

Reinsurance Solutions

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THE POWER OF INSIGHT.<sup>sm</sup>

**Post-Level Premium Period Experience**  
David N. Wylde, FSA, MAAA

SEAC Spring Meeting, June 16-18, 2010

TRANSAMERICA  
REINSURANCE

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**Transamerica Experience Database – 10 Year Term**

- Database filters
  - Issue years 1993 - 1997
  - Exposure years 1/1/2004 - 6/30/2008
  - Original face amounts \$100,000+
- Experience characteristics
  - Policy years 7 - 16
  - Lapse: \$34 billion exposed with \$10 billion of lapses
  - Mortality: \$32 billion exposed with \$67 million of claims
- Block characteristics
  - 78% male
  - 94% nonsmoker
  - Average issue age 42

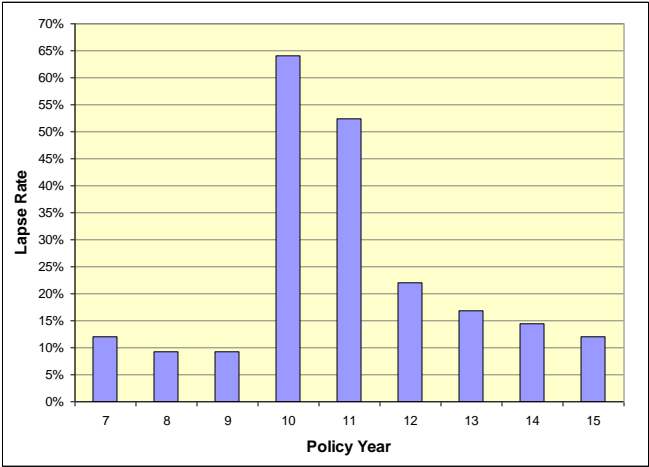
TRANSAMERICA  
REINSURANCE

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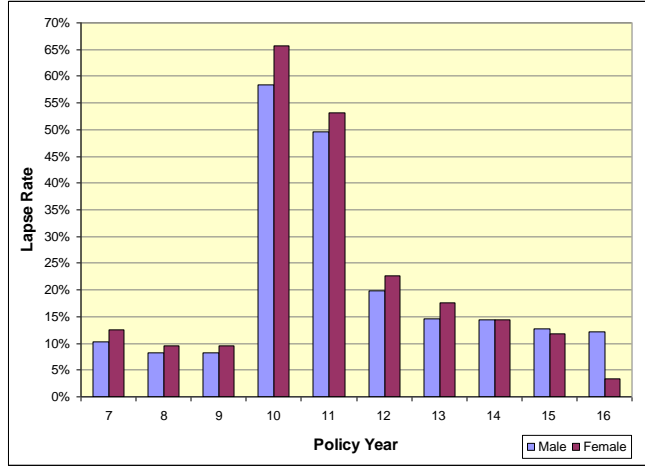
# Lapse Experience



