APPENDIX

Appendix A1. Details of deviations and additions to Pre-Registered Analyses

A pre-analysis plan[1] outlined the methods and analyses we intended to undertake. While analyses were already underway, the research team identified some methodological changes necessary to improve the analyses and found these changes to be sufficiently different. We summarize the methods included in the pre-analysis plan and the analyses that had to be modified or excluded.

Analysis	Method detailed in pre-analysis plan	Update	Reason
Unit of observation	Appendix III of the pre-analysis plan incorrectly explained that some outcomes were going to be measured at the participant level, and some at the family level.	All outcomes studied are exclusively at the participant level. No outcomes capture the household as the unit of analysis.	Recruitment forms only included information on the applicant and not on other household members therefore administrative data could only be linked to the head of the household.
Inverse Probability Weighting	Calculate a difference in means (ITT) between those assigned treatment and control and CACE for each outcome. Weights were not specified.	Adjust the control and treatment means using inverse probability weights based on the probability of a person being in the sample. For additional details please refer to Appendix A3.	The pre-analysis plan did not directly mention weighting outcomes to reflect different treatment probabilities of treatment created by having a rolling application process and multiple lotteries. This weighting is necessary to account for observed and unobserved differences between groups eligible for different lotteries.
Use of Services	Defined in Appendix III of the pre-analysis plan as "Count of interactions with D.C. Continuum of Care."	A binary variable equal to 1 if anyone interacted with the Continuum of Care.	A binary variable was used to align the measure with the homelessness outcome measure, which is also binary.

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[1] https://osf.io/r47hb/

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Housing Stability and Economic Well Being Outcome Variables	Appendix III of the pre-analysis plan listed all primary and secondary outcomes	We intended to include more diverse measures of housing stability and economic well-being including: evictions and eviction proceedings, the rate of application for the District's Emergency Rental Assistance Program (ERAP), the rate of application for emergency assistance with utilities through the Low Income Home Energy Assistance Program (LIHEAP), employment, and earnings.	At the time of writing, we were unable to obtain administrative data (employment, income, court interactions, outcomes, and proceedings). We were only able to access data and outcomes available in the HMIS and TANF databases.
Treatment on the Treated (ATT) estimate	Section G of the Pre-Analysis Plan outlines an approach to account for the fact that we do not know which members of the control group would not meeting final eligibility requirements	No ATT analysis was conducted.	Data on employment and income were viewed as vital to this analysis. Since those data were not available (see above), this estimate was not calculated.

