# Supplementary Information

When Is Paying Cash Cheaper Than Billing Insurance for Scheduled Imaging?

This single file contains all supplementary material for the manuscript.


| Item | | Contents |
|---|---|---|
| Supplementary Table S1 | S2 | Facility self-pay MRI price lists reviewed |
| Supplementary Code | S3 | |
| README.md | S3 | What the code reproduces and how to run it |
| reproduce.py | S4 | Full source code of the model |
| summary.txt | S8 | Complete output of a full run |
| table3_base_case.csv | S9 | Output data for Table 3 |
| table5_paired.csv | S9 | Output data for Table 5 |
| table4_plans_and_robustness.csv | S10 | Output data for Table 4 and the robustness check |

## Supplementary Table S1. What posted self-pay MRI prices include: facility price lists reviewed

| Facility | Type | Location | Prices posted (self-pay) | What the price list says is included | Source (facility's own price list) |
|---|---|---|---|---|---|
| HonorHealth Outpatient Medical Imaging Centers | Hospital-affiliated health system outpatient imaging | Phoenix area, Arizona | Brain MRI without and with contrast (70553): prompt pay $1,027; direct pay $1,335; average estimated total $2,054 | States that listed prices do not include professional fees for services of hospital-based radiologists | https://www.honorhealth.com/sites/default/files/documents/patient-and-visitors/honorhealth-average-pricing-mri.pdf |
| Signature Medical Group (Signature Orthopedics, South County) | Physician-group imaging | St. Louis, Missouri | MRI without contrast $450; MRI with and without contrast $700; brain MRI (70553) $675 | States that prices are all-inclusive and include the radiologist reading and contrast | https://www.signaturemedicalgroup.com/patient-resources/pay-my-bill/imaging-selfpay/ |
| Advantage MRI | Freestanding imaging center | Ohio (lists Beachwood, Cleveland and Columbus) | MRI $400; brain MRI with orbits, internal auditory canals, MRA or pituitary $800; $100 added to studies ordered with contrast | States that all fees include professional interpretation; contrast priced separately | https://advantagemri.us.com/pricing |
| Advanced Medical Imaging | Freestanding imaging center | Seminole and St. Petersburg, Florida | MRI without contrast $295; MRI with and without contrast $395 | States that every price includes the radiologist's read and report, with no separate professional fee; separate price for contrast studies | https://www.advancedimg.com/pricing |

*Notes.* Price lists were found by web search and read on November 5, 2026. Only each facility's own published price list was used; aggregator websites and blogs were excluded. The sample is small and not random, so it shows how inclusions vary rather than how often each pattern occurs. Prices are current self-pay prices as posted, are not adjusted to 2025 dollars, and are not comparable with the 2021–2022 hospital prices used in the model. The HonorHealth list shows no date.

## Supplementary Code

The supplementary code consists of a Python script (`reproduce.py`), its documentation (`README.md`), the complete output of a full run (`summary.txt`), and the three CSV files the script writes (`table3_base_case.csv`, `table4_plans_and_robustness.csv`, `table5_paired.csv`). Each is reproduced in full below. The script listing can be copied from this PDF into a file named `reproduce.py` and run as described in the README.

### README.md

**Supplement to** *When Is Paying Cash Cheaper Than Billing Insurance for Scheduled Imaging?*

**What this does.** `reproduce.py` rebuilds every model result in the paper from the published inputs in Table 1:

| Paper item | What the script prints or writes |
|---|---|
| Methods: check of the piecewise break-even rule | Mismatches in 250,000 random plan-and-price cases (expected: 0) |
| Spending distribution fit | Fitted median and mean vs the reported mean |
| Table 3 | `output/table3_base_case.csv` |
| Table 4 and the robustness check | `output/table4_plans_and_robustness.csv` (shares under log-normal, Weibull, gamma and log-linear fits) |
| Sensitivity grid (3 deductibles × 3 coinsurance rates × 2 maximums) | Range of the brain MRI share |
| Table 5 and the paired-price results | `output/table5_paired.csv` |
| Deductible-credit results | Cheaper / more expensive / same shares; timing example; share where credit reproduces an insured claim |
| Figure 6 caps | Maximum share as the cash price approaches zero |
| Fixed copayments | Cash-minus-plan for $350 and $100 copayments |
| Price-tool example (Discussion) | Year totals at hospital B and center C |

A full run's output is saved in `output/summary.txt`.

