

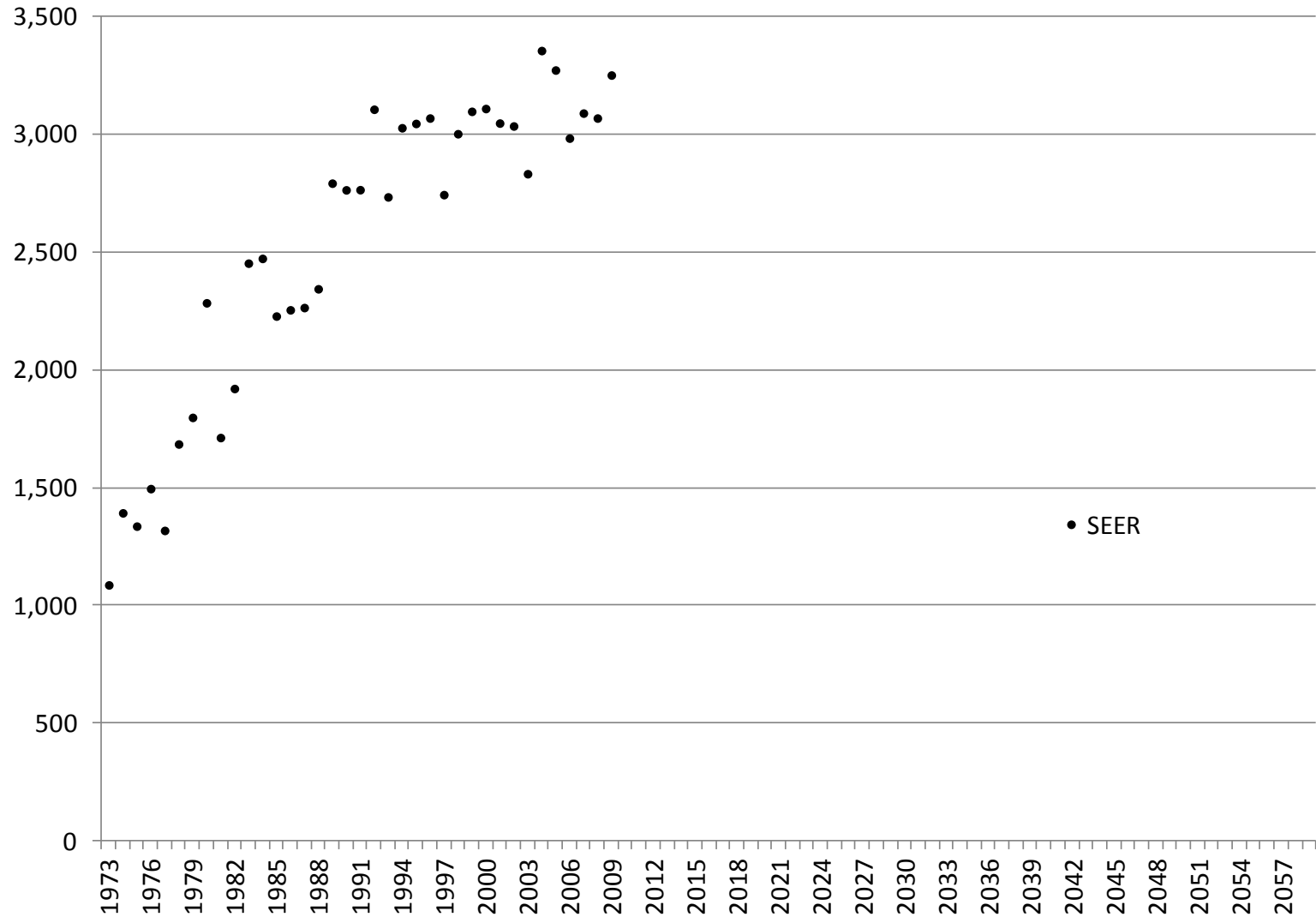
Mesothelioma incidence modeling and forecasting