Appendix A2. DHS Systems and Processes of Family prioritization for families

Families System
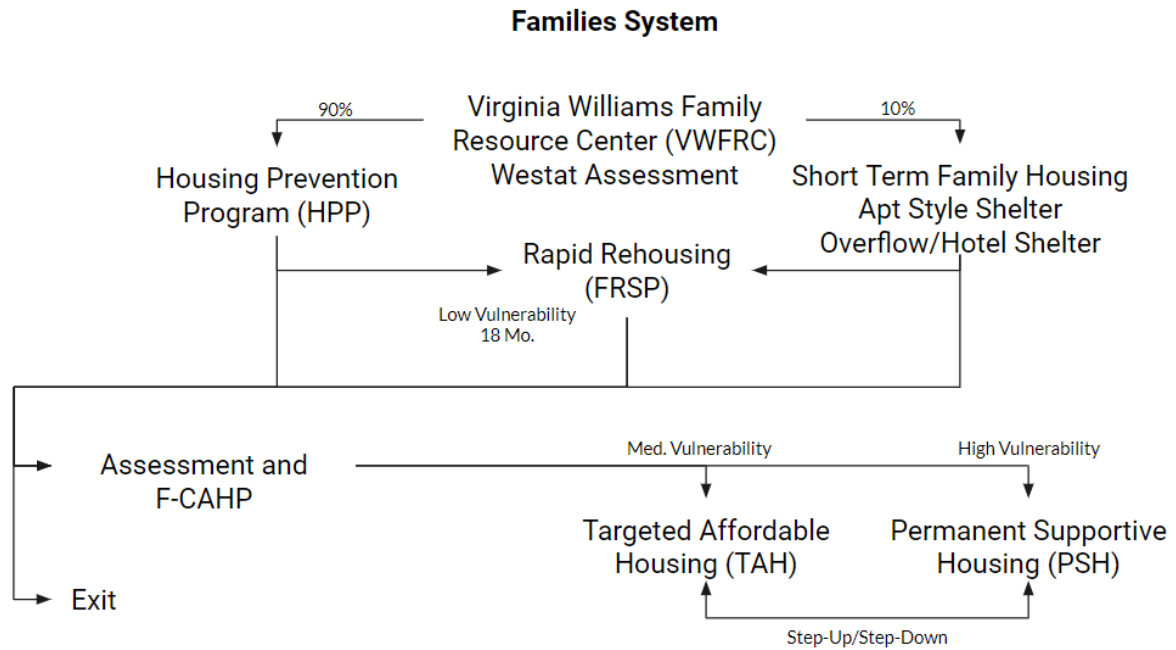
Source: DHS

Appendix A3: Lotteries and Treatment Probabilities

Lottery	# of People Selected and Included in Year 1 Study (N=229)	Lottery Dates	Treatment Probability across five waves
1	48	1/22/2018	38.51%
2	54	2/14/2018	32.12%
3	61	4/20/2018	28.98%
4	36	6/18/2018	13.34%
5	30	7/25/2018	6.40%

Because offers of enrollment in DC Flex were assigned by rolling lotteries, each participant's outcome is weighted by the inverse of their probability of being selected. For example, the weight for wave 1 participants assigned to treatment above is calculated as follows:

1/(p1+(1-p1)*p2+(1-p1)*(1-p2)*p3+(1-p2)*(1-p2)*(1-p3)*p4+(1-p1)*(1-p2)*(1-p3)*(1-p4)*p5),

where p is the proportion of people randomized to treatment within each wave).

Appendix A4: DHS housing options for families in DC

Program Description	Eligibility requirements	Amount of benefits each program gives	Duration of benefits
Rapid Re-housing (RRH) / Family Rehousing and Stabilization (FRSP)	• Experiencing homelessness. • Proof of DC residency. • Financial capacity to pay full rent amount at end of the term period. • Must be in full compliance with TANF requirements. •No preconditions (such as employment, income, absence of a criminal record, or sobriety)	• Rent and security deposit. • The resources and services provided are typically tailored to the household's needs.	Minimum of four months. RRH is meant to last for a total of 12 months, in practice, it last longer until the family is no longer at risk of homelessness, but case management (e.g., childcare, employment assistance, navigation through income benefits, etc.) can continue if requested.
Emergency Shelter (ES)	• Social service proof of residency (DHS, 2016). • Lack of fixed, regular nighttime residence or having primary nighttime residence in a shelter, transitional housing facility, or places not meant for human habitation.	• The VWFRC provides the following resources to people living in ES: ERAP, TANF, food stamps, Medicaid, TANF, and childcare subsidy. • Not all families in ES are placed in apartment-style shelters. The offering of private rooms (with bathrooms and kitchens) for families are scarce and has been heavily debated (Gathright, 2021). For families experiencing homelessness, DC utilizes hotel rooms when emergency shelters and short-term family housing sites are at capacity.	Non-profit organizations operate emergency shelters under contract with DHS and are mandated to provide shelter for up to 90 days or until the recipient has been offered two permanent housing opportunities. In practice, recipients of ES cannot be asked to leave until they have alternative housing.
Transitional Housing	There are 14 programs in DC, for adults -- each location has different eligibility criteria in terms of demographics and eight programs are specific to families (Department of Human Services, 2020)	• The recipient must pay 30% of their income towards rent. (DHS, 2019). • Comprehensive support services including a case manager differ based on need (e.g., job training, substance abuse counseling, life skills training, and social skills development).	Less than 2 years.

