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Reimagining Health Economics: Actuarial Pathways to Sustainable Care

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Abstract

This paper introduces the Actuarial Risk Architecture for Comprehensive Health (ARCH) as a comparative actuarial diagnostic that distinguishes value-based care maturity from long-run fiscal sustainability. ARCH assesses system sustainability across four dimensions — Adequacy, Resilience, Capacity, and Horizon — and is applied to Australia, the United States, and India alongside a companion Actuarial VBC Maturity Model that maps each system's progression from fee-for-service to population-based payment. *Existing health-system frameworks describe components; ARCH is designed to diagnose which financing constraint is binding for the next feasible reform step.* The framework reframes health-system diagnostics in terms of capital adequacy, shock-absorption capacity, and risk-adjustment integrity rather than clinical performance metrics—complementary to the WHO building-blocks and OECD resilience frameworks, but built for actuaries advising on fiscal sustainability and risk transfer rather than on clinical performance alone.

The central finding is a paradox of payment sophistication. The United States has built one of the most extensive VBC architectures globally yet scores weakest on Horizon; Australia shows strong coverage foundations but a structural prevention gap and binding workforce constraints; India's digital infrastructure creates long-run opportunity, but Resilience and risk-adjustment capacity remain binding. Three applications illustrate ARCH in operation: a Behavioural Adjustment Factor (BAF) framework for prevention economics, a GLP-1 stress test of cross-system resilience, and a concrete Australian policy implication — a PHI-routed prevention fund designed as the first stage of a longer-horizon financing reform. ARCH is offered as a tool to help the actuarial profession move from measuring health system performance to designing it.

Keywords: health economics; value-based care; actuarial science; ARCH framework; risk adjustment; prevention economics; GLP-1; Australia; United States; India

Abbreviations: ABHA, Ayushman Bharat Health Account; ACO, Accountable Care Organisation; AN-ACC, Australian National Aged Care Classification; ARCH, Actuarial Risk Architecture for Comprehensive Health; BAF, Behavioural Adjustment Factor; CMMI, Center for Medicare and Medicaid Innovation; FFS, fee-for-service; HCC, Hierarchical Condition Category; MSSP, Medicare Shared Savings Program; NHCX, National Health Claims Exchange; NWAU, National Weighted Activity Unit; OOPE, out-of-pocket expenditure; PBS, Pharmaceutical Benefits Scheme; PHI, private health insurance; PMJAY, Pradhan Mantri Jan Arogya Yojana; THE, total health expenditure; VBC, value-based care.

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1. Introduction: The Health Economy at an Inflection Point

Three health systems, three continents, one structural problem. Australia spends 10.1% of GDP on health yet allocates only 2.9% to prevention (AIHW, 2025a). The United States spends 18% of GDP and has built one of the most extensive value-based care architectures globally, yet CMMI’s first decade of VBC model testing increased federal spending by $5.4 billion net (CBO, 2023). India’s 77–101 million diabetics face medical inflation of 12–15% annually, with insurance penetration at just 3.7% of GDP (NHSRC, 2024).

These pressures share a common analytical character. They involve long-horizon financial obligations whose magnitude is uncertain. They require risk pooling mechanisms whose design has distributional consequences—that is, consequences for who pays and who benefits. They demand scenario simulation under deep uncertainty. They are actuarial problems. And they call for what this Summit describes as “the Great Recalibration”—a structural shift from paying for volume to paying for value.

To support that argument, this paper introduces two complementary frameworks. The Actuarial Risk Architecture for Comprehensive Health (ARCH) framework provides a four-dimensional diagnostic—Adequacy, Resilience, Capacity, and Horizon—assessing whether each system is structurally capable of sustaining its health financing trajectory. The Actuarial VBC Maturity Model maps where each system stands on the journey from fee-for-service to population health management. Together, they offer both a sustainability lens and a positioning tool.

The paper addresses three questions: how to distinguish payment-model maturity from system sustainability in a comparative framework; under what institutional conditions VBC advancement translates into fiscal sustainability or fails to do so; and which actuarial primitives—risk adjustment validity, benchmark stability, tail-risk financing, behavioural adherence—are most binding under real-world adoption. These yield three testable propositions: (P1) VBC maturity is neither necessary nor sufficient for sustainability, mediated by macro-fiscal constraints and risk adjustment integrity; (P2) workforce and data infrastructure constraints are first-order determinants of feasible VBC depth; (P3) wrong-pocket incentive misalignment predicts systematic underinvestment in prevention even when clinical effectiveness is high.

This paper is a *framework development and illustrative application* contribution: it develops an actuarial diagnostic (ARCH) and a VBC maturity taxonomy, demonstrates their use through three country applications using public policy and national accounts sources, and aims for decision-useful comparative diagnosis rather than causal attribution. Propositions P1–P3 are stated as hypotheses for future empirical testing, not as claims established here.

1A. Data and Methods

This study is a comparative, descriptive policy analysis using publicly available, country-level health expenditure accounts and programme/policy documents for Australia, the United States, and India. For each country, the most recent reported national health expenditure totals and supporting system indicators are extracted from official statistical and policy sources (Appendix A provides the indicator-level source map). All financial values are reported in nominal local currency for the stated reporting year (Australia 2023–24; United States calendar year 2024; India 2021–22), and cross-system comparisons emphasise structural ratios (health expenditure as percentage of GDP, out-of-pocket share) rather than purchasing-power-parity conversions, which introduce their own measurement complications in health services.

ARCH is an indicator-based diagnostic that organises health system sustainability into four dimensions, each operationalised via a predefined indicator set (Appendix A). Indicators are normalised to a 0–10 scale using rule-based thresholds; dimension scores are equally weighted aggregates, with sensitivity tests over alternative weights reported in Section 5. To illustrate the impact of weighting choices, the paper tests an "Australian fiscal priority" scenario (Horizon 40%, Capacity 25%, Adequacy 20%, Resilience 15%); under this weighting, Australia's overall score declines from 6.4 to 6.2, confirming that the equal-weight composite understates Horizon vulnerability. Future operationalisation could employ Delphi-method elicitation to produce consensus weights with documented rationale, following OECD/JRC (2008) guidance on composite indicator construction (OECD & JRC, 2008).

A question frequently raised about ARCH ratings is how much they reflect observed data versus subjective judgement. The answer has two parts. Dimension scores aggregate observable, source-attributed indicator data using rule-based thresholds: each indicator is drawn from a specific public account or programme document (detailed in Appendix A), and the mapping from raw indicator values to the 0–10 ordinal scale follows pre-specified rules rather than ad hoc expert opinion. The normative components are the threshold calibration (where exactly on each indicator scale the boundaries between score bands fall) and the equal-weighting of dimensions—both of which are explicit, documented choices rather than hidden assumptions. Section 5 reports sensitivity tests over alternative dimension weights, confirming that dimensional rankings are robust to plausible normative variation even if composite scores are not. ARCH is therefore best understood as rule-based indicator aggregation with transparent normative assumptions, not as calibrated statistical estimation—a distinction the Limitations section also acknowledges.

