PWBM Social Security Conventional Calculations

Penn Wharton Budget Model

September 15, 2026

THE QUESTION

How would a written Social Security reform proposal change people's payments and the program's finances?

Histories and law	Assemble individual records and resolve the rules that apply.
Benefit calculation	Follow earnings, claiming, and family relationships through to payments.
Engineering and review	Translate the proposal, test its implementation, and explain the resulting score.

A conventional comparison applies baseline and reform rules to specified population, economic, and claiming assumptions.

Histories and law

Why Social Security needs lifetime records

COMPARISON ONLY: OUTSIDE THIS CALCULATOR

Annual income taxes: one year's facts (or, e.g., taxpayer provided past loss info):

- Current filing unit.
- Current income and deductions.
- Rules for the tax year.
- Some history, such as carryforwards.

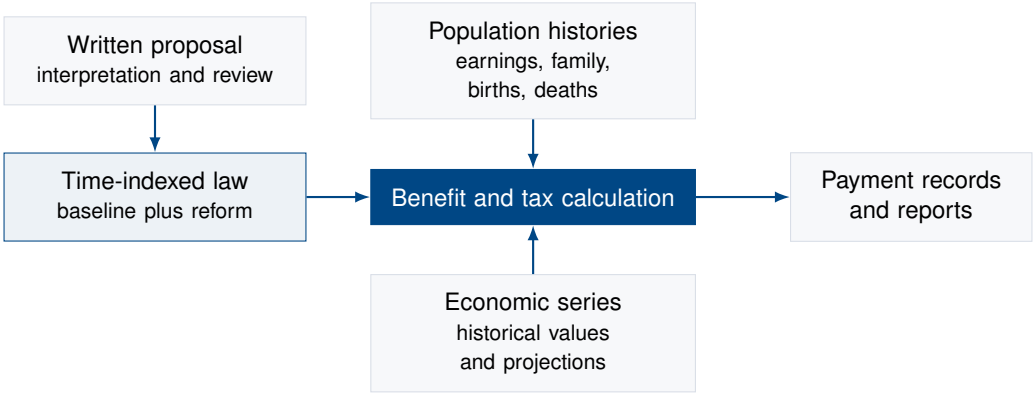
THIS CALCULATOR

Social Security: a lifetime of records

- Decades of individual earnings.
- Past eligibility, claims, and payments.
- Mutable graphs: Family links that can survive divorce or death and can expand with remarriage and dependent children.
- Rules that vary by year and birth cohort.

In sum: Social Security calculations are more complicated than standard tax calculations. The unit of record is an individual, but benefits depend on a family graph that changes over time. Entitlements based on family relationships can continue after divorce or a family member's death. Different rules govern each relationship, including individual and family benefit limits. These rules also vary by calendar year and birth cohort.

One pipeline, with histories and law as separate inputs



The microsimulation supplies population histories; the calculator applies the rules; reporting constructs the financial measures.

The law runs on several clocks

Clock	What it determines
Birth cohort	Full retirement age and other cohort-specific rules.
Eligibility year	The ordinary retirement formula's bend points.
Claiming month	Early reductions, delayed credits, and when a payment begins.
Payment year	Subsequent adjustments and the rules governing that year's payment.
Reform effective date	When a new rule starts, with separate phase-in or grandfathering conditions.

A worker can become eligible under one year's formula, claim later, and receive payments under many subsequent calendar years.

Ordinary retirement: Benefit calculation; claiming adjustments.

A reform can change the rule for only some cohorts

SCHEMATIC: A CHANGE APPLIED TO NEWLY ELIGIBLE COHORTS

	Before reform	Phase-in	Later years
Earlier cohort	Prior rule	Prior rule	Prior rule
Transition cohort	Not yet eligible	Partial change	Partial change
Later cohort	Not yet eligible	Not yet eligible	Full change

