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Decreased Time From Human Immunodeficiency Virus Diagnosis to Care, Antiretroviral Therapy Initiation, and Virologic Suppression during the Citywide RAPID Initiative in San Francisco

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(See the Editorial Commentary by Gardner and Hawkins on pages e129–31.)

Background. Early virologic suppression (VS) after human immunodeficiency virus (HIV) infection improves individual health outcomes and decreases onward transmission. In San Francisco, immediate antiretroviral therapy (ART) at HIV diagnosis was piloted in 2013–2014 and expanded citywide in 2015 in a rapid start initiative to link all new diagnoses to care within 5 days and start ART at the first care visit.

Methods. HIV providers and linkage navigators were trained on a rapid start protocol with sites caring for vulnerable populations prioritized. Dates of HIV diagnosis, first care visit, ART initiation, and VS were abstracted from the San Francisco Department of Public Health HIV surveillance registry.

Results. During 2013–2017, among 1354 new HIV diagnoses in San Francisco, median days from diagnosis to first VS decreased from 145 to 76 (48%; $P < .0001$) and from first care visit to ART initiation decreased from 28 to 1 (96%; $P < .0001$). By 2017, 28% of new diagnoses had a rapid start, which was independently associated with Latinx ethnicity (AOR, 1.73; 95% CI, 1.15–2.60) and recent year of diagnosis (2017; AOR, 16.84; 95% CI, 8.03–35.33). Persons with a rapid ART start were more likely to be virologically suppressed within 12 months of diagnosis than those with a non-rapid start (RR, 1.17; 95% CI, 1.10–1.24).

Conclusions. During a multisector initiative to optimize ART initiation, median time from diagnosis to VS decreased by nearly half. Immediate ART at care initiation was achieved across many, but not all, populations, and was associated with improved suppression rates.

Keywords. HIV; antiretroviral therapy initiation (ART); treatment strategies; immediate ART.

Universal initiation of antiretroviral therapy (ART) for persons diagnosed with human immunodeficiency virus (HIV), regardless of CD4 count, is associated with decreased serious AIDS-related and non-AIDS–related events [1] and decreased sexual transmission of HIV [2]. In the international setting, randomized clinical trials of immediate ART initiation on the day of diagnosis or first clinic visit have demonstrated reduced times to ART initiation [3] and first virologic suppression (VS) [4, 5], improved retention in care with VS [6], and reduced mortality [6]. Offering immediate ART at HIV diagnosis has been recommended by the World Health Organization since 2017 [7] and by leading US guideline committees since 2018 [8] and 2019 [9]. To achieve this, a person newly diagnosed with HIV must be immediately linked to a care setting in which ART can be prescribed and seen by a treating provider who is able to initiate ART at the first care visit.

Despite the benefits of early treatment, ART initiation is often delayed. In the United States during 2017, 66% of persons newly diagnosed with HIV at the Centers for Disease Control and Prevention (CDC)–funded testing sites were linked to care within 90 days [10]. After the first clinic visit, clinicians have historically waited for results of baseline laboratory tests prior to initiating ART. In 2013–2014, the HIV clinic at the public safety-net hospital in San Francisco (ZSFG) piloted the Rapid ART Program Initiative for new Diagnoses (RAPID) for immediate ART at diagnosis [11]. In early 2015, the San Francisco Getting to Zero (SFGTZ) initiative [12], a consortium of academic HIV specialists, public health leaders, community-based organizations, clinicians, and interested community members, prioritized implementation of a citywide RAPID protocol [13].

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This protocol focused on optimizing existing systems for timely linkage to HIV care and on training providers in why and how to initiate ART at the first care visit, taking into account diverse care sites, patient populations, insurance plans, and testing and linkage programs throughout the city.

We used 2013–2017 San Francisco Department of Public Health (SFDPH) HIV surveillance data [14], during early implementation of citywide RAPID, to assess changes in time from HIV diagnosis to 3 endpoints: linkage to care, initiation of ART, and first VS. We identified factors associated with rapid ART initiation and compared the prevalence of VS within 12 months of diagnosis for those who underwent rapid ART initiation versus those who did not.