Worked Example: Australia's Horizon Dimension (Score 5.5/10). Three indicators contribute to Australia's Horizon score. Demographic trajectory (17% → 23% aged 65+ by 2050): moderate but sustained pressure, sub-score 6. Chronic disease acceleration (54% of disease spending—A$98 billion—on chronic conditions with known prevention pathways): sub-score 5. Long-run expenditure path (10.1% → est. 12–13% of GDP by 2050 under current policy): sub-score 5. The equal-weighted composite is 5.3; Table 3 reports 5.5, reflecting half-point rounding for presentational consistency across dimensions. Interpretation: the system is functional today but structurally vulnerable to demographic and prevention gaps—the pattern the prevention investment fund proposed in Section 10 is designed to mitigate. Each sub-score is derived from the indicator thresholds in Appendix A; readers can replicate the exercise for any dimension and country using the same source data.

2. The ARCH Framework: A System-Level Sustainability Diagnostic

Health system design decisions that appear technically sound within individual domain analyses frequently produce adverse systemic consequences when their interactions are not adequately considered. A risk adjustment model optimised for one programme may create selection effects that undermine provider viability in another. A VBC payment model designed for an information-rich environment may produce unintended patient avoidance when deployed without robust risk adjustment. Prevention investment frameworks that are economically rational in isolation may be politically unsustainable without financing mechanisms that capture and recycle their returns.

The Actuarial Risk Architecture for Comprehensive Health (ARCH) framework provides a structured diagnostic for these system-level interactions. *Existing health-system frameworks describe components; ARCH is designed to diagnose which financing constraint is binding for the next feasible reform step.* ARCH complements established health system frameworks—WHO building blocks (WHO, 2022) (financing, workforce, information, service delivery, governance, technologies) and OECD health system resilience concepts (OECD, 2025)—by reorganising them into actuarially decision-relevant constructs: capital adequacy, shock absorption, binding constraints, and long-horizon solvency. What ARCH adds to these frameworks is threefold: (a) explicit horizon-risk distribution thinking, where the output is conceptually a probability distribution over long-run trajectories rather than a point estimate; (b) integration with contract-level actuarial tools (risk adjustment, stop-loss, capitation rate-setting); and (c) a bridge between payment design and system sustainability that existing frameworks do not provide.

A note on scoring methodology: the construction of ARCH scores—including the balance of observed data versus structured expert judgement, the rule-based threshold logic, and the sensitivity of results to alternative dimension weights—is detailed in Section 1A. Appendix A provides the indicator-level source map.

ARCH assesses health system sustainability along four dimensions:

Adequacy measures whether the system's financing, coverage, and care delivery components are sufficient to meet the health needs of the covered population under expected conditions. An inadequate system fails not through dramatic collapse but through gradual deterioration of access and quality—individuals defer treatment, develop more serious conditions, and present later at higher cost.

Resilience measures the system's capacity to absorb shocks—pandemic events, GLP-1-scale pharmaceutical cost shocks, acute fiscal shocks—without structural failure. In VBC contexts, resilience includes the robustness of shared savings benchmarks to extreme-year claims experience.

Capacity measures the human, physical, and informational capital available to deliver care relative to current and projected demand. Data infrastructure capacity determines which tier of the VBC Maturity Model is operationally achievable. Workforce capacity determines whether care coordination commitments can be honoured.

Horizon measures long-run financial sustainability under actuarially rigorous projection, extending to the 20–30 year time horizon where demographic transition effects and chronic disease trajectory impacts are most significant. The output is not a point estimate but a probability distribution—an expected trajectory surrounded by confidence intervals. This distributional thinking is the actuarial profession's most distinctive contribution, and the one most poorly served by conventional fiscal analysis.

Each dimension is assessed against indicator families, scored on an ordinal 0–10 scale anchored at approximate thresholds: below 4 indicates structural inadequacy; 4–6 indicates functional but under pressure; above 6 indicates adequate with identified risks. The full scoring methodology is detailed in Appendix A. ARCH scores are intended to structure comparative discussion and surface relative strengths and vulnerabilities, not to substitute for fully calibrated modelling.

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3. The VBC Maturity Model: Mapping the Transition

The transition from volume-based to value-based payment is a structural journey that can be categorised into five levels of actuarial sophistication, underpinned by the canonical framing of value as health outcomes achieved per dollar spent (Porter, 2010). This maturity model assesses how risk is shared and how outcomes are integrated into the financial architecture of the system.

Table 1: Actuarial VBC Maturity Model

Level	Stage	Description	Country Position (2026)
1	Fee-for-Service	Volume-based payment; no quality linkage; retrospective reimbursement	India (private sector baseline); Australia (FFS component of MBS)
2	Pay-for-Reporting	Data submission incentives; quality measurement without financial consequences	Australia (PIP QI incentive; MyMedicare); India (PMJAY 5-KPI framework)
3	Shared Savings	Upside-only or two-sided risk; benchmarked against historical spending	U.S. (MSSP; ACO REACH); Australia (PHN outcomes commissioning pilots)
4	Bundled/Episode	Single payment for defined care episodes; risk-adjusted target pricing	U.S. (BPCI Advanced; Transforming Episode Accountability Model [TEAM] 2026–2030); India (PMJAY package rates as nascent bundles*)
5	Full Capitation / Population Health	PMPM payment for total cost of care; provider accepts full actuarial risk	U.S. (ACO REACH CKCC track); aspirational for Australia and India

Note: India's Level 4 positioning is nascent. PMJAY package rates fix payment per procedure—a precondition for bundled payment—but the current implementation lacks the risk-adjusted episode definition and quality-linked reconciliation that characterise full Level 4 models.

The Maturity Model's five levels correspond broadly to the Health Care Payment Learning and Action Network (HCP-LAN) Alternative Payment Model categories: Level 1 maps to LAN Category 1 (FFS with no link to quality); Levels 2–3 map to LAN Categories 2–3 (FFS linked to quality and APMs built on FFS architecture); and Levels 4–5 map to LAN Category 4 (population-based payment) (HCP-LAN, 2025). The crosswalk is intentional—it reduces "new taxonomy" concerns while preserving the Maturity Model's emphasis on actuarial risk transfer depth, which the LAN framework treats less explicitly.

A critical question the Maturity Model raises but does not answer in isolation is: what must be solved before a system can safely transition between levels? Advancing without addressing prerequisites risks collapsing Resilience—a pattern visible in CMMI's experience of model proliferation without standardisation. The following table maps the binding prerequisites for key transitions:

Table 1A: Risk Transfer Prerequisites for VBC Maturity Transitions

Transition	Binding Prerequisite	ARCH Dimension Affected	Country Most Relevant
Level 1 → 2 (FFS → Reporting)	Minimum data infrastructure for quality measurement; provider registry	Capacity	India (ABHA/NHCX adoption)
Level 2 → 3 (Reporting → Shared Savings)	Valid risk adjustment at individual level; historical benchmark stability	Adequacy, Capacity	Australia (no individual risk scoring in PHI)
Level 3 → 4 (Shared Savings → Bundled)	Episode definition with clinical consensus; risk-adjusted target pricing that covers actual cost	Adequacy	India (42% of PMJAY packages priced below cost at inception)
Level 4 → 5 (Bundled → Full Capitation)	Actuarial certification of capitation rates; stop-loss/reinsurance markets; mature causal evaluation	Resilience	U.S. (Actuarial Standards of Practice [ASOP] 49 infrastructure exists); aspirational for others

The table makes explicit what the Maturity Model's level descriptions leave implicit: each transition carries a risk transfer that requires specific ARCH conditions to be met. A system that advances in maturity without satisfying these prerequisites does not achieve genuine VBC—it transfers risk to entities not equipped to bear it.