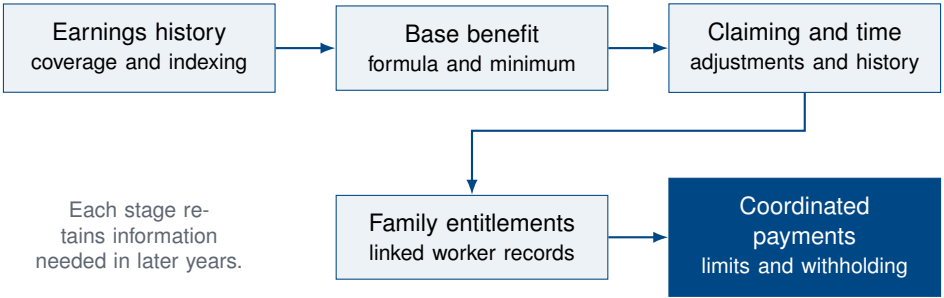
The cohort's formula treatment can persist while its dollar benefit continues to receive later adjustments.

The system must preserve the rule assigned to a cohort and apply the appropriate rules in each payment year.

Benefit calculation

From an earnings record to an actual payment

THE CALCULATION INSIDE THE PIPELINE



A benefit formula produces an intermediate amount. A payment requires the rest of the calculation.

Three earnings concepts serve different purposes

Earnings concept	Question it answers
Taxable earnings	How much payroll tax is due this year?
Benefit-creditable earnings	What earnings enter the insured-status and benefit calculations?
Earnings-test income	How much of an early claimant's benefit is withheld?

The record retains wages and self-employment income under the rules applicable in each year.

A reform that taxes additional earnings must separately specify whether those earnings also earn additional benefits.

Build the worker's average from a lifetime record

STANDARD CALCULATION

1. Establish coverage and insured status.
2. Apply each year's creditable-earnings cap.
3. Wage-index the earlier earnings years.
4. Select the highest 35 indexed years, including zeros when needed.

Average indexed monthly earnings

$$\text{AIME} = \left\lfloor \frac{\sum_{y \in S} \widetilde{E}_y}{420} \right\rfloor$$

S: selected years; $\widetilde{E}_y$: indexed earnings.

The denominator is 35 years $\times$ 12 months.

EARNINGS RECOMPUTATION

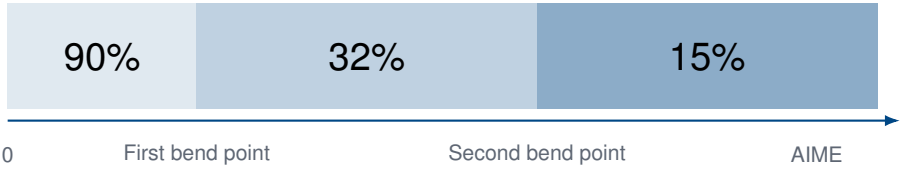
5. Later earnings can replace a lower year and trigger recomputation.

The same current wage can produce different benefits because the entire earnings path matters.

Ordinary retirement benefit calculation; PWBM AIME implementation. Other statutory computation methods have their own rules.

Apply the progressive formula to the indexed average

PRIMARY INSURANCE AMOUNT (PIA): THE WORKER'S BASE BENEFIT



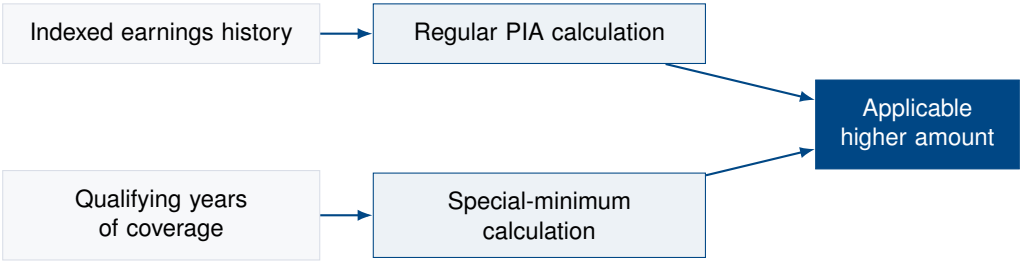
$$\text{PIA} = 0.90\,A_1 + 0.32\,A_2 + 0.15\,A_3$$

A_1, A_2, A_3 are the portions of AIME in the three bands. Band widths above are schematic.

The bend points are tied to the worker's **eligibility year**. Later claiming does not simply substitute that later year's bend points.

Primary insurance amount formula. Statutory truncation applies.

