

Worker Paid Leave Usage Simulation (Worker PLUS) Model

Issue Brief: A Guide to Performing a Policy Simulation of a Parental Leave Program for Federal Civilian Employees

January 2021

OVERVIEW

This brief provides a step-by-step guide to performing an example policy simulation using the Worker Paid Leave Usage Simulation (Worker PLUS) model developed by IMPAQ International and the Institute for Women's Policy Research for the Chief Evaluation Office at the U.S. Department of Labor (DOL). With the guidance in this brief, readers will learn how the model can be configured and how similar simulations can be executed.

The example leave policy considered is the recently proposed parental leave program among the compensation and benefits package of the National Defense Authorization Act (NDAA) for Fiscal Year 2020, a law signed by President Donald J. Trump on December 20, 2019.ⁱ The program is expected to provide up to 12 weeks of paid parental leave in connection with the birth, adoption, or foster care placement of a child occurring on or after October 1, 2020 for federal civilian employees who are covered by Family and Medical Leave Act (FMLA) provisions.ⁱⁱ While the detailed regulations and guidelines have yet to be finalized and issued by the U.S. Office of Personnel Management (OPM), we have chosen for the simulation model program parameters that best reflect the known features of the program. For unknown features, we either adopted parameters that are comparable to features of existing state programs or conservatively set parameter values that would lead to larger estimates of program outlay.

To fully understand this brief, readers should first review a separate brief in this issue brief series, *A Guide to Performing Example Simulations*, to ensure all hardware, software, and dataset requirements are satisfied before launching the model.ⁱⁱⁱ This brief assumes that the microsimulation model has been properly launched and focuses on (i) the configuration of the model to perform the policy simulation of parental leave for federal civilian employees, and (ii) a discussion of simulation results, reconciling them against outlay estimates of the same program published by the Congressional Budget Office (CBO).

CONFIGURING THE MODEL

We configure the model to best reflect the known features of the parental leave program for federal civilian employees, using the government worker subsample of the 2014–2018 American Community Survey (ACS) Public Use Microdata Sample (PUMS). For undetermined features of the program, we follow the principle of avoiding underestimating program outlays by using conservative values, such as full wage replacement, full take-up rates, and universal eligibility to receive benefits simultaneously from the program and employer.

To perform the policy simulation, the user should first turn on the *Advanced Parameters* option on the bottom-right corner of the graphical user interface (GUI), above the *Run* button, to show all model parameters and options, as shown in **Exhibit 1**, and then apply the following configuration:

To facilitate understanding of the potential impacts of different policy alternatives on workers' leave-taking behaviors and program costs, the U.S. Department of Labor's Chief Evaluation Office contracted with IMPAQ International, and its partner Institute for Women's Policy Research (IWPR), to develop the Worker Paid Leave Usage Simulation (Worker PLUS) model, an open-sourced microsimulation tool based on public microdata and predictive modeling. The model and other relevant materials are publicly available at [\[hyperlink\]](#).

This issue brief provides a step-by-step guide to using the Worker PLUS model to perform an example policy simulation of the recently proposed parental leave program for federal workers. The model uses as its intakes the 2018 DOL Family and Medical Leave Act Employee Survey and the sample of civilian employees at the federal government from the 2014–2018 American Community Survey Public Use Microdata Sample and applies program parameters that best reflect the proposed leave program. The model predicts an annual program outlay of \$866 million if assuming full take-up. This result is similar to the average annual cost projection of \$833 million over fiscal years 2021–2024 estimated by the Congressional Budget Office.

- **FMLA File:** This is the file path of the public 2018 FMLA Employee Survey. The file path should include the full file name with the “.csv” extension for file format. The user can click the *Browse* button on the right to navigate to any local directory where the FMLA data file is located. The data file must be in *csv* format.
- **FMLA Wave:** This is the wave year of the FMLA Employee Survey data. The user can choose from 2012 or 2018, the two years for which FMLA data are used for modeling. The user should set this field to 2018 to perform the simulation illustrated in this brief.^{iv}
- **ACS Directory:** This is the file path of the ACS PUMS data. The user can click the *Browse* button to navigate to the desired local directory. Assuming that the ACS directory is *.acs*, the following sub-directory structure is required for performing simulations for the federal employee sample in ACS PUMS:
 - *.acs/2018/household_files/*
gov_workers_us_household_2018_fed_state_local.csv
 - *.acs/2018/person_files/*
gov_workers_us_person_2018_fed_state_local.csv