METHODS

Citywide RAPID Program

The programmatic goal of citywide RAPID was linkage to care within 5 days of HIV diagnosis, with ART initiation within 1 day of the first care visit. An SFGTZ RAPID subcommittee created an implementation plan and protocol outlining components of the first care visit: counseling, medical evaluation, baseline laboratory testing (CD4 lymphocyte count, HIV RNA, human leukocyte antigen (HLA)-B*5701 status, resistance genotyping, renal and liver function, complete blood count), benefits navigation, and ART initiation (tenofovir/emtricitabine plus an integrase inhibitor or pharmacologically boosted darunavir). Once baseline laboratory results were available, ART modification was at individual providers' discretion. Patients were eligible for RAPID if they had any of the following: (1) a new, confirmed HIV diagnosis by the recommended CDC algorithm (reactive p24 antigen/antibody plus reactive differentiation antibody or detectable HIV RNA) [15]; (2) a presumed positive HIV diagnosis (reactive HIV antibody or p24 antigen/antibody prior to confirmation but with a high pretest probability of HIV infection based on the presence of risk factors for HIV infection with or without symptoms of acute retroviral syndrome); or (3) laboratory evidence of acute HIV infection (nonreactive HIV antibody or p24 antigen/antibody with a detectable HIV RNA). Persons with a presumed positive HIV diagnosis could be offered ART with the understanding that it would be stopped if the final test results showed that HIV infection was not present. Details of the clinical protocol can be found in the Supplementary Material.

The SFDPH Linkage, Integration, Navigation, and Comprehensive Services (LINCS) team provides partner services to all individuals newly diagnosed with HIV and ensures that they are linked to care. Navigators from LINCS were trained to link persons to care within the objectives of RAPID and equipped with a regularly updated directory [16] listing HIV providers trained on RAPID, the type of insurance accepted, availability of on-site benefits navigation and enrollment, and focus populations served.

The HIV providers at a variety of clinical sites in San Francisco were prioritized for RAPID education based on the volume of new HIV diagnoses seen, as determined by surveillance data. Given known sociodemographic disparities in new diagnoses, linkage to care, ART, and VS in San Francisco [17], sites and providers seeing youth (13–29 years) and Latinx and African-American patients were also prioritized. RAPID committee members educated clinicians and clinic staff about RAPID implementation through in-services, medical grand rounds, individual meetings, and the dissemination of written materials. A public health detailing program, sending a RAPID-proficient SFDPH physician or nurse to HIV clinics for an hour-long training on RAPID, was added in late 2016 [18].

Data Collection

California law requires medical providers to report persons diagnosed with HIV and laboratories to report all HIV-related test results to the local health department. San Francisco Department of Public Health staff perform enhanced case surveillance and collect information on sociodemographic characteristics, address and housing status, HIV testing history, and ART regimens at time of initial case report, through periodic medical chart reviews at intervals ranging from 6 to 18 months, using statistical methods developed by CDC, including capture-recapture. The completeness of HIV case and laboratory reporting in San Francisco is routinely evaluated and found to be consistently over 95% complete [17].

Measures

San Francisco residents diagnosed and reported with HIV infection from 1 January 2013 through 31 December 2017 were included in this analysis. Follow-up information was current through 15 April 2019. Date of HIV diagnosis was defined as the earliest confirmed reactive HIV antibody or antigen/antibody test, detectable HIV RNA, or charted physician diagnosis of HIV infection. The first care visit was defined as the date of first CD4 count or HIV RNA (which are not typically collected during linkage) after diagnosis. "Not in care" was defined as no CD4 count or HIV RNA recorded after date of diagnosis. Antiretroviral therapy initiation was defined as the date ART was first prescribed in the medical chart. HIV VS was defined as viral load (VL) less than 200 copies/mL. Time, in days, from diagnosis to first care visit, first care visit to ART initiation, ART initiation to VS, and overall time from diagnosis to VS was calculated. Newly diagnosed persons were retrospectively categorized into 3 ART initiation groups: Rapid (first care visit within 5 working days of diagnosis and ART initiation within 1 day of the first care visit), non-rapid ART (started ART more than 6 days after diagnosis), and no ART (no recorded ART prescription). Persons found to be virologically suppressed or taking ART prior to their date of diagnosis were excluded from analysis. We compared the rapid and