The Maturity Model describes *where* each system stands. The question it does not answer is *whether* each system is structurally capable of progressing further—and sustainably. That is the question the ARCH framework addresses. The remainder of this paper applies both frameworks to three health systems, examines the actuarial modelling capabilities required to operationalise them, and stress-tests them against the two most significant emerging challenges in health economics: the prevention financing gap and the GLP-1 pharmaceutical cost shock.

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4. Comparative Health Financing Landscapes

4.1 Australia: Medicare, PHI, and the Prevention Deficit

Australia's health system blends universal public coverage through Medicare with a substantial private health insurance (PHI) sector. Total health expenditure reached A$270.5 billion in 2023–24, or A$10,037 per capita, representing 10.1% of GDP (AIHW, 2025a). Federal and state governments together funded approximately 70% of total expenditure. Per-person expenditure in real terms decreased by 1.3%, reflecting rapid population growth and a tightening fiscal environment (AIHW, 2025b).

The PHI sector has reached a participation milestone: 45.2% of Australians now hold hospital cover—a record high driven by post-pandemic concerns about public hospital wait times (APRA, 2025a). Under Australia's community-rating regime, insurers cannot price based on health status, creating a structural reliance on risk equalisation transfers to compensate funds with older, higher-claiming member pools. This mechanism now accounts for 49% of total hospital claim costs, up from 37% in 2005—a trajectory the Actuaries Institute describes as "quiet structural pressure" (Actuaries Institute, 2025a; APRA, 2025b).

The 2025–26 Budget committed A$7.9 billion—the largest single investment in Medicare since its 1984 creation—to expand bulk billing incentives, targeting nine in ten GP visits bulk-billed by 2030 (Australian Government, 2025). Despite this investment, prevention spending remains at just 2.9% of total government health expenditure, well below the National Preventive Health Strategy's target of 5% by 2030 (AIHW, 2025c). Chronic conditions consumed A$98 billion (54% of disease-related spending), while potentially avoidable risk factor spending totalled A$38 billion.

The actuarial sustainability challenge in Australia is not one of near-term insolvency but of structural trajectory. Demographic ageing will raise the proportion of Australians aged 65 and over from approximately 17% today to an estimated 23% by 2050, while per capita health expenditure for those aged 85 and over is approximately four times that of those aged 45 to 54. Section 9 examines this dynamic through the AN-ACC aged care reform as a worked example of actuarial-led pricing redesign.

ARCH Implication. Australia scores 7.5/10 on Adequacy (universal Medicare base) but only 5.5/10 on Horizon. The prevention spending deficit is not merely a public health shortfall; viewed through the ARCH lens, it is a latent Horizon risk being deferred rather than resolved—an investment gap today that compounds into a financing crisis over the next two decades. Between 2024 and 2050, the aged dependency ratio will shift from approximately 27 dependents per 100 working-age Australians to an estimated 38—a 41% increase in demographic pressure on the health financing base (Australian Treasury, 2023). The underlying mechanism is an intergenerational fiscal transfer: Australians aged 65 and over are net beneficiaries of health, aged care, and pension spending, while the working-age cohort (25–64) is the net taxpayer base. As the ratio shifts, the per-capita tax burden on the working-age cohort rises, creating political pressure on the very health expenditure commitments that Adequacy depends on.

4.2 United States: The VBC Laboratory

The United States operates the highest-spending health system globally and among the most extensive laboratories for value-based care experimentation. National health expenditure reached $5.28 trillion in 2024 (18.0% of GDP), growing 7.2% year-over-year (CMS, 2026a). Projected spending will reach $8.58 trillion by 2033 (20.3% of GDP) (Poisal et al., 2025). A pivotal shift has occurred within Medicare, with 55% of eligible beneficiaries now enrolled in Medicare Advantage plans as of 2025, leading to a projected $615 billion in payments to MA plans for 2026 (MedPAC, 2026). However, Medicare spends approximately 14% more per enrollee in MA than it would in traditional fee-for-service, translating to approximately $76 billion—roughly 14% of the equivalent fee-for-service cost base—primarily attributable to coding intensity and favourable selection (MedPAC, 2026).

The Medicare Shared Savings Program (MSSP) delivered record results in 2024: $6.58 billion in gross savings and $2.48 billion in net savings across 476 ACOs covering 10.3 million beneficiaries—an average savings rate of 4.71% (CMS, 2025a). Since 2012, ACOs have generated $35 billion in cumulative gross savings. Two-thirds of ACOs now operate in enhanced downside-risk tracks generating 82% of total savings. Three design principles emerge as transferable: physician-led ACOs consistently outperform hospital-led ACOs in per-capita savings; meaningful savings emerge only when providers accept genuine financial risk; and the CMS-HCC V28 transition—expanding from 86 to 115 hierarchical condition categories while removing approximately 2,000 ICD-10 codes from risk-adjustable pools—creates benchmarking challenges that require actuarial recalibration (CMS, 2024).

A deeper reading of the U.S. ARCH paradox runs through Goodhart’s Law: when a metric becomes a target, it ceases to function as a metric. VBC targets utilisation, but U.S. health inflation is driven predominantly by unit prices, not units of service. ACO capital requirements and reporting burdens have accelerated provider consolidation — independent physicians have sold to hospital systems and private-equity aggregators, and the resulting localised pricing power has absorbed much of the utilisation savings VBC was designed to generate. The approximately $76 billion per-year Medicare Advantage overpayment (MedPAC, 2026) reflects the same dynamic on the coding side: risk-score intensity is the metric, so risk-score intensity is what gets optimised, independent of underlying clinical acuity. For the ARCH diagnostic, this sharpens the maturity-versus-sustainability distinction: Level 5 capitation without concurrent anti-gaming machinery — prospective risk-score audits, consolidation-aware benchmarking, and unit-price-based rather than utilisation-based benchmarks — is not progress up the maturity ladder but a faster route to the Horizon problem it purports to solve.

However, the VBC trajectory is not linear. In March 2025, CMMI terminated four payment models and restructured its portfolio (CMS, 2025b). CMMI Director Abe Sutton announced the abandonment of the previously stated goal to place all fee-for-service Medicare beneficiaries under accountable care arrangements by 2030 (Hall Render, 2025). For Australian and Indian actuaries, the transferable lesson is that model proliferation without standardisation creates administrative drag that can consume a substantial portion of the efficiency gains VBC is designed to deliver—healthcare administrative costs in the U.S. represent approximately 34% of total expenditure (Himmelstein et al., 2020).

ARCH Implication. The United States scores highest on Capacity (8.0/10) and Resilience (7.0/10) but lowest on Horizon (4.0/10). This is not a paradox—it reflects that VBC model sophistication and long-run fiscal sustainability are related but distinct properties. The U.S.

has built among the most advanced VBC architectures globally but has not yet solved the underlying financing sustainability problem that architecture was intended to address.