Permanent Supportive Housing (PSH)	• Being continuously homeless for a year or more or having had at least four episodes of homelessness in the past three years. • Eligibility is based on vulnerability assessments related to chronic physical and mental health issues (DHS, 2011.)	•Places families in housing via Housing-First model. •Goal-based case management, housing search assistance, connections to employment and training, school navigation for children, pairing youth with volunteer mentors, and connections to community resources.	•Permanent. •Tenants pay a share of their rent, generally on a sliding scale.
Emergency Rental Assistance Program (ERAP)	• Proof of DC residency. • Income below 125% of the monthly federal poverty level according to household size. • Be presented with an eviction letter or show documents that they are in arrears with rent and utility • Demonstrate that they have no other available resources for resolving the emergency • Demonstrate that the provision of emergency rental assistance services will substantially, if not entirely, alleviate the emergency during the 30 day period immediately following the authorization of payment. • Have at least one dependent who is 18 years or younger or age 60 years or older or a person with a disability.	$2,582.61 (on average). Total assistance payment depends on the circumstances and may not exceed $6,000,	Up to 5 months.

Homelessness Prevention Program (HPP)	• 30% of Median Family Income or below • Meet the homeless definition based on the Westat evaluation (*Appendix A2*). • eligibility verification is required every 3 months	VWFRC services include emergency rental assistance, housing resources, homelessness diversion services, emergency family housing, and community-based resources	Dependent on what set of services one receives (shelter vs. rental assistance for instance).
Targeted Affordable Housing (TAH)	• Assistance is focused on families or individuals that are disabled and/or are of old age	The household can independently function without intensive case management and is connected to community resources in order to remain stably housed but services are typically less intense than PSH.	•Permanent rental subsidy. •Tenants pay a share of their rent, generally on a sliding scale.

Note: The amount of assistance a family may receive is based on the Westat and VI-SPDAT assessments which are conducted on all families in order to determine their placement.

Appendix A5:
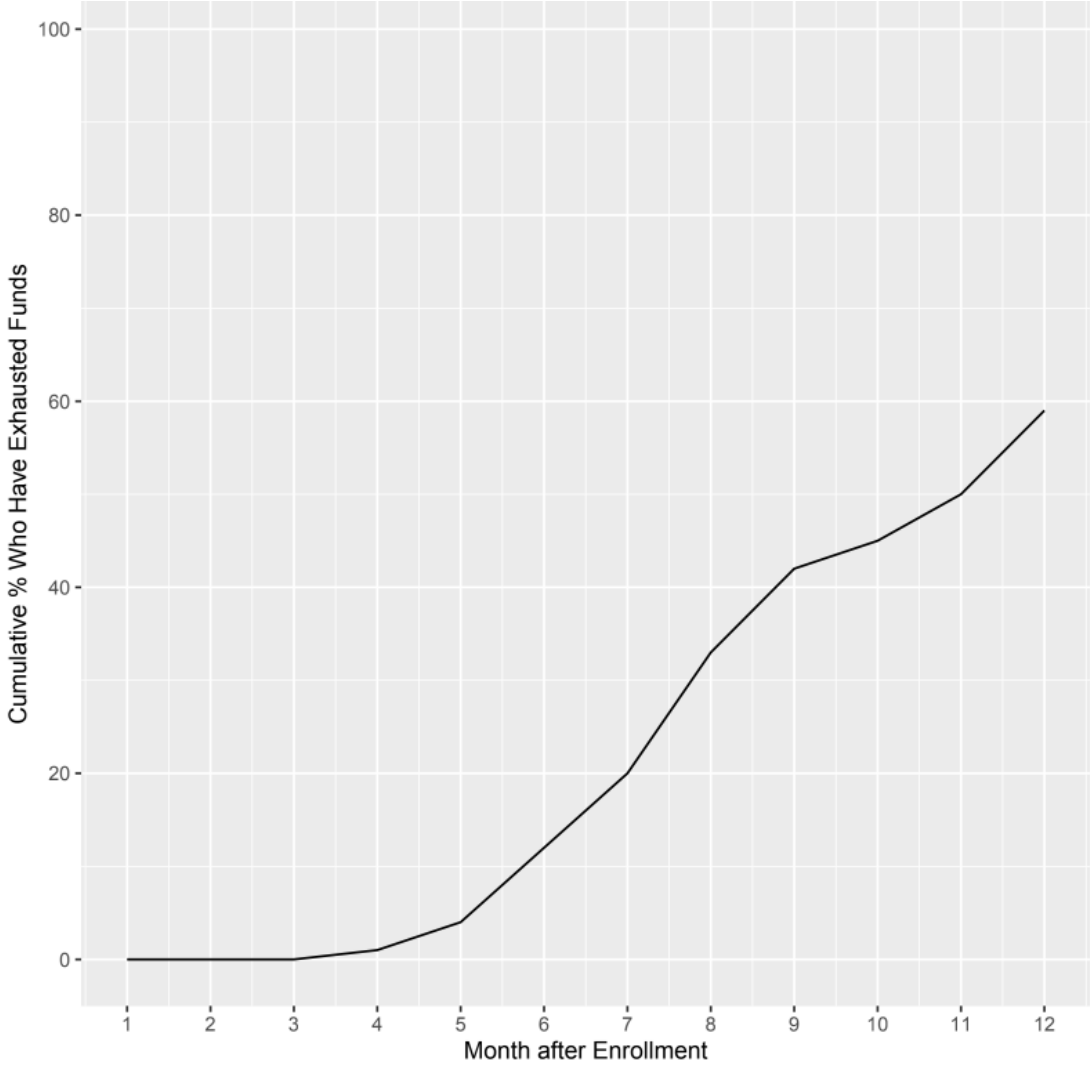
Appendix A6: Breakdown of Service utilization in HMIS between October 2018 and October 2019.