non-rapid groups by sociodemographic characteristics, year of diagnosis, and VS at the last measurement within 12 months of diagnosis. Sociodemographic data were abstracted from medical charts and case report forms; homelessness was defined at time of diagnosis either by self-report or reporting an address as a homeless shelter or free postal address not connected to a residence. Data included in the analysis are part of core public health disease surveillance, and analysis of routinely collected surveillance data does not require institutional review board review.

Statistical Analysis

Contingency tables and chi-square tests were used to compare the differences in proportions of persons who were linked to care and who started ART by gender, age, race/ethnicity, exposure, and housing status. Longitudinal changes in the median time from diagnosis to care, care to ART initiation, and ART initiation to VS were analyzed using the Kruskal-Wallis test of differences. Multivariable logistic regression identified factors associated with rapid ART initiation. Relative risk (RR) ratios calculated the likelihood of VS within 12 months of diagnosis among persons in the rapid group compared with those in the non-rapid group. *P* values less than .05 and 95% confidence intervals (CIs) for ratios that did not include 1.0 were considered statistically significant.

RESULTS

New HIV Diagnoses, Linkage to Care, Antiretroviral Therapy Initiation, and Virologic Suppression

There were 1354 new HIV diagnoses in San Francisco over the study period, of whom 89% were male (Table 1). Over half were nonwhite and 9% reported homelessness. Overall, 96% were linked to care, 88% of whom started ART. Linkage was lowest among females (94%) and those with unidentified exposure (87%). There were no significant differences in the prevalence of ART initiation by sociodemographic or exposure category.

From 2013 to 2017, the annual HIV diagnoses in San Francisco decreased from 399 to 207 (Table 2). Median time from diagnosis to first care visit decreased by 44%, from 9 to 5 days ($P < .001$). Median time from first care visit to ART initiation decreased by 96%, from 28 days to 1 day ($P < .0001$) and decreased significantly among all sociodemographic and exposure categories. By 2017, the largest decrease in median time from care to ART (100%; to 0 days) had occurred among males, 30–39-year-old, African Americans, Latinx, men who have sex with men (MSM), and housed persons. Asian/Pacific Islanders (5 days), MSM who inject drugs (5 days), and persons reporting homelessness (5 days) had the longest median time from care to ART and the smallest decreases from 2013 (86%, 84%, and 83%, respectively). Median time from ART initiation to VS decreased by 37%, from 79 to 50 days ($P = .0007$). Median time from diagnosis to VS decreased by 48% between 2013 and 2017, from 145 to 76 days ($P < .0001$), but this varied widely by sociodemographic and exposure category. Time from diagnosis to VS, which had decreased since 2013, increased between 2016 and 2017 among 30–39-year-olds, African Americans, MSM and inject drugs, and persons who inject drugs (PWID), while plateauing or continuing to decrease among other groups.

Table 1. New HIV Diagnoses, Linkage to Care, and ART Initiation in San Francisco (2013–2017)

Group	New HIV, n (%)	Linked to Care, n (%)	Started ART, n (%)
All	1354	1298 (96)	1148 (88)
Gender		*P* = .65	*P* = .83
Male	1207 (89)	1158 (96)	1022 (88)
Female	107 (8)	101 (94)	91 (90)
Trans female	40 (3)	39 (98)	35 (90)
Age		*P* = .65	*P* = .41
13–29 y	439 (32)	422 (96)	368 (87)
30–39 y	413 (31)	398 (96)	350 (88)
≥40 y	502 (37)	478 (95)	430 (90)
Race/ethnicity		*P* = .60	*P* = .57
White	571 (42)	553 (97)	481 (87)
African American	182 (13)	173 (95)	153 (88)
Latinx	359 (27)	343 (96)	309 (90)
Asian/Pacific Islander	174 (13)	165 (95)	146 (88)
Other	68 (5)	64 (94)	59 (92)
Housing status		*P* = .65	*P* = .78
Housed	1226 (91)	1176 (96)	950 (85)
Homeless	128 (9)	122 (95)	96 (84)
Exposure		*P* = .01	*P* = .46
MSM	975 (72)	936 (96)	826 (88)
PWID	109 (8)	101 (93)	85 (84)
MSM-PWID	160 (12)	155 (97)	140 (90)
Heterosexual	79 (6)	79 (100)	73 (92)
Unidentified	31 (2)	27 (87)	24 (89)