2014 Casualty Loss Reserve Seminar

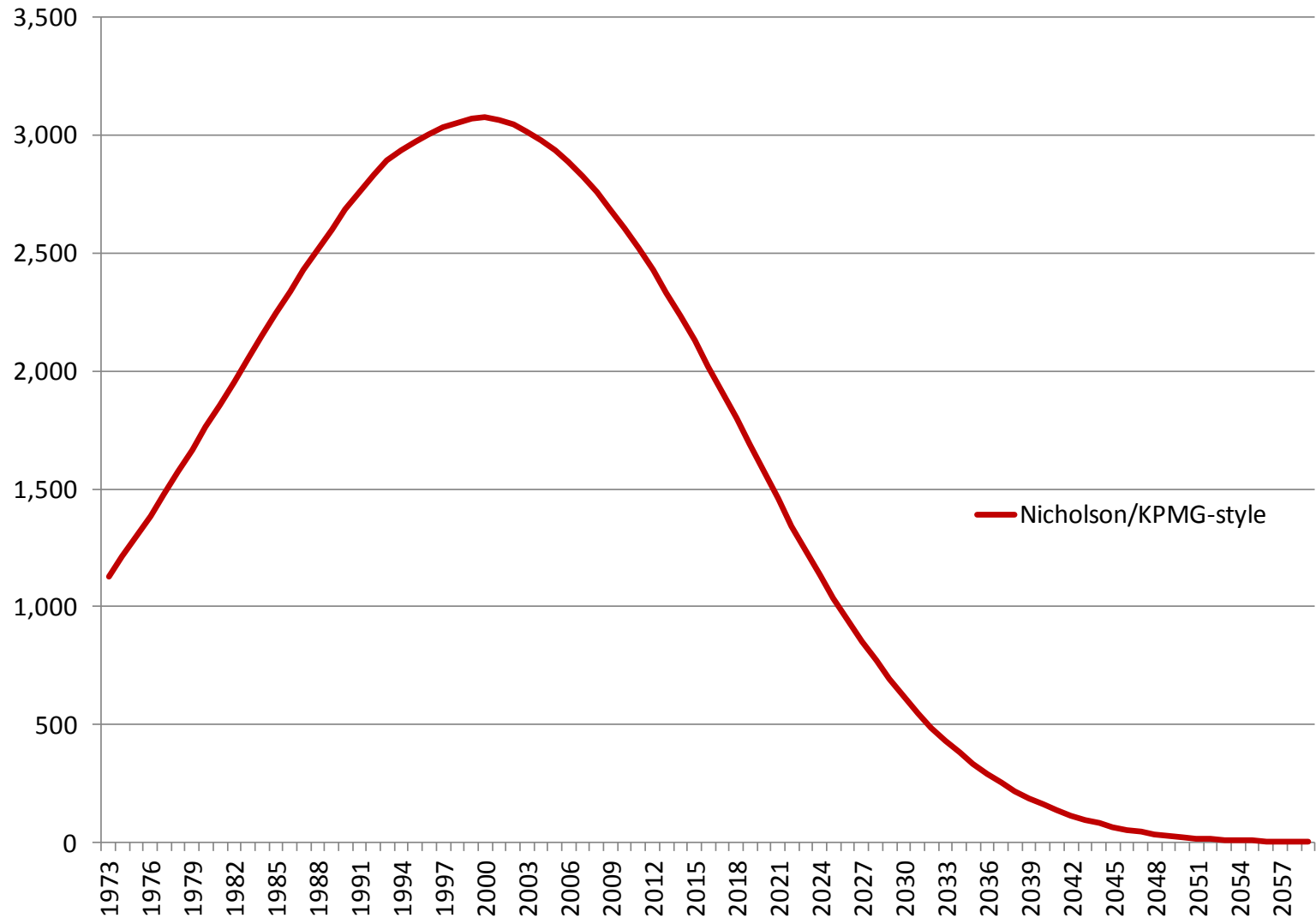
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Mesothelioma incidence has remained relatively constant in the last several years