Programs and services	Unweighted Average Number of days			Weighted Average Number of days		
	Compliers (N=102)	Non Compliers (N=127)	Controls (N=439)	Compliers (N=102)	Non Compliers (N=127)	Controls (N=439)
PSH	0	0	2.8	0	0	3.0
TAH	0	2.9	10.0	0	2.6	10.3
RRH	14.0	72.2	72.0	14.5	72.5	70.4
ES	1.5	10.5	4.6	1.3	9.6	4.7
HPP	3.7	12.0	9.0	3.3	11.2	9.1

Averages are unconditional (i.e., they take into account individuals with zero utilization).

Appendix A7: Sensitivity analysis, including households (51) who have not completed 1 year into the study

Table A7.1: DC Flex impact on homelessness and service utilization

Year 1 results:	Entered Emergency Shelter or Transitional Housing	Service Utilization.
Complier Outcome (N=129)	8.4%	16.7%
Counterfactual Complier Outcome	4.2%	42.5%
CACE coefficient (SE)	4.2pp (4.0pp)	-25.8 pp (7.5pp)
Treatment Group Outcome (N=280)	6.2%	30.6%
Control Group Outcome	4.2%	42.5%
ITT coefficient (SE)	2pp (1.8pp)	-11.9 pp (3.5pp)

Note: Among the additional participants (51) no compiler ended up in emergency shelter, however five individuals who were assigned to treatment and did not take up the program did end up in emergency shelter. SE = standard error. pp = percentage points

Table A7.2: DC Flex impact on TANF amount received and the likelihood of TANF receipt

Year 1 results	TANF amount received	% TANF Receipt
Complier Outcome (N = 129)	$211	43.8%
Counterfactual Complier Outcome	$184	41.8%
CACE coefficient (SE)	$27 ($45)	0.2pp (8.2pp)
Treatment Group Outcome (N =	$196	42.8%
Control Group Outcome	$184	41.8%
ITT coefficient (SE)	$12.3 ($20.8)	0.1pp (3.8pp)

SE = standard error. pp= percentage points

Table A7.3: DC Flex impact on ERAP amount received and the likelihood of ERAP receipt in one year

Year 1 results	ERAP amount received	% ERAP Receipt
Complier Outcome (N = 129)	$227	6.3%
Counterfactual Complier Outcome	$348	10.4%
CACE coefficient (SE)	-$121 ($160)	-4.1 pp (4.4pp)
Treatment Group Outcome (N = 280)	$289	8.9%
Control Group Outcome	$348	10.4%
ITT coefficient (SE)	-$55.8 ($73.5)	-1.8pp (1.9 pp)

SE = standard error. pp = percentage points.