**How to run.**

```
pip install numpy scipy
python reproduce.py
```

It takes about one minute.

**Notes on matching the paper.**

- Inputs are the whole-dollar values in Table 1. All reported model figures match this script's output (fixed random seeds).
- With a different random seed, simulation results (credit scenarios) vary by about 1 percentage point.
- The deductible-counting limitation applies here too: the spending distribution includes some spending that would not count toward a deductible.

## reproduce.py

```python
"""Reproduce the model results in "When Is Paying Cash Cheaper Than Billing Insurance for Scheduled Imaging?"

Run:  python reproduce.py            (writes CSV files to ./output and prints a summary)
Needs: Python 3.9+, numpy, scipy

Every input is a published figure listed in Table 1 of the manuscript, already in 2025 dollars.
"""
import csv
import os

import numpy as np
from scipy import optimize, stats

OUT = os.path.join(os.path.dirname(os.path.abspath(__file__)), "output")
os.makedirs(OUT, exist_ok=True)

# ------------------------------------------------------------------------------ inputs (Table 1)
SERVICES = {  # cash 25th pct, cash median, negotiated median (2025 dollars)
    "Brain MRI (70553)": dict(c25=1536, c50=2540, n50=1990),
    "Head CT (70450)": dict(c25=655, c50=1142, n50=896),
    "Mammogram, one breast (77065)": dict(c25=173, c50=248, n50=253),
    "Mammogram, both breasts (77066)": dict(c25=216, c50=305, n50=318),
}
MRI_IQR = dict(cash=(1536, 2540, 3875), neg=(1072, 1990, 3348))
PAIRED_MEDIAN_RATIO = 1.04            # Wang et al. 2023, radiology
PLANS = {                              # deductible, coinsurance, out-of-pocket maximum
    "Base case": (1886, 0.20, 9200),
    "HSA-qualified minimum": (1650, 0.20, 8300),
    "Gold standardized": (1500, 0.25, 7800),
    "Silver standardized": (5000, 0.40, 8000),
    "Expanded bronze standardized": (7500, 0.50, 9200),
}
P_ZERO = 0.12                                       # share with no spending billed to the plan
SPEND_POINTS = [(1063.0, 0.44), (10632.0, 0.85)]    # overall CDF points, 2025 dollars
REPORTED_MEAN = 7129.0


# ------------------------------------------------------------------------------ spending distributions
COND = [(x, (p - P_ZERO) / (1 - P_ZERO)) for x, p in SPEND_POINTS]


def fit_lognormal():
    (x1, q1), (x2, q2) = COND
    z1, z2 = stats.norm.ppf(q1), stats.norm.ppf(q2)
    s = (np.log(x2) - np.log(x1)) / (z2 - z1)
    return stats.lognorm(s=s, scale=np.exp(np.log(x1) - z1 * s))


def fit_two_param(make, x0):
    sol = optimize.least_squares(lambda p: [make(*p).cdf(x) - q for x, q in COND], x0,
                                 bounds=([1e-3, 1e-3], [1e3, 1e7]))
    return make(*sol.x)


class LogLinear:
    """CDF interpolated linearly in log(dollars) through the published points (12% at $50 floor)."""
    x = np.log([50.0, 1063.0, 10632.0]); p = np.array([P_ZERO, 0.44, 0.85])

    def overall_cdf(self, s):
        ls = np.log(np.maximum(np.asarray(s, float), 1e-9))
        slope = (self.p[2] - self.p[1]) / (self.x[2] - self.x[1])
        out = np.interp(ls, self.x, self.p)
        out = np.where(ls > self.x[2], np.minimum(1, self.p[2] + slope * (ls - self.x[2])), out)
        return np.where(ls < self.x[0], P_ZERO, out)


LOGNORMAL = fit_lognormal()
DISTRIBUTIONS = {
    "log-normal (base case)": LOGNORMAL,
    "Weibull": fit_two_param(lambda k, lam: stats.weibull_min(c=k, scale=lam), [0.6, 5000]),
    "gamma": fit_two_param(lambda a, sc: stats.gamma(a=a, scale=sc), [0.4, 20000]),
    "log-linear interpolation": LogLinear(),
}


def share_below(dist, s):
    """Share of all commercially insured people (including zero spenders) with other spending < s."""