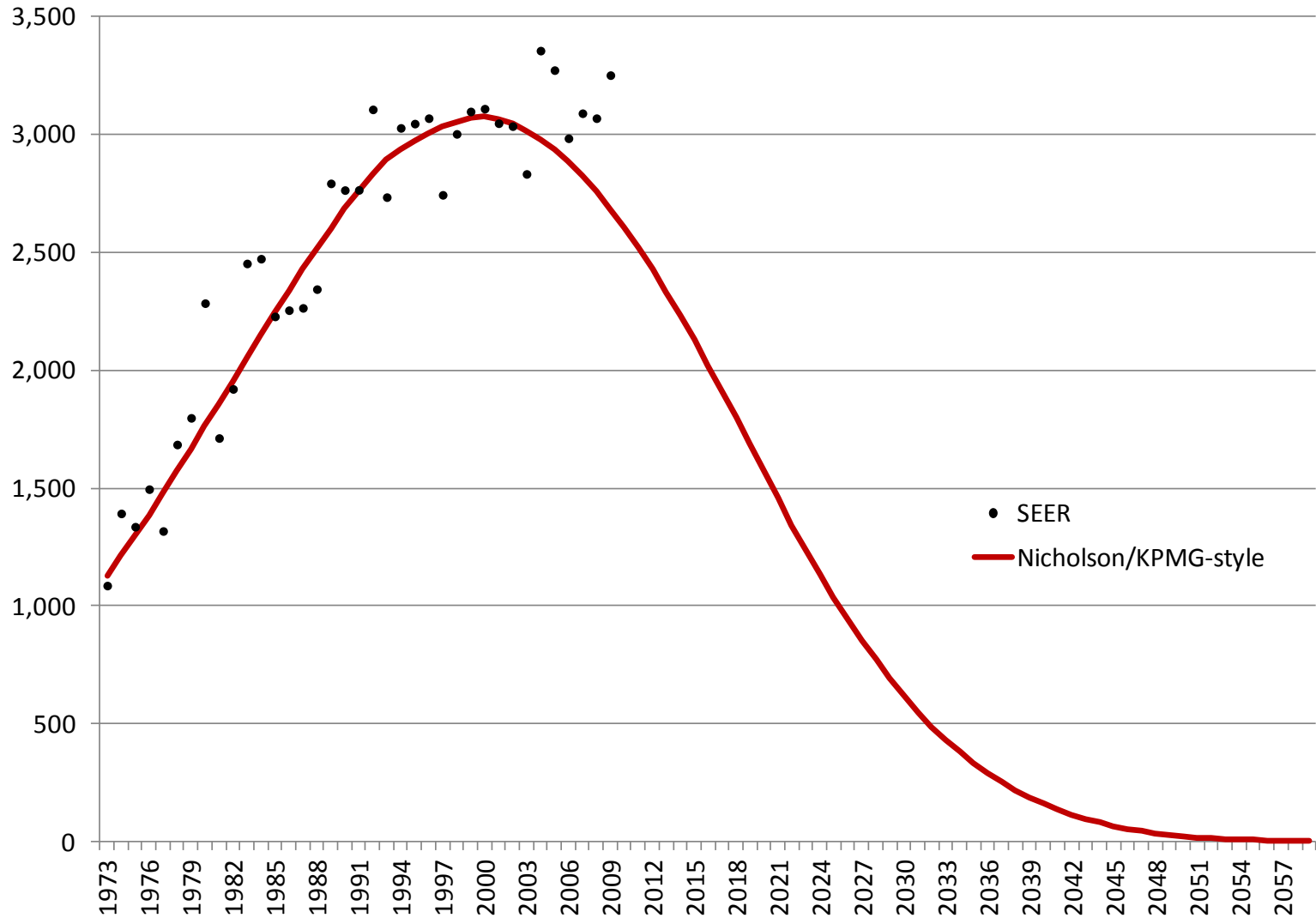
However, the typical incidence models have predicted a declining asbestos-related diagnoses



There has been ample literature attempting to estimate the future number of mesotheliomas in the US population

- Higginson (1980)
- Enterline (1981)
- Peto et al (1981)
- Nicholson et al (1981, 1982)
- Walker et al (1983)
- Lilienfeld et al (1988)
- KPMG (1992)
- Stallard (2001)
- Stallard et al (2004)
 - Though these models had different approaches for estimating the future mesothelioma incidence and resulted in different levels of future counts, all had a common assumption:
 - ◆ **Either all mesotheliomas are asbestos related or all mesotheliomas were generated by the same process**

Models that assume that all mesothelioma is caused by asbestos do not fit the data well



Scientific literature has studied whether asbestos is the only cause of mesothelioma

- Studies have estimated that a significant portion of mesothelioma diagnoses are **not** related to asbestos exposure above background levels
 - Pleural mesothelioma: 20%-50% male and 70%-80% female
 - Peritoneal mesothelioma: 70%-85% male and female
- See, for instance
 - Attanoos, R. L. and Timothy C. Allen (2014), Advances in surgical pathology, Lippincott Williams & Wilkins
 - Carbone, M. et al (2012), “Malignant Mesothelioma: Facts, Myths and Hypotheses,” Journal of Cellular Physiology, 227(1)
 - Moolgavkar, S. H. et al (2009), “Pleural and peritoneal mesotheliomas in SEER: age effects and temporal trends, 1973-2005,” Cancer Causes Control, 20