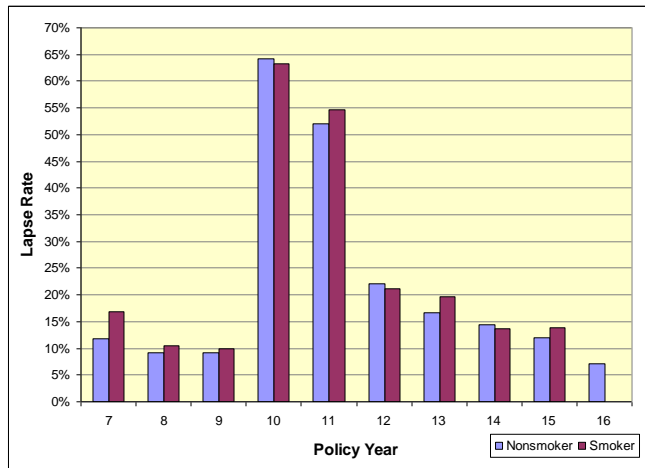
## Lapse Experience – All



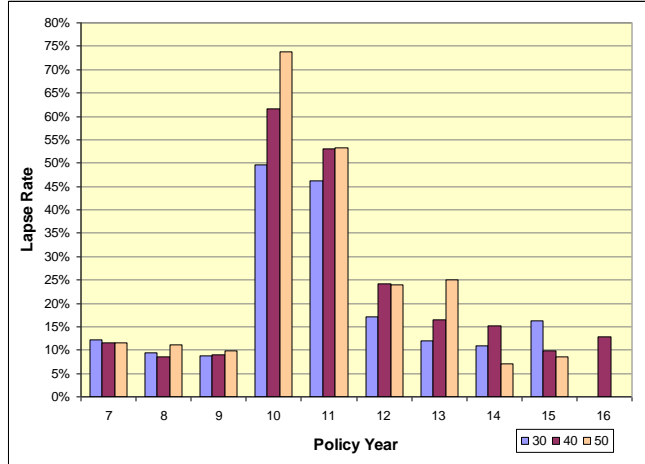
### Lapse Experience – By Gender



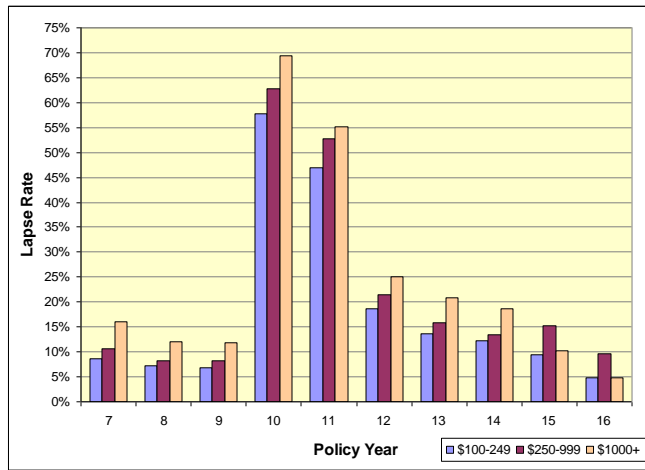
### Lapse Experience – By Smoking Status



### Lapse Experience – By Issue Age



### Lapse Experience – By Original Face



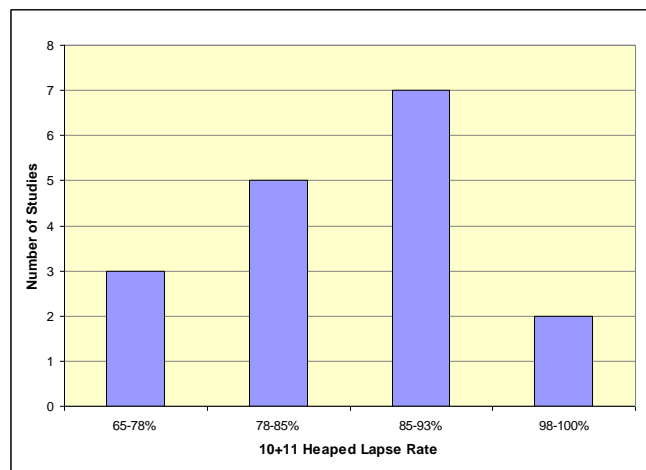
## Policy Year 10+11 Summary

- Lapses are concentrated at the end of policy year 10 and the first few months of policy year 11
- Overall 10+11 heaped rate is 83%
- Gender
  - Male = 79%
  - Female = 84%
- Issue Age
  - Age 30 = 73%
  - Age 40 = 82%
  - Age 50 = 88%
- Smoking Status
  - Nonsmoker = 83%
  - Smoker = 83%
- Face Amount
  - \$100-249k = 78%
  - \$250-999k = 82%
  - \$1000k+ = 86%



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## Distribution of 10+11 Heaped Lapse Rates