    s = np.asarray(s, float)
    if isinstance(dist, LogLinear):
        return np.where(s > 0, dist.overall_cdf(s), 0.0)
```

```
    return np.where(s > 0, P_ZERO + (1 - P_ZERO) * dist.cdf(s), 0.0)


# ------------------------------------------------------------------------- cost-sharing model
def claim(x, d, m, c):
    """Patient payment for a claim of size x with remaining deductible d and out-of-pocket room m."""
    k = np.minimum(x, d)
    pay = np.minimum(m, k + c * (x - k))
    return pay, d - k, m - pay


def annual_plan(S, Pn, D, c, M):
    return claim(np.asarray(S, float) + Pn, D, M, c)[0]


def annual_cash(S, C, D, c, M):
    return C + claim(np.asarray(S, float), D, M, c)[0]


def break_even(C, Pn, D, c, M):
    """Piecewise threshold S*: without credit, cash is cheaper exactly when other spending < S*.
    The closed form holds when M - D >= c * Pn, which is true for every plan in the paper; for the rare
    simulated hospitals with very high negotiated rates where it does not hold, S* is found numerically."""
    C, Pn = np.broadcast_arrays(np.asarray(C, float), np.asarray(Pn, float))
    out = np.where(C >= Pn, 0.0,
          np.where(C > c * Pn, np.maximum(0.0, D - (C - c * Pn) / (1 - c)),
                   D + (M - D - C) / c))
    bad = (M - D < c * Pn) & (C < Pn)
    for i in np.flatnonzero(bad):
        out.flat[i] = _numeric_break_even(C.flat[i], Pn.flat[i], D, c, M)
    return out


def _numeric_break_even(C, Pn, D, c, M):
    """Largest S with cash cheaper (the added cost of billing falls as S rises, so the set is an interval)."""
    gain = lambda S: float(annual_plan(S, Pn, D, c, M) - annual_cash(S, C, D, c, M))
    if gain(0.0) <= 0:
        return 0.0
    lo, hi = 0.0, M + Pn
    for _ in range(100):
        mid = (lo + hi) / 2
        lo, hi = (mid, hi) if gain(mid) > 0 else (lo, mid)
    return lo


def check_rule(n=250_000, seed=1):
    """Compare the piecewise rule with the direct annual calculation on both sides of S*."""
    rng = np.random.default_rng(seed)
    D = rng.uniform(300, 8000, n); c = rng.uniform(0.05, 0.6, n)
    Pn = rng.uniform(100, 4000, n); C = rng.uniform(20, 5000, n)
    M = D + c * Pn + rng.uniform(0, 8000, n)
    Sstar = np.where(C >= Pn, 0.0, np.where(C > c * Pn, np.maximum(0, D - (C - c * Pn) / (1 - c)), D + (M - D - C) / c))
    bad = 0
    for S in (Sstar * 0.99 - 0.5, Sstar * 1.01 + 0.5):
        ok = S >= 0
        cheaper = annual_cash(S, C, D, c, M) < annual_plan(S, Pn, D, c, M) - 1e-9
        bad += int(np.sum(ok & (cheaper != (S < Sstar))))
    return bad


def simulate_year(C, Pn, D, c, M, credit, n=400_000, seed=3, dist=LOGNORMAL):
    """Sequential year: other spending before the test, the test, then spending after it."""
    rng = np.random.default_rng(seed)
    S = np.where(rng.random(n) >= P_ZERO, dist.rvs(size=n, random_state=rng), 0.0)
    u = rng.random(n); S1, S2 = u * S, (1 - u) * S

    def run(pay_cash):
        d = np.full(n, float(D)); m = np.full(n, float(M))
        p1, d, m = claim(S1, d, m, c); total = p1
        d_at_test = d.copy()
        if pay_cash:
            total = total + C
            if credit:
                d = d - np.minimum(C, d); m = m - np.minimum(C, m)
        else:
            p, d, m = claim(np.full(n, float(Pn)), d, m, c); total = total + p
        p2, d, m = claim(S2, d, m, c)
        return total + p2, d_at_test

    plan, d_at_test = run(False)
    cash, _ = run(True)
    diff = cash - plan
```

```
    return dict(cheaper=np.mean(diff < -0.005), more=np.mean(diff > 0.005),
                same=np.mean(np.abs(diff) <= 0.005),
                credit_reproduces=np.mean(C <= d_at_test))


def paired_simulation(rho, calibrate=True, n=300_000, seed=7, dist=LOGNORMAL):