The New HIV column shows the number and percentage of new cases of HIV infection across all years analyzed, by sociodemographic group (column percentages). The Linked to Care column indicates the number and percentage of new cases in each group who entered care. The Started ART column indicates the number and percentage of linked patients in each group who started ART.

Abbreviations: ART, antiretroviral therapy; HIV, human immunodeficiency virus; MSM, men who have sex with men; MSM-PWID, men who have sex with men and inject drugs; PWID, persons who inject drugs.

Rapid Antiretroviral Therapy and Virologic Suppression

The proportion of newly diagnosed persons who were linked to care within 5 working days and who started ART within 1 day of their first care appointment (rapid starts) increased from 2% in 2013 to 28% in 2017 (Table 3). Trans females, persons reporting homelessness, and persons diagnosed in 2013 had the lowest prevalence of rapid starts. In a multivariable model that included gender, race/ethnicity, age, housing status, and year of diagnosis, Latinx ethnicity and being diagnosed with HIV after 2013 were associated with a greater likelihood of rapid ART

Table 2. Time From Diagnosis to Care, ART, and Virologic Suppression, in San Francisco

Outcome	2013 (n = 399)	2014 (n = 329)	2015 (n = 295)	2016 (n = 265)	2017 (n = 207)	*P*	Change: 2013–2017, %
Diagnosis to care (all)	9	7	8	6	5	.0004	−44
Care to ART initiation							
All	28	21	7	3	1	<.0001	−96
Male	28	21	7	3	0	<.0001	−100
Female	72	20	21	3	3	<.0001	−96
13–29 y	28	21	7	1	1	<.0001	−96
30–39 y	28	18	8	3	0	<.0001	−100
≥40 y	30	22	9	7	1	<.0001	−97
White	27	27	8	7	1	<.0001	−96
African American	41	48	7	6	0	<.0001	−100
Latinx	29	15	6	1	0	<.0001	−100
Asian/PI	36	22	7	4	5	<.0001	−86
MSM	27	21	7	1	0	<.0001	−100
PWID	98	20	31	6	2	<.0001	−98
MSM-PWID	31	43	13	14	5	.0006	−84
Heterosexual	46	12	7	1	3	.0003	−93
Housed	28	21	7	2	0	<.0001	−100
Homeless	30	94	24	10	5	0.004	−83
ART to RNA <200 copies/mL (all)	79	55	53	48	50	.0007	−37
Diagnosis to RNA <200 copies/mL (days)							
All	145	106	84	74	76	<.0001	−48
Male	140	103	82	74	76	<.0001	−46
Female	245	113	99	87	72	.0052	−71
13–29 y	167	106	90	77	78	<.0001	−53
30–39 y	140	119	79	69	94	<.0001	−33
≥40 y	134	94	84	88	66	<.0001	−51
White	143	105	89	94	69	<.0001	−52
African American	147	191	102	70	103	.0033	−30
Latinx	139	91	74	68	79	<.0001	−43
Asian/PI	159	106	66	68	49	<.0001	−69
MSM	135	94	79	74	72	<.0001	−47
PWID	245	161	148	86	169	.10	−31
MSM-PWID	189	154	208	86	154	.012	−19
Heterosexual	159	70	96	52	64	.0004	−60
Housed	144	97	80	74	78	<.0001	−46
Homeless	161	215	176	77	66	.0024	−59

Data presented as time, in median days, from diagnosis to first care visit, first care visit to ART initiation, ART initiation to virologic suppression (RNA <200 copies/mL), and diagnosis to virologic suppression, as well as number of new HIV cases, are listed by year of diagnosis. Individual intervals do not sum to the overall time from diagnosis to first viral load <200 copies/mL as each interval was measured separately, using the individuals who were available for data collection during that interval.
Abbreviations: ART, antiretroviral therapy; MSM, men who have sex with men; MSM-PWID, men who have sex with men and inject drugs; PI, Pacific Islander; PWID, persons who inject drugs.

initiation. The adjusted odds ratio (AOR) for undergoing rapid ART initiation increased each year compared with 2013.

