Evidence-based Underwriting in Life and Health Insurance

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Faculty Disclosure

	No, nothing to disclose
X	Yes, please specify:

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								- Analytical services
								- Data
								- Underwriting systems

Evidence-based underwriting / insurance medicine

Where is the evidence?

- **Life Insurance?** Everybody dies. Once. Not always during contract term, so links to application data lost.
  - mortality tables for populations are good
  - models for underwriting individuals are weak.
- **Disability insurance**? Incidence rates just 0,3% per year. Models for underwriting individuals are guesswork.
- **Health insurance?** Potentially vast data volumes available. But is it really there?

Is health insurance data the answer?

Potentially huge data volumes: Several "events" per year per person: (examinations, diagnoses, treatments, medications, hospital visits, days off work, deaths…)

In many countries this raw data is wilfully destroyed!

- clearing institutions aggregate the data for each insurer, destroying the link to the individual (German government health system)
- data protection laws prevent insurers from retaining details (CH)

Insurers often fail to store data in accessible form

A German solution?

Over 10% of Germans opt out of the government health system and have full private health insurance PHI (9 million persons)

The private health insurers receive **full**, **individual** claims data , and can store it for an unlimited duration.

50% of the PHI market pools its data with RISK-CONSULTING, some since 1992

The RISK-CONSULTING data-base contains:

> 350 million contract-years of data, with

> 20 years of continuous medical histories, and

> 700 million medical claims

Example: High blood pressure

2,900,000 cases with **12 observation years** per case on average

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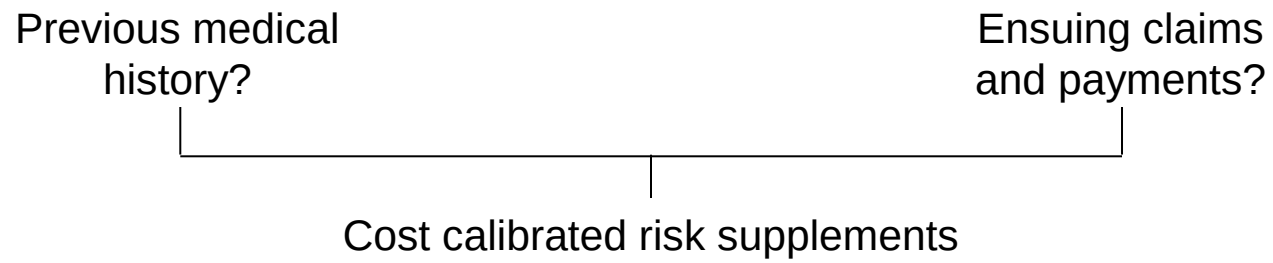
Example: Diabetes Mellitus (Type 2)