    D, c, M = PLANS["Base case"]
    rng = np.random.default_rng(seed)
    z75 = stats.norm.ppf(0.75)
    s_c = np.log(MRI_IQR["cash"][2] / MRI_IQR["cash"][0]) / (2 * z75)
    s_n = np.log(MRI_IQR["neg"][2] / MRI_IQR["neg"][0]) / (2 * z75)
    z = rng.multivariate_normal([0, 0], [[1, rho], [rho, 1]], size=n)
    neg = MRI_IQR["neg"][1] * np.exp(s_n * z[:, 1])
    cash = MRI_IQR["cash"][1] * np.exp(s_c * z[:, 0])
    if calibrate:
        cash *= PAIRED_MEDIAN_RATIO / np.median(cash / neg)
    ratio = cash / neg
    share = share_below(dist, break_even(cash, neg, D, c, M))
    below = cash < neg
    return dict(median_diff=np.median(cash - neg), r10=np.percentile(ratio, 10), r90=np.percentile(ratio, 90),
                cash_le_neg=np.mean(cash <= neg), avg_share=share.mean(),
                avg_share_if_cash_below=share[below].mean())


def write_csv(name, header, rows):
    with open(os.path.join(OUT, name), "w", newline="") as f:
        w = csv.writer(f); w.writerow(header); w.writerows(rows)


def main():
    D, c, M = PLANS["Base case"]
    print("Piecewise rule mismatches in 250,000 random cases (M - D >= c*Pn):", check_rule())
    print(f"Log-normal fit: median among spenders ${LOGNORMAL.median():,.0f}; overall mean "
          f"${(1 - P_ZERO) * LOGNORMAL.mean():,.0f} vs reported ${REPORTED_MEAN:,.0f}")

    # Table 3
    rows = []
    for name, s in SERVICES.items():
        for label, C in (("median", s["c50"]), ("25th percentile", s["c25"])):
            Pn = s["n50"]
            no_other = annual_cash(0, C, D, c, M) - annual_plan(0, Pn, D, c, M)
            met = annual_cash(D, C, D, c, M) - annual_plan(D, Pn, D, c, M)
            Sstar = float(break_even(C, Pn, D, c, M))
            rows.append([name, label, C, Pn, round(float(no_other)), round(float(met)),
                         round(Sstar) if Sstar > 0 else "Never", round(100 * float(share_below(LOGNORMAL, Sstar)))])
    write_csv("table3_base_case.csv", ["service", "cash price", "cash", "negotiated", "added cost, no other care",
                                       "added cost, deductible met", "break-even other spending", "share %"], rows)
    print("\nTable 3 (positive = cash costs more)"); [print("  ", r) for r in rows]

    # Table 4 and robustness
    rows = []
    for plan, (Dp, cp, Mp) in PLANS.items():
        row = [plan]
        for name in ("Brain MRI (70553)", "Head CT (70450)", "Mammogram, one breast (77065)"):
            s = SERVICES[name]; Sstar = float(break_even(s["c25"], s["n50"], Dp, cp, Mp))
            row += [round(Sstar)] + [round(100 * float(share_below(d, Sstar))) for d in DISTRIBUTIONS.values()]
        rows.append(row)
    hdr = ["plan"]
    for svc in ("MRI", "CT", "mammogram"):
        hdr += [f"{svc} break-even"] + [f"{svc} share % ({k})" for k in DISTRIBUTIONS]
    write_csv("table4_plans_and_robustness.csv", hdr, rows)
    print("\nTable 4 break-even and shares (log-normal, Weibull, gamma, log-linear)"); [print("  ", r) for r in rows]

    # Deductible x coinsurance x maximum grid (Results, Plan design)
    grid = [float(share_below(LOGNORMAL, break_even(1536, 1990, Dg, cg, Mg)))
            for Dg in (1650, 1886, 2631) for cg in (0.1, 0.2, 0.3) for Mg in (9200, 4000)]
    print(f"\nGrid of 3 deductibles x 3 coinsurance rates x 2 maximums: MRI share {min(grid):.0%} to {max(grid):.0%}")

    # Table 5
    rows = []
    for rho in (0.0, 0.5, 0.8, 0.9):
        r = paired_simulation(rho)
        unc = paired_simulation(rho, calibrate=False)
        alt = [paired_simulation(rho, dist=d)["avg_share"] for k, d in DISTRIBUTIONS.items() if k != "log-normal (base case)"
    ↪ ]
        rows.append([rho, round(r["median_diff"]), f"{r['r10']:.2f}-{r['r90']:.2f}", round(100 * r["cash_le_neg"]),