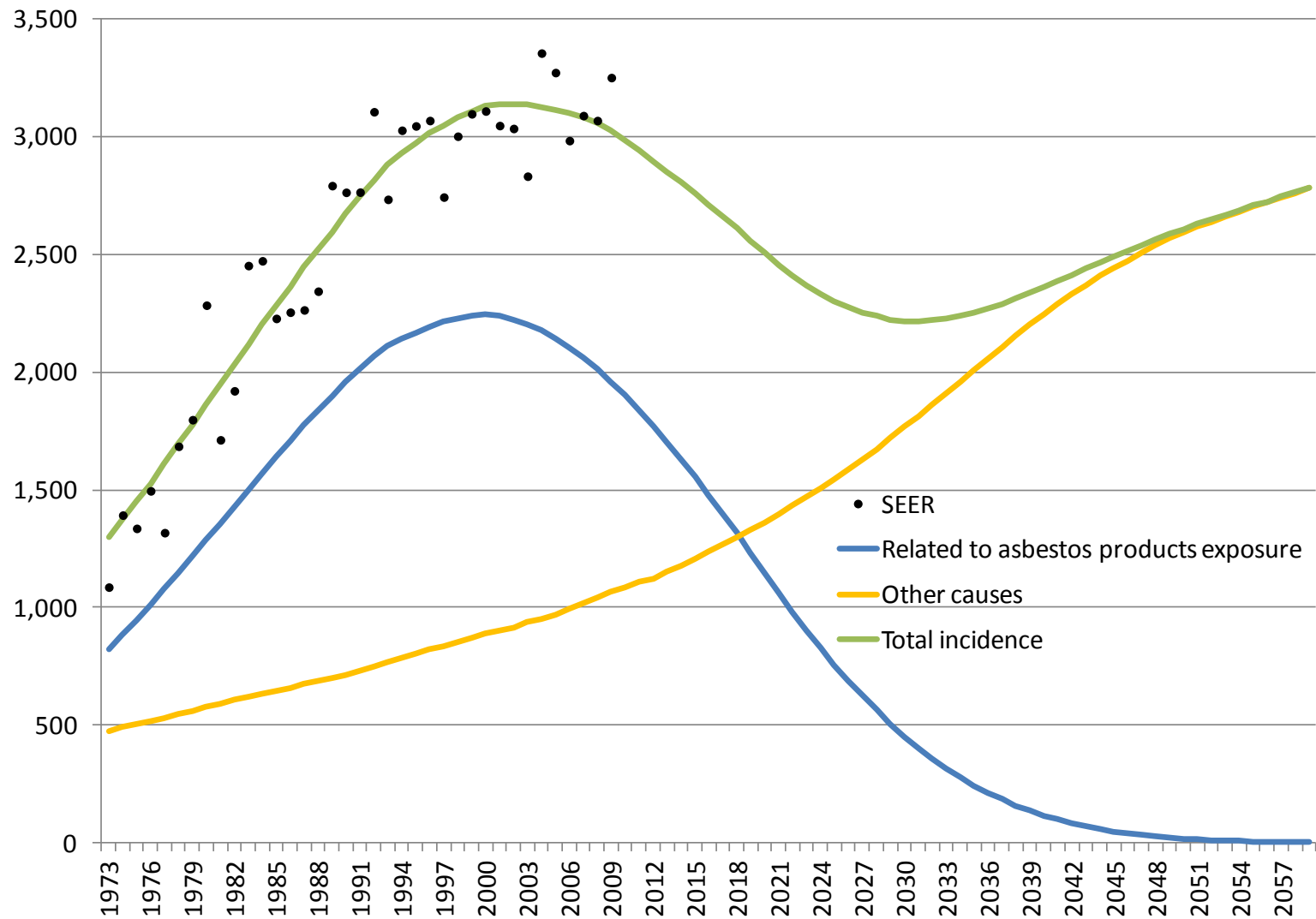
In fact, there may be several different factors that contribute to mesothelioma incidence other than any asbestos products exposure