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## Mortality Experience



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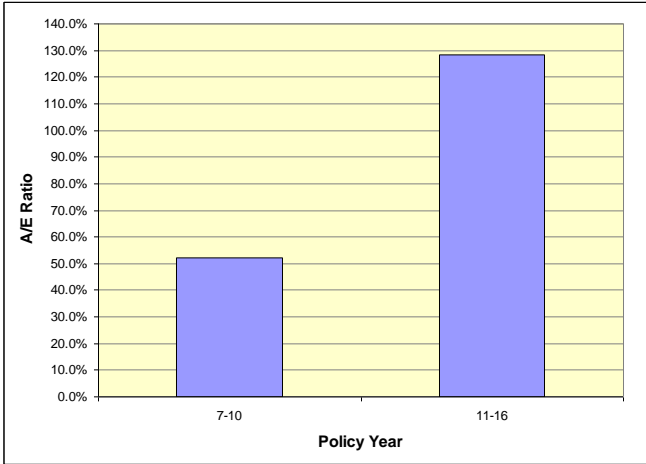
## Mortality Study Details

- Expected table is the SOA 2001 VBT (gender and smoking distinct)
- Exposure amounts
  - Pol yr 7-10 = \$26.8 billion
  - Pol yr 11-16 = \$5.1 billion
- Claim amounts
  - Pol yr 7-10 = \$44.5 million
  - Pol yr 11-16 = \$22.7 million
- Claim counts
  - Pol yr 7-10 = 613
  - Pol yr 11-16 = 203

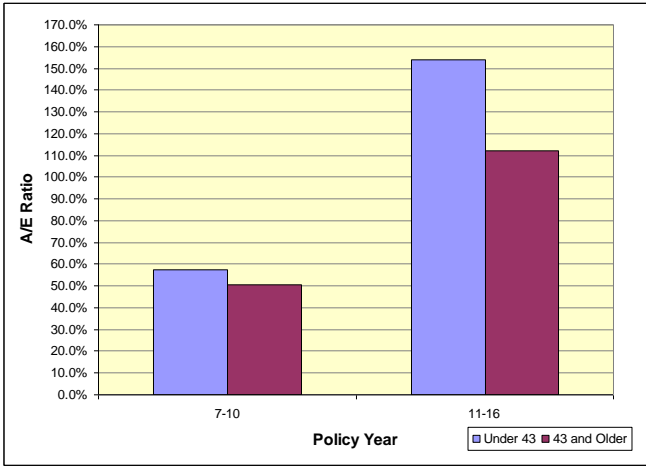


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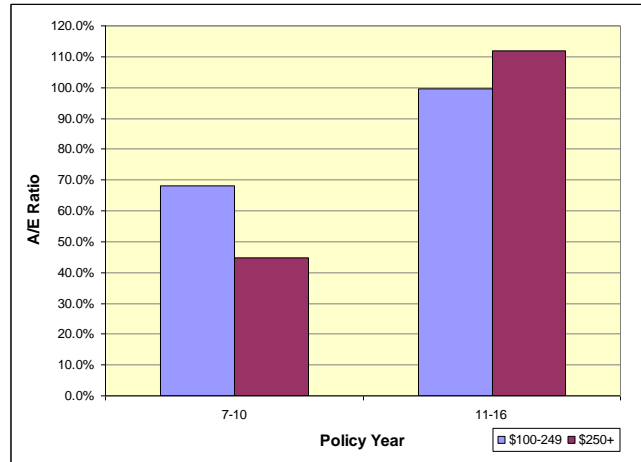
### Mortality Experience – All



### Mortality Experience – Issue Age



## Mortality Experience – Original Face



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## Mortality Deterioration – Summary

- Combined
  - A/E ratio 7-10 = 52%
  - A/E ratio 11-16 = 128%
  - Deterioration factor = 246%
- Factor by Age
  - Under 43 = 267%
  - 43 and Over = 222%
- Factor by Face
  - \$100-249k = 147%
  - \$250k and Over = 250%



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## Analyzing the Results



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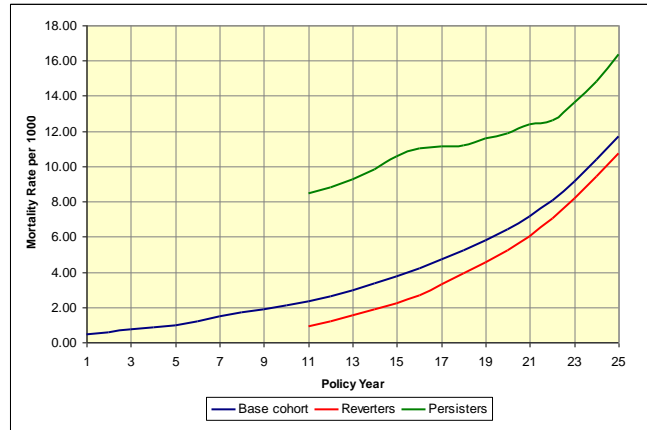
### Dukes-MacDonald Selective Lapsation Model