                     round(100 * r["avg_share"]), round(100 * unc["avg_share"]),
                     round(100 * r["avg_share_if_cash_below"]), f"{100 * min(alt):.1f}-{100 * max(alt):.1f}"])
    write_csv("table5_paired.csv", ["correlation", "median paired difference", "ratio 10th-90th",
                                    "hospitals cash<=negotiated %", "average share %", "uncalibrated share %",
                                    "share where cash below own rate %", "share, alternative distributions %"], rows)
    print("\nTable 5"); [print("  ", r) for r in rows]
```

```
    # Credit scenarios
    mri, ct = SERVICES["Brain MRI (70553)"], SERVICES["Head CT (70450)"]
    cr = simulate_year(mri["c25"], mri["n50"], D, c, M, credit=True)
    nc = simulate_year(mri["c25"], mri["n50"], D, c, M, credit=False)
    cr_ct = simulate_year(ct["c25"], ct["n50"], D, c, M, credit=True)
    print(f"\nMRI, full credit: cheaper {cr['cheaper']:.1%}, more {cr['more']:.1%}, same {cr['same']:.1%} "
          f"(no credit: cheaper {nc['cheaper']:.1%})")
    print(f"Credited payment reproduces an insured claim (C <= deductible left at scan): MRI {cr['credit_reproduces']:.0%}, "
          f"CT {cr_ct['credit_reproduces']:.0%}")

    # Timing example: $1,000 other care before or after a credited cash MRI
    def year(order, pay_cash):
        d, m, tot = float(D), float(M), 0.0
        seq = ["other", "test"] if order == "before" else ["test", "other"]
        for item in seq:
            if item == "other":
                p, d, m = claim(1000.0, d, m, c); tot += p
            elif pay_cash:
                tot += mri["c25"]; d -= min(mri["c25"], d); m -= min(mri["c25"], m)
            else:
                p, d, m = claim(float(mri["n50"]), d, m, c); tot += p
        return tot
    for order in ("after", "before"):
        print(f"Other care {order} a credited cash MRI: cash minus plan = "
              f"{year('before' if order == 'before' else 'after', True) - year('before' if order == 'before' else 'after',
     ↪ False):+.0f}")

    # Figure 6 caps (cash price near zero)
    for plan in ("Base case", "Expanded bronze standardized"):
        Dp, cp, Mp = PLANS[plan]
        print(f"Cap on share as cash price -> 0, {plan}: {float(share_below(LOGNORMAL, break_even(1e-6, mri['n50'], Dp, cp,
     ↪ Mp))):.0%}")

    # Copayment examples
    for cop in (350, 100):
        for name in ("Brain MRI (70553)", "Head CT (70450)", "Mammogram, one breast (77065)"):
            s = SERVICES[name]
            print(f"${cop} copay, {name}: cash minus plan = {s['c25'] - min(cop, s['n50']):+.0f}")

    # Price-tool example (Discussion): $300 already spent; centre C from Bay Area midpoint savings
    spent = 300.0
    def plan_year(Pn, later):
        d, m = D - spent, M - spent
        p, d, m = claim(float(Pn), d, m, c); q_, d, m = claim(float(later), d, m, c); return p + q_
    def cash_year(C, later, credit):
        d, m = D - spent, M - spent
        if credit:
            d -= min(C, d); m -= min(C, m)
        q_, d, m = claim(float(later), d, m, c); return C + q_
    neg_c = round(mri["n50"] * (1 - 0.545)); cash_c = round(neg_c * (1 - 0.16))
    print(f"\nTool example: centre C in-network ${neg_c}, cash ${cash_c}")
    for label, Pn, C in (("Hospital B", mri["n50"], mri["c25"]), ("Centre C", neg_c, cash_c)):
        print(f"  {label}: plan only ${plan_year(Pn, 0):,.0f}; cash only ${cash_year(C, 0, False):,.0f}; "
              f"with $1,000 later care: plan ${plan_year(Pn, 1000):,.0f}, cash ${cash_year(C, 1000, False):,.0f}, "
              f"credited cash ${cash_year(C, 1000, True):,.0f}")


if __name__ == "__main__":
    main()
```

