Denver Supportive Housing Social Impact Bond Initiative: Final Outcome Payments

Report to the Governance Committee

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In 2016, the City and County of Denver and eight private investors closed on the city's first social impact bond (SIB), an $8.6 million investment to fund a supportive housing program for people who experience homelessness and have frequent interactions with the criminal justice system. The investors provided funding for supportive services, and the project leveraged state and federal housing resources and received Medicaid revenue for some services. According to the SIB contract, if the program met the goals for keeping people housed and reducing the number of days they spend in jail, the city would make outcome payments to the investors. If the program did not meet its outcome goals, the city would not repay the investors. Over the five years of the project, Colorado Coalition for the Homeless and the Mental Health Center of Denver housed 365 participants as part of the Denver SIB program.

As of October 2020, the city had made four payments that totaled $3,913,932.96 to investors for housing stability outcomes achieved from January 1, 2016, to June 30, 2020. This brief details the fifth and final assessment of housing stability payment outcomes and the assessment of the program's impact on the number of days participants were in jail from January 1, 2016, through December 31, 2020. The new housing stability payment from the city to investors for this reporting period is $620,978.40, and the jail day outcomes payment for the project is $5,104,000.00. In total, the city will repay $9,638,911.36, a $1,038,911.36 return on the investor's original investment.[1]
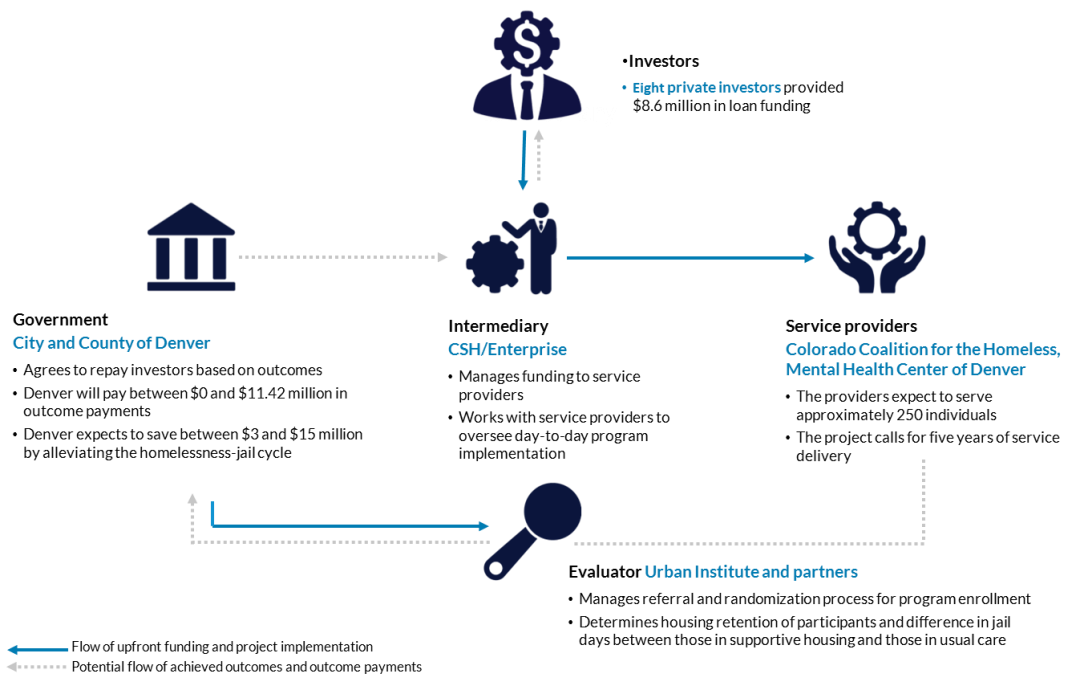
SIB Background

A lack of affordable housing and supportive services, as well as the criminalization of homelessness, can have dire consequences. People who experience chronic homelessness can also spend time in jail, a cycle that affects their health and well-being and does not address the underlying causes of homelessness. Before the City and County launched the SIB initiative, Denver's Office of Behavioral

Health Strategies (formerly the Denver Crime Prevention and Control Commission) calculated that about 250 people in the target population spent an average of 59 nights in jail annually and interacted with other systems, such as detox and emergency care, costing the city $7.3 million a year.[2] Supportive housing aims to stabilize people caught in a homelessness-jail cycle through housing assistance and intensive services, increasing their housing stability and decreasing their number of jail days.