150,000 cases with
12 observation years
per case on average

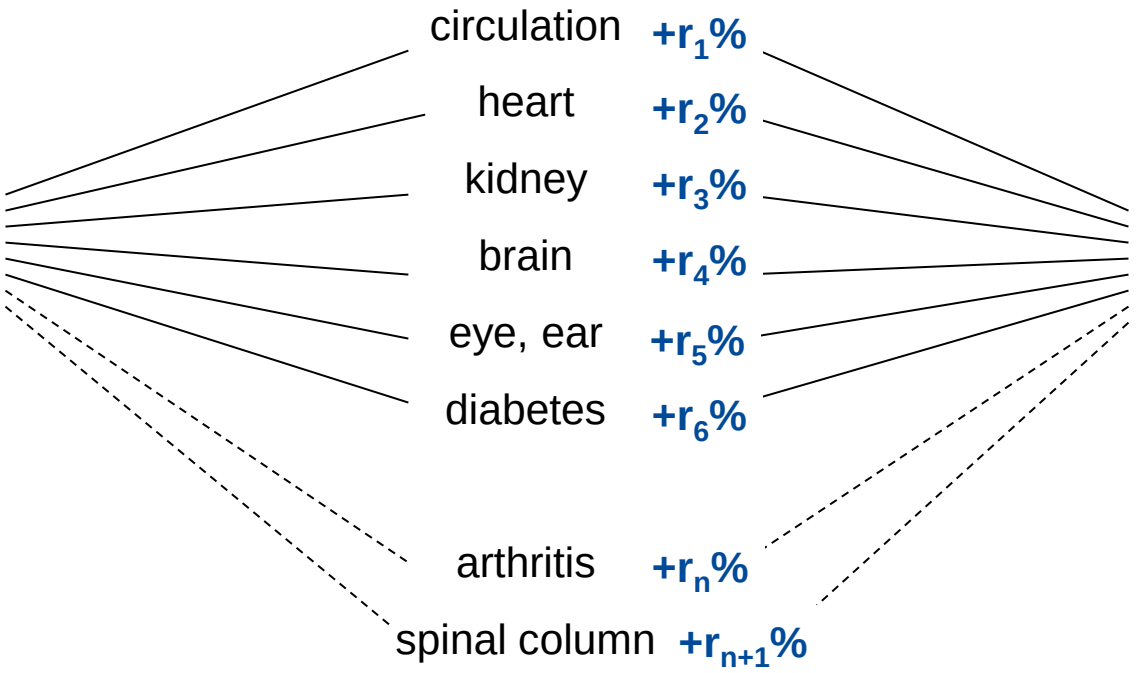
Evidence-based risk assessment in Health Insurance

Retrospective view:



Example:

Medical history:
hypertension



N > 350 m years of observations

Hidden danger for insurers

Benefit payments for policy holders with recent haemorrhoids (out-patient)

Index year		Following 3 years			
Benefits for haemorrhoids		Cases of treatment per PH and year	Rate of illness haemorrhoids per PH and year	Benefits total [€ / year]	Benefits haemorrhoids [€ / year]
Men	no	3.2	2%	425	3
	yes	8.4	51%	1075	60
Women	no	6.4	2%	775	3
	yes	13.1	25%	1625	25

Evidence-based risk assessment in Life Insurance?

We know what people died from, but not how they got that ill!

TODESURSACHEN

2.1 Sterbefälle 2007 nach ausgewählten Todesursachen, Altersgruppen und Gesch

2.1.1 Insgesamt

Pos-Nr. der ICD-10	Todesursache		Gestorbene insgesamt	Davon im Alter von ... bis unter ... Jahren: < 1 Jahr	1 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40
			Anza										
A00-T98	Insgesamt	m	391.139	1.518	301	220	223	990	1.503	1.575	1.755	3.257	
		w	436.016	1.138	248	131	168	425	527	621	821	1.704	
		z	827.155	2.656	549	351	391	1.415	2.030	2.196	2.576	4.961	
A00-B99	KAPITEL I: Bestimmte infektiöse und parasitäre Krankheiten	m	6.293	15	16	4	7	16	19	27	33	67	
		w	7.597	7	13	7	4	5	11	9	24	54	
		z	13.890	22	29	11	11	21	30	36	57	121	
A15-A19	Tuberkulose	m	209	-	-	-	-	1	-	2	1	1	
		w	135	-	-	1	-	-	-	-	-	2	
		z	344	-	-	1	-	1	-	2	1	3	
C00-D48	KAPITEL II: Neubildungen	m	115.938	17	53	53	53	89	137	155	232	521	
		w	101.351	14	37	28	42	57	79	128	275	648	
		z	217.289	31	90	81	95	146	216	283	507	1.169	
C00-C97	Bösartige Neubildungen	m	113.405	11	51	52	50	85	132	149	227	508	
		w	98.360	11	35	27	39	53	79	123	267	640	
		z	211.765	22	86	79	89	138	211	272	494	1.148	
C15-C26	Bösartige Neubildungen der Verdauungsorgane	m	36.312	3	5	-	-	4	12	24	46	148	
		w	31.880	1	3	-	2	3	7	27	54	87	
		z	68.192	4	8	-	2	7	19	51	100	235	
C30-C39	Bösartige Neubildungen der Atmungsorgane und sonstiger intrathorakaler Organe	m	30.702	-	-	1	-	5	8	9	14	68	
		w	12.800	1	2	1	1	1	4	9	13	60	
		z	43.502	1	2	2	1	6	12	18	27	128	
C50	Bösartige Neubildung der Brustdrüse (Mamma)	m	249	1	-	-	-	-	-	-	1	1	
		w	16.780	-	-	1	-	1	1	14	54	198	
		z	17.029	1	-	1	-	1	1	14	55	199	
C51-C58	Bösartige Neubildungen der weiblichen Genitalorgane	w	10.645	-	-	-	-	-	5	10	32	108	
C60-C63	Bösartige Neubildungen der männlichen Genitalorgane	m	11.769	1	-	1	-	3	11	7	8	18	
C81-C96	Bösartige Neubildungen des lymphatischen, blutbildenden und verwandten Gewebes	m	8.667	2	15	16	15	24	42	43	54	71	
		w	7.887	3	8	3	12	15	21	24	31	50	
		z	16.554	5	23	19	27	39	63	67	85	121	
D50-D89	KAPITEL III: Krankheiten des Blutes und der blutbildenden Organe sowie bestimmte Störungen mit Beteiligung des	m	903	6	2	3	2	5	3	8	6	9	
		w	1.233	7	4	2	-	3	3	8	1	6	