- Naturally-occurring asbestos in the environment
- Non-asbestos fibers and/or chemicals
 - Fibrous Zeolite (Erionite)
 - Fluoro-edenite
 - Refractory ceramic fibers
 - Carbon nanotubes
 - Other organic fibers
- Radiation
- Spontaneous or idiopathic
 - Genetics
- SV40 virus in vaccines

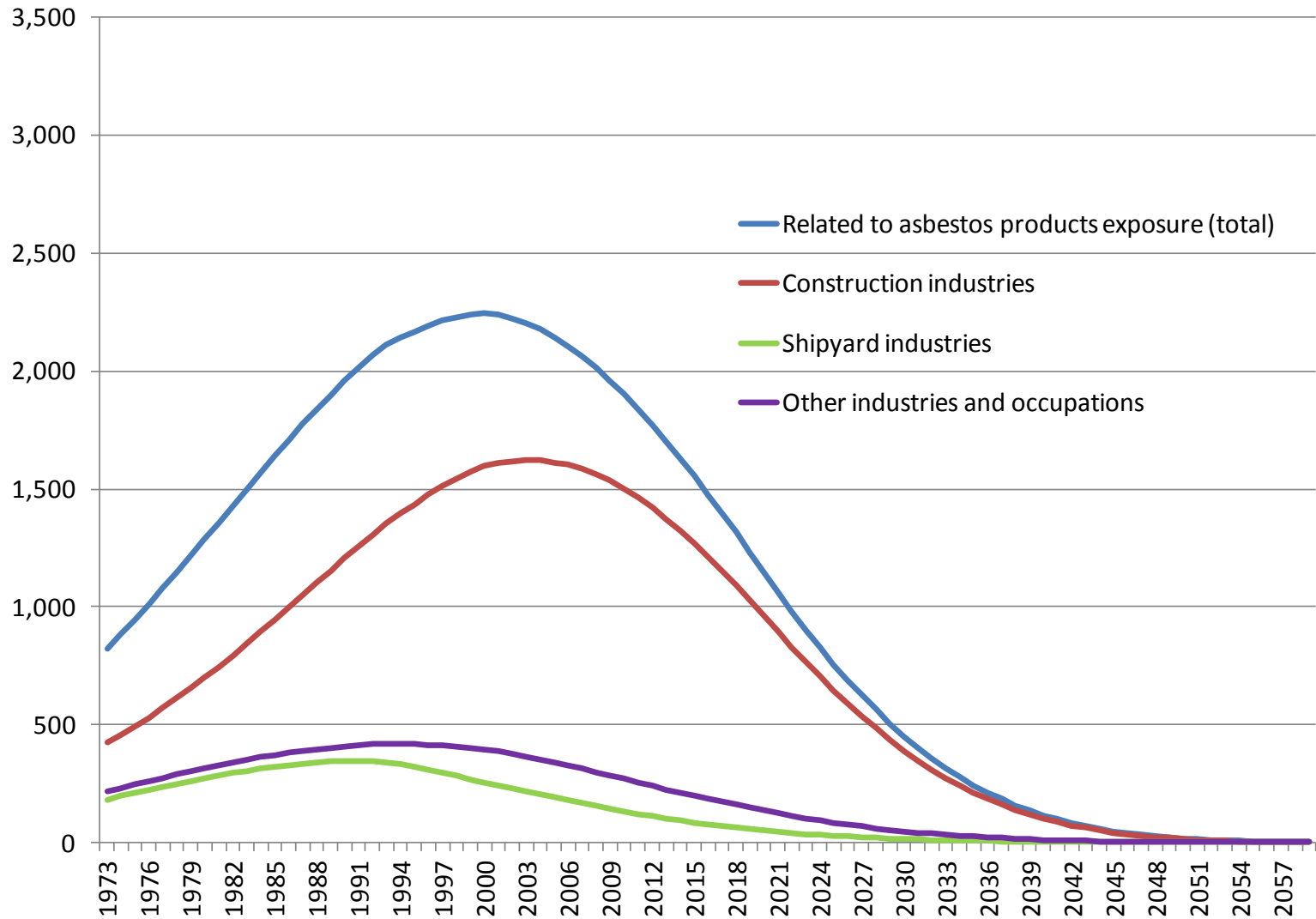
Therefore, a model that tries to estimate the number of mesotheliomas in the population should account for its potential sources

