Professional Caregiver Insurance Risk Risk disaggregation and insurer performance, with implications for health care provider insurance risk assumption

Thomas Cox PhD, RN

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2,700,000 Americans lose health insurance
www.HealthCareforAmericaNow.org

Health Insurers Break Profit Records as 2.7 Million Americans Lose Coverage

FEBRUARY 2010

NOT an actuary

NOT in insurance

Registered Nurse

Mathematician

Chartered Property Casualty Underwriter

Licensed health care risk manager

Insurance/Re-insurance ratemaking, reserving, and expense accounting

Professional Caregiver Insurance Risk

Professional Caregiver Insurance Risk refers to the assumption and management of insurance risks by health providers through:

- Global capitation,
- Managed care
- Profit centers
- Employment
- Episode based/DRG/Average cost pricing schemes
- etc

Risk assuming health care providers (RAHCPs) include:

- Hospitals,
- Long term care facilities
- Rehabilitation centers
- Home health agencies
- MDs, RNs, PT, SWs, Psychotherapists
- etc

Efficient producers of goods and services

- Produce highest amounts of goods/services for fixed resources
- All resources used to produce goods/services
- No slack capacity
- Price/Quality competitive in the marketplace

Efficient Insurers

- Produce highest amounts of insurance services for fixed resources
- Uses all available resources to produce insurance services
- No slack capacity
- Price/Quality competitive in the marketplace

Skills required to run insurance operations

- Actuaries: Ratemaking, reserving, forecasting
- Underwriters: Assess risks, assess potential insureds
- Claims management
- Legal
- Financial

Efficient Health Care Providers

- Produce highest amounts of health care services for fixed resources
- Uses all available resources to produce health care services
- No slack capacity
- Price/Quality competitive in the marketplace

Skills needed: MDs, PAs, NPs, RNs, LPNs, CNAs etc

What is not needed $\rightarrow$ inefficient?

- Actuarial, accounting, underwriting specialists/consultants
- Litigation risks due to undisclosed insurance operations
- Reinsurance to cover excessive costs
- Claims management functions

These costs divert resources from optimally efficient production of health services

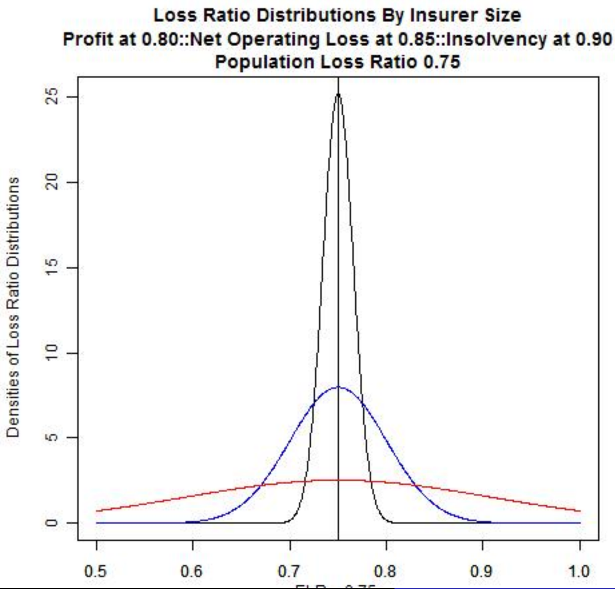
Paradigm Insurer (PI) Operating Assumptions

- All insurers, including risk accepting health care providers, randomly select policyholders
- How far do insurer's LR estimates deviate from the population loss ratio (PLR)?
- Paradigm Insurer's standard error is $s_e = 0.05$
- **Standard error for portfolio size M is: $s_{e_M} = \sqrt{\frac{N_{PI}}{M}} * s_e$**
- Calculate probabilities of other insurers' LRs using s_e
- Larger insurers have smaller s_es $\Rightarrow \widehat{PLR}$ estimates lie closer to the PLR than smaller insurers
- How does portfolio size (s_e) affect operating results for 5 insurers/health providers

