

IORTI

Methods Memorandum

An independent update of the economic cost of excessive alcohol consumption in the United States, 2010 → 2021

Field	Value
Prepared for	IORTI
Model version	1.0
Base year	2010 (Sacks et al. 2015, 26-component framework)
Target year	2021 (calendar)
Dollar convention	Nominal 2021 dollars
Perspective	Societal cost of illness
Geographic scope	United States, 50 states + DC; Iowa modelled bottom-up
Mortality valuation	Human capital (headline); VSL as a separate scenario
Acceptance tests	32 of 32 passing

STATUS OF THIS ESTIMATE

This is an independent application of a published methodology. It is not a CDC estimate. CDC has neither produced, reviewed, nor endorsed any figure in this document.

Correct usage: "We independently updated the cost framework used in the CDC-supported 2010 estimate using 2021 inputs."

Incorrect usage: "CDC estimates that excessive drinking now costs..."

Contents

1. Summary of findings

Applying the published 26-component framework to 2021 inputs produces a societal cost of \$473.6 billion under a strict update that preserves the original structure, and \$420.2 billion under a modernized specification that corrects for documented methodological breaks. The scenario range is \$376.7 billion to \$539.4 billion. Government bore \$198.3 billion, or 41.9% of the strict-track total.

The strict result is 90.2% above the published 2010 figure of \$249.0 billion. Simple inflation adjustment would have produced only \$309.5 billion, which is the central reason the brief rejects inflation-only updating: it revises prices while assuming that deaths, hospitalizations, treatment episodes and crashes did not change. They changed substantially, and in both directions.

Headline results

Measure	2010 published	Track B strict	Track C modernized
Total societal cost (\$B)	249.0	473.6	420.2
Healthcare (\$B)	28.4	45.4	46.6
Lost productivity (\$B)	179.1	372.3	316.2
Other costs (\$B)	41.6	55.9	57.4
Government cost (\$B)	100.7	198.3	179.1
Government share	40.4%	41.9%	42.6%
Cost per resident	\$807	\$1,427	\$1,266
Cost per standard drink	\$2.05	\$3.17	\$2.81
Government cost per drink	\$0.83	\$1.33	—

Which number should be used externally? Track C. The strict track is required by the brief as a faithful reproduction of the published structure, and it is reported here in full. But two of its largest drivers rest on comparisons that the source agencies explicitly warn against making. Track C removes the measurable part of that contamination and is the more defensible figure for public use. The \$53.4 billion gap between the two tracks is the model's best estimate of how much of the strict result is methodology rather than real change.

The three findings that matter most

Alcohol-related death roughly doubled, and this is real. Alcohol-induced deaths — a narrow category with an ICD-10 definition that did not change across the window — rose from 25,692 in 2010 to 54,258 in 2021, a factor of 2.11. This series is clean. It independently corroborates the direction, though not the magnitude, of the broader ARDI increase from about 88,000 to about 178,000 deaths.

Harm shifted from acute to chronic. Binge-drinking prevalence was essentially flat and underage drinking fell 41%, while alcohol use disorder prevalence and alcoholic liver disease deaths rose sharply. Costs concentrated accordingly: the underage subset fell from 9.7% of the

total to 5.4%, while chronic-condition components grew fastest. This composition change has direct prevention-targeting implications.

Federal alcohol research funding fell in real terms. The NIAAA appropriation grew 20.0% nominal between FY2010 and FY2021 against 24.3% general inflation and 35.2% medical inflation. Component 7 is the one line in the model that uses actual observed federal spending rather than a trended estimate, and it declined in real terms while the burden it addresses roughly doubled.

2. Analytic design

The work is built as three linked tracks, kept strictly separate because several modern data systems are not comparable with their 2010 versions.