Evidence-based risk assessment in Health Insurance

Retrospective view:

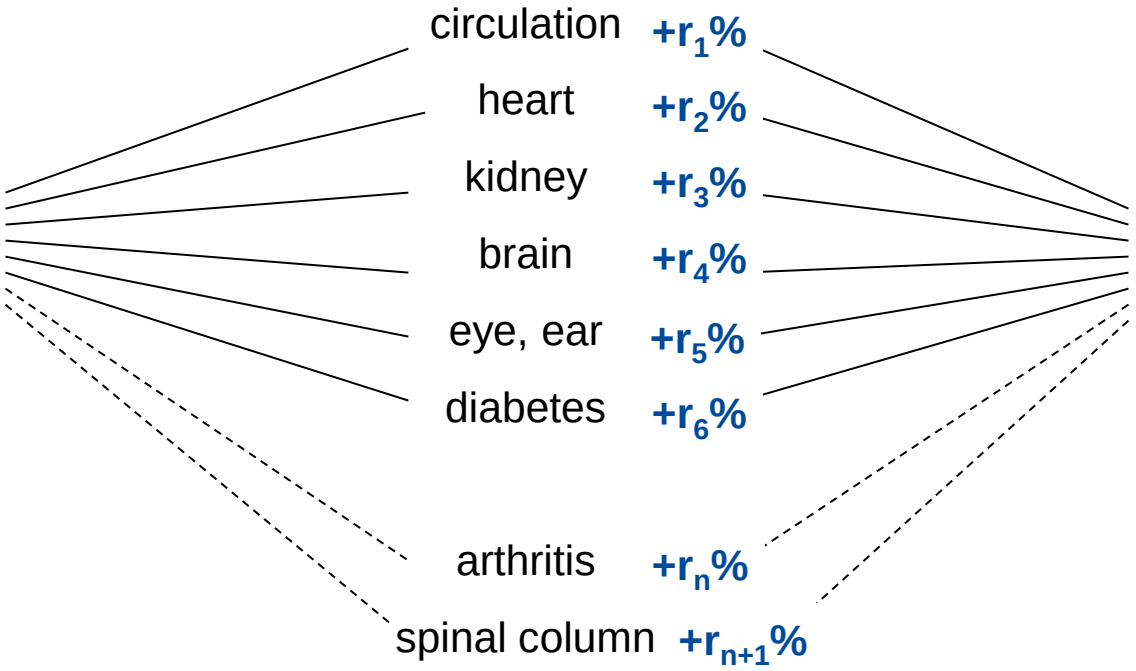
Previous medical history?

Ensuing benefit payments?