A minimum benefit has its own history requirements



A new minimum-benefit proposal must define qualifying work, indexation, cohort coverage, and interaction with the regular formula.

Special minimum benefit; PWBM regular and special-minimum PIA services.

Claiming turns the base amount into a monthly benefit

The worker's claiming decision

- Before full retirement age: an early-claim reduction.
- At full retirement age: the base amount.
- Later: delayed credits, up to age 70.

Information that must persist

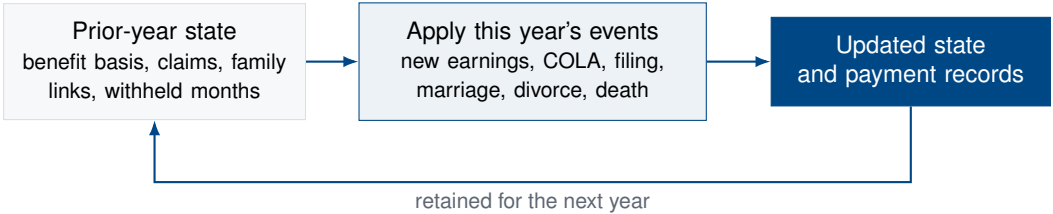
Birth cohort; eligibility date; claiming month; reduction or credit history; applicable rounding.

A monthly rate still needs payable months, family coordination, and withholding to determine annual dollars.

Eligibility, filing, and payment are separate events. Spousal filing rules can also link two benefit claims.

Early and late retirement; Filing rules.

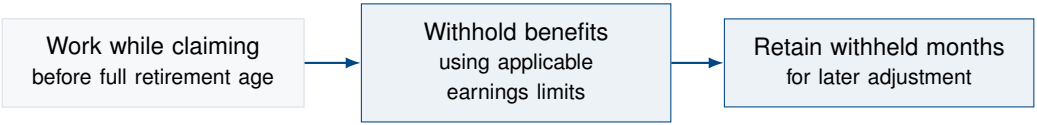
Advance the record, not just the person's age



Earlier decisions can remain relevant long after a claimant's earnings or household have changed.

The engine must carry forward each continuing entitlement on each relevant worker's record.

The earnings test connects today's payment to later years

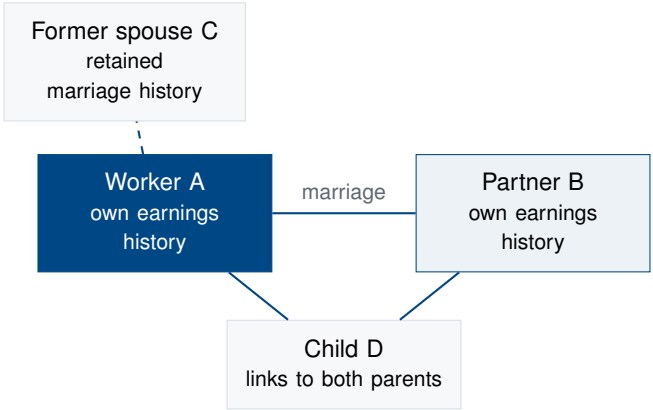


- The full-retirement-age year has a different earnings limit and counting period.
- Qualifying withheld months can reduce the early-claim adjustment later.
- Withholding can also change payments to dependents on the worker's record.

Checking only the initial award misses interactions between work, withholding, and later benefits.

Retirement benefits while working; Family deductions and adjustments.

Family benefits require a graph of individual records

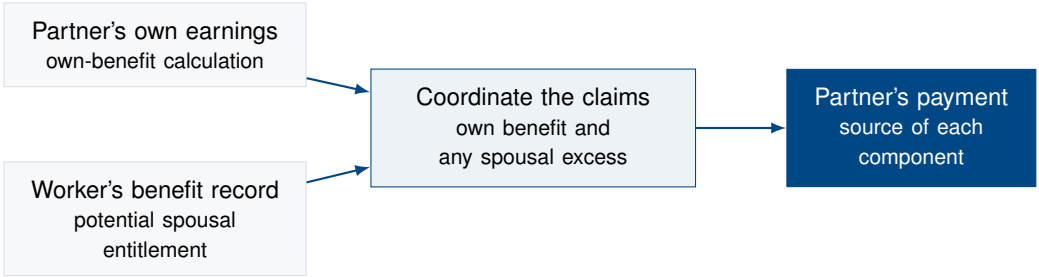


Every person has a record.