Track	Purpose	Status
A — Reproduce 2010	Enter the 26 published component values and confirm they reproduce every published aggregate. Serves as the model's unit test.	PASSED
B — Strict update	Apply $\text{cost}(2021) = \text{cost}(2010) \times \text{incidence factor} \times \text{price factor}$, preserving the published structure and definitions even where the underlying series have broken.	\$473.6B
C — Modernized	Recalculate the components where science or data systems materially changed: bridged mortality, DSM-adjusted AUD prevalence, severity-weighted crashes, binge-driven fetal alcohol exposure.	\$420.2B

2.1 Track A — the unit test

The 26 published component values reproduce all three category subtotals exactly (\$28,379.1M healthcare, \$179,084.9M lost productivity, \$41,562.5M other costs). Their sum is \$249,026.5M against a published \$249,026.4M. That \$0.1M difference is a publication rounding artifact: each of the 26 values is reported to one decimal place, and the exact sum of the rounded values differs from the rounded sum. It is not a model error, and it is documented rather than silently absorbed.

Two derived measures provide genuinely independent validation. The published \$807 per resident is reproduced as \$806.57 using the April 1, 2010 Census count. More usefully, the ethanol-to-standard-drink conversion specified in the brief, applied to NIAAA apparent consumption, yields 121.4763 billion standard drinks for 2010 — which reproduces the published \$2.05 per drink to four decimal places and \$0.83 government cost per drink to three. Because the conversion chain involves four separate constants and a population denominator that NIAAA does not publish, this agreement is strong evidence that the volume calculation is correctly specified.

2.2 Definitions preserved

The replication retains the 2010 case definitions: binge drinking at 4+ drinks per occasion for women and 5+ for men; heavy drinking at more than 8 drinks per week for women and 15 or more for men; any consumption below age 21; and any consumption during pregnancy. Where a modern survey uses a different threshold, the difference is recorded as a comparability break rather than silently substituted. The most consequential instance is the NSDUH binge threshold for women, which moved from 5+ to 4+ drinks in 2015 — this makes the 2021 binge measure broader than the 2010 measure, so the observed decline in binge prevalence understates the true decline.

2.3 Perspective and the treatment of government

The model measures resource costs and productivity losses borne by individuals, families, employers, insurers and government. Transfer payments are not counted as new societal

costs. Government cost is a subset of the societal total, never an addition to it — a rule enforced by automated test in the workbook, which verifies that no component's government cost exceeds that component's total and that federal plus state and local sums exactly to the government figure.

3. The 26 components

Every component stores both endpoint values of both factors, never a bare ratio. Factors are carried at 28 significant digits and rounded only for publication tables. Confidence grades run A (directly observed and comparable) to D (literature assumption or weakly comparable); 4 components are grade A, 6 grade B, 6 grade C, and 10 grade D.