4.3 India: The Emerging Giant

India's health economy is defined by scale, speed of transformation, and persistent structural gaps. Total health expenditure reached ₹9.04 lakh crore (~US$108 billion), representing 3.83% of GDP in 2021–22 (NHSRC, 2024). Government health expenditure has risen sharply from 1.28% of GDP in 2018–19 to 1.9% in 2023–24, growing at a CAGR of 15.8% (in nominal rupee terms) (PIB, 2025). The 2026–27 Union Budget allocated ₹1,06,530 crore to the Ministry of Health and Family Welfare, a 10% increase over the previous year (PIB, 2026a). Out-of-pocket expenditure declined from 64% to 39.4% of total health expenditure—though this remains more than double the global average.

The Pradhan Mantri Jan Arogya Yojana (PMJAY), the world's largest government-funded health insurance scheme, has issued over 43.52 crore Ayushman cards, authorised 9.84 crore hospital admissions worth over ₹1.40 lakh crore, and saved beneficiaries an estimated ₹1.25 lakh crore in out-of-pocket expenses (PIB, 2026b). IRDAI's sweeping 2024–25 reforms—replacing 37 regulations with 7 consolidated ones—signal a structural modernisation of the insurance sector. Insurance penetration at 3.7% of GDP remains dramatically below the global average of 7.3% (IRDAI, 2025).

The Ayushman Bharat Health Account (ABHA) has registered 73.98 crore accounts with 49.06 crore health records linked (PIB, 2024). The National Health Claims Exchange (NHCX) is designed to standardise claims exchange across hospitals, insurers, and third-party administrators; government reporting indicates over 41,000 hospitals onboarded, though independent reporting suggests adoption among private integrators remains limited (PIB, 2026c). The 2026 NHCX Innovation Meet at IIT Hyderabad showcased technical solutions for persistent interoperability barriers—including legacy-system-to-FHIR converters and PDF-to-insurance-plan microservices—but private hospitals remain hesitant due to the operational burden of ABDM certification and the complexity of managing asynchronous API workflows without increasing clinician time-on-task (ABDM, 2026).

This digital infrastructure represents latent capacity for VBC contracting at scale, but two concrete prerequisites must be met before that capacity becomes operational: first, NHCX claims exchange must achieve meaningful private hospital participation (currently concentrated in government facilities), supported by transaction-driven incentive schemes such as the Digital Health Incentive Scheme (DHIS); and second, PMJAY must introduce individual patient risk scores for at least a subset of high-cost chronic disease procedures, building on the ABHA data layer to move beyond uniform package rates. PMJAY's Health Benefit Package has undergone five revisions, evolving from uniform national rates to differential pricing with evidence-based Health Technology Assessment. At inception, approximately 42% of packages were priced below 50% of actual service cost—a structural deficiency that suppressed utilisation of needed care (Angell et al., 2024). Subsequent revisions introduced differential pricing by city tier and care level, along with 10–15% incentives for NABH-accredited and teaching hospitals.

ARCH Implication. India's relatively strong Horizon score (6.0/10) against weak Adequacy (4.0/10) and Resilience (3.5/10) scores reflects the demographic dividend window—the period during which the working-age population is large relative to dependents. The ARCH framework's policy implication for India is clear: invest in Adequacy and Capacity now, while the Horizon score allows it, rather than waiting until demographic pressure forces costly catch-up investment.

4.4 Comparative Summary

Table 2: Cross-System Financing Comparison *(Data as of: Australia FY2023–24; United States CY2024; India FY2021–22)*

Metric	Australia	United States	India
Total health expenditure	A$270.5B (10.1% GDP)	$5.28T (18.0% GDP)	₹9.04L Cr (3.83% GDP)
Out-of-pocket share	~20%	~11%	39.4%
Prevention spend (% govt health)	2.9%	~2.7% (under threat)	Minimal
Key structural constraint	Ageing trajectory; prevention deficit	Trust Fund solvency; 20% GDP horizon	Coverage gaps; OOPE burden
VBC Maturity Level	Level 1–2	Level 2–5	Level 1–2 (nascent Level 4)

5. The ARCH Diagnostic: Scoring Three Systems

The preceding country profiles established the structural financing landscape. This section asks the next question: how do those differences translate into comparative sustainability when assessed through a unified actuarial diagnostic?

Before reading the scores below, two reminders on what they are and are not. First, ARCH values are ordinal band assignments on a 0–10 scale, not calibrated point estimates; the framework's primary value lies in dimensional diagnosis—identifying which financing constraint is binding for each system—rather than in aggregate ranking, and composite scores should not be over-interpreted. Second, as a directional external check, the Horizon scores in Table 3 are consistent with independent long-run pressure indicators: countries scoring lower on Horizon (United States, Australia) correspond to systems with higher projected long-run health expenditure growth in OECD and IMF fiscal-pressure assessments, while India's relatively higher Horizon band reflects its earlier demographic position. This is supportive, not validating; formal calibration against external projections is left to subsequent work.

Table 3: ARCH Framework—Illustrative Band Assignments on a 0–10 Ordinal Scale *(Scored March 2026; indicator sources detailed in Appendix A. Values are ordinal band assignments on a 0–10 scale, not calibrated statistical estimates; a half-point round-half-up convention applies to dimension and overall scores, and the composite is the equal-weighted mean of the four dimensional bands)*

Dimension	Australia	United States	India	Key Constraint

Dimension	Australia	United States	India	Key Constraint
Adequacy	7.5 / 10	5.5 / 10	4.0 / 10	Coverage gaps; OOPE burden
Resilience	6.5 / 10	7.0 / 10	3.5 / 10	Reserve buffers; appropriation risk
Capacity	6.0 / 10	8.0 / 10	4.5 / 10	GP shortfall; data maturity
Horizon	5.5 / 10	4.0 / 10	6.0 / 10	Ageing trajectory; Trust Fund risk
Overall	**6.4 / 10**	**6.1 / 10**	**4.5 / 10**	—

The ARCH scores reveal a finding not immediately apparent from the VBC Maturity Model alone: the United States, furthest along the VBC maturity continuum, has the weakest Horizon score. This is the central insight—that VBC sophistication and fiscal sustainability are related but distinct properties.

The purpose of ARCH is not to rank systems but to identify the binding constraint that determines the next feasible policy step. For Australia, that constraint is Horizon—prevention investment and workforce capacity. For the United States, it is also Horizon—but driven by financing sustainability rather than prevention. For India, the binding constraints are Adequacy and Resilience—coverage depth and risk adjustment capability must be addressed before VBC maturity can advance.

For Australia, the ARCH diagnostic identifies Horizon as the primary concern. The projected GP shortfall of 6,100–8,900 FTE by 2048 is a Capacity constraint that limits achievable VBC sophistication in primary care regardless of payment model design (Dept. of Health & Aged Care, 2024). This means that even a well-designed move up the VBC Maturity Model could stall without parallel workforce investment.

One-way sensitivity tests over indicator weights confirm that the country rankings on individual dimensions are robust to plausible alternative normative weights: Australia's Adequacy advantage, the U.S. Horizon vulnerability, and India's Resilience deficit persist across tested scenarios. The overall composite scores are more sensitive to weighting choices, reinforcing that ARCH's primary value lies in dimensional diagnosis rather than aggregate ranking.

To illustrate how ARCH might be operationalised, consider Australia's Resilience dimension in detail. The system absorbed the COVID-19 shock with relative structural integrity, supported by fiscal capacity and a functioning universal coverage base. But the GLP-1 cost shock tests a different kind of resilience: not a temporary demand surge but a permanent upward shift in pharmaceutical expenditure with uncertain long-horizon offset. The actuarial question is whether PHI risk equalisation mechanisms and Pharmaceutical Benefits Scheme (PBS) pricing arrangements can absorb this shift without triggering affordability-driven membership attrition—a question that links Resilience directly back to Adequacy through the community-rating architecture.