## summary.txt (output of a full run)

```
Piecewise rule mismatches in 250,000 random cases (M - D >= c*Pn): 0
Log-normal fit: median among spenders $1,971; overall mean $8,303 vs reported $7,129

Table 3 (positive = cash costs more)
   ['Brain MRI (70553)', 'median', 2540, 1990, 633, 2142, 'Never', 0]
   ['Brain MRI (70553)', '25th percentile', 1536, 1990, -371, 1138, 464, 30]
   ['Head CT (70450)', 'median', 1142, 896, 246, 963, 'Never', 0]
   ['Head CT (70450)', '25th percentile', 655, 896, -241, 476, 1291, 48]
   ['Mammogram, one breast (77065)', 'median', 248, 253, -5, 197, 1639, 52]
   ['Mammogram, one breast (77065)', '25th percentile', 173, 253, -80, 122, 1733, 53]
   ['Mammogram, both breasts (77066)', 'median', 305, 318, -13, 241, 1584, 52]
   ['Mammogram, both breasts (77066)', '25th percentile', 216, 318, -102, 152, 1696, 53]

Table 4 break-even and shares (log-normal, Weibull, gamma, log-linear)
   ['Base case', 464, 30, 33, 34, 35, 1291, 48, 47, 47, 47, 1733, 53, 52, 51, 53]
   ['HSA-qualified minimum', 228, 22, 27, 28, 28, 1055, 44, 44, 44, 44, 1497, 51, 49, 49, 50]
   ['Gold standardized', 115, 17, 22, 24, 21, 925, 41, 42, 42, 43, 1354, 49, 48, 47, 48]
   ['Silver standardized', 3767, 69, 66, 65, 67, 4506, 72, 70, 68, 70, 4880, 73, 71, 70, 71]
   ['Expanded bronze standardized', 6418, 78, 76, 75, 76, 7086, 79, 78, 77, 78, 7407, 80, 79, 78, 79]

Grid of 3 deductibles x 3 coinsurance rates x 2 maximums: MRI share 19% to 48%

Table 5
   [0.0, 71, '0.26-4.19', 49, 19, 14, 39, '19.5-19.9']
   [0.5, 65, '0.39-2.81', 48, 14, 9, 29, '14.1-14.4']
   [0.8, 62, '0.54-1.99', 47, 9, 4, 19, '9.5-9.7']
   [0.9, 63, '0.64-1.68', 46, 7, 2, 15, '7.1-7.3']

MRI, full credit: cheaper 47.1%, more 50.8%, same 2.1% (no credit: cheaper 30.2%)
Credited payment reproduces an insured claim (C <= deductible left at scan): MRI 43%, CT 64%
Other care after a credited cash MRI: cash minus plan = -91
Other care before a credited cash MRI: cash minus plan = +429
Cap on share as cash price -> 0, Base case: 96%
Cap on share as cash price -> 0, Expanded bronze standardized: 85%
$350 copay, Brain MRI (70553): cash minus plan = +1186
$350 copay, Head CT (70450): cash minus plan = +305
$350 copay, Mammogram, one breast (77065): cash minus plan = -80
$100 copay, Brain MRI (70553): cash minus plan = +1436
$100 copay, Head CT (70450): cash minus plan = +555
$100 copay, Mammogram, one breast (77065): cash minus plan = +73

Tool example: centre C in-network $905, cash $760
  Hospital B: plan only $1,667; cash only $1,536; with $1,000 later care: plan $1,867, cash $2,536, credited cash $1,776
  Centre C: plan only $905; cash only $760; with $1,000 later care: plan $1,650, cash $1,760, credited cash $1,621
```