#	Component	2010 \$M	Inc.	Price	Track B \$M	Track C \$M	Gr
1	Specialty care for abuse/dependence	12,044.6	1.0048	1.3523	16,366.6	16,366.6	D
2	Hospitalization	5,948.5	1.5120	1.3523	12,162.3	12,162.3	C
3	Ambulatory care	1,524.5	1.6527	1.3523	3,407.2	2,966.2	D
4	Nursing home	1,166.8	0.9358	1.3790	1,505.6	1,505.6	C
5	Drugs and other services	1,545.5	1.6527	1.3523	3,454.1	3,007.1	D
6	FAS healthcare	2,750.0	0.9162	1.3523	3,407.2	5,385.6	A
7	Prevention and research	1,048.8	1.0000	1.2002	1,258.8	1,258.8	B
8	Training	34.8	1.2000	1.3577	56.7	56.7	D
9	Health insurance administration	2,315.6	1.0000	1.0166	3,797.9	3,900.7	B
10	Impaired productivity at work	76,858.6	1.6527	1.3577	172,459.1	150,140.9	D
11	Impaired productivity at home	6,218.0	1.6527	1.3577	13,952.3	12,146.7	D
12	Absenteeism	4,619.9	1.0254	1.3577	6,431.8	6,431.8	C
13	Productivity while in specialty care	1,983.4	1.0048	1.3577	2,705.8	2,705.8	D
14	Productivity while hospitalized	228.4	1.5120	1.3577	468.8	468.8	C
15	Premature mortality	75,204.5	1.5623	1.3577	159,517.9	125,996.7	D
16	Incarceration of perpetrators	9,150.5	0.7832	1.3577	9,729.7	9,729.7	A
17	Crime victims	2,704.8	1.2046	1.3577	4,423.5	4,423.5	B
18	FAS productivity	2,116.8	0.9162	1.3577	2,633.1	4,162.0	A
19	Crime-victim property damage	559.4	0.8259	1.2427	574.1	574.1	B
20	Criminal justice - corrections	15,865.9	0.7832	1.6030	19,918.1	19,918.1	B
21	Criminal justice - alcohol crimes	2,160.0	0.6099	2.2114	2,913.4	2,913.4	C
22	Criminal justice - violent/property crime	5,998.8	0.9000	1.4986	8,091.2	8,091.2	D
23	Criminal justice - private legal	228.1	0.9000	1.4152	290.5	290.5	D
24	Motor-vehicle crashes	13,461.9	1.1558	1.2427	19,335.1	20,574.4	C
25	Fire losses	2,914.3	1.0165	1.4513	4,299.3	4,299.3	B
26	FAS special education	374.1	0.9162	1.3406	459.5	726.3	A

3.1 The five components that drive the result

These six lines account for the great majority of the 2021 total and of its uncertainty. Four of the six carry grade D.

Component	Track B \$B	Change	Grade
Impaired productivity at work	172.5	+124%	D
Premature mortality	159.5	+112%	D
Criminal justice - corrections	19.9	+26%	B
Motor-vehicle crashes	19.3	+44%	C
Specialty care for abuse/dependence	16.4	+36%	D
Impaired productivity at home	14.0	+124%	D

3.2 Where the model departs from a naive update

Components 20, 21, 22 and 25 use observed expenditure, not trended cost. For corrections, police, courts and fire protection the brief directs the use of actual government spending where a comparable modern series exists. The incidence and price factors for these lines are decomposed so that their product returns exactly the observed expenditure growth. A consequence worth stating plainly: because the quantity term cancels algebraically, changing the arrest or fire counts for these components does not move the result at all. The published incidence and price columns for these four lines are not independently meaningful and should not be read as if they were.

Component 24 was re-specified after review. Components 19 through 26 sum exactly to the published "Other costs" total, which establishes that crash medical and productivity costs are already counted in components 1–6 and 10–18. Component 24 is therefore property damage, travel delay, insurance administration and legal cost. Driving it with alcohol-impaired fatalities and NHTSA total economic cost per crash — a figure dominated by the medical and productivity costs priced elsewhere in this model — would double-count. The component now uses crash volume and a general price index. The rejected specification gives \$479.6 billion at the total level and is retained in the sensitivity table for transparency.

Component 9 uses an administrative load, not total administrative spending. Health insurance administration scales with the volume of alcohol-attributable health spending, which the incidence factor already carries. Its price factor is therefore NHEA administration and net cost of insurance divided by total NHEA — an administrative load of 1.0166 — not the 1.6678 growth in total administrative spending. The same correction was applied to components 4 and 5.

4. Comparability breaks and how each was handled

This is the substantive core of the work. Nearly every high-value series in the 2010 framework has been redesigned, redefined or discontinued since. Pretending otherwise would produce a precise and wrong number.