Of the 186 persons with a rapid ART start between 2013 and 2017, 91% had VS at their last measurement, compared with 78% of those with a non-rapid start (RR, 1.17) (Table 4). Of persons diagnosed with HIV in 2016, only 2% of those with a rapid start were not virologically suppressed at their last measurement versus 21% with a non-rapid start (RR of VS, 1.24). Although there was a trend towards greater VS at last measurement among those with a rapid start in 2014, 2015, and 2017, this did not reach statistical significance in those years. The proportion of cases starting ART within 30 days of diagnosis increased from 25% in 2013 to 66% in 2017.

DISCUSSION

During the first 5 years of a multisector effort to optimize ART initiation, median time from HIV diagnosis to first virologic suppression decreased by almost half, to 76 days, achieving targets on a citywide scale that had previously been reported in single-site programs [11, 19–22]. This required improvements at each step along the continuum from communication of a positive HIV test result, to insurance navigation and linkage to care, clinic-level patient flow, and prescribing behavior. Most notably, the median time from first care visit to ART prescription dropped 96%, from 28 days to 1 day. The proportion of patients linked to care within 5 days and started on ART within 1 day, a composite measure of

Table 3. ART Initiation by Sex, Race/Ethnicity, Age, Housing Status, and Year of Diagnosis

Group	Rapid ART, n (%)	Non-Rapid ART Days From Diagnosis to ART, n (%)			No ART, n (%)	AOR (Rapid vs Non-Rapid ART)	95% CI	*P*
		>6–30	31–90	>90				
All (N = 1354; 100%)	186 (14)	438 (32)	295 (22)	229 (17)	206 (15)			
Sex/gender[a]								
Male	173 (14)	394 (33)	266 (22)	189 (16)	185 (15)	Ref		
Female	12 (11)	33 (31)	18 (17)	28 (26)	16 (15)	.61	.31–1.19	.15
Trans female	1 (3)	11 (28)	11 (28)	12 (30)	5 (13)			
Race/ethnicity								
White	62 (11)	191 (33)	133 (23)	95 (17)	90 (16)	Ref		
African American	25 (14)	49 (27)	35 (19)	44 (24)	29 (16)	1.16	.67–1.99	.60
Latinx	68 (19)	112 (31)	80 (22)	49 (14)	50 (14)	1.73	1.15–2.60	.008
Asian/Pacific Islander	21 (12)	62 (36)	38 (22)	25 (14)	28 (16)	.94	.53–1.64	.82
Other	10 (15)	24 (35)	9 (13)	16 (24)	9 (13)	1.25	.57–2.72	.58
Age								
13–29 y	67 (15)	142 (32)	83 (19)	76 (17)	71 (16)	1.14	.78–1.71	.54
30–39 y	56 (14)	136 (33)	95 (23)	63 (15)	63 (15)	.92	.61–1.41	.71
≥40 y	63 (13)	160 (32)	117 (23)	90 (18)	72 (14)	Ref		
Housing status								
Housed	174 (14)	403 (33)	273 (22)	194 (16)	182 (15)	Ref		
Homeless	12 (9)	35 (27)	22 (17)	35 (27)	24 (19)	.58	.30–1.12	.12
Year of diagnosis								
2013	9 (2)	86 (23)	105 (28)	90 (24)	79 (21)	Ref		
2014	22 (8)	96 (33)	70 (24)	62 (21)	39 (13)	3.0	1.35–6.65	.007
2015	40 (15)	96 (36)	54 (20)	43 (16)	35 (13)	6.37	3.01–13.47	<.0001
2016	57 (26)	82 (37)	45 (20)	21 (10)	16 (7)	12.33	5.92–25.71	<.0001
2017	58 (28)	78 (38)	21 (10)	13 (6)	37 (18)	16.84	8.03–35.33	<.0001
	Rapid ART: 80 017	Non-rapid ART (all): 58 688						