During this presentation, PI is viewed both as a risk retaining insurer and as transferring all its insurance risks to smaller, risk assuming health care providers

Normal Distributions - Loss Ratio Distributions

How Standard Errors Vary With Portfolio Size



Paradigm Insurer Operating Assumptions

- Issues policies at 12:00 AM on January 1, 20X1 that end at 12:00 AM on January 1, 20X2
- Writes 1,000,000 policies
- Charges $4,000 per policy
- Earns premiums of $4,000,000,000
- Bears “risk” because its loss ratio is unknown until after 12:00 AM on January 1, 20X2
- Financial outcomes are completely determined by its loss ratio
- Has expected loss ratio (ELR) $0.75 per premium dollar ($3,000,000,000 in losses)
- Has fixed underwriting expenses of $0.15 per premium dollar ($600,000,000 in expenses)
- Has a profit contingency of 5% ($200,000,000)
- Has a risk premium of 5% ($200,000,000)
- Incurs and pays claims of $3,000,000,000 or less (LR = $0.75) from current revenues, and earns profits of at least 10% with probability 0.5000
- Incurs and pays claims of $3,200,000,000 or less (LR = $0.80) from current revenues, and earns profits of at least 5% with probability 0.8413
- Incurs and pays claims of $3,400,000,000 or less (LR = $0.85) from current revenues, and avoids net operating losses with probability 0.9772
- Maintains “surplus” of $200,000,000 which, in combination with its expected loss provision, profit margin, and risk premium, protect it from insolvency with probability 0.9987 (i.e. the solvency standard), allowing it to cover losses as high as $3,600,000,000 (LR = $0.90) at year end
- Becomes insolvent, shuts its doors, and ceases operations when losses exceed $3,600,000,000, occurring with probability 0.0013

Paradigm Insurer Operating Assumptions

- 1,000,000 policies
- \$4,000 per policy
- Expected loss ratio (ELR) \$0.75
- Underwriting expenses \$0.15
- Profit contingency \$0.05 (\$200,000,000)
- Risk premium \$0.05 (\$200,000,000)
- Claims $<$ \$3,000,000,000 $\rightarrow$ UW gain $>$ 10% with probability 0.5000
- Claims $<$ \$3,200,000,000 $\rightarrow$ UW Profit $>$ 5% with probability 0.8413
- Claims $<$ \$3,400,000,000 $\rightarrow$ Avoids net UW loss with probability 0.9772
- Surplus $\rightarrow$ \$200,000,000 protects it from insolvency with probability 0.9987
- Becomes insolvent with probability 0.0013

PIs loss ratios are distributed as N(PLR = 0.75, $s_{e_{1,000,000}}$ = 0.05)

NB: All insurers have identical probabilities (0.5000) that net UW revenues $\geq$ 10% when $LR_N \leq \$0.75$

Since the expected loss ratio ($0.75) for all randomly selected portfolios is the same, all insurers have identical probabilities of net UW revenues $\geq$ 10%

$$
\begin{aligned}
Prob[LR_N \leq \$0.75] &= \Phi\left[\frac{(LR_N - PLR)}{s_{e_N}}\right] \\
&= \Phi\left[\frac{\$0.75 - \$0.75}{s_{e_N}}\right] \\
&= \Phi\left[0\right] \\
&= 0.5000
\end{aligned}
$$

How does profitability vary with portfolio size?

PROBABILITY PROFITS $\geq$ 5% (LR $\leq$ \$0.80) BY PORTFOLIO SIZE

The flaw in all risk transferring health care finance mechanisms is that small insurers face greater risks of adverse financial outcomes than large insurers.