- The Bates White incidence model considers that mesothelioma diagnoses can be caused by
 - Exposure to asbestos-containing products
 - Other sources, collectively referred to as background
- The model jointly estimates a
 - Nicholson/KPMG-style occupational-based model
 - A model of cancer generation in the general population based on age, gender, and population size
- The estimation routine uses the scientific observation that most female mesothelioma diagnoses are not related to exposure to asbestos products

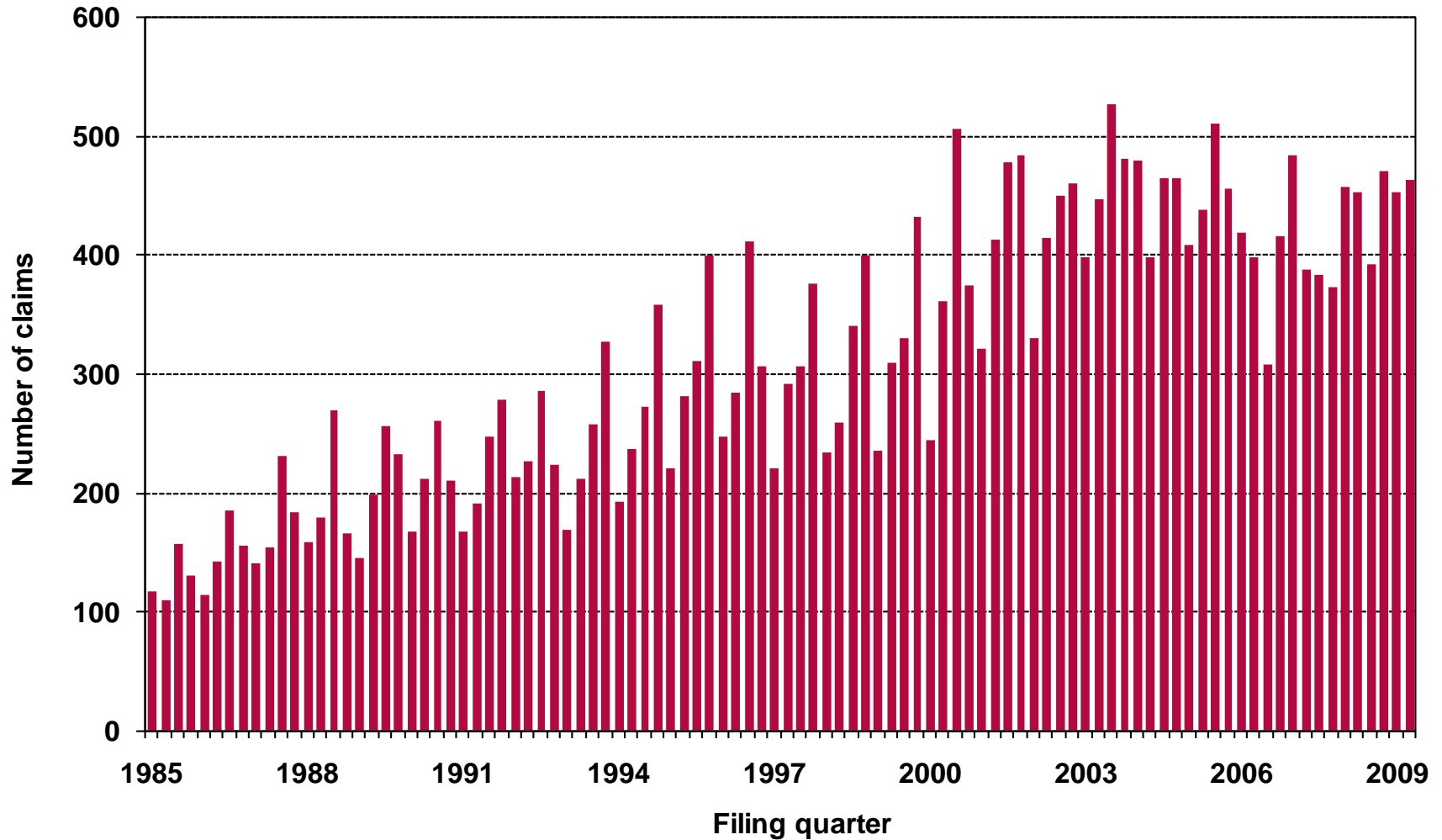
Bates White's statistical model can explain the difference between the typical models and the data



Theoretically, the asbestos litigation focus should be only on diagnoses caused by asbestos products exposure and in how the exposure occurred