Cost calibrated risk supplements

Example:

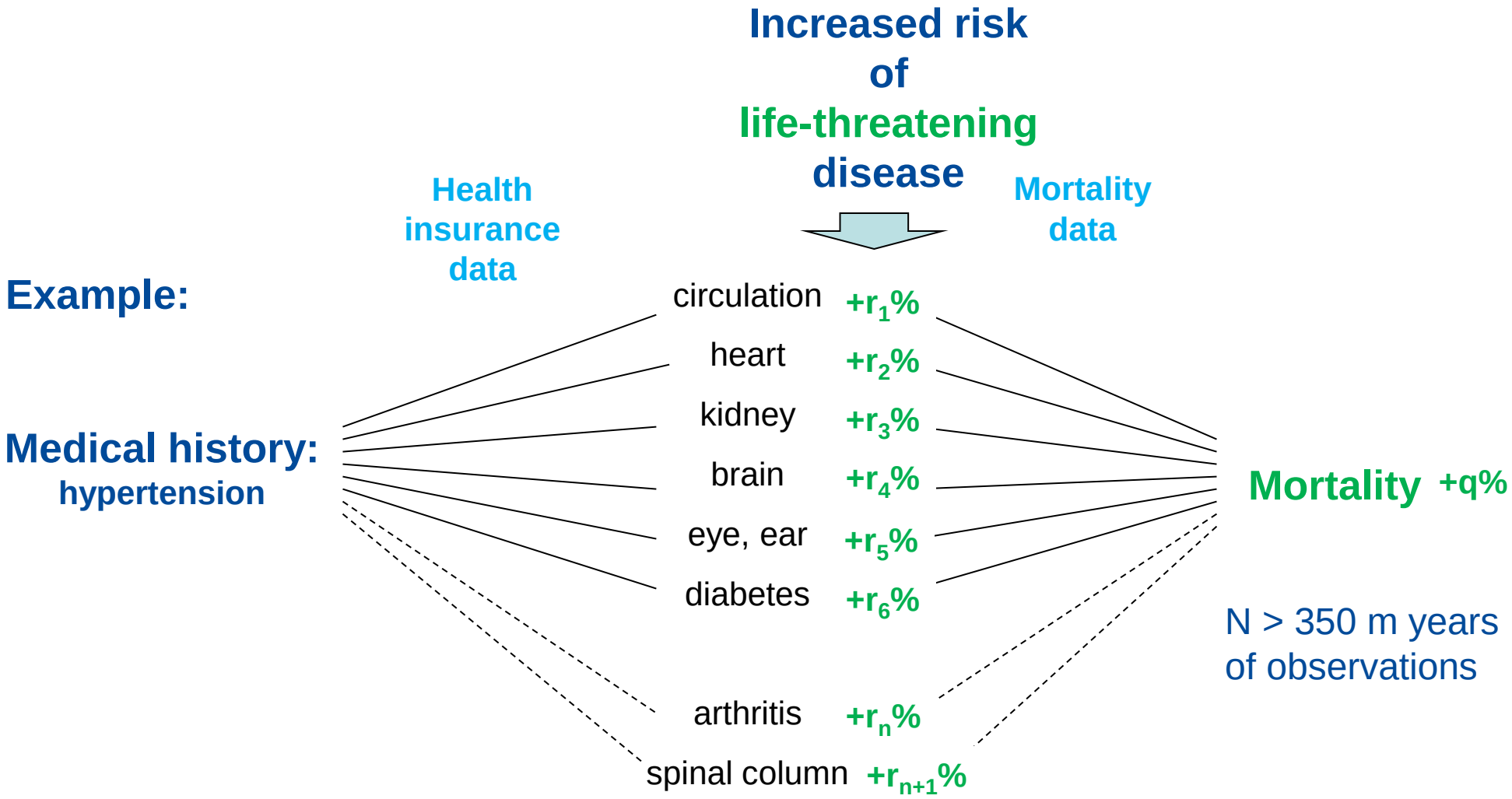
Medical history:
hypertension



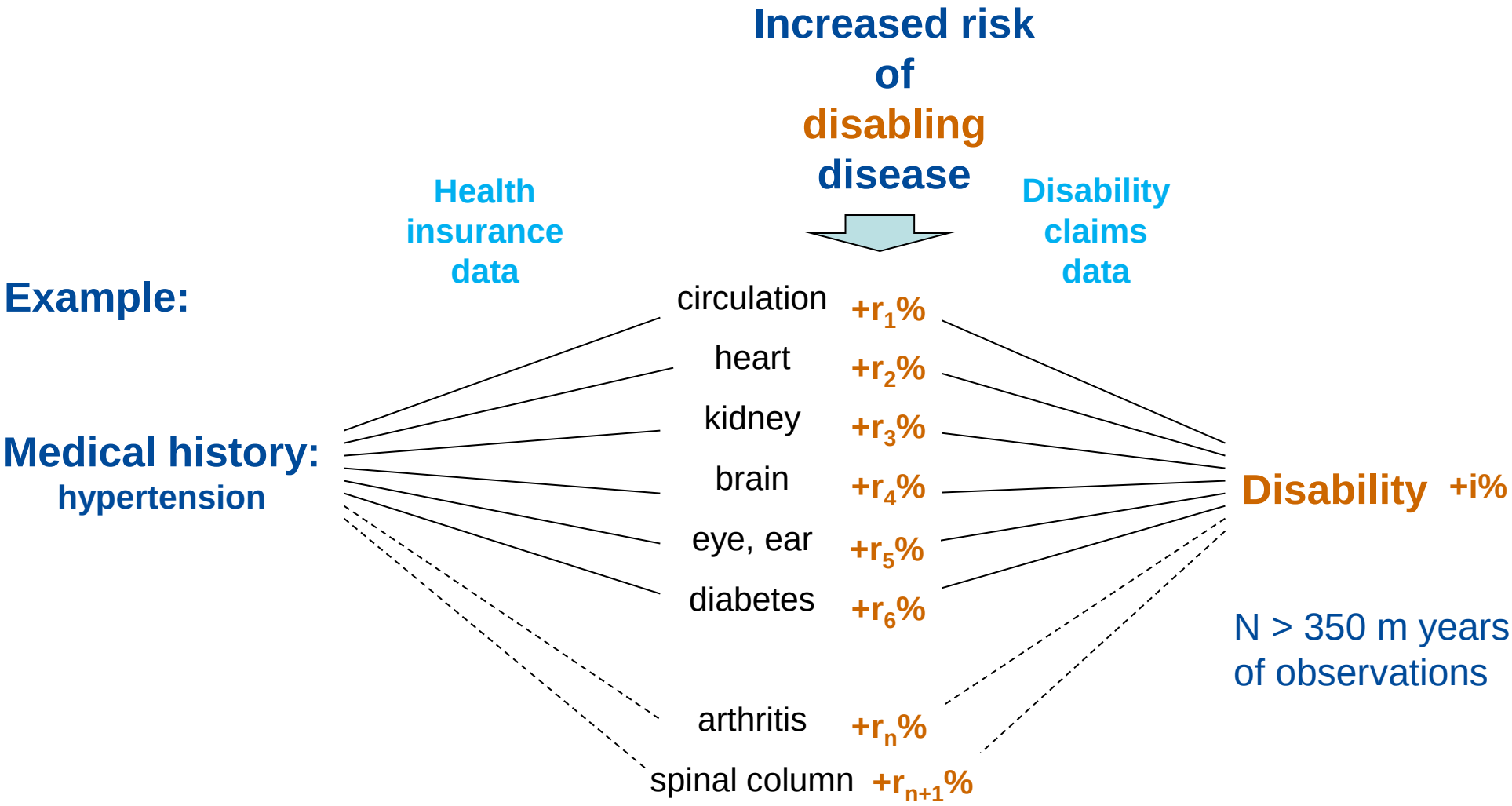
total claims costs **+Z%**

N > 350 m years of observations

Evidence-based risk assessment in Life Insurance



Evidence-based risk assessment in Disability Ins.



Evidence-based risk assessment in Accident Ins. ?

Accidents usually lead to medical treatments, paid by health insurance

German health insurance data contains "accident" flags, but these must be treated with caution.