To launch the supportive housing program, the City and County developed an agreement with Denver PFS LLC, an entity established by the Corporation for Supportive Housing and Enterprise Community Partners, to execute the SIB. Eight lenders provided private investment for the SIB,[3] and the project leveraged additional funding through state and federal housing resources and Medicaid reimbursement. In the first year, Colorado Coalition for the Homeless provided supportive housing services. The Mental Health Center of Denver joined in providing supportive housing services in the second year. The City and County provided staff for the program referral process, and many other agencies and organizations, including the Denver Police Department and Denver Sheriff Department, provided administrative data for the evaluation. The Urban Institute conducted a five-year randomized controlled trial evaluation and implementation study in collaboration with partners from The Evaluation Center at the University of Colorado Denver and the Center for Housing and Homelessness Research at the University of Denver. Figure 1 shows the basic structure of the SIB project.

FIGURE 1

Denver Supportive Housing Social Impact Bond Initiative Framework

•**Investors**
• **Eight private investors** provided $8.6 million in loan funding

Government
City and County of Denver
• Agrees to repay investors based on outcomes
• Denver will pay between $0 and $11.42 million in outcome payments
• Denver expects to save between $3 and $15 million by alleviating the homelessness-jail cycle

Intermediary
CSH/Enterprise
• Manages funding to service providers
• Works with service providers to oversee day-to-day program implementation

Service providers
Colorado Coalition for the Homeless, Mental Health Center of Denver
• The providers expect to serve approximately 250 individuals
• The project calls for five years of service delivery

Evaluator Urban Institute and partners
• Manages referral and randomization process for program enrollment
• Determines housing retention of participants and difference in jail days between those in supportive housing and those in usual care

← Flow of upfront funding and project implementation
◄····· Potential flow of achieved outcomes and outcome payments

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Source: Adapted from US Government Accountability Office (GAO), "Pay for Success: A Look at a New Way for Government to Finance Prevention Programs Based on Measured Results" (Washington, DC: GAO, n.d.) and the Urban Institute Pay for Success Initiative.

The first housing stability outcomes report was released in October 2017 (Gillespie et al. 2017), the second was released in November 2018 (Cunningham et al. 2018), the third was released in November 2019 (Cunningham et al. 2019), and the fourth was released in November 2020 (Gillespie et al. 2020). In this outcomes report, we calculate the fifth and final outcomes payment for the SIB program, including the final housing stability payment and the first and only payment for reduction in jail days.

Housing Stability Outcomes and Payments

From January 1, 2016, through December 31, 2020, 365 individuals moved into SIB-funded supportive housing (table 1). Of those people, 92 percent (or 334 individuals) signed their leases by December 31, 2019, meaning that their housing stability outcomes could be tracked for at least one year before the evaluation closed. And of those people, 86 percent (or 287 individuals) had been in housing for at least 365 days.

Some participants exited housing; these exits were categorized as planned or unplanned. This categorization recognizes that some exits were intentional and positive, such as a move to other permanent housing. Deaths were also categorized as planned exits so provider performance would not be penalized because of the vulnerability of some participants. Unplanned exits were any interruption that caused a participant to be out of housing for more than 90 days, including jail stays of more than 90 days. Unplanned exits were tracked to measure project performance, but participants who left housing could reengage with the program. From January 1, 2016, through December 31, 2020, 129 people exited housing. Forty-four participants had planned exits—38 died, and 6 exited to other permanent housing. Eighty-seven participants had unplanned exits. Two participants (included in the numbers above) had an unplanned exit followed by a planned exit. The primary reason for an unplanned exit was a jail stay that lasted longer than 90 days. Of the 365 people who secured housing through the program, a small share (9 percent) had an unplanned exit and later reengaged in the program and reentered housing.