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6. Actuarial Modelling for Value-Based Care

If the ARCH diagnostic identifies where systems are vulnerable, the next question is whether each system possesses the actuarial and data capabilities needed to mitigate those vulnerabilities. Operational VBC requires three core capabilities: dynamic risk adjustment, stochastic scenario simulation, and causal programme evaluation. The three systems are at very different points of readiness on each.

Table 4: Actuarial Modelling Readiness by System and Capability

Capability	Australia	United States	India
Dynamic risk adjustment	AN-ACC (aged care) is structurally advanced; PHI relies on community rating + risk equalisation rather than individual risk scoring	CMS-HCC V28 is the global benchmark; ML models (Franklin) emerging; SDOH integration under active research	No individual risk scoring; PMJAY package rates lack acuity adjustment; ABHA data layer exists but is not yet actuarially exploited
Stochastic scenario simulation	Applied to pandemic modelling (SVEI3RD compartmental model); GP workforce projection; nascent in PHI capital modelling	Mature: Monte Carlo for ACO risk corridors, stop-loss design, capitation rate-setting (ASOP 49); extensive commercial actuarial infrastructure	Minimal: scenario simulation capacity constrained by limited claims data history and actuarial workforce depth
Causal programme evaluation	Limited: PIP QI and MyMedicare lack formal causal evaluation designs; Institute advocacy for stronger evaluation	Among the most advanced globally: propensity score matching, DiD, TMLE applied to MSSP, BPCI, ACO REACH programme evaluations	Emerging: PMJAY evaluations rely on descriptive utilisation data; no formal causal programme evaluation infrastructure yet

6.1 Dynamic Risk Adjustment

Risk adjustment has evolved from simple demographic correction in the 1980s to sophisticated diagnosis-based predictive systems. The CMS-HCC V28 transition represents the most significant recalibration in a decade, expanding from 86 to 115 hierarchical condition categories and aligning with ICD-10-CM clinical precision (CMS, 2024). Recent research demonstrates that machine learning models—such as the “Franklin” risk adjustment model—significantly improve predictive accuracy compared to traditional HCC methods, ingesting total diagnostic profiles and accounting for complex non-linear interactions among codes (PubMed Central, 2025).

In Australia, the AN-ACC model for residential aged care takes a structurally different approach: a hybrid facility–individual classification system with 13 classes, priced at A$280.01 per National Weighted Activity Unit (NWAU) as of October 2024, incorporating functional assessment through independent Assessment Management Organisations—a feature that removes provider incentives for over-classification (IHACPA, 2024). India’s PMJAY operates without individual risk scoring; at inception, approximately 42% of packages were priced below 50% of actual cost, creating incentives to under-serve PMJAY patients (Angell et al., 2024).

SOA research (2025) demonstrates that social determinants of health (SDOH) factors improve model fit most for populations with below-average morbidity risk and above-average social risk—precisely the populations that risk adjustment must protect to ensure VBC equity (SOA, 2025).

6.2 Scenario Simulation

Monte Carlo simulation enables actuaries to generate full probability distributions of financial outcomes—essential for VBC contracts that transfer financial risk to providers. Key applications include shared savings upside/downside modelling, catastrophic reserve requirements for risk-bearing providers, and stop-loss reinsurance design for ACOs (Bednar, 2017). The COVID-19 pandemic exposed a critical gap between traditional actuarial reserving and extreme event modelling. The SVEI3RD compartmental model, demonstrated using Victoria, Australia COVID-19 data, separates infectious states into asymptomatic, mild, and severe/ICU substates—enabling more accurate insurance benefit calculations than standard SIR models (Feng et al., 2024).

Australia's projected GP shortfall of 6,100–8,900 FTE by 2048 illustrates how scenario simulation informs the ARCH Capacity dimension: workforce availability determines which tier of the VBC Maturity Model is operationally achievable in primary care (Dept. of Health & Aged Care, 2024).

6.3 Causal Programme Evaluation

Machine learning adoption among actuaries has more than doubled, from 16% to 40% between 2019 and 2023 (SOA, 2023). Gradient boosting and random forest algorithms now complement traditional generalised linear model (GLM)-based pricing models, while causal inference methods—propensity score matching, difference-in-differences, targeted maximum likelihood estimation—are essential for VBC programme evaluation. Capitation rate development follows a structured actuarial process codified in ASOP No. 49, where a 2% pre-tax underwriting margin yields approximately 62% probability of profitability—illustrating that risk transfer under capitation is genuine, not notional (Gibson et al., 2019).

Implication. If actuaries are to move from measurement to architecture, capability building must focus on three fronts: incentive-compatible risk adjustment that does not reward gaming, shock modelling for contracts and budgets under tail-risk scenarios, and credible counterfactual evaluation that can distinguish programme effect from secular trend. Table 4 shows that none of the three systems has achieved maturity across all three capabilities simultaneously.

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7. Prevention Economics: The Productivity Dividend

Modelling capability is necessary but not sufficient: systems also need investment in prevention to shift the disease trajectory that ARCH's Horizon dimension measures. This section examines why prevention remains systematically underfunded and how the Behavioural Adjustment Factor (BAF) framework quantifies the gap between trial promise and population reality.

7.1 The Prevention Spending Gap

The "productivity dividend" of prevention—the measurable gains in reduced acute care costs, avoided disability payments, and increased labour force participation—remains largely uncaptured. Australia's 2.9% of government health spend on prevention falls well below its own NPHS target of 5% by 2030, with no measurable progress since the strategy's 2021 launch (AIHW, 2025d). In the United States, each National Diabetes Prevention Program enrollee achieved an average reduction of $4,552 in two-year direct medical costs, with 88% probability that enrolment saved money (Zhuo et al., 2025). Yet the proposed 2025 federal budget would eliminate the CDC's National Center for Chronic Disease Prevention entirely (HHS, 2025). India has minimal formal prevention infrastructure but a massive untapped opportunity (Nanda, 2026a).

Three structural features explain the financing gap: the *discount rate problem* (prevention investments yield avoided costs distributed over decades, which annual insurance contracts and three-year political cycles systematically underweight); the *attribution problem* (the insurer that pays for prevention today may not capture the financial benefit as individuals move between funds); and the *measurement problem* (the counterfactual is inherently unobservable). The health economics literature identifies these collectively under the "wrong-pocket" phenomenon: the entity that bears the cost of prevention is frequently not the entity that captures the downstream savings, creating systematic underinvestment even when clinical effectiveness is high (Alami et al., 2023). Actuarial methods for long-horizon present value calculation and causal inference are directly applicable to all three barriers—and the wrong-pocket framing provides the policy rationale for the PHI risk equalisation mechanism proposed in the Conclusion.