Appendix A8: Heterogeneity model

A8.1 First stage equation: Probability of DC Flex Uptake

Variables	Coef.	Std. Err.	P>|t|
Constant	0.27	0.22	0.217
Age	0.00	0.00	0.481
Number of people in the household	-0.05	0.07	0.497
Number of children	0.04	0.08	0.613
Currently working	0.10	0.11	0.323
Days since last reported date of employment	0.00	0.00	0.672
Annual Income	0.00	0.00	0.524
Rent Amount	0.00	0.00	0.61
Split rent for housing unit with someone not in their household	0.02	0.13	0.851
Sought Services at VWFRC prior to application	-0.04	0.08	0.571
Applied for ERAP prior to application	-0.03	0.08	0.711
Applied for Homelessness Prevention Program prior to application	0.01	0.11	0.925
Applied for Rapid Rehousing prior to application	0.13	0.09	0.141
Applied for Transitional Housing prior to application	-0.22	0.17	0.203
Received Rapid Rehousing at the time of the application	-0.13	0.10	0.164
Received Transitional Housing at the time of the application	0.15	0.40	0.699
Received Housing Choice Voucher Program at the time of the application	-0.18	0.15	0.228
Received Project-based Section 8 Housing at the time of the application	-0.40	0.24	0.098

A8.2 Second stage equation: Impact of DC Flex on DHS Total Annual Cost

Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
Constant	15,415	2,561	0	8,283	3,357	0.004	8,041	3,594	0.026
T_i	-1,957	3,527	0.579	242	4,656	0.959	371	4,836	0.939
$\hat{p}T_i$	4,652	7,511	0.536	-6,220	2,2059	0.778	8,788	33,779	0.795
$\hat{p}^2T_i$				12,295	2,8519	0.667	-53,261	116,420	0.647
$\hat{p}^3T_i$							67,498	117,259	0.565
$\hat{p}$	-12,431	5,413	0.022	33,325	15,100	0.028	31,833	17,042	0.062
$\hat{p}^2$				-61,223	18,890	0.001	-51,383	55,213	0.352
$\hat{p}^3$							-11,221	59,150	0.850
Likelihood-ratio test.				LR chi2(2) = 15.71* Prob > chi2=0.0004			LR chi2(2) = 16.06* Prob > chi2 =0.0003 LR chi2(2) = 0.35** Prob > chi2=0.8399		

T_i=treatment assignment. $\hat{p}$=probability of DC Flex uptake. *Assumption: Linear model is nested in quadratic model or cubic model. **Assumption: quadratic model is nested in cubic model.

F-test on joint significance $\hat{p}T_i=\hat{p}^2T_i=\hat{p}^3T_i=0$, F= 0.22. Prob > F = 0.8858

A8.3 Second stage equation: Impact of DC Flex on DHS Total Annual Benefits Received by Participants

Variable	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|	Coef.	Std. Err.	P>|t|
Constant	10,136	1,496	0	5,343	1962	0.007	5,227	2,100	0.013
T_i	-3,193	2,061	0.122	197	2721	0.942	401	2,826	0.887
$\hat{p}T_i$	9,171	4,388	0.037	-11,658	12894	0.366	-21,433	19,741	0.278
$\hat{p}^2T_i$				27,231	16670	0.103	65,742	68,037	0.334

$\hat{p}^3 T_i$							-38,281	68,528	0.577
$\hat{p}$	-10,180	3,162	0.001	20564	8826	0.02	19,844	9,959	0.047
$\hat{p}^2$				-41,137	11042	0	-36,387	32,267	0.26
$\hat{p}^3$							-5,417	34,568	0.876
Likelihood-ratio test.			LR chi2(2) = 15.09* Prob > chi2=0.0005			LR chi2(2) = 15.66* Prob > chi2=0.0003 LR chi2(2) = 0.58** Prob > chi2=0.7495			

T_i=treatment assignment. $\hat{p}_i$=probability of DC Flex uptake. *Assumption: Linear model is nested in quadratic model or cubic model. **Assumption: quadratic model is next in cubic model.

F-test on joint significance $\hat{p}_i T_i = \hat{p}_i^2 T_i = \hat{p}_i^3 T_i = 0$, F= 2.17. Prob > F = 0.0903

Appendix A9: Distribution of Costs and Benefits

Histograms by treatment assignment

Histograms by treatment assignment

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