Risk assuming health care providers are less efficient than the insurers they accept risks from, so they must reduce benefits to their patients to compensate for their inefficient insurance operations.

$$\begin{aligned} Prob[LR_N \leq \$0.80] &= \Phi\left[\frac{(LR_N - PLR)}{s_{e_N}}\right] \\ &= \Phi\left[\frac{\$0.80 - \$0.75}{s_{e_N}}\right] \\ &= \Phi\left[\frac{\$0.05}{s_{e_N}}\right] \end{aligned}$$

PROBABILITY PROFITS $\geq$ 5% (I.E. LR $\leq$ \$0.80) BY PORTFOLIO SIZE

PI's probability of earning profits $\geq$ 5% is:

$$
\begin{aligned}
Prob[LR_{1,000,000} \leq \$0.85] &= \Phi\left[\frac{(LR_N - PLR)}{se_{1,000,000}}\right] \\
&= \Phi\left[\frac{\$0.80 - \$0.75}{se_{1,000,000}}\right] \\
&= \Phi\left[\frac{\$0.05}{\$0.05}\right] \\
&= \Phi[1.0000] \\
&= 0.8413
\end{aligned}
$$

Probability of net operating loss (NOL) by portfolio size

All insurers avoid net operating losses when $LR_N \leq 0.85$

The probability that an insurer with N policies in force avoids a net operating loss depends on its standard error:

$$
\begin{aligned}
Prob[LR_N \leq 0.85] &= \Phi\left[\frac{(LR_N - PLR)}{s_{e_N}}\right] \\
&= \Phi\left[\frac{0.85 - 0.75}{s_{e_N}}\right] \\
&= \Phi\left[\frac{0.10}{s_{e_N}}\right]
\end{aligned}
$$

Probability of net operating loss (NOL) by portfolio size

All insurers avoid net operating losses when $LR_N \leq 0.85$

PI's probability of avoiding a net operating loss is:

$$
\begin{aligned}
Prob[LR_{1,000,000} \leq 0.85] &= \Phi\left[\frac{(LR_{1,000,000} - PLR)}{s_{e_{1,000,000}}}\right] \\
&= \Phi\left[\frac{0.85 - 0.75}{s_{e_{1,000,000}}}\right] \\
&= \Phi\left[\frac{0.10}{0.05}\right] \\
&= \Phi[2.0000] \\
&= 0.9772
\end{aligned}
$$

All insurers protect against loss ratios except for probability 0.0013

Each insurer must maintain surplus to cover losses between 0.85 and its solvency preserving loss ratio

PI's solvency preserving surplus requirement is:

$$
\begin{aligned}
Surplus_{1,000,000} &= 1,000,000 * \$4,000 * ((ELR + 3 * s_{e_{1,000,000}}) - 0.85) \\
&= \$4,000,000,000 * ((0.75 + 3 * 0.05) - 0.85) \\
&= \$4,000,000,000 * (0.90 - 0.85) \\
&= \$4,000,000,000 * .05 \\
&= \$200,000,000
\end{aligned}
$$

MAXIMUM SUSTAINABLE BENEFIT

Level of claims insurers can plan to pay and maintain probability of profits $\geq$ 5% at 0.8413

MSB_N **varies by portfolio size (standard error)**

An insurer's MSB is one standard error lower than $0.80:

$$MSB_N = \$0.80 - 1 * s_{e_N} \tag{1}$$

PI's MSB is:

$$\begin{aligned} MSB_{1,000,000} &= \$0.80 - 1 * s_{e_{1,000,000}} \\ &= \$0.80 - 1 * \$0.05 \\ &= \$0.75 \end{aligned}$$

The higher an insurer's standard error, the lower they must set their MSBs to maintain their probability of achieving profits $\geq$ $0.05 at 0.8413

How do insurer operating results vary by portfolio size?

OPERATING CHARACTERISTICS BY PORTFOLIO SIZE

	Paradigm Insurer
(1) Insurer (sample) portfolio size	1,000,000
(2) Standard error of the portfolio mean LR	0.0500
(3) Probability insurer earns profits $\geq$ 5%	0.8413
(4) Probability of no net operating losses	0.9772
(5) Solvency preserving loss ratio	0.9000
(6) Individual insurer's surplus requirement	$200,000,000
(7) Total surplus for 1,000,000 policies	$200,000,000
(8) Maximum sustainable benefits	$0.7500
(9) Maximum average benefit per policyholder	$3,000

Source: Standard Errors: Life, Health & Death When Hospitals, Long Term Care Facilities, Home Health Agencies, Physicians & Nurses Are Insurers.