The *.acs/2018/household_files* and the *.acs/2018/person_files* folders should contain the national-level ACS PUMS household and person data files that contain all government employees. We use reduced ACS data files that contain *only* government employees to minimize runtime for data loading and processing. We will provide these reduced data files along with the final version of the model.
- **Output Directory:** This is the directory where model output files will be saved.
- **State to Simulate:** The user should set *All* as the underlying population, which corresponds to federal employees across all states and the District of Columbia (DC).
- **State of Work:** The user should uncheck this box, as the population under consideration encompasses federal employees across all states and DC. Therefore, whether the state of interest is defined by state of residence or state of work is irrelevant. As the model will use *.acs/2018/household_files* and *.acs/2018/person_files* to store the government employee subsample of the ACS PUMS, this box should be unchecked so that data files can be properly located and loaded.
- **Year:** The year should be set to 2018, the ending year of the most recent 5-year ACS PUMS as of October 2020, to best represent the population that would be affected by the policy.
- **Simulation Method:** The user can choose any preferred method. In this guide, we set the method to *Random Forest*, one of the better performing methods for predicting maternity disability leave taking and need, as reported in a separate brief that focuses on testing model performance across different simulation methods.^v
- **Random Seed:** Set to any integer between 0 and 2^{32} . The simulation results will remain identical on the same machine as long as the same seed value is specified. We recommend using the same integer for comparisons for easy tracking and replication. The

Exhibit 1: Graphical User Interface with Advanced Parameters

The screenshot displays the 'Paid Leave Micro-Simulator' application window. The top section contains input fields for:

- FMLA File:** data/fmla/fmla_2018/FMLA_2018_Employee_PUF.csv
- FMLA Wave:** 2018
- ACS Directory:** E:/workfiles/Microsimulation/microsim/data/acs
- Output Directory:** E:/workfiles/Microsimulation/microsim/output
- State to Simulate:** All (with a checked 'State of Work' option)
- Year:** 2018
- Simulation Method:** Random Forest
- Random Seed:** 12345
- Engine Type:** Python

 A 'Compare' button is located at the bottom right of this section. Below this is a 'Program' tab with sub-tabs for 'Population' and 'Simulation'. The 'Simulation' sub-tab is active, showing:

- Eligibility Rules:** A table with columns for Earnings (0), Weeks (50), Hours (1250), and Employer Size (1).
- Max Weeks:** A table with columns for Own Health (0), Maternity (12), New Child (12), Ill Child (0), Ill Spouse (0), and Ill Parent (0).
- Leave Types Allowed:** Checkboxes for Own Health, Maternity (checked), New Child (checked), Ill Child, Ill Spouse, and Ill Parent.
- Eligible Employee Types:** Checkboxes for Private Employees, Self Employed, Government Employees, Federal Employees (checked), State Employees, and Local Employees.
- Benefit Financing:** Payroll Tax Rate (%) set to 1.0, Maximum Taxable Earnings (\$) set to 100000, and State Income Tax Rate (%) set to 5.0. There is an unchecked checkbox for 'Apply Benefits Tax'.
- Wage Replacement:** Wage Replacement Type set to Flat, Replacement Ratio set to 1.
- Weekly Benefit Cap:** 1000
- Waiting Period:** 5
- Unchecked checkboxes for 'Dependency Allowance' and 'Recollect'.

 At the bottom right, there is a 'Run' button and a status indicator for 'Advanced Parameters: On Off'.

results in this brief can be replicated using the random seed value 12345 on a Windows 10 Pro operating system with OS Build version 19041.630. The results may slightly vary for different Windows operating systems and OS Build versions.

- **Engine Type:** This should be set to Python. The results of this brief can be replicated by using the Python model. We do not recommend using the R engine for the policy simulation considered in this brief, as the R engine will need to loop through all individual state ACS data files to extract government employee subsamples, thus causing substantially longer runtime.
- Parameters under *Program*, *Population*, and *Simulation* tabs: The suggested parameter values are presented in **Exhibit 2**, along with notes explaining how parameter values are determined.
- After above configuration steps, the user can click the *Run* button to execute the simulation.