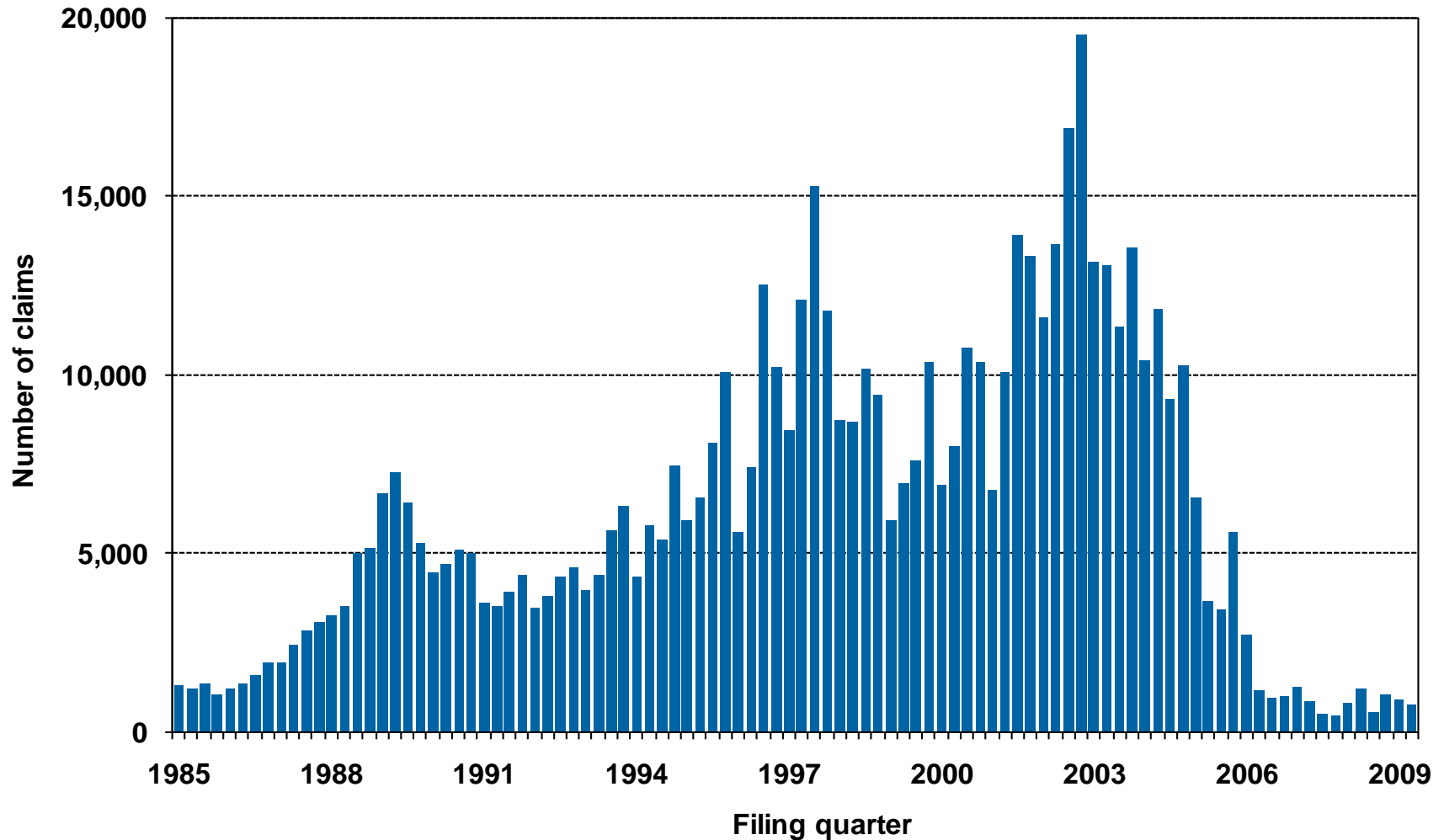


Focusing on the asbestos litigation: historically, U.S. mesothelioma tort filings by quarter were driven by epidemiology