Break	What happened	Treatment
CDC ARDI method	Three documented breaks since the 2006–2010 release: updated relative risks (2020); a new underreporting adjustment scaling self-report to 73% of per-capita sales, replacing the old indexing procedure (2022); new acute-cause fractions and refined esophageal cancer attribution (2024). Causes analysed grew from 54 to 58. CDC states current output "should not be compared" with pre-2024 releases.	Track B uses the strict endpoints and flags them grade D. Track C builds a two-leg bridge: the method-consistent ARDI window (2016–17 → 2020–21, 137,927 → 178,307) for the later leg, and the stable alcohol-induced series damped by the elasticity between the two measures for the earlier leg. Result: 1.604 rather than the naive 2.031.
NSDUH DSM-IV → DSM-5	Alcohol use disorder was reassessed under DSM-5 from 2020. The legal problems criterion was dropped and craving added; the threshold moved to 2+ of 11 criteria. SAMHSA's own impact study measures the definitional effect at 7.4% → 8.5% on pooled data.	Track C divides the observed prevalence ratio by the measured 1.1486 definitional factor. The residual still contains the mode effect.
NSDUH 2021 multimode	Web collection was introduced and the overall response rate fell to 10.3%. SAMHSA states 2021 estimates "are not comparable with estimates from 2020 or prior years."	Not separable from real change with published data. Carried into the scenario range and named as an escalation item.
BRFSS 2011 redesign	Cell-phone households added and weighting changed from poststratification to raking. CDC calls 2011 a new baseline.	BRFSS is not used as a primary driver. The binge series that would have been the better absenteeism driver also stops at 2017.
FBI NIBRS transition	The FBI stopped accepting Summary Reporting System submissions in 2021. Coverage fell to 65.7% of population; NYPD and LAPD submitted nothing. No national arrest estimate for 2021 exists.	2019 substituted as the modern endpoint for component 21, which therefore has a different target year from the rest of the model. Because component 21 uses observed expenditure, this substitution does not actually change the result.
N-SSATS → N-SUMHSS	The treatment-facility survey was merged with the mental health survey in 2021 and covers a broader facility universe. SAMHSA states the two "should not be compared statistically."	Used as the component 1 and 13 driver at grade D, with a ±20% band in the scenario range.
NCVS household reweighting	The 2017 reweighting cut the NCVS household count about 8%, breaking property victimization counts. Rates are unaffected.	Property victimization is reconstructed from the rate multiplied by CPS household counts rather than taken from the published count.
ICD-9 → ICD-10-CM	The October 2015 coding transition sits between the endpoints and breaks alcohol-diagnosis capture in discharge data. No national 2021 alcohol-hospitalization count is published.	Hospitalization is extrapolated from the observed 2010–2015 NIAAA series using an elasticity to alcohol-induced deaths estimated on that same observed window.
COVID-19	2021 is a substantively unusual year: jail	Reported as context throughout. A pre-

Break	What happened	Treatment
	populations 13% below 2019, NCVS violence at a trough (4.6M vs 6.6M in 2022), nursing home census collapsed, government receipts and public health spending transitorily elevated.	pandemic government-share sensitivity is run, moving government from \$198.3B to \$183.7B.

5. Government cost

The brief is explicit that the historical 40.4% must not be applied to the new total, and that the component-by-component logic must be recreated instead. It also does not supply the component-level government figures from the 2010 appendix, which are not in the material provided. The approach taken is therefore to reconstruct the allocation logic and validate it against the one published aggregate.

Each component is assigned a 2010 public share from payer evidence: specialty treatment at 60% (SAMHSA reports 69% of all SUD spending is publicly financed), nursing home at 62% reflecting Medicaid dominance, prevention and research at 100%, corrections and criminal justice at 100%, private legal defense and crash property damage at zero, fire and special education at 90%. Motor-vehicle crashes are held at zero public share, preserving the 2010 appendix convention.

That leaves one free parameter: the share of foregone production treated as lost government revenue. It is solved so the 2010 government total closes on the published \$100,674.8M exactly, giving 32.15%. This value is then checked against an independent quantity it was not fitted to — BEA total government current receipts as a share of national income, 30.74% in 2010. The agreement is reassuring but should not be oversold: the calibrated value is a residual that absorbs error in every assumed payer share, and plausible alternative assumptions move it between roughly 30% and 33%.