How do insurer operating results vary by portfolio size?

OPERATING CHARACTERISTICS BY PORTFOLIO SIZE

	National Health Insurer	Insurer B	Paradigm Insurer	Insurer D	Insurer E
Portfolio size	307,000,000	10,000,000	1,000,000	100,000	10,000
Standard error	0.0029	0.0158	0.0500	0.1581	0.5000
P[Profits $\geq$ 5%]	1.0000	0.9992	0.8413	0.6241	0.5398
P[No NOL]	1.0000	1.0000	0.9772	0.7365	0.5793
SPLR	0.7587	0.7976	0.9000	1.2261	2.2557
Surplus	\$0	\$0	\$200,000,000	\$150,440,000	\$56,228,000
Total surplus	\$0	\$0	\$200,000,000	\$1,504,400,000	\$5,622,800,000
MSB	\$0.7971	\$0.7842	\$0.7500	\$0.6419	\$0.3000
Max benefit	\$3,188	\$3,137	\$3,000	\$2,568	\$1,200

Source: Standard Errors: Life, Health & Death When Hospitals, Long Term Care Facilities, Home Health Agencies, Physicians & Nurses Are Insurers.

Operating Characteristics by Portfolio Size

PROBABILITY OF EARNING PROFITS GREATER THAN 5%

Portfolio Size	Standard Error	P[Profits > 5%]
307,000,000	0.0029	1.0000
10,000,000	0.0158	0.9992
1,000,000	0.0500	0.8413
100,000	0.1581	0.6241
10,000	0.5000	0.5398

Source: Standard Errors: Life, Health & Death When Hospitals, Long Term Care Facilities, Home Health Agencies, Physicians & Nurses Are Insurers.

Operating Characteristics by Portfolio Size

PROBABILITY OF AVOIDING NET OPERATING LOSSES

Portfolio Size	Standard Error	Probability No Net Operating Loss
307,000,000	0.0029	1.0000
10,000,000	0.0158	1.0000
1,000,000	0.0500	0.9772
100,000	0.1581	0.7365
10,000	0.5000	0.5793

Source: Standard Errors: Life, Health & Death When Hospitals, Long Term Care Facilities, Home Health Agencies, Physicians & Nurses Are Insurers.

Operating Characteristics by Portfolio Size

SOLVENCY PRESERVING LOSS RATIO
LOSS RATIOS HIGHER THAN THIS
OCCUR WITH PROBABILITY ≤ 0.0013
IN HEALTH CARE SETTINGS THE IMPLICATION IS
AT LEAST 1 PATIENT DID NOT GET NEEDED SERVICES

Portfolio Size	Standard Error	Solvency Preserving Loss Ratio
307,000,000	0.0029	0.7587
10,000,000	0.0158	0.7976
1,000,000	0.0500	0.9000
100,000	0.1581	1.2261
10,000	0.5000	2.2557

Source: Standard Errors: Life, Health & Death When Hospitals, Long Term Care Facilities, Home Health Agencies, Physicians & Nurses Are Insurers.

Operating Characteristics by Portfolio Size

DOLLARS OF SURPLUS REQUIRED
TO AVOID INSOLVENCY WITH PROBABILITY 0.9987

Portfolio Size	Standard Error	Surplus Required To Meet SPLR
307,000,000	0.0029	$0
10,000,000	0.0158	$0
1,000,000	0.0500	$200,000,000
100,000	0.1581	$150,440,000
10,000	0.5000	$56,228,000

Source: Standard Errors: Life, Health & Death When Hospitals, Long Term Care Facilities, Home Health Agencies, Physicians & Nurses Are Insurers.

Operating Characteristics by Portfolio Size

TOTAL DOLLARS OF SURPLUS REQUIRED
TO AVOID INSOLVENCY WITH PROBABILITY 0.9987 FOR 1,000,000 POLICIES

Portfolio Size	Standard Error	Total Surplus
307,000,000	0.0029	$0
10,000,000	0.0158	$0
1,000,000	0.0500	$200,000,000
100,000	0.1581	$1,504,400,000
10,000	0.5000	$5,622,800,000

Source: Standard Errors: Life, Health & Death When Hospitals, Long Term Care Facilities, Home Health Agencies, Physicians & Nurses Are Insurers.