7.2 The Behavioural Adjustment Factor: Quantifying Intervention Impact

Section 7.2 operationalises ARCH's Horizon dimension by quantifying the behavioural leakage between clinical-trial efficacy and population-scale effect. The author's BAF framework addresses a fundamental challenge in prevention actuarial modelling: stated behaviour change in clinical trials rarely translates fully to real-world population-scale interventions. The BAF breaks the intervention journey into four sequential stages—Reach, Engagement, Clinical Translation, Durability—and applies a discount factor at each stage reflecting real-world effectiveness versus trial efficacy:

BAF = 1 − (R × E × C × D)

A higher BAF indicates greater erosion of trial efficacy in real-world implementation: a BAF of 0.916 means 91.6% of the trial benefit is lost through cumulative leakage across the four stages. The composite product R × E × C × D represents the fraction of trial efficacy that survives to population-level impact.

Table 5: BAF Waterfall—Diabetes Prevention Illustration

Stage	Factor	Assumed Rate	Cumulative Product	Meaning
Reach	R	0.40	0.400	40% of eligible population contacted
Engagement	E	0.60	0.240	60% of those contacted complete programme
Clinical	C	0.70	0.168	70% of trial clinical effect

Stage	Factor	Assumed Rate	Cumulative Product	Meaning
Translation				replicated
Durability	D	0.50	0.084	50% of effect sustained at three years
BAF			**1 − 0.084 = 0.916**	**91.6% of trial benefit lost**

Effective population-level risk reduction: 58% × (1 − 0.916) = 4.9% (base-case scenario illustration under the parameters of Table 5; Table 5A below shows this figure ranging from 2.3% to 7.8% across delivery archetypes, and the Limitations section records that population-scale empirical calibration remains outstanding)

The BAF parameters above are illustrative point estimates. To move toward empirical calibration, the table below shows plausible BAF ranges across three clinical delivery archetypes, reflecting how programme design choices alter the leakage profile:

Table 5A: BAF Sensitivity by Delivery Archetype

Delivery Archetype	R (Reach)	E (Engagement)	C (Clinical Translation)	D (Durability)	Composite (R×E×C×D)	Effective Risk Reduction
Digital health (app-based, remote)	0.55–0.65	0.35–0.45	0.60–0.70	0.35–0.45	0.040–0.092	2.3%–5.3%
In-person coaching (clinic-based)	0.30–0.40	0.60–0.70	0.70–0.80	0.50–0.60	0.063–0.134	3.7%–7.8%
Community health worker (outreach)	0.50–0.60	0.50–0.60	0.55–0.65	0.40–0.50	0.055–0.117	3.2%–6.8%

The pattern is instructive: digital programmes achieve higher reach but lower engagement and durability; in-person coaching achieves the highest composite effectiveness but at lower reach; community outreach balances both but with lower clinical translation fidelity. The choice of delivery archetype is therefore an actuarial variable, not merely a clinical one—and optimal programme design may involve hybrid architectures that maximise the composite product rather than any single stage.

The collapse from 58% trial efficacy to 4.9% real-world effectiveness under the base-case assumptions is the central problem that actuarial prevention models must address. The archetype sensitivity analysis (Table 5A) shows this figure ranging from 2.3% to 7.8%

depending on delivery design—but the base case remains the benchmark against which programme design choices should be evaluated. The simulation framework, calibrated using Medical Expenditure Panel Survey (MEPS) and National Health and Nutrition Examination Survey (NHANES) data, reveals that early and adaptive interventions consistently dominate delayed or high-cost, low-impact programmes. Critically, preliminary analysis from the author's ongoing work suggests an approximately 32% ROI equity gap across income strata, with full peer-reviewed results forthcoming in the British Actuarial Journal (Nanda, 2026b). The lowest-income quintile receives significantly less value from identical intervention programmes due to lower reach, engagement, and adherence sustainability. This finding has direct implications for ARCH's Adequacy dimension: risk adjustment models that ignore behavioural response heterogeneity will systematically under-compensate providers serving disadvantaged populations, creating a structural link between prevention equity and system-level sustainability.

Methodological note. The BAF as presented above treats R, E, C, and D as independent factors — a simplification that understates real-world covariance. Patients most easily reached (high R) are systematically the most health-literate and motivated, so engagement and durability are not independent draws; they are conditional on the selection pattern produced by outreach design. A more rigorous statement of the framework is $P(impact) = P(R) \times P(E \mid R) \times P(C \mid R, E) \times P(D \mid R, E, C)$, acknowledging that Healthy-Adherer bias compounds across the waterfall rather than being averaged out of it. The simpler multiplicative form is retained in this paper because the current parameter set is illustrative, not empirically calibrated; the conditional reformulation, together with programme-specific covariance estimation, is pursued in the author's forthcoming British Actuarial Journal paper (Nanda, 2026b). The practical implication for ARCH is that Horizon scores that treat intervention benefits as independent multiplications of trial efficacy will systematically overstate real-world sustainability gains; BAF is the diagnostic that quantifies this overstatement and therefore forms the actuarial link between intervention design and long-horizon fiscal sustainability.

Implication. Prevention ROI is not only about clinical efficacy; it is about operational execution and adherence dynamics—which are measurable, modelable, and contractible if data systems support it. The BAF framework converts what is often treated as a qualitative implementation concern into a quantitative actuarial parameter.

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8. The GLP-1 Stress Test: Cross-System Resilience

If prevention economics tests ARCH's Horizon dimension, the GLP-1 pharmaceutical shock tests Resilience—and the interaction between the two.

On 20 March 2026—two months before this conference—semaglutide's patent expired in India, opening the market to what reports indicate are more than fifty generic manufacturers at initial pricing of ₹3,500–5,000/month (NDTV Profit, 2026; Reuters, 2026). This single event crystallises the GLP-1 receptor agonist challenge for health system financing—among the most significant emerging pharmaceutical cost pressures since the HIV treatment era, and a revealing stress test of each system's resilience under the ARCH framework.

In the United States, CMS has announced the “Medicare GLP-1 Bridge” programme for 1 July 2026 through 31 December 2026, transitioning to the BALANCE (Better Approaches to Lifestyle and Nutrition for Community and Equity) Part D model announced for January

2027—though given CMMI's March 2025 precedent of terminating models mid-stream, the actuarial audience should note implementation risk (CMS, 2026b; CMS, 2026c). GLP-1 claims rose from 6.9% to 10.5% of employer drug claims between 2023 and 2025, with projected premium increases of 6.1–13.8% (BCBS Association, 2025). Health Affairs estimates that expanded Medicare coverage of anti-obesity medications could increase annual spending by $3.1–6.1 billion (Sood et al., 2024). In India, the 50–60% price reduction from generic entry still leaves semaglutide at approximately 18% of median monthly income (Nanda, 2026a). In Australia, obesity costs the health system approximately A$7 billion annually, yet implementation of the National Obesity Strategy 2022–2032 has lacked dedicated prevention funding (AIHW, 2025e).

The year 2026 marks an inflection point for GLP-1 accessibility with the debut of oral formulations—Novo Nordisk's oral semaglutide received late-2025 approval, and Eli Lilly's orforglipron is anticipated for 2026 approval (Novo Nordisk, 2025). Oral medications eliminate cold-chain logistics requirements and needle-hesitancy barriers, potentially expanding use to paediatric populations and areas without refrigeration infrastructure.