- Lapses in excess of some baseline rate are anti-selective
- Total of expected deaths from the excess lapse group (“reverters”) and expected deaths from the group continuing their insurance (“persisters”) must equal the expected deaths arising from the original cohort using the baseline lapses
- Reverters follow the select mortality curve of a newly underwritten attained-issue-age group
- Conservation of deaths is used to mathematically solve for the mortality of the persisters
- Model also allows for only some portion (effectiveness rate) of the reverters to follow attained-issue-age mortality, the rest follow point-in-scale mortality



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### Sample Mortality – Male NS Issue Age 40 100% of 2001 VBT with 100% Effectiveness Rate



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### Input Data for Dukes-MacDonald Calculation

#### ■ Lapse

- Baseline rate (policy years 7-9) ~10%
- Heaped 10<sup>th</sup> year rate ~83%

#### ■ Mortality

- Baseline A/E ratio (policy years 7-10) ~52%
- Deteriorated A/E ratio (policy years 11-16) ~128%
- Deteriorated A/E as a percent of baseline ~246%



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## Dukes-MacDonald Calculation – Effectiveness Rate

- Dukes-MacDonald mortality prediction is somewhat sensitive to the effectiveness rate assumption
- Predicted deterioration results for various effectiveness rate assumptions:

Effectiveness Rate	Average Mortality Multiple
45%	190%
55%	210%
65%	230%
75%	250%
85%	270%



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## Sample Calculation – Male NS Issue Age 40

- Baseline mortality is 52% of SOA 2001 VBT
- Effectiveness rate is 75%
- Calculation details

Policy Year	Lapse Rate	Base Cohort	Selective Reverters	Non-Selective Reverters	Persisters	Original Cohort Mortality Rate	Persister Mortality Rate
1	10.0%	1,000,000				0.22	
2	10.0%	899,799				0.30	
3	10.0%	809,575				0.37	
4	10.0%	728,348				0.43	
5	10.0%	655,230				0.51	
6	10.0%	589,404				0.63	
7	10.0%	530,130				0.76	
8	10.0%	476,754				0.88	
9	10.0%	428,700				0.98	
10	83.0%	385,451				1.09	
11	15.0%	346,528	210,805	70,268	65,455	1.21	3.60
12	15.0%	311,499	189,637	63,165	58,698	1.36	3.76
13	15.0%	279,967	170,567	56,771	52,629	1.54	3.98
14	15.0%	251,583	153,390	51,015	47,177	1.74	4.24
15	15.0%	226,031	137,917	45,834	42,280	1.96	4.55
16	15.0%	203,030	123,982	41,170	37,879	2.19	4.78

Persister mortality is approximately 250% of original cohort



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### Shock Lapse and Mortality Deterioration Observations on 10 Year Term Experience

- Effect of grace period is noticeable in the data
- Combined policy year 10+11 lapse rate by amount is around 83%
- Immediate post-shock lapse rates by amount are running between 15% and 20% in policy years 12-16
- Mortality deterioration as a percentage of baseline is approximately 245% over policy years 11-16
- Overall experience appears to follow a Dukes-MacDonald model with an effectiveness rate of 75% – i.e., lapses are not entirely anti-selective



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### Additional Resources

- Transactions of Society of Actuaries, 1980 Vol. 32
  - *Pricing a Select and Ultimate Annual Renewable Term Product*
    - Jeffery Dukes and Andrew M. MacDonald
- The Messenger, April 2010
  - *Understanding Post-Level Experience*
    - David Wylde
- Society of Actuaries
  - *Report on the Survey of Post-Level Premium Period Lapse and Mortality Assumptions for Level Premium Term Plans*
  - *Report on the Lapse and Mortality Experience of Post-Level Premium Period Term Plans*
    - Tim Rozar, Scott Rushing, Doug Knowling



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