Operating Characteristics by Portfolio Size

DOLLARS OF SURPLUS REQUIRED
TO AVOID INSOLVENCY WITH PROBABILITY 0.9987

Portfolio Size	Standard Error	Maximum Sustainable Benefit
307,000,000	0.0029	0.7971
10,000,000	0.0158	0.7842
1,000,000	0.0500	0.7500
100,000	0.1581	0.6419
10,000	0.5000	0.3000

Source: Standard Errors: Life, Health & Death When Hospitals, Long Term Care Facilities, Home Health Agencies, Physicians & Nurses Are Insurers. ©2010 Thomas Cox PhD, RN

Operating Characteristics by Portfolio Size

MAXIMUM DOLLAR VALUE OF AVERAGE POLICYHOLDER BENEFIT
PROBABILITY OF EARNING PROFITS $\geq$ 5% = 0.8413

Portfolio Size	Standard Error	Maximum Sustainable Benefit
307,000,000	0.0029	0.7971
10,000,000	0.0158	0.7842
1,000,000	0.0500	0.7500
100,000	0.1581	0.6419
10,000	0.5000	0.3000

Source: Standard Errors: Life, Health & Death When Hospitals, Long Term Care Facilities, Home Health Agencies, Physicians & Nurses Are Insurers.

Conclusions

Compared to smaller insurers, large insurers have:

- Higher probabilities of achieving profits $\geq$ 5%
- Higher probabilities of avoiding net operating losses
- Higher probabilities of maintaining solvency
- Lower Solvency Preserving Loss Ratios
- Lower Surplus requirements
- Higher Maximum Sustainable Benefits
- Higher policyholder benefits
- Higher levels of efficiency

Conclusions

Compared to larger risk retaining insurers, risk assuming health care provider have:

- Lower probabilities of achieving profits $\geq 5\%$
- Lower probabilities of avoiding net operating losses
- Lower probabilities of maintaining solvency
- Higher Solvency Preserving Loss Ratios
- Higher Surplus requirements
- Lower Maximum Sustainable Benefits
- Lower policyholder benefits
- Lower levels of efficiency

Conclusions

PI AND RAHCPs WERE PERFECTLY EFFICIENT BEFORE RISK TRANSFER

- PI provides a maximum of \$0.80/premium dollar to risk assuming health care providers to earn profits of 5%
- PI has little motivation to give up a probability of 0.50 of UW gain $\geq$ 10%
- PI only transfers risk if it thinks it can do **much** better
- PI exceeds gains from risk retention if it transfers risks to health care providers for far less than their expected value
- HCPs may bid less than the expected value of their assumed losses - they aren't experts in risk management, economics, or insurance
- PI's profits are \$0.85 - HCP_{Bid} per premium dollar
- All HCPs must target care below the expected value of their assumed losses

RISK TRANSFERS TO HCPs **DO NOT PROMOTE EFFICIENCY** THEY **CAUSE INEFFICIENCY**, REDUCE THE LEVEL OF SERVICES AVAILABLE, AND CANNOT BE COMPENSATED FOR BY ANY METHOD OF RISK ADJUSTMENT BECAUSE THE INEFFICIENCY OF RISK DISAGGREGATION IS TOO SEVERE

Conclusions

PI AND RAHCPS WERE PERFECTLY EFFICIENT BEFORE RISK TRANSFER

- Cause efficient care providers to become inefficient insurers
- Cause efficient care providers to become inefficient care providers
- Reduce the level of health services available per dollar of premium
- Cannot be mitigated by any method of risk adjusted capitation rates
- Cannot be mitigated by any method of reinsurance
- Cannot be mitigated by increased provider efficiency
- Only a return to risk retention by insurers, or true national/state health insurers can restore fiscal efficiency to American health care (finance) systems
- The loss in efficiency due to risk disaggregation is too severe to address