TABLE 1
Lease-Ups and Exits for Denver Social Impact Bond Supportive Housing Program Participants

	Number	Share
Housing lease-ups		
Leased up in housing	365	
Time between lease-up and end of reporting period is less than 365 days	31	8%
Time between lease-up and end of reporting period is at least 365 days	334	92%
Stay in housing was greater than or equal to 365 days	*287*	*86%*
Housing stability		
Individuals who remained in housing as of January 1, 2021	260	71%
Individuals who never exited housing	236	65%
Individuals who reentered housing after an exit[a]	32	9%
Individuals with housing exits after lease-up[b]	**129**	**35%**
Individuals with planned exits	44	12%
Individuals with unplanned exits	87	24%

Sources: Days in housing and exit data are based on Colorado Coalition for the Homeless and Mental Health Center of Denver program data from January 1, 2016, through December 31, 2020.

Notes: An unplanned exit is any interruption that caused the participant to be out of housing for more than 90 days.

[a] Nine participants exited a second time—seven unplanned and two planned—after reentry, and one of those nine had a subsequent reentry.

[b] Two individuals had both planned and unplanned exits and are included in the counts for both groups.

As specified in the contract, housing stability was calculated for participants who met the payment requirement (figure 2). Participants were considered stably housed if they remained in housing for at least 365 days without any episodes away from housing for longer than 90 days or if they had a planned exit from housing at any point. The contract designated the first six months of the project as a pilot period, so this time was not included in the calculation that determined the size of the success payment from the city to investors based on the number of days that participants are housed. (The pilot period did, however, count for determining whether a participant achieved at least one year in housing.) Days that participants spent in jail were also subtracted from the total days in housing. The remaining total adjusted days in housing were multiplied by $15.12 to calculate the success payment from the city.

FIGURE 2
Summary of Housing Stability Payment Calculation

EQUATION

(X)-(X)-(X) **=** TOTAL ADJUSTED DAYS IN HOUSING ***** $15.12/DAY **=** TOTAL HOUSING STABILITY PAYMENT FOR PARTICIPANTS MEETING PAYMENT REQUIREMENTS

| NUMBER OF DAYS IN HOUSING | **—** | NUMBER OF DAYS IN PILOT PERIOD | **—** | NUMBER OF DAYS IN JAIL | **=** |

TOTAL ADJUSTED DAYS IN HOUSING ***** $15.12/DAY = TOTAL HOUSING STABILITY PAYMENT FOR PARTICIPANTS MEETING PAYMENT REQUIREMENTS

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Note: Calculation of the housing stability success payment is detailed in Article 4, Section 4.02, of the Denver SIB contract dated February 2016.

In accordance with the Denver SIB contract, housing stability outcomes were tracked for the project's full observation period (January 1, 2016, through December 31, 2020) for participants in supportive housing who met the payment requirement. As table 2 shows, 301 participants met the payment requirement, 257 of whom maintained their housing for a full year and 44 of whom had a planned exit. Together, the participants who were housed for 365 days or who had a planned exit spent 311,666 days in housing.

After deducting days within the pilot period (2,871 days) and days participants spent in jail (8,867 days), the project achieved 299,928 total adjusted days in housing. Excluding previous payments for housing days that covered the first through 18th quarters, this outcome calls for a fifth and final housing stability payment of $620,978.40 from the City and County of Denver.

TABLE 2

Payment Calculation for Housing Stability Outcomes

Quarters 1–20 (January 1, 2016, through December 31, 2020)

	Count
Number of participants meeting payment requirement	301
Number of participants maintaining voucher for 365 days	257
Number of participants with planned exit	44
A. Total days in housing for participants meeting payment requirements	311,666
B. Minus total days in housing during the pilot period (1/1/2016–6/30/2016)	(2,871)
C. Minus total days in jail during the payment period (7/1/2016–12/31/2020)	(8,867)
D. Total adjusted days in housing for participants meeting payment requirement (D = A – B – C)	299,928
Total payment for participants meeting payment requirement ($15.12/day)	$4,534,911.36
Minus total payment investors received for Q1–18	($3,913,932.96)
Total payment for Q19–20	$620,978.40

Sources: Days in housing and exit data are based on Colorado Coalition for the Homeless and Mental Health Center of Denver program data from January 1, 2016, through December 31, 2020. Jail data are from the Denver Sheriff Department and do not include days spent in prisons or any jails outside Denver.

Note: In quarters 1 through 18, participants reached 258,858 total adjusted days in housing, which amounted to a payment to investors of $3,913,932.96.