New HIV cases, stratified by sociodemographic group and year of diagnosis, who met the definition of a rapid start (rapid ART, defined as diagnosis to care within 5 days and ART initiation within 1 day of first care visit) versus non-rapid ART (started ART >6–30, 31–90, or >90 days after diagnosis) versus no ART start. AOR refers to odds of rapid ART versus non-rapid ART (>6 to >90 days, excluding the no ART group), adjusting for sex at birth, race/ethnicity, age, housing status at diagnosis, and year of HIV diagnosis. Median HIV RNA at diagnosis, copies/mL.
Abbreviations: AOR, adjusted odds ratio; ART, antiretroviral therapy; CI, confidence interval; HIV, human immunodeficiency virus; Ref, reference.
[a]Due to the small number of trans females, the AOR for rapid versus non-rapid ART was estimated using sex at birth rather than gender.

linkage navigation, clinic flow, and prescribing, increased from 2% to 28%. Compared with 2013, the AOR of starting ART within 6 days of diagnosis increased each year, from 3.0 in 2014, during the single-hospital RAPID pilot, to 16.84 after the first 2 years of citywide implementation, suggesting increasing acceptance of immediate ART. Finally, rapid ART was associated with improved virologic outcomes: the likelihood of VS at the last VL measurement within the first year of diagnosis was 17% higher for those who underwent a rapid start. These results align with outcomes of single-clinic immediate ART programs in Atlanta [19], New Orleans [21], London [20], and San Francisco [22], adding evidence in favor of offering ART at diagnosis.

Table 4. Virologic Suppression in Persons Receiving Rapid Versus Non-Rapid ART, by Year

Year Diagnosed	HIV RNA <200 Copies/mL at Last Test Within 12 Months of Diagnosis, n (%)				Relative Risk (95% CI)
	Rapid ART		Non-Rapid ART		
	Yes	No	Yes	No	
All	169 (91)	17 (9)	749 (78)	213 (22)	1.17 (1.10–1.24)
2013	7 (78)	2 (22)	207 (74)	74 (26)	.99 (.70–1.41)
2014	19 (86)	3 (14)	181 (79)	47 (21)	1.09 (.91–1.30)
2015	36 (90)	4 (10)	154 (80)	39 (20)	1.13 (1.00–1.28)
2016	56 (98)	1 (2)	117 (79)	31 (21)	1.24 (1.14–1.36)
2017	51 (88)	7 (12)	90 (80)	22 (20)	1.09 (.96–1.25)

Data show the number and percentage of persons diagnosed with HIV who had a suppressed viral load at most recent testing within 12 months of HIV diagnosis, comparing those who started ART within 6 days of diagnosis (rapid ART) with those starting ART >6 days from diagnosis. "Year" refers to year of HIV diagnosis. "Relative Risk" refers to risk (or likelihood) of virologic suppression in the rapid ART group versus the non-rapid ART group.
Abbreviations: ART, antiretroviral therapy; CI, confidence interval; HIV, human immunodeficiency virus.