A payment may depend on another person's record.

The graph changes over time, but a past relationship can remain legally relevant after the household separates.

Coordinate the partner's own and spousal entitlements



Claiming ages and filing rules matter for each component. Child-in-care eligibility adds another route to consider.

A spouse's own earnings can change both eligibility and the auxiliary amount payable.

Benefits for a spouse; PWBM spousal-excess and filing logic.

Divorce changes the household, but may preserve a claim

Retain the legal history

Marriage start and end dates; duration; later marriages; the former spouse's identity and benefit record.

A marriage lasting at least ten years can support divorced-spouse eligibility when the other conditions are met.

Evaluate the current entitlement

Check age, marital status, own-benefit entitlement, and the applicable former-spouse conditions.

More than one qualifying former marriage can create candidates on different worker records.

The calculator needs the relationship history and the claimant's own earnings record to determine the payment.

20 CFR 404.331. Duration alone does not establish entitlement.

Death changes the benefits, not the need for the record

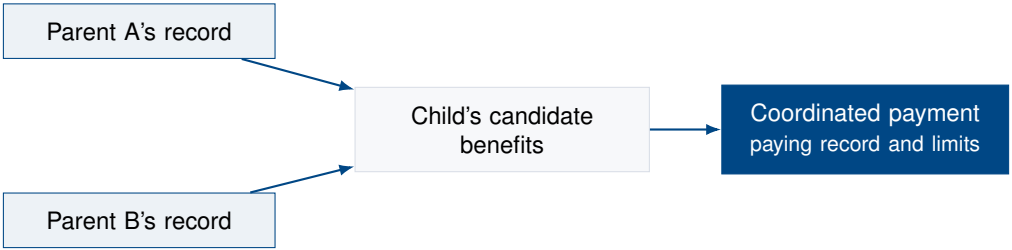


The survivor's age, own entitlement, later marriage, and family circumstances can affect the result.

A deceased person can leave the population while their record continues to support years of family payments.

20 CFR 404.335; 404.352; PWBM deceased-worker and survivor policies.

A child can have entitlements on both parents' records



Track the child's eligibility facts and each parent link through later years. Student, disability, and dependency conditions matter where applicable.

Multiple entitlements can require a combined-family-maximum calculation, while the child is paid on one record.

POMS RS 00615.770; 20 CFR 404.350.

Coordinate candidate benefits before recording payments

Across a person's entitlements

Resolve own and auxiliary benefits, competing claims, and the source worker for each payment.

Preserve each continuing entitlement even when another record currently provides the payment.

Across a worker's family

Apply the relevant family maximum, dependent allocation, and earnings-test adjustments.

Divorced-spouse and surviving-divorced-spouse benefits have a family-maximum exemption.

Family limits attach to worker records and benefit rules. A residential household is not the calculation boundary.

POMS RS 00615.680; RS 00615.770; PWBM reconciliation.

The payment ledger supports two complementary views

Recipient	Source worker	Benefit type	Payment
A	A	Retirement	Own component
B	B	Retirement	Own component
B	A	Spousal	Auxiliary component
D	A	Child	Coordinated amount

Group by recipient

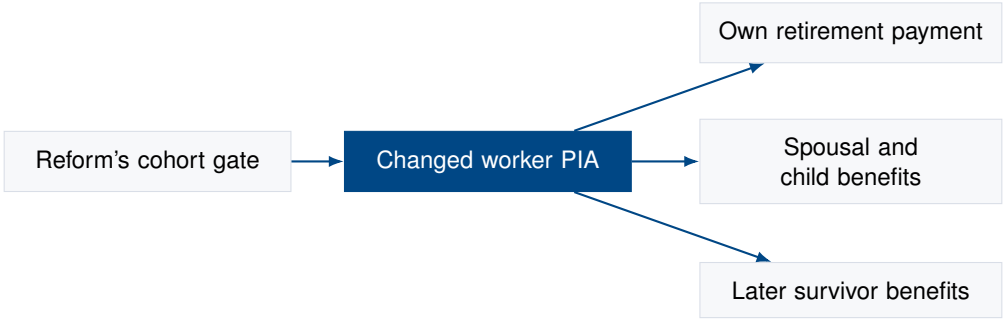
What does person B receive, and why?