Jail Day Outcomes

From January 1, 2016, through December 31, 2020, 724 individuals were randomized into the Denver SIB evaluation's treatment group (those who received supportive housing) or the control group (those who received the usual care) (table 3). By measuring success through a randomized controlled trial evaluation, the City and County can be certain that the supportive housing provided by the SIB was the cause of any observed reduction in the number of days that participants in the supportive housing program spent in jail.

TABLE 3
Baseline Characteristics of Denver Social Impact Bond Evaluation Population

	Treatment group	Control group	Difference
Demographics			
Age (mean)	44.1	44.3	-0.2
Men	87.1%	83.1%	3.9
Race/ethnicity * +			
Black	32.0%	35.2%	-3.2
White	45.5%	49.3%	-3.9
Native American	7.7%	3.9%	3.8
Latinx	14.6%	11.4%	3.2
Jail stays in the 3 years before randomization			
Number of jail stays (mean)	4.9	5.4	-0.5**
Number of jail days (mean)	127.3	132.0	-4.7
Arrests in the 3 years before randomization			
Number of arrests (mean)	12.6	13.9	-1.3**
Number of custodial arrests (mean)	6.6	7.2	-0.6**

Sources: Demographic and arrest data are from the Denver Police Department. Jail stay data are from the Denver Sheriff Department.

Notes: Sample for the treatment group is 363 people. Sample for the control group is 361 people. All data are from three years before randomization.

+ Significance is based on a chi-squared test.

*/**/*** Significant at the 0.10/0.05/0.01 level.

Jail Day Payment

As specified in the contract, reductions in jail days were calculated as the difference between the average number of days that members of the treatment group and members of the control group spent in jail in the three years after randomization. The size of the payment to the investors was determined by the percentage difference between the mean jail days of the treatment and control groups and the thresholds identified in the Denver SIB contract (table 4).

TABLE 4
Percentage Difference Payment Thresholds for Jail Day Outcomes

Threshold	Payment per percentage point
<20% difference in mean jail days	$0
20 to <30% difference	$160,000
30 to <65% difference	(30 x $160,000) + $38,000 per percentage point above 30%
> or equal to 65% difference	Maximum payment ($6,130,000 total)

Notes: Payment thresholds are detailed in Article 4, Section 4.03, of the Denver SIB contract dated February 2016. The percentage difference in mean jail days is calculated as the difference between the mean jail days of the control and treatment groups divided by the mean jail days of the control group.

In accordance with the Denver SIB contract, jail day outcomes were tracked for the project's full observation period (January 1, 2016, through December 31, 2020) for participants in the treatment and control groups. The members of each group were randomized before January 1, 2018. Each group's

mean jail days were regression-adjusted and estimated using the treatment-on-the-treated (TOT) approach, which defined treatment as being housed by June 23, 2018 (see Cunningham et al. 2016). We controlled for race or ethnicity, age at randomization, gender, the number of jail days in the three years before randomization, the number of jail stays in the three years before randomization, the number of arrests in the three years before randomization, and the number of custodial arrests in the three years before randomization. The SIB contract bases payments on the TOT estimate of the difference in jail days. Three years after randomization, housed participants (the treated group) had a mean of 85.93 jail days, and people in the control group had a mean of 138.32 jail days. The percentage difference between the mean jail days of the treated and control groups was 38 percent (table 5).

TABLE 5

Mean Jail Days and the Percentage Difference in Jail Days for Treated and Control Groups

	1 year after randomization	2 years after randomization	3 years after randomization
Mean jail days, treated (housed) group	37.91	70.53	85.93
Mean jail days, control group	65.63	109.28	138.32
Percentage difference	42%	35%	38%

Source: Jail data are from the Denver Sheriff Department and do not include days spent in prisons or jails outside Denver.
Notes: Sample for the treated group is 363 people. Sample for the control group is 361 people. The percentage difference is calculated as the difference between the mean jail days of the control and treatment groups divided by the mean days of the control group.

According to the payment thresholds for jail day outcomes, the payment for a percentage difference of 38 percent is 30 multiplied by $160,000 plus $38,000 multiplied by 8 (i.e., the number of percentage points above 30 percent). This outcome calls for a payment of $5,104,000.00 from the City and County of Denver.