Time from first care visit to ART initiation decreased significantly among all groups, reaching 0 days among males, African Americans, Latinx, housed persons, and those 30–39 years of age, with a median time of only 1–5 days in other groups, including youth, PWID, and those reporting homelessness. The AORs of rapid ART initiation were significantly higher among Latinx persons than those in other racial/ethnic groups. These findings may be partially explained by the order in which RAPID was disseminated to care providers. Providers and leadership at a safety-net HIV clinic pioneered the RAPID program and, as early leaders of the Getting to Zero initiative, prioritized RAPID expansion to care sites that provide much of the HIV care for racial and ethnic minorities, the homeless, and youth in San Francisco. A strong safety-net system in San Francisco, supported by federal and state medical benefits programs such as the AIDS Drug Assistance Program (ADAP), expanded Medicaid ("MediCal"), and city health coverage, ensures that almost all individuals, regardless of insurance, income, or immigration status, have access to medical care including ART. Early and ongoing trainings for linkage workers, and a regularly updated list of RAPID HIV providers citywide, may have helped shorten time from diagnosis to care from community-based HIV testing sites. Disparities remained in time from diagnosis to first VS, particularly among PWID regardless of sexual orientation, African Americans, and persons 30–39 years of age; interestingly, these disparities appeared or worsened among persons diagnosed in 2017 versus 2016, while time from first care visit to ART initiation continued to improve in these groups over the same period. Additionally, rapid ART was not associated with VS at last measurement for people diagnosed in 2017, unlike in 2016. Together, these observations suggest that immediate ART initiation at diagnosis, while highly feasible across a broad range of sociodemographic groups, is not sufficient to overcome all obstacles to VS, particularly among the most economically and psychosocially vulnerable members of society, at a time of worsening socioeconomic disparities, and that interventions such as treatment for drug use and mental illness, stigma reduction, housing support, and intensified case management, alongside immediate ART at diagnosis, will be needed to achieve durable VS, improved health, and decreased HIV transmission citywide.

Our study has limitations. Although case and population-based surveillance data have the advantages of rigorous, systematic collection and completeness, they cannot establish a causal link between the RAPID initiative and improvements in outcomes. Persons willing to undergo rapid ART start might possess other attributes, such as self-efficacy, trust in their provider and the medical system, and psychosocial stability, that are associated with medication adherence and VS [23–25]. Integrase strand transfer inhibitors (INSTIs), which can suppress viral replication within weeks, assumed an increasingly prominent role in US treatment guidelines between 2013 and 2017 [9], and the proportion of newly diagnosed persons in San Francisco who started ART containing an INSTI increased from 47% in 2013 to 74% in 2016 (SFDPH HIV surveillance; data not published). However, the introduction of INSTIs would not impact time from diagnosis to care or care to ART initiation. In addition, we saw yearly improvements during the rollout of RAPID that suggested a shift in the culture of ART initiation in San Francisco, such that increasing numbers of newly diagnosed persons were started within 30 days of diagnosis, even if they did not meet the definition for a rapid start.

Another limitation is that the use of first recorded VS may represent time-to-measurement rather than time-to-event. This would potentially bias outcomes towards the null among those with longer intervals between visits, which might explain lower rates of observed VS in persons with difficulty attending medical appointments. Also, using a snapshot (VS at last measurement within 12 months of diagnosis) could either overestimate (by missing periods of nonsuppression) or underestimate (due to missed laboratory measurements among those with VS but not attending medical visits or who have moved away) suppression. We did not analyze data on VS beyond 12 months from diagnosis and ART initiation, and we know from local epidemiologic data that maintaining VS among persons living with HIV is challenging, particularly in racial/ethnic minorities, PWID, and those experiencing homelessness [14]. Encouragingly for our setting, at the HIV clinic at ZSFG where over 95% of rapid-start patients achieved VS, there were high rates of re-suppression in the small percentage of patients who rebounded [22]. Also, while immediate ART improved early retention in care and VS versus standard of care in studies [4, 6] in Haiti and Lesotho, those differences disappeared at 24 months [26] in Lesotho due to "catch up" by persons randomized to standard of care.

The SFDPH HIV surveillance unit does not routinely collect data on mental illness; thus, we could not examine the effect of this potential barrier to RAPID uptake, particularly among persons reporting homelessness. Clinic-level data and qualitative techniques may be more suited to examining care-related and individual barriers to immediate ART initiation. Finally, the favorable insurance landscape in San Francisco, with coverage available regardless of income, may make our findings less generalizable to other cities.

In summary, we found that during a collaborative, multisector initiative to optimize the time to achieving VS, the median time from diagnosis to VS and time from first care visit to ART initiation dramatically decreased and the likelihood of VS increased. HIV surveillance data greatly contributed to designing RAPID programs, measuring progress, and identifying opportunities for improvement. Additional work is needed to examine the relationship between rapid ART initiation and durable VS, and to continue to make ART at HIV diagnosis available to all.

Supplementary Data

Supplementary materials are available at *Clinical Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

Notes

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