Group by source worker

What payments does A's record support?

These are two views of the same payment rows; they are not separate amounts to add together.

One formula change can propagate across the family



Minimums, competing entitlements, and family limits can alter or absorb the initial formula effect.

A zero direct effect on a person's own formula does not establish a zero effect on the benefits they receive through family records.

Engineering and review

Translate the proposal into explicit policy decisions

BEFORE IMPLEMENTATION: WHAT DOES THE TEXT REQUIRE?

Decision	Specification
What changes?	Formula, parameter, eligibility condition, or payment rule.
Who is affected?	Birth cohorts, newly eligible workers, existing recipients, or families.
When?	Effective date, phase-in, grandfathering, and any sunset.
What interacts?	Existing minimums, family benefits, taxes, and other provisions.

Human policy review resolves ambiguous language before the software is treated as an implementation of the proposal.

Represent the reform as composable, dated changes

INTERMEDIATE REPRESENTATION (IR): STRUCTURED POLICY CHANGES



Change the values

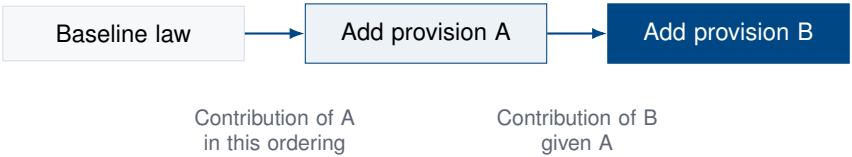
Overlay a parameter schedule, including its cohort and phase-in logic.

Change the calculation

Replace the service implementing a rule while retaining its place in the engine.

Resolve the reform with the baseline law timeline so every calculation receives the applicable rule and parameter values.

Composable provisions support packages and interaction tests



A benefit-formula reduction and a minimum-benefit increase can offset each other for some workers.

Run the complete package to measure the combined effect. Successive additions reveal interactions under a declared order.

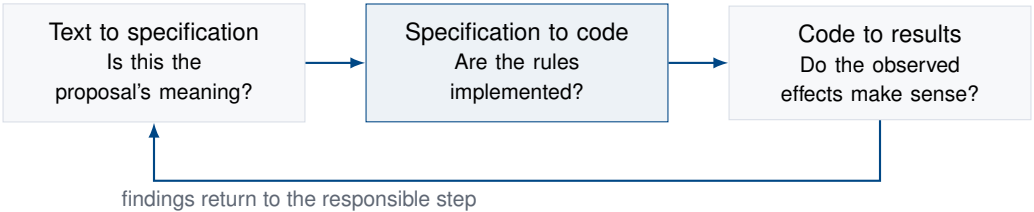
The sum of separately scored provisions need not equal the package score.

Test the errors that a plausible implementation could make

Possible error	Targeted evidence
Wrong formula or rounding	Independent arithmetic for selected cases.
Wrong cohort or phase year	Cases immediately on both sides of each boundary.
Reform never activates	A known nonzero effect through the configured engine.
Wrong family payment	Multi-person scenarios checking final payment rows.
Weak tests accept a wrong rule	Deliberately insert that error and verify rejection.

Adversarial testing asks whether the tests can distinguish the intended reform from a convincing but incorrect implementation.

Review the policy, code, and results separately



AI-assisted implementation and separate reviewing agents accelerate the work. Human reviewers assess policy interpretation and accept the result.

Before the full run, state expected signs, affected cohorts, and zero-effect cases; then investigate departures from those expectations.

Build the score from an inspectable hierarchy of results

Level	What reviewers can inspect
Individual	Benefits, taxes, claiming, and each payment's source worker.
Distribution	Changes by cohort and earnings or benefit group.
Annual finances	National benefit costs, revenues, taxable payroll, and reserves.
75-year summary	Discounted income and cost, actuarial balance, and financing adequacy.

Matched baseline and reform inputs support comparison. Population weights, calibration, and additional financial components connect payment records to national totals.

A 75-year improvement and a near-term reserve-depletion date answer different questions. Review both.