Exhibit 2: Suggested Model Parameters for the Policy Simulation

Tab	Parameter or Parameter Section	Parameter Value(s)	Notes
Program	Eligibility Rules	Earnings = 0 Weeks = 50 Hours = 1,250 Employer Size = 1	The requirement on hours follows the current FMLA eligibility requirements for unpaid leave coverage.
	Max Weeks	Maternity = 12 New Child = 12 All other fields = 0	
	Leave Types Allowed	Check Maternity and New Child and uncheck the rest	
	Eligible Employee Types	Check Federal Employees and uncheck the rest	
	Benefit Financing	Any value, e.g., Payroll Tax Rate = 1%, Maximum Taxable Earnings = \$100,000	The user can easily recalculate Administrative Budget Financing (ABF) results in the ABF tab of the results window after simulation.
	Wage Replacement Type	Flat	We consider full wage replacement. Hence, the type should be set to Flat.
	Replacement Ratio	1	The flat rate is conservatively set to full replacement to avoid underestimating program outlay.
	Weekly Benefit Cap	\$1,000	Comparable to caps for existing state programs (\$1,300 in California, \$667 in New Jersey, and \$852 in Rhode Island). Also, \$1000 is the cap currently adopted by the DC program. ^{vi}
	Waiting Period	5 days	Same as typical waiting periods for state programs (CA/NJ/RI).
	Dependency Allowance	Unchecked	
Recollect	Unchecked		
Population	Take-Up Rates	Set to 1 for all 6 leave types	Conservatively set to full participation among all individuals needing leave to avoid underestimating program outlay.
	Share of Dual Receivers	1	Conservatively set to 1 so program use would never be crowded out by other employer benefits.
	Minimum Leave Length Applied	5 days	Comparable to existing state programs (CA/NJ/RI) that distribute benefits by week.
	Alpha	Any numeric value. We recommend setting to 0.	This parameter governs the random draw of program participants based on leave length. Alpha = 0 represents a random draw where probability of program take-up is independent of leave length. The probability increases as the value of alpha increases. However, in this policy simulation, the value of alpha would not affect simulation results due to Take-Up Rates = 1. Therefore, all workers

Tab	Parameter or Parameter Section	Parameter Value(s)	Notes
			with leave needs will participate, and simulating program take-up status is not needed.
Simulation	Existing State Program	Leave empty	Must be empty. If any state is selected, parameters under <i>Program</i> and <i>Population</i> tabs would be automatically filled in by values customized to the selected state.
	Clone Factor	1	The national federal government worker subsample from the ACS PUMS is sufficiently large (about 170,000 rows) for simulation; hence, there is no need for cloning of the sample to increase granularity of simulation outcomes.

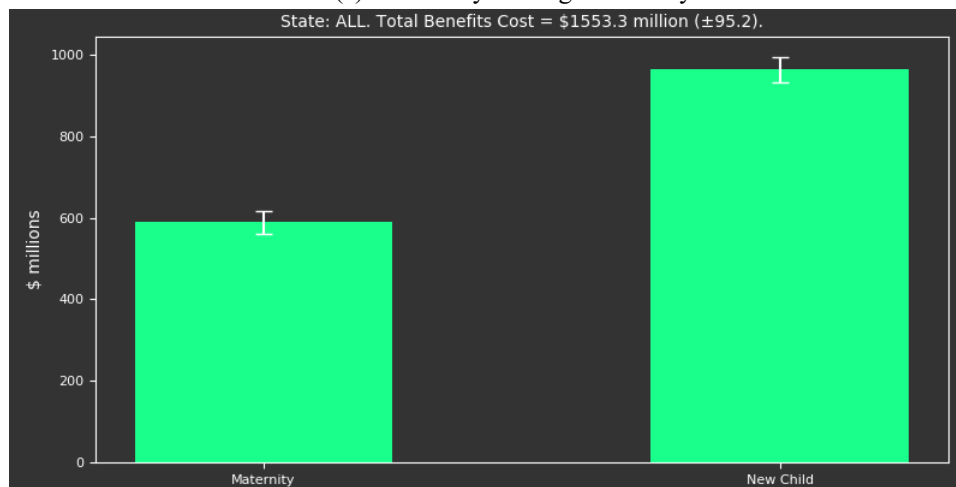
SIMULATION RESULTS

The model estimates annual program outlay to be \$864 million after adjusting for the cap for leave length and the eligible population base, comparable to CBO’s average projection of \$833 million per year over fiscal years 2021–2024. The difference could be driven by the conservative parameters adopted, including full replacement and full participation.