The 2021 allocation applies the same component logic with current payer data, scaling health components by the rise in the public share of national health spending (42.6% to 48.6%) and the productivity parameter by the rise in government receipts relative to national income (to 36.13%). Federal and state/local splits use CMS sponsor analysis for healthcare, BEA receipts for productivity, and BJS Justice Expenditure and Employment shares for justice functions. Component 7 is assigned entirely to the federal government because its cost basis is a federal appropriation.

Two honest caveats on the government figure

About \$18 billion of the \$198.3 billion rests on two ratios that 2021 inflated transitorily: the public share of health spending, lifted by COVID provider relief and vaccination spending, and government receipts relative to national income. Holding both at pre-pandemic levels gives \$183.7 billion.

The acceptance tests that "confirm" the 2010 government total and the 40.4% share are identities by construction and cannot fail. They are labelled as such in the QA register rather than presented as independent validation.

5.1 The crash convention, tested rather than changed

The 2010 appendix assigned no crash cost to government. A modern alternative assigning 25% to public payers and public services was tested. Note that this cannot simply be added: because the productivity parameter is a residual calibrated against a fixed 2010 government total, assigning crash costs to government in 2021 requires re-solving the 2010 calibration, which lowers the productivity residual. Done correctly the net effect is negative — government falls from \$198.3 billion to \$195.3 billion, not upward as a naive addition would suggest.

6. Uncertainty, scenarios and decomposition

The ranges below are scenario ranges produced by varying named assumptions. They are not confidence intervals and must not be described as such; no statistical procedure generated them.

Scenario	Total \$B	Government \$B
Track B — strict update	473.6	198.3
Track C — modernized central	420.2	179.1
Low (built on Track C)	376.7	—
High (built on Track B)	539.4	—
Pre-pandemic government shares	473.6	183.7
Modern crash government share, calibration re-solved	473.6	195.3
Original 40.4% convention applied to the total	473.6	191.3
Crash component on the rejected fatality specification	479.6	198.3
VSL mortality valuation — SEPARATE MEASURE	2,542.9	—

The VSL figure is not a bigger version of the headline

Valuing alcohol-attributable deaths at the 2021 US DOT value of a statistical life produces \$2,542.9 billion. This measures willingness to pay to avoid mortality risk — a different quantity from the foregone production that human-capital valuation measures. It cannot be compared with the 2010 estimate, cannot be added to any other line, and should never appear in the same sentence as the headline without this explanation. It is reported because current federal regulatory practice uses VSL, not because it is an alternative estimate of the same thing.

6.1 What actually changed since 2010

Counterfactual	Total \$B	vs 2010	Reading
2010 published baseline	249.0	—	Starting point
Inflation only (CPI-U)	309.5	+24%	What inflating \$249B would give. Rejected as a method.
Price factors only	342.3	+40%	Medical, compensation and justice prices outran general inflation.
Incidence factors only	346.1	+39%	Burden change alone, dominated by mortality and AUD prevalence.
Track B strict	473.6	+90.2%	Both factors
Track C modernized	420.2	+68.7%	Method-corrected
Method effect (B – C)	53.4	—	How much of the strict result is methodology, not real change.

6.2 Overlapping subsets — never to be summed

Subsets are calculated bottom-up from component attribution fractions calibrated so the same logic reproduces the published 2010 values of \$191.1B, \$24.3B and \$5.5B. A single person, and a single dollar of cost, can appear in more than one subset: an 18-year-old drinking heavily is in both the binge and the underage line. Adding them double-counts.