Jail Days by Race

One of the evaluation specifications was to examine whether the impact of Denver SIB services varied across participants by race or ethnicity (table 6). The values below represent the effect of treatment on the average days in jail for white, Black, Latinx, and Native American participants.[4] Although some of these differences across race seem large, none is statistically significant. Therefore, we cannot conclude that the impact of the Denver SIB supportive housing program on days spent in jail varied based on the race or ethnicity of a participant.

TABLE 6
**Regression-Adjusted Differences in Jail Days between the Treatment and Control Group
3 Years after Randomization, by Race or Ethnicity**

Estimation method	N	White	Black	Latinx	Native American
Intent-to-treat	724	-31.30	-51.15	-30.88	-32.50
Treatment-on-the-treated	724	-48.43	-66.24	-47.82	-41.75

Source: Jail data are from the Denver Sheriff Department and do not include days spent in prisons or jails outside Denver.
Notes: The intent-to-treat approach compared outcomes of a treatment group of individuals who were selected for supportive housing (but who may or may not have received housing) with those of a control group of individuals who were not selected for supportive housing. The treatment-on-the-treated approach compared outcomes of those in the treatment group who were housed by the time the outcome was measured with those of the control group.
*/**/*** Difference is significant at the 0.10/0.05/0.01 level.

Appendix. Methodology

The housing stability calculations use Denver Sheriff Department data on jail stays and Colorado Coalition for the Homeless and Mental Health Center of Denver data on lease-ups and housing exits. The Colorado Coalition for the Homeless data include information on the dates of lease-up and housing exits from January 1, 2016, through December 31, 2020. The Mental Health Center of Denver data include information on the dates of lease-up and housing exits from January 1, 2017, through December 31, 2020. The Denver Sheriff Department data include the booking start and end dates of all jail stays from January 1, 2009, through December 31, 2020, for all people randomized into treatment by January 1, 2021, as well as the nine people who participated in the pilot.

Participants were determined to have met the housing stability payment requirement if they had been housed for 365 or more days without an absence from housing for more than 90 days or if they had leased up and had a planned exit. Participants who had an unplanned exit before 365 days but who reached 365 days in housing after housing reentry met the payment requirement for their second stay in housing. For those meeting the payment requirement, days in housing were calculated as the last day in housing or December 31, 2020 (whichever came first) minus the date of lease-up or January 1, 2016 (whichever came last). The days in housing during the pilot period were calculated as the last day of housing or June 30, 2016 (whichever came first) minus the date of lease-up or January 1, 2016 (whichever came last). Days in jail during the payment period were calculated as the booking end date, the housing exit date, or December 31, 2020 (whichever came first) minus the booking start date, the lease-up date, or June 30, 2016 (whichever came last). Jail days were included only if they took place while the participant was housed after the pilot period, from July 1, 2016, through December 31, 2020. So that both the first day and last day were counted, one day was added to each of the following measures: days in housing, days in housing during the pilot period, and days in jail. Each of the following measures was calculated at the individual level and then summed for all participants meeting the payment requirement: days in housing, days in housing during the pilot period, and days in jail. Total adjusted days in housing were then calculated by taking the total days in housing and subtracting the total days in housing during the pilot period and the total time in jail.

Jail day reductions were measured as the difference in the mean jail days of the treatment and control groups in the three years after randomization and were estimated using a treatment-on-the-treated approach described below.

To understand the calculation of treatment impacts using the TOT approach, we first explain how treatment impacts were calculated using the intent-to-treat (ITT) approach. The ITT estimate was defined as the difference between the average outcomes for the treatment group and those for the control group, adjusting for pre-randomization covariates.

All eligible people randomized into the treatment group were counted in the treatment population regardless of whether they engaged with the service provider, passed the housing screen, or obtained housing. All eligible people randomized into the control group were counted in the control population even if they enrolled with the SIB service provider or obtained housing.