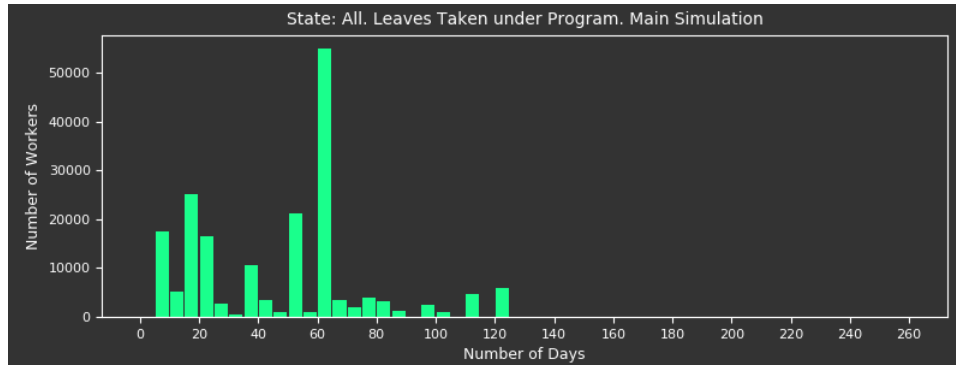
After the simulation has been completed, the GUI will present a results window, from which the user can click the *Save Figure* button to extract figures from the *Summary* and *Population Analysis* tabs, as presented in **Exhibit 3** (a) and (b). **Exhibit 3** (a) shows that annual total program outlay is estimated to be \$1.5 billion. We note, however, that two adjustments are needed to convert this estimate to the final estimate for the proposed program (the details to implement these adjustments using a separate code file are provided in Appendix A).

Exhibit 3: Simulation Results

(a) Summary of Program Outlay



(b) Distribution of Leave Lengths Covered by Program, Maternity and New Child Combined



Note: All exhibits are available for download from the results window of the Worker PLUS model upon completion of simulation. Simulation results are based on all federal government workers identified from the 2014–2018 ACS PUMS across 50 states and DC. For (a), sample size of eligible workers is 166,233, representing an underlying worker population estimate of 3,362,103. For each bar in (a), the 95% confidence interval derived from the ACS replication weights is also displayed. For (b), samples size of program participants is 8,714, representing an underlying worker population estimate of 188,120.

First, the Worker PLUS model applies leave length caps separately for maternity disability leave and leave for bonding with a new child, which are both 12 weeks, as shown in **Exhibit 1** and **Exhibit 2**. The proposed program for federal employees, however, has suggested a *joint* cap of 12 weeks for both types of leave combined. The leave length distribution shown in **Exhibit 3** (b) suggests that about 15% of workers have total leave lengths exceeding the 12-week (60-day) joint cap. To correct for this, we cap total leave length for these workers using the output ACS person file produced by the model and scale down their paid leave benefit proportionally. After this step, total outlay estimate is adjusted to \$1.4 billion.

Second, the Worker PLUS model relies on ACS PUMS as the target prediction sample, from which the ACS sample weights are used for estimating the size of the population of federal workers. The estimate is of 3.36 million federal employees based on the 2014–2018 ACS PUMS data, a significant overestimation, as indicated by the 2.1 million worker count published by OPM.^{vii} Such inaccuracy in weight total estimates for subgroups (in our case, federal workers) is not uncommon in survey data, due to constraints in survey weight design. Therefore, to allow the program outlay estimate to correctly represent the underlying population, we scale down the outlay estimate by a factor of $2.1/3.36 = 0.625$. During this step, we assume that the percentage of overestimation of population weight in the ACS PUMS data is not correlated with the workers' eligibility for the program under consideration. After this adjustment, the total outlay estimate becomes \$866.2 million, and the breakdown is \$311.7 million for the maternity disability leave benefit and \$554.5 million for benefits paid for leave for bonding with a new child.

Our final outlay estimate of \$866.2 million is comparable to (and 4% higher than) the outlay projection estimated by CBO,^{viii} which estimates that the outlay of the same program would be \$790, \$818, \$846, and \$876 million over fiscal years 2021–2024, an annual average of \$832.5 million. Without knowing further details on CBO's methodology, we attribute our higher estimate to conservative input parameters adopted for the simulation to avoid underestimating outlay, including full wage replacement and full participation, as shown in **Exhibit 2**.