The actuarial modelling challenge across all three markets is structurally similar: balancing upfront pharmaceutical spend against long-horizon reductions in diabetes, cardiovascular, and musculoskeletal conditions using BAF-calibrated adherence assumptions. The clinical evidence base is strengthening: the SELECT trial (NEJM, 2023) demonstrated that semaglutide reduced major adverse cardiovascular events in overweight and obese patients without diabetes, providing the strongest evidence to date for long-horizon cardiovascular offsets (Lincoff et al., 2023). However, real-world adherence and pricing dynamics will determine whether these clinical benefits translate to actuarial value at the system level—a distinction the BAF framework is designed to quantify.

Table 6: GLP-1 ARCH Stress Test—Impact by System

ARCH Dimension	Australia	United States	India
Resilience	Moderate pressure: PBS pricing controls provide buffer, but absence of integrated obesity strategy leaves system reactive	Moderate-to-high pressure: Medicare coverage creates immediate fiscal exposure; employer premium spiral risk	Severe without income support: generic entry reduces unit cost but population-scale affordability remains binding
Horizon	Potentially favourable if offsets materialise: A$7B obesity cost base suggests significant downstream savings	Mixed: 20% reduction in major adverse cardiovascular events (SELECT trial (Lincoff et al., 2023)) compelling, but sustainability contingent on adherence durability and coverage scope	Favourable in long run: 77–101M diabetics represent enormous addressable disease burden if access barriers are resolved

Implication. GLP-1s illustrate why Resilience and Horizon must be analysed together: annual budgets absorb pharmaceutical costs now; cardiovascular and metabolic offsets, if real, arrive later under uncertain adherence. The actuarial profession's distinctive contribution is modelling this temporal mismatch as a present-value problem with distributional uncertainty—precisely the kind of analysis that conventional budget scoring misses.

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9. Case Study: Australia’s Aged Care Actuarial Transformation

The replacement of the Aged Care Funding Instrument (ACFI) with AN-ACC on 1 October 2022 represents a landmark actuarial-led pricing reform in Australian social policy. The AN-ACC model links government subsidy to resident and service characteristics through 13 classification classes, with independent Assessment Management Organisations removing provider incentives for over-classification (IHACPA, 2024). The AN-ACC price increased to A$280.01 from October 2024—a 13% increase funding the Fair Work Commission’s Stage 3 pay rise and increased minimum care minutes (215 per resident per day) (IHACPA, 2024).

Aged care is Australia’s fourth-largest government expense programme at A$39.2 billion in 2024–25, with cumulative care funding increasing approximately 58% since 2022 (GEN Aged Care Data, 2025). The Actuaries Institute’s 2025 paper on aged care and disability pricing highlighted that competition for resources between the NDIS and aged care programmes has “reportedly negatively affected access for those in schemes paying lower prices”—underscoring the need for actuarial pricing harmonisation across care sectors (Actuaries Institute, 2025b).

ARCH Implication. The aged care–disability interface bears directly on the Capacity dimension: workforce competition between programmes constrains the system’s ability to deliver on its care commitments. With aged care and NDIS together consuming over A$70 billion annually (Dept. of Finance, 2025; GEN Aged Care Data, 2025) and competing for the same personal care workforce, pricing signals in one sector directly affect staffing availability in the other—a dynamic that the projected GP shortfall of 6,100–8,900 FTE by 2048 will intensify. For Australian actuaries, designing cross-sector pricing frameworks that prevent cost-shifting between programmes is not an abstract exercise; it is the most immediate Capacity constraint on VBC maturity advancement in primary and community care.

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10. Conclusion: Toward a Sustainable Health Economy

The Great Recalibration is not a future aspiration—it is an imperative already in motion. Three conclusions emerge from the analysis.

First, maturity is not sustainability. The VBC Maturity Model and ARCH framework together reveal that increasing payment-model sophistication is not the same as ensuring long-run fiscal sustainability. The United States demonstrates this most clearly: among the most advanced VBC architectures globally, yet the weakest Horizon score. India illustrates the converse: modest VBC maturity, but a demographic window that permits proactive investment before pressure intensifies. The country applications are consistent with all three propositions advanced in the Introduction—the divergence of maturity from sustainability (P1), the binding force of workforce and data constraints (P2), and the structural underinvestment in prevention driven by wrong-pocket misalignment (P3)—though formal empirical testing awaits.

Second, actuaries add value through horizon-risk design, not only measurement. The MSSP’s trajectory demonstrates that VBC at scale works when providers accept genuine financial risk and when physician-led accountability structures are preserved. India's PMJAY experience illustrates what happens when payment reform outpaces risk adjustment capability. The BAF framework shows that prevention's productivity dividend can only be captured through models that account for real-world behavioural leakage—the collapse from 58% trial efficacy to 4.9% population-level effectiveness under base-case assumptions, ranging to 2–8% across delivery archetypes. These are design problems, not measurement problems.

Bridge: from diagnostic to design. If ARCH is accepted as a diagnostic, what follows for Australia is concrete. Horizon (5.5/10) is the binding dimension; Adequacy (7.5/10) is structurally vulnerable to prevention under-investment; Capacity (6.0/10) is constrained by workforce supply that no payment-model choice can resolve in the short term. Among existing institutional levers, PHI risk equalisation is the only instrument that already operates across the full privately insured population, already reallocates funds at scale, and is already under actuarial governance — making it the most realistic vehicle for aligning funder incentives with long-horizon prevention outcomes without creating an entirely new financing architecture. The proposal below is the specific institutional form this reasoning implies. It is not the only possible intervention, but it is the one that minimises new legislative machinery while most directly addressing the ARCH Horizon constraint.

Third — and most immediately relevant to this audience — Australia's practical agenda is prevention finance, cross-sector pricing coherence, and behavioural calibration. This paper proposes a two-stage mechanism. *Stage 1* is a PHI-routed pilot fund capitalised at 1% of PHI premium revenue — approximately A$290 million against the 2024–25 base of roughly A$29 billion in private health insurance premiums (APRA, 2025a) — operating through the existing risk equalisation framework. This is the scale a sector operating on 3–5% net margins can absorb without triggering a premium-spiral response, and it is sized as a first stage precisely because it must not do so. *Stage 2* is an aspirational target of 1% of total health expenditure (approximately A$2.7 billion (AIHW, 2025a)), which is the scale at which prevention spending could plausibly move Australia's ARCH Horizon score toward the upper half of the scale within a decade. Stage 2 cannot be carried by the PHI sector alone: it requires Commonwealth co-funding and cross-sector gain-sharing contracts with state hospital systems, because the acute-care savings generated by successful prevention accrue predominantly to the public sector, not to the private funds that financed the intervention. Governance of Stage 2 would require a tri-partite stewardship entity — jointly constituted by the Commonwealth, the private health insurance industry, and state hospital systems, with APRA-led actuarial oversight of counterfactual attribution standards and joint Commonwealth–state accountability for gain-sharing payments — to match the cross-sector character of the savings flow. Under Stage 1, funds that invest in upstream health improvement for their member pools would receive risk equalisation credit; returns would be measured against BAF-calibrated counterfactuals over five-year cycles, with a claw-back provision for programmes that fail to demonstrate measurable chronic disease cost improvement and enhanced credit for those that exceed projections. A remaining adverse-selection risk is that "prevention-active" funds could attract healthier members and inflate apparent performance; the transition from retrospective to prospective, risk-adjusted equalisation (discussed below) is the principal mitigant, because prospective risk scoring credits funds for the morbidity they carry rather than the claims they incur, neutralising the selection advantage.