The ITT estimate was measured as the average individual outcomes for the treatment population minus the average individual outcomes for the control population. Pre-randomization covariates were controlled for using a regression framework. Specifically, the ITT estimate, π_Y, was measured using the following regression equation:

$$Y_i = \alpha + \beta^T T_i + \sum_{n=1}^{N} \beta^n X_i^n + \varepsilon_i$$

In the equation, Y_i is the number of jail days for each individual, *i*, who was randomly assigned. T_i is an indicator equal to 1 for individuals assigned to the treatment group and to 0 for individuals assigned to the control group. β^T is the parameter of the ITT effect on the outcome (Y_i), the number of population members assigned to the treatment population and control population, respectively. X^n is a vector of pre-randomization covariates and β^n is the vector of coefficients on the covariate, X^n. ε is the regression error term. The inclusion of the pre-randomization covariates was intended to improve the precision of the estimates. The list of covariates to control for in the model is $X_i^1 \dots X_i^{Nn}$: race, ethnicity, age at randomization, gender, the number of jail days in the three years before randomization, the number of jail stays in the three years before randomization, the number of arrests in the three years before randomization, and the number of custodial arrests in the three years before randomization.

The TOT estimate was calculated using an instrumental variables (IV) estimate (Angrist, Imbens, and Rubin 1996). The IV estimate is per person served, among those who comply with their referral assignment; this accounts for the fact that some people referred to the Denver SIB supportive housing program may not enroll and that some people in the control group may end up receiving services from the program. Study participants are one of three types: those who will always enroll in the Denver SIB program regardless of whether they are referred to it or not; those who will never enroll in the program, even if they are referred to it; and (3) those who comply with whatever referral assignment they receive, whether it is to enroll in the program or to remain in the control group. The IV estimate represents the effect of enrollment in the supportive housing program on study outcomes among this third group, the compliers. In the special circumstance where decisions to comply or not are independent of the study outcomes, the IV estimate also represents the average treatment effect.

The IV estimate scaled up the ITT estimate by the difference between the treatment group's and the control group's fractions enrolled in the Denver SIB. Conceptually, the effect of referring an individual to the Denver SIB on enrollment in the Denver SIB was estimated in exactly the same manner as calculating the ITT, except the dependent variable in the model was enrollment:

$$P_i = \alpha + \delta^T T_i + \sum_{n=1}^{N} \delta^n X_i^n + \varepsilon_i$$

In this equation, P_i is 1 if the individual, i, actually enrolled in the program, regardless of whether they were in the treatment group or the control group. Enrollment will be defined as the participant's having an initial housing lease-up (enrollment) date in SIB housing. T_i is an indicator equal to 1 for individuals assigned to the treatment group and 0 for individuals assigned to the control group. δ^T is the parameter of the effect of being randomly assigned into treatment on actual enrollment (P_i). X^n is a vector of pre-randomization covariates, and δ^n is the vector of coefficients on the covariates, X^n. ε is the regression error term. The IV estimate is the ratio of the two estimates:

$$\text{TOT estimate} = \frac{\beta^T}{\delta^T}$$

In practice, the two equations were estimated simultaneously using a two-stage least squares estimation procedure. In the first stage, the dependent variable (enrolling in the program) was regressed on the exogenous covariates plus the instrument (randomization into treatment). In the second stage, fitted values from the first-stage regression were plugged directly into the structural equation in place of the endogenous regressor (enrolling in the program). The same covariates were included as in the ITT regression.

Because the payment schedule specified the payment amount in per-person-served units, the IV estimate was the basis for the performance-based outcome payments. The IV estimate also represents the per-participant-served difference in mean jail days between the treatment and control groups, among those who comply with referral assignments.

Notes

[1] According to Section 2.02 of the loan agreement, the Northern Trust Corporation will share a portion of their housing stability success payments with the providers.

[2] For the Denver Social Impact Bond Initiative fact sheet, see "Mayor Hancock Announces Social Impact Bonds to Serve First 25 Participants at North Colorado Station," Denver Department of Finance, news release, February 16, 2016, https://www.csh.org/wp-content/uploads/2011/12/Denver-SIB-launch-release-2-16-16.pdf.

[3] The Denver SIB lenders are Arnold Ventures, the Ben and Lucy Ana Walton Fund of the Walton Family Foundation, the Colorado Health Foundation, Denver Foundation, Living Cities Blended Catalyst Fund LLC, Nonprofit Finance Fund, the Northern Trust Corporation, and the Piton Foundation.

[4] These values are calculated from intent-to-treat and treatment-on-the-treated regressions where treatment was interacted with race dummies. Similar results are found when running separate regressions by race.

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