CONCLUDING REMARKS

This brief provides a step-by-step guide on how to use the Worker PLUS model to perform a policy simulation of a recently signed law under which a new parental leave program would be implemented among federal civilian workers. With the model parameters configured to best reflect the known features of the program, adopting conservative settings for unknown features, and adjusting for leave length caps and eligible population base estimate, the model is shown to produce outlay estimates that are comparable to CBO's program cost projection. The Worker PLUS model's estimate of total program benefit outlay is 4% larger than the CBO estimate. This difference may be due to the conservative input parameters adopted by the model to avoid underestimating the outlays.

With the flexibility of the model, similar policy simulations can be performed for other proposed or established paid leave programs. The user should carefully examine actual program features, apply parameter values in the model accordingly, and make proper adjustments for factors that cannot be fully accounted for by the model. If a parameter value cannot be determined, we recommend following the principle of avoiding outlay underestimation, such as assuming higher program take-up rates.

APPENDIX A: GUIDE TO REPLICATING RESULTS IN THIS ISSUE BRIEF

Model users should follow the steps below to replicate the results in this brief. The results can be replicated using the random seed value 12345 on a Windows 10 Pro operating system with OS Build version 19041.630. The results may slightly vary for different Windows operating systems and OS Build versions.

1. Ensure that all model materials have been downloaded according to the Worker PLUS Model User Manual.^{ix}
2. Ensure that the file *reconcile_results_policy_for_gov_workers.py* is placed in the same directory as other code files, such as *_5a_aux_functions.py* and *Utils.py*.
3. Follow the user manual to launch the model GUI.
4. Follow the guide provided in this brief to configure the model and execute the simulation.
5. Upon completion of simulation, figures in **Exhibit 3** can be downloaded using the *Save Figure* button from the *Summary* and *Population Analysis* tabs.
6. Locate the output folder. The latest output folder can be identified by the folder name, which will contain the date stamp and time stamp when the model was executed. For example, the folder named “*output_20200924_115049_main simulation*” contains simulation output files from the simulation executed on September 24, 2020 at 11:50:49 local machine time.
7. Locate the output ACS microdata file, named as “*acs_sim_all_[datestamp]_[timestamp].csv*” where [datestamp] and [timestamp] are respectively the date stamp and time stamp of the time when the simulation was executed.
8. Update Line 10 in the code file *reconcile_results_policy_for_gov_workers.py*, using the name of the output ACS microdata file identified from Step 7.
9. Run *reconcile_results_policy_for_gov_workers.py* from terminal, and the numerical results of outlay estimate adjustment will be displayed in the terminal.

ⁱ Congress (2019) National Defense Authorization Act for Fiscal Year 2020. S.1790. 116th Congress (2019–2020).

ⁱⁱ Cabaniss, D. (2019). Memorandum for: Heads of Executive Departments and Agencies. Subject: Paid Parental Leave for Federal Employees. December 27. CPM 2019-29.

ⁱⁱⁱ IMPAQ (2021). Worker Paid Leave Usage Simulation (PLUS) Model. Issue Brief: A Guide to Performing Example Simulations.

^{iv} The 2012 wave of the DOL FMLA Employee Survey allows users to perform simulations for evaluating programs using historical actual program data dating back to 2012.

^v IMPAQ (2021). Worker Paid Leave Usage Simulation (PLUS) Model. Issue Brief: Model Testing.

^{vi} Paid Family Leave Weekly Benefit Calculator. Department of Employment Services. Washington, DC. Retrieved June 25, 2020, from <https://does.dc.gov/page/dc-paid-family-leave>

^{vii} Congressional Research Service (2019). Federal Workforce Statistics Sources: OPM and OMB.

^{viii} Swagel, P.L. (2019). Re: Statutory Pay-As-You-Go Effects of S. 1790, the National Defense Authorization Act for Fiscal Year 2020 and the Budgetary Effects of the Federal Employee Paid Leave Act. December 11.

^{ix} The Worker PLUS Model User Manual is provided along with model code and data files during model downloading. See IMPAQ (2021). Worker Paid Leave Usage Simulation Model User Manual.