### table3_base_case.csv

Brain MRI, head CT and mammography under the base-case plan. Positive added cost means cash costs more. Dollar values in 2025 dollars.

| Service | Cash price | Cash | Negotiated | Added cost, no other care | Added cost, deductible met | Break-even other spending | Share % |
|---|---|---|---|---|---|---|---|
| Brain MRI (70553) | median | 2540 | 1990 | 633 | 2142 | Never | 0 |
| Brain MRI (70553) | 25th percentile | 1536 | 1990 | −371 | 1138 | 464 | 30 |
| Head CT (70450) | median | 1142 | 896 | 246 | 963 | Never | 0 |
| Head CT (70450) | 25th percentile | 655 | 896 | −241 | 476 | 1291 | 48 |
| Mammogram, one breast (77065) | median | 248 | 253 | −5 | 197 | 1639 | 52 |
| Mammogram, one breast (77065) | 25th percentile | 173 | 253 | −80 | 122 | 1733 | 53 |
| Mammogram, both breasts (77066) | median | 305 | 318 | −13 | 241 | 1584 | 52 |
| Mammogram, both breasts (77066) | 25th percentile | 216 | 318 | −102 | 152 | 1696 | 53 |

### table5_paired.csv

Paired-price results by correlation between a hospital's cash and negotiated prices.

| Correlation | Median paired difference | Ratio 10th–90th | Hospitals cash ≤ negotiated % | Average share % | Uncalibrated share % | Share where cash below own rate % | Share, alternative distributions % |
|---|---|---|---|---|---|---|---|
| 0.0 | 71 | 0.26–4.19 | 49 | 19 | 14 | 39 | 19.5–19.9 |
| 0.5 | 65 | 0.39–2.81 | 48 | 14 | 9 | 29 | 14.1–14.4 |
| 0.8 | 62 | 0.54–1.99 | 47 | 9 | 4 | 19 | 9.5–9.7 |
| 0.9 | 63 | 0.64–1.68 | 46 | 7 | 2 | 15 | 7.1–7.3 |

**table4_plans_and_robustness.csv**

Break-even other spending (dollars) and share of enrollees for whom cash is cheaper (%) by plan, under the base-case log-normal spending distribution and three alternative fits (Weibull, gamma, log-linear interpolation).

| | Brain MRI | | | | | Head CT | | | | | Mammogram | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Share % | | | | | Share % | | | | | Share % | | | |
| Plan | Break-even | Log-normal | Weibull | Gamma | Log-linear | Break-even | Log-normal | Weibull | Gamma | Log-linear | Break-even | Log-normal | Weibull | Gamma | Log-linear |
| Base case | 464 | 30 | 33 | 34 | 35 | 1291 | 48 | 47 | 47 | 47 | 1733 | 53 | 52 | 51 | 53 |
| HSA-qualified minimum | 228 | 22 | 27 | 28 | 28 | 1055 | 44 | 44 | 44 | 44 | 1497 | 51 | 49 | 49 | 50 |
| Gold standardized | 115 | 17 | 22 | 24 | 21 | 925 | 41 | 42 | 42 | 43 | 1354 | 49 | 48 | 47 | 48 |
| Silver standardized | 3767 | 69 | 66 | 65 | 67 | 4506 | 72 | 70 | 68 | 70 | 4880 | 73 | 71 | 70 | 71 |
| Expanded bronze standardized | 6418 | 78 | 76 | 75 | 76 | 7086 | 79 | 78 | 77 | 78 | 7407 | 80 | 79 | 78 | 79 |