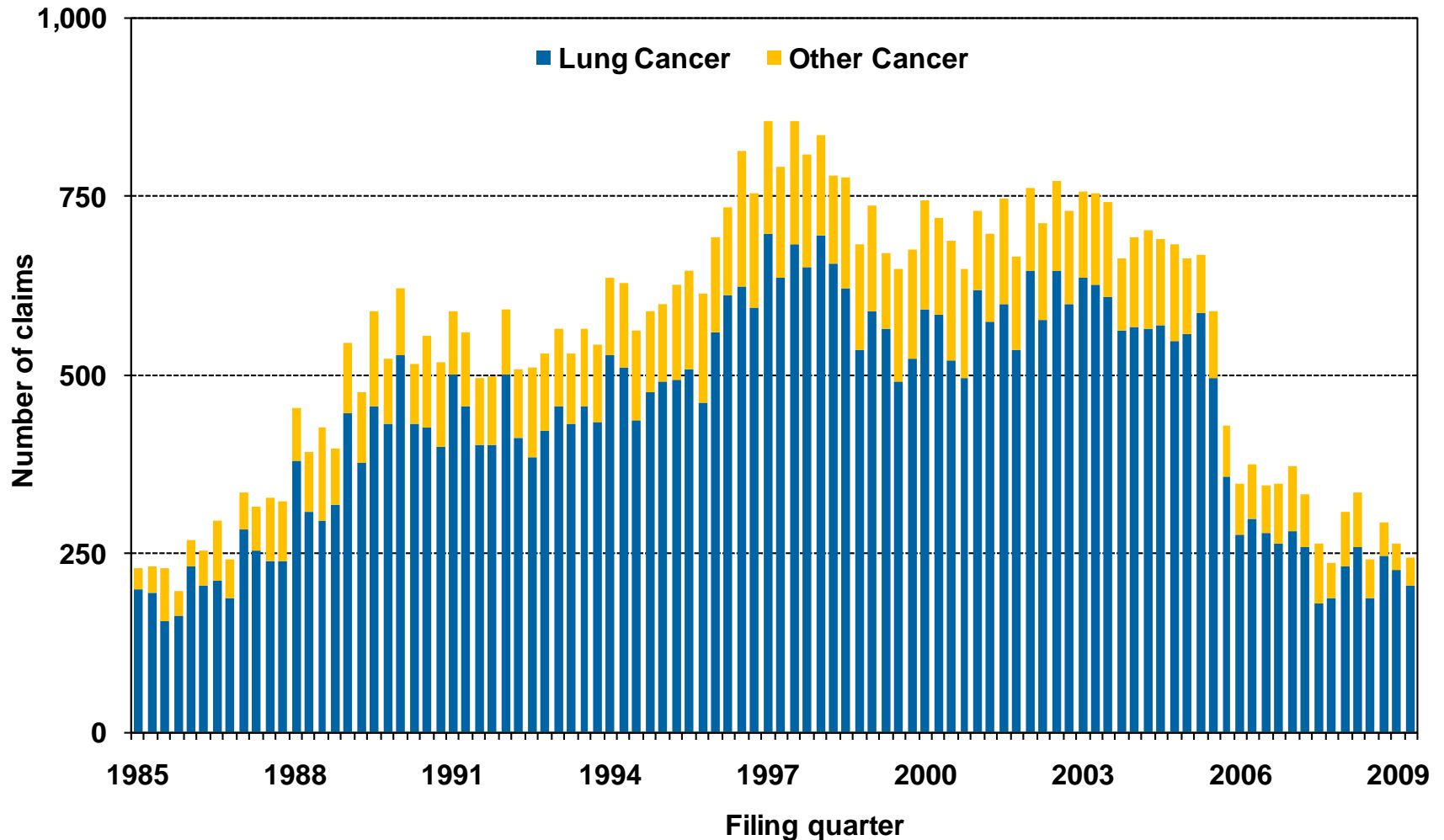
Source: Bates White claimant database

Non-malignant filings were driven by economics: mass recruitment led to a surge that subsequently collapsed



Source: Bates White claimant database

And lung and other cancer tort filings basically followed the non-malignant claims as their surge was mostly a byproduct of mass recruitment



Source: Bates White claimant database

How will a higher proportion of mesothelioma diagnoses unrelated to asbestos products exposure affect asbestos litigation?

- How will causation in mesothelioma cases play a role in future trials?
- How will the way in which mesothelioma claims are pursued by plaintiff firms and defended be affected?
- How will the asbestos litigation system react to a growing portion of mesothelioma diagnoses with tenuous or no linkage to asbestos-containing products' exposure?
- How will this issue affect the number of mesothelioma claims filed, the number of claims settled, and settlement amounts in the tort system?

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