PWBM WORKFLOW EXPERIENCE

Work that often took weeks or months can become a reviewed score in less than a day.

What makes it faster

Reusable policy rules; composable changes; automated tests and reporting; review focused on explicit decisions.

What makes it reviewable

Policy specification; resolved law; test and review evidence; run configuration; micro and aggregate results.

Follow an aggregate change back to the affected people, their payment calculations, and the provision that changed the rule.

Whole-workflow statement: PWBM experience. Timing depends on reform scope; the appendix reports the narrower automated-run benchmark.

Appendix

Appendix: worked examples

- Worker, spouse, and divorced-spouse benefits.
- Family limits, two parent records, and survivor priority.
- A phased PIA reform and hypothetical workers.
- A 75-year reform score and calculation time.

Worker born in 1960: base benefit at eligibility

First eligible in 2022.

Earnings and eligibility inputs

Annual earnings, 2000–2021	$50,000
AIME	$3,469
2022 first bend point	$1,024
2022 second bend point	$6,172

PIA at eligibility

$$0.90 \times 1{,}024 = 921.60$$

$$0.32 \times (3{,}469 - 1{,}024) = 782.40$$

$$\mathrm{PIA}_{2022} = \boxed{\$1{,}704.00}$$

This worker has no AIME above the second bend point.

The eligibility-year formula is established before the worker claims in 2024.

Source: PWBM retirement test case and Social Security Administration bend points. Nominal dollars.

Same worker: claiming three years early in 2024

Step	Calculation
Apply the 8.7% adjustment	$\$1{,}704.00 \times 1.087 \rightarrow \$1{,}852.20$
Apply the 3.2% adjustment	$\$1{,}852.20 \times 1.032 \rightarrow \$1{,}911.40$
Reduce for 36 early months	$36 \times (5/9)\% = 20\%$
Monthly payment in 2024	$\$1{,}911.40 \times 0.80 \rightarrow \$1{,}529$
Full-year payment	$\$1{,}529 \times 12 = \$18{,}348$

Truncate the adjusted PIA to dimes at each step; truncate the monthly payment to whole dollars. No earnings-test withholding in this case.

The base benefit, monthly benefit, and annual payment are three different quantities.

Source: PWBM illustrative model calculation, using Social Security Administration claiming rules and cost-of-living adjustments.

Spouse at full retirement age: with and without own earnings

No withholding or binding family limit.

2024 monthly amount	No own earnings	Own earnings
Worker's PIA	$1,911.40	$1,911.40
Half of worker's PIA	$955.70	$955.70
Partner's own PIA	$0.00	$697.40
Unrounded spousal excess	$955.70	$258.30
Own payment component	$0	$697
Spousal payment component	$955	$258
Total monthly payment	**$955**	**$955**

The payment total is the same here, but the amount supported by each worker's record differs.

Source: PWBM illustrative model calculations. Each payment component is truncated to whole dollars.

Divorced spouse: own retirement plus a spousal benefit

History and conditions

Married June 1985; divorced January 2020; claim January 2024.

The claimant remains unmarried, has reached full retirement age, and satisfies the other eligibility conditions.

2024 annual payment

Own retirement	$8,364
Divorced-spouse component	$3,096
Total	$11,460

The former spouse remains the source worker for the auxiliary component.

The past marriage supports the eligibility inquiry; the claimant's own entitlement helps determine the amount.

Source: PWBM illustrative model calculation. Rules: divorced-spouse eligibility and family-maximum exemption.

Worker, spouse, and two children: a binding family maximum

Assume a worker PIA and own payment of $2,000, an applicable family maximum of $3,500, and a spouse plus two children each otherwise due $1,000 monthly. Full-year entitlement, with no age reductions or withholding.

Recipient	Before the limit	After the limit
Worker	$2,000	$2,000
Spouse	$1,000	$500
Child 1	$1,000	$500
Child 2	$1,000	$500
Total monthly payment	$5,000	$3,500

Available for the three dependents: $\$3{,}500 - \$2{,}000 = \$1{,}500$. Each receives one-third in this equal-benefit case.

Illustrative, not test case. Assumed family maximum. Rules: 20 CFR 404.403.

