | 22.3 | 1642881 | 13446 | 0.756 | 0.138 | 119 | 8.8 | 0.89 | 0.85 | 99.13 | 0.635 |
| 1365 | 0.0198 | 50.4 | 179629 | 852 | 0.083 | 0.02 | 177 | 5.9 | 0.83 | 0.81 | 98.66 | 0.047 |
| 1366 | 0.0482 | 20.8 | 2058077 | 10771 | 0.947 | 0.103 | 228 | 4.6 | 0.78 | 0.9 | 98.13 | 0.415 |
|   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1371| 0.0242| 41.3| 108875| 1141| 0.05| 0.022| 105| 9.9| 0.9| 0.7| 97.77| 0.048|
| 1372| 0.0485| 20.6| 1148357| 1832| 0.528| 0.083| 105| 5.3| 0.81| 0.86| 96.9| 0.271|
| 1374| 0.0301| 33.2| 1029747| 1868| 0.474| 0.029| 233| 4.5| 0.78| 0.94| 99.43| 0.203|
| 1376| 0.0116| 86.3| 77573| 394| 0.036| 0.016| 427| 2.4| 0.59| 0.7| 96.63| 0.008|
| 1383| 0.0212| 47.1| 216603| 886| 0.1| 0.019| 114| 9.1| 0.89| 0.84| 96.33| 0.088|
| 1387| 0.0226| 44.3| 1454687| 991| 0.669| 0.02| 218| 4.8| 0.79| 0.97| 97.63| 0.307|
| 1390| 0.0341| 29.3| 3156364| 2662| 1.452| 0.035| 343| 3| 0.67| 0.98| 99.63| 0.423|
| 1403| 0.0099| 101.3| 310985| 341| 0.143| 0.016| 219| 4.7| 0.79| 0.9| 99.47| 0.065|
| 1404*| 0.0047| 212.2| 455125| 221| 0.209| 0.022| 218| 4.8| 0.79| 0.91| 99.6| 0.096|
| 1406| 0.0426| 23.5| 2417122| 5420| 1.112| 0.058| 220| 4.7| 0.79| 0.95| 97.07| 0.505|
| 1407| 0.0125| 80| 302145| 426| 0.139| 0.016| 252| 4.1| 0.76| 0.9| 98.47| 0.055|
| 1409| 0.0237| 42.2| 605596| 1091| 0.279| 0.021| 229| 4.5| 0.78| 0.93| 100| 0.122|
| 1410| 0.08| 12.5| 1878494| 152486| 0.864| 0.877| 201| 5.2| 0.81| 0.5| 99.58| 0.43|
| 1413| 0.0163| 61.4| 435577| 585| 0.2| 0.017| 145| 7.2| 0.86| 0.92| 99.47| 0.138|
| 1420| 0.0154| 65.1| 49537| 752| 0.023| 0.023| 222| 4.7| 0.79| 0.5| 98.58| 0.01|
| 1421*| 0.0053| 187.1| 126772| 233| 0.058| 0.02| 195| 5.3| 0.81| 0.74| 100| 0.03|
| 1422| 0.0219| 45.7| 184656| 938| 0.085| 0.02| 254| 4.1| 0.76| 0.81| 100| 0.033|
| 1425| 0.0345| 29| 555697| 2708| 0.256| 0.036| 186| 5.6| 0.82| 0.88| 99.4| 0.138|
| 1429| 0.0113| 88.3| 16698| 386| 0.008| 0.016| 125| 8.3| 0.88| 0.33| 99.6| 0.006|
| 1430| 0.0294| 34| 1190664| 1767| 0.548| 0.028| 240| 4.3| 0.77| 0.95| 95.43| 0.228|
| 1438| 0.0086| 116.5| 169731| 307| 0.078| 0.016| 132| 7.9| 0.87| 0.83| 100| 0.059|
| 1442| 0.0261| 38.4| 1654434| 1330| 0.761| 0.023| 133| 7.9| 0.87| 0.97| 100| 0.572|
| 1444| 0.0221| 45.2| 649891| 957| 0.299| 0.02| 128| 8.1| 0.88| 0.94| 98.9| 0.234|
| 1449| 0.0314| 31.8| 729341| 2084| 0.335| 0.031| 144| 7.2| 0.86| 0.92| 96.77| 0.233|
| 1452| 0.0211| 47.4| 372977| 878| 0.172| 0.019| 227| 4.6| 0.78| 0.9| 97.8| 0.076|
| 1458| 0.0366| 27.3| 775355| 5702| 0.357| 0.072| 155| 6.7| 0.85| 0.83| 96.05| 0.23|
| 1475| 0.0133| 75.1| 61681| 456| 0.028| 0.016| 220| 4.7| 0.79| 0.64| 99.37| 0.013|
| 1476| 0.0089| 112.6| 219652| 1453| 0.101| 0.075| 147| 7.1| 0.86| 0.57| 99.72| 0.069|