Subset	2010 \$B	2021 \$B	2021 share
Binge drinking	191.1	357.1	75.4%
Underage drinking	24.3	25.6	5.4%
Drinking during pregnancy	5.5	6.8	1.4%

7. State allocation

National costs are allocated to states using component-specific allocators: alcohol-induced death share for burden-driven components, ethanol volume share for consumption-driven components, population share for population-driven components, each wage-adjusted where the component values labor. State allocations sum exactly to the national total by construction.

State results are materially weaker than the national model

No state-level corrections expenditure series was obtainable, so justice components are allocated on population rather than actual spending.

State per-capita ethanol is a 2023 series used as a relative allocator and rescaled to the national 2021 volume; 2021 state values were retrievable for only 10 jurisdictions.

State cost-per-drink is distorted by tourism and cross-border purchasing. New Hampshire and Delaware sell far more alcohol than their residents drink; both should be flagged in any state comparison.

Treat every state figure as grade C or worse.

State	Total \$B	Per resident	Per drink
California	66.6	\$1,701	\$3.14
Texas	35.8	\$1,210	\$2.85
New York	31.1	\$1,566	\$3.85
Florida	29.1	\$1,335	\$2.50
Illinois	18.5	\$1,455	\$3.35
Pennsylvania	18.2	\$1,395	\$3.15
Ohio	16.2	\$1,378	\$3.73
Michigan	15.5	\$1,546	\$3.70

Full results for all 51 jurisdictions are on tab 10 of the workbook.

7A. The Iowa state replication

Iowa is the one jurisdiction here with a full bottom-up state model. That is possible because Sacks et al. published state-level 2010 costs, so Iowa has a genuine Track A unit test rather than a share of the national number: \$1,933.6 million total, \$635 per resident, \$1.59 per standard drink. The model reproduces all three before computing anything for 2021.

Measure	Iowa 2010 published	Track B strict	Track C modernized
Total societal cost (\$B)	1.93	3.57	3.25
Government cost (\$B)	—	1.56	1.44
Government share	—	43.7%	44.3%
Cost per resident	\$635	\$1,115	\$1,016
Cost per standard drink	\$1.59	\$2.52	\$2.30

7A.1 Construction

Sacks et al. published state totals but not state components, so the Iowa 2010 component vector is allocated from the national components using 2010 Iowa allocators and then rescaled so the sum reproduces \$1,933.6 million exactly. The rescaling factor is itself a diagnostic: at 0.9256 it says the unrescaled allocator overstates Iowa by 8 percent, a modest and disclosed adjustment rather than a large silent one.

16 of the 26 components then use an Iowa-specific incidence driver. The remaining 10 fall back to the national driver and are individually flagged NATIONAL FALLBACK in the workbook and in the explorer tooltip. No Iowa series was retrievable for 2010 treatment counts, state-level victimization, alcohol-involved crash volume, fire loss, or 2021 OWI arrests. Price factors remain national where the underlying index is national by construction (CPI, NHEA), with Iowa wage and per-pupil series substituted where the component values labor or education.

Iowa's 2010 per-capita ethanol is back-solved from the published \$1.59 per drink, exactly as the national model back-solves the population-14+ share from \$2.05. It lands at 2.297 gallons against a national 2.26, 1.7 percent higher, consistent with Iowa's slightly-above-average apparent consumption. That the back-solve produces a plausible figure rather than an absurd one is meaningful evidence the conversion chain is correctly specified at state level.

Three independent constructions of Iowa 2021 agree

The bottom-up Iowa model gives \$3.57 billion. Anchoring Iowa's published 2010 figure and growing it at the national rate gives \$3.68 billion. The two agree within 3 percent, which is real validation because one applies Iowa drivers component by component and the other does not. The burden-weighted allocation gives \$4.66 billion, roughly 31 percent higher, because it leans on Iowa's 2021 alcohol-death share while Iowa's published 2010 cost per resident was the second-lowest in the country. This disagreement is what prompted the change to the national state method described in section 7B.