Child eligible on two parents' records: a 2% benefit increase

Both parents remain entitled, and the child remains eligible. Assume no withholding or competing benefit and no family limit reducing either candidate.

Monthly amount	**Year t**	**Year $t+1$**
Candidate on parent A	\$1,000	\$1,020
Candidate on parent B	\$600	\$612
Child's coordinated payment	\$1,000	\$1,020
Paying record	Parent A	Parent A

The child receives one payment while retaining eligibility on both records. A change in family circumstances can make the other record relevant later.

Illustrative, not test case. Rules: Social Security Administration simultaneous-entitlement guidance.

Worker's death: a surviving spouse or two eligible children

Qualifying spouse has priority

A surviving spouse lived with the worker at death; two otherwise qualifying children survive.

Spouse	$255.00
Each child	$0.00
Total lump sum	$255.00

No qualifying spouse

Two children satisfy the applicable child-benefit conditions for the month of death.

Child 1	$127.50
Child 2	$127.50
Total lump sum	$255.00

Resolve eligibility and priority across the deceased worker's claimants. This one-time payment is separate from monthly survivor benefits.

Illustrative, not test case. Rules: lump-sum death benefit and children's shares.

Reform: phase the top benefit factor from 15% to 5%

$$\text{PIA} = 0.90A_1 + 0.32A_2 + f_3(e)A_3$$

e is the eligibility year.

Affected workers

The reduction applies to earnings above the second bend point for workers first eligible in 2028 or later.

Eligibility year	Top factor
2027 and earlier	15%
2028	13%
2029	11%
2030	9%
2031	7%
2032 onward	5%

The first affected eligibility year is 2028. A worker first eligible in 2027 retains the 15% factor even when claiming later.

Source: PWBM reform calculation, September 2026, run 0196.

Fully phased reform: workers with different lifetime earnings

Fixed AIME and bend points.

$$\Delta \mathrm{PIA} = (0.05 - 0.15)\max(\mathrm{AIME} - b_2, 0)$$

AIME above second bend point	Factor change	Monthly PIA change
\$0	−0.10	\$0
\$1,000	−0.10	−\$100
\$3,000	−0.10	−\$300

These are direct changes to the regular PIA. Minimums, claiming, later adjustments, and family coordination determine the final payment effects.

Illustrative, not test case. Before truncation and subsequent adjustments. b_2 is the second bend point.

Workers claiming at 62: reform effects by cohort and earnings

Hypothetical male workers.

Birth / eligibility year	Earnings pattern	Baseline	Reform	Change
1965 / 2027	Maximum	$3,064	$3,064	0.00%
1966 / 2028	Maximum	$3,265	$3,163	−3.12%
1970 / 2032	Maximum	$3,920	$3,305	−15.69%
1970 / 2032	High	$3,211	$3,069	−4.42%
1970 / 2032	Medium	$2,417	$2,417	0.00%

Nominal monthly dollars in each cohort's claim year, after early-claim adjustment. Compare baseline and reform within a row.

The reform leaves the 2027 eligibility cohort unchanged. For the 2032 cohort, it reduces benefits for high and maximum earners while leaving the medium earner unchanged.

Source: PWBM reform calculation, September 2026, run 0196. Social Security Administration earnings patterns.

Top benefit factor reform: program finances over 2026–2100

Measure	Baseline	Reform
Actuarial balance, % of baseline taxable payroll	−4.78	−4.36
Combined-program reserve depletion	Feb. 2035	Feb. 2035

+0.42 percentage points

Improvement in the 75-year balance.

About 9%

Share of the baseline shortfall eliminated.

The phase-in reaches newly eligible cohorts. The longer-run financing gain does not change the reported near-term depletion month in this run.

Source: PWBM reform calculation, September 2026, run 0196. Disability costs change proportionally under this calculation's reporting assumptions.

Top benefit factor reform: calculation and reporting time

Stage	Recorded duration
Population construction	15.6 minutes
Baseline calculation	51.9 minutes
Reform calculation	52.6 minutes
Entire pipeline through final reports	**134.5 minutes**

The total includes reporting and other pipeline work.

An already configured baseline and reform run completes in about 2 hours 15 minutes.

Source: PWBM run 0196 completion log. Excludes proposal interpretation, test development, queue waiting, and human review.