This prevention fund proposal requires honest acknowledgement of implementation constraints. PHI risk equalisation already operates under structural strain—transfers now represent 49% of total hospital claim costs, up from 37% in 2005, reflecting the progressive ageing of insured pools under community rating. Adding a prevention investment mandate to this mechanism requires careful calibration to avoid amplifying instability: cross-subsidies that already compress insurer margins leave limited room for additional obligations before community rating itself becomes actuarially untenable.

The existing risk equalisation architecture is also retrospective and claims-based, which creates a secondary structural problem: a fund that succeeds in keeping members out of hospital sees its claims—and therefore its equalisation receipts—fall. Under the current design, the mechanism financially penalises the funds it is meant to reward. Operationalising the prevention credit therefore requires a transition from retrospective claims equalisation to prospective, risk-adjusted equalisation, analogous to the CMS-HCC construction described in Section 4.2, in which funds are paid for the risk they manage rather than the claims they incur. This is a non-trivial legislative and actuarial programme in its own right and should be staged alongside the Stage 1 pilot rather than assumed to be in place at launch.

Legislative amendment to the Private Health Insurance Act 2007 would be required, with APRA oversight of fund-level prevention investment accounting and counterfactual attribution standards. The five-year measurement cycle and claw-back provision embedded in the proposal mitigate moral hazard, but they depend on robust counterfactual methodology that does not yet exist at scale in Australia—a gap that actuaries are well placed to close. These are conditions that must be met before the mechanism can operate as designed, not fatal objections to the proposal. A secondary benefit of the prevention fund pilot would be the generation of longitudinal outcome data at the individual member level—data that could serve as the empirical foundation for individual risk scoring in PHI, addressing the Level 2→3 transition prerequisite identified in Table 1A.

If actuaries do not design the next generation of VBC and prevention financing, others will—and may not bring the same discipline to Horizon risk that our profession can. For India, the immediate priority is operationalising ABHA data for individual risk scoring in PMJAY's highest-cost procedure categories—a change that could materially advance genuine Level 3 VBC contracting while the demographic dividend window remains open. *ARCH is offered not as a description of health systems but as a way to diagnose which financing constraint is binding, and therefore which reform step is feasible next, in each.* The ARCH framework is offered as a tool to help move the profession from measuring health system performance to actively shaping it. The actuarial toolkit assembled here—ARCH, BAF, and the risk-transfer prerequisites—is offered as a first generation of design tools, explicitly illustrative and subject to the empirical calibration programme described in the Limitations section. The Great Recalibration needs architects. Actuaries should be first among them.

Key Messages for Australian Actuaries

1. The prevention gap is an ARCH Horizon crisis in slow motion. Australia's 2.9% prevention spend against a 5% target compounds into structural fiscal pressure by 2040: every year of underinvestment deepens the chronic disease cost base that the working-age cohort will eventually finance. Actuaries can model this trajectory now using BAF-calibrated tools, and should be doing so in PHI pricing, long-term care reserving, and government budget advice.

2. PHI risk equalisation is both symptom and lever. At 49% of hospital claim costs, the equalisation transfer currently masks community rating strains from an ageing membership pool—it is a symptom of the Horizon problem. With the right legislative design and actuarial safeguards, the same mechanism could fund prevention investment that offsets that strain over a 5–10 year horizon, converting a symptom into a structural solution. The design challenge is squarely actuarial.

3. The workforce constraint is the binding VBC constraint. No payment model reform advances past Level 2–3 without addressing the projected 6,100–8,900 GP FTE shortfall by 2048. Workforce modelling—translating supply/demand projections into capitation rate feasibility and care coordination capacity estimates—is actuarial work. Actuaries should be at the table in workforce planning, not only in pricing and reserving.

Limitations

Five limitations apply. First, ARCH scores are ordinal assessments—rule-based indicator aggregates informed by observable data but not calibrated statistical estimates; two scorers applying the same indicator set could arrive at modestly different results, especially on Resilience where quantitative benchmarks are sparse. ARCH threshold selection is partly normative and has not yet been validated against historical health-system outcomes. Second, cross-country comparability is constrained by definitional differences in national health accounts (treatment of long-term care, capital expenditure, and informal out-of-pocket spending varies across the three systems), data lags (India's most recent national accounts are 2021–22), and structural non-equivalence (comparing a federated insurance system, a universal tax-funded system, and an emerging mixed system requires interpretive judgement that no scoring methodology can fully resolve). Third, BAF parameters are illustrative; population-scale calibration requires programme-specific reach, engagement, and adherence data that this paper does not generate. BAF should be interpreted as an early-stage conceptual tool, not an empirically validated universal parameter set. Fourth, the GLP-1 policy landscape is evolving rapidly and some claims—particularly regarding the CMS BALANCE/Bridge programme—are based on announced rather than enacted policy. Fifth, the Goodhart's Law interpretation offered in Section 4.2 for the U.S. VBC overpayment pattern is a structural reading that the paper treats as consistent with the observed evidence rather than a formally identified causal mechanism; alternative explanations—including provider consolidation, commercial pricing power, and differential market concentration across plan types—operate in the same direction and are not mutually exclusive with the measurement-system critique, and a full decomposition is beyond this paper's scope.

Ethics and Data Availability

No individual-level patient data were used in this analysis. All data sources are publicly available aggregate national accounts, programme performance reports, and policy documents. Ethics review was therefore not required. Source URLs and access dates are provided in the reference list; an indicator-level source map is presented in Appendix A. For future work involving claims-level data, de-identification standards appropriate to each jurisdiction would apply.

Appendix A: ARCH Scoring Indicators

Dimension	Indicator	Australia	United States	India
Adequacy	Coverage breadth	Universal (Medicare)	92.1% insured	~55% (PMJAY + PHI)
	Benefit design sufficiency	Comprehensive	Plan-dependent	Package-rate limited
	Out-of-pocket burden	~20% of THE	~11% of THE	39.4% of THE
	Provider network access	Adequate; rural gaps	Adequate; narrowing in MA	Severely constrained
Resilience	Reserve adequacy	PHI capital standards (APRA)	RBC + ACA MLR floors	Limited; fiscal buffers thin
	Fiscal buffer capacity	Strong sovereign balance sheet	Debt-constrained; Trust Fund risk	Appropriation-dependent
	Stress-test exposure (GLP-1)	Moderate (PBS controls)	High (Medicare coverage 2026)	High (affordability-gated)
Capacity	Workforce supply projection	GP shortfall 6,100–8,900 FTE by 2048	Adequate aggregate; distribution gaps	0.7 physicians per 1,000 pop
	Data infrastructure maturity	My Health Record (24.2M); 99% GP registration	EHR mandate; FHIR APIs	ABHA (73.98 Cr); NHCX (41K+ hospitals)
	Care coordination capability	Nascent (MyMedicare)	Mature (ACO infrastructure)	Minimal
Horizon	Demographic trajectory	17% → 23% aged 65+ by 2050	Baby-boom ageing through 2029	Demographic dividend window open
	Chronic disease acceleration	54% of disease spending (A$98B)	90% of $4.5T spending	77–101M diabetics; 12–15% medical inflation
	Long-run expenditure path	10.1% → est. 12–13% GDP by 2050	18% → 20.3% GDP by 2033	3.83% GDP; rising but from low base

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