7A.2 What Iowa shows that the national model does not

Driver	Iowa	Iowa ratio	United States	US ratio
Alcohol-induced deaths	233 to 608	2.609	25,692 to 54,258	2.112
Alcohol-impaired traffic deaths	90 to 118	1.311	10,136 to 13,384	1.320
Prison population	9,455 to 8,562	0.906	2.27M to 1.78M	0.783
Underage past-month drinking	28.6% to 19.8%	0.693	26.3% to 15.1%	0.574
Binge drinking, 12+	26.6% to 23.7%	0.891	23.1% to 21.5%	0.931
Alcohol use disorder	7.78% to 10.95%	1.408	7.0% to 10.6%	1.514
Live births	38,715 to 36,783	0.950	4.00M to 3.66M	0.916

Iowa's alcohol deaths rose faster than the nation's. Alcohol-induced deaths went from 233 to 608, a factor of 2.61 against a national 2.11. Iowa started from a low base, second-cheapest state per resident in 2010, and closed part of the gap in the wrong direction. This is the most consequential Iowa-specific finding and it rests on the cleanest series in the model, one whose medical definition did not change across the window.

Iowa's composition of harm differs. Underage drinking fell 31 percent against a national 43 percent, so underage is a larger share of Iowa's alcohol cost than of the nation's. Iowa's prison population fell 9 percent against a national 22 percent, so corrections carries more weight. Binge drinking runs above the national rate in both years. Each of these points a prevention program somewhere different from where the national numbers would.

7B. Re-anchoring the national state layer

The Iowa work exposed a defect in the original state allocation, and it has been corrected. The first version allocated the 2021 national total to states by 2021 burden share. That method pulls every state toward the national mean and discards each state's actual published 2010 level. Iowa showed the size of the problem: the allocator gave \$4.66 billion against \$3.68 billion from the anchor.

Each state's 2021 cost is now its published 2010 cost grown at the national rate, normalized so the 51 states reconcile exactly to the national 2021 total. The 51 published values sum to \$249,026.3 million against a national \$249,026.5 million, a difference attributable to per-state publication rounding. The burden-weighted allocation is retained as a comparison column so the disagreement between the two methods stays visible rather than being resolved silently.

The two methods diverge by more than 35 percent for eleven jurisdictions. Louisiana diverges most, at 67 percent: its published 2010 cost per resident was above the national average while its 2021 alcohol-induced death rate is well below it, so the anchor and the allocator pull in opposite directions. These are genuine method disagreements about a quantity neither method observes directly, not errors.

The published state anchors are themselves apportioned

The 2010 state values in Sacks et al. were produced by allocating national totals to states, which is the same criticism the Minnesota authors later levelled at the method. Their state-specific rebuild produced \$7.85 billion for Minnesota against \$5.52 billion from apportionment, a 42 percent gap.

So anchoring fixes the pull-to-the-mean problem, but the anchors themselves are likely conservative for any given state. Only a full bottom-up state model resolves it, and Iowa is the one state that has one here. Every other state figure should be read as indicative.

8. Quality assurance

All 32 national and 17 Iowa acceptance tests pass. The registers are on tabs 12 and IA_12 of the workbook, which also carries live formula checks that re-evaluate whenever the workbook recalculates — so a reader who changes an input sees immediately whether the model still reconciles.

8.1 Second-reviewer findings and corrections

An independent reviewer examined the five highest-value components, all government-share formulas, both constructed elasticity bridges, unit consistency and the subset logic. The review confirmed the arithmetic reproduced to under \$0.05M on every component, and found six specification errors, all of which were corrected before this document was written. The corrections reduced the strict-track total by \$8.6 billion.

Finding	Correction	Effect
Component 9 multiplied a total-expenditure ratio by a volume factor	Price factor changed to administrative load (NHEA admin ÷ total NHEA)	−\$2.4B
Components 4 and 5 had the same defect	Component 4 price restated as spending per resident; component 5 price changed to medical CPI	−\$0.2B net
Component 24 used fatalities and total crash cost for what is a property-damage line	Re-specified on crash volume and a general price index	−\$6.0B
The crash government scenario added public cost without re-solving the 2010 calibration	Calibration now re-solved under the alternative convention; the net effect is negative	Sign reversed
The 60/40 crime weighting was applied to levels, giving property crime an 83% effective weight	Weighting applied to ratios as intended	+\$0.05B
Subset attribution split incarceration and corrections from the policing of the same offences	Components 16 and 20 moved into the acute set	Binge subset − \$9B

Three further reviewer observations were accepted as disclosures rather than corrections: that two acceptance tests are identities by construction, that roughly \$18 billion of the government figure rests on COVID-transient ratios, and that the observed-expenditure components have algebraically inert quantity terms. All three are stated in this memorandum and in the workbook.

9. Limitations

This section is written to be quoted in full alongside any public release of the numbers.

- This is an independent application of a published CDC-supported methodology. It is not a CDC estimate and has not been reviewed or endorsed by CDC.
- The two largest components — impaired workplace productivity and premature mortality, together about 70% of the total — both carry grade D drivers in the strict track, because both underlying series carry breaks their source agencies explicitly warn against comparing across.
- The increase from 2010 cannot be cleanly decomposed into real change versus methodological change. The model estimates the methodology component at \$53.4 billion by differencing the two tracks, but this is itself an estimate built on constructed bridges.
- 2021 is not a representative year. Pandemic effects run in both directions: alcohol deaths and consumption were elevated, while incarceration, crime victimization, nursing-home census and crash exposure were depressed. A 2019 or 2022 replication would be a useful check and is recommended as Phase 5.
- No national 2021 arrest estimate exists. No national 2021 alcohol-related hospitalization count is published. No nationally representative FAS or FASD prevalence estimate exists for either endpoint. Each gap is handled by a documented substitution, not by assumption.
- The government figure reconstructs the 2010 allocation logic rather than reproducing published component-level government values, which were not available in the source material provided.
- State estimates other than Iowa are each state's published 2010 cost grown at the national rate. They do not reflect state-specific burden trends, and the published anchors are themselves apportioned from national totals. Cost per drink at state level is materially distorted by cross-border purchasing and tourism.
- Iowa is the only state with a bottom-up model, and even there 10 of 26 components fall back to national drivers. Iowa's mortality baseline is the 2011-2015 ARDI window, not 2006-2010, so its strict-track mortality factor carries a period mismatch on top of the method breaks the national model already has.
- Apparent consumption is a sales-and-tax measure, not self-report. It is roughly 1.5 to 2 times higher than survey self-reports, and the per-drink figures depend on it.
- Human-capital valuation of mortality is retained for comparability with 2010. It produces conceptually different and much smaller values than willingness-to-pay approaches now standard in federal regulatory analysis.

10. Recommended next steps

- Obtain the Sacks et al. supplementary appendices. The component-level government allocations and state allocators in those appendices would replace the largest reconstructed element of this model.

- Run the ARDI Custom Data Portal to extract age- and sex-stratified alcohol-attributable deaths under a single method specification for both endpoints. This is the single highest-value action available and would convert the model's largest grade D driver to grade B.
- Pull HCUPnet CCSR MBD017 for 2010 and 2021 directly, replacing the elasticity extrapolation in component 2.
- Replicate for 2019 and 2022 to bound the COVID distortion.
- Obtain Census ASLGF state corrections and judicial expenditure to replace population-based justice allocation at state level.
- Extend the Iowa bottom-up approach to other states. The binding constraint is state-level data retrieval, not method — the Iowa module is parameterised and a second state needs only its driver set.
- Run the ARDI Custom Data Portal for Iowa specifically, to replace the 2011-2015 mortality baseline with a 2006-2010 one and remove the period mismatch in Iowa's largest component.