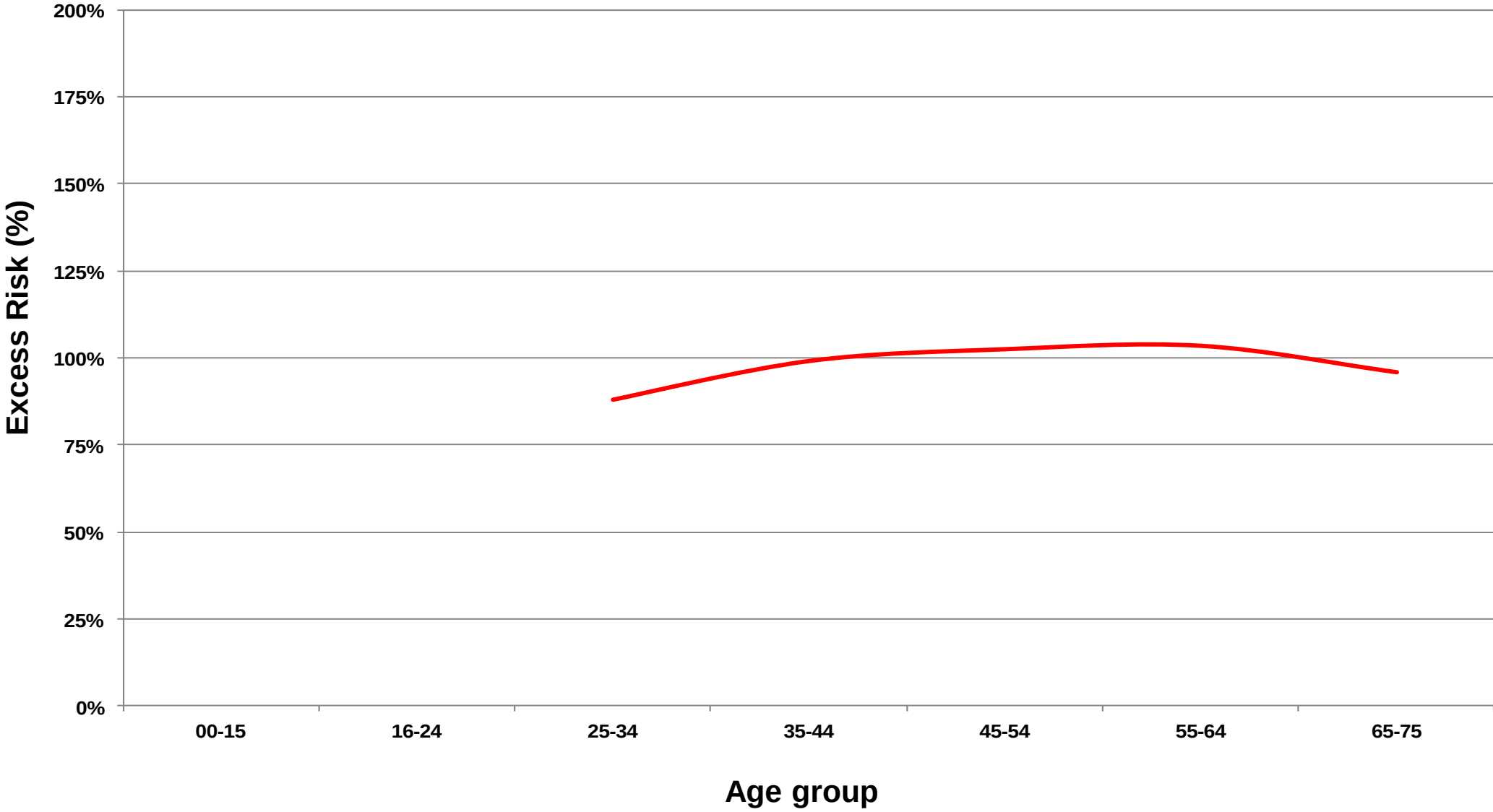
Careful analysis of the health data can show whether a claim in accident insurance would have occurred

We have looked at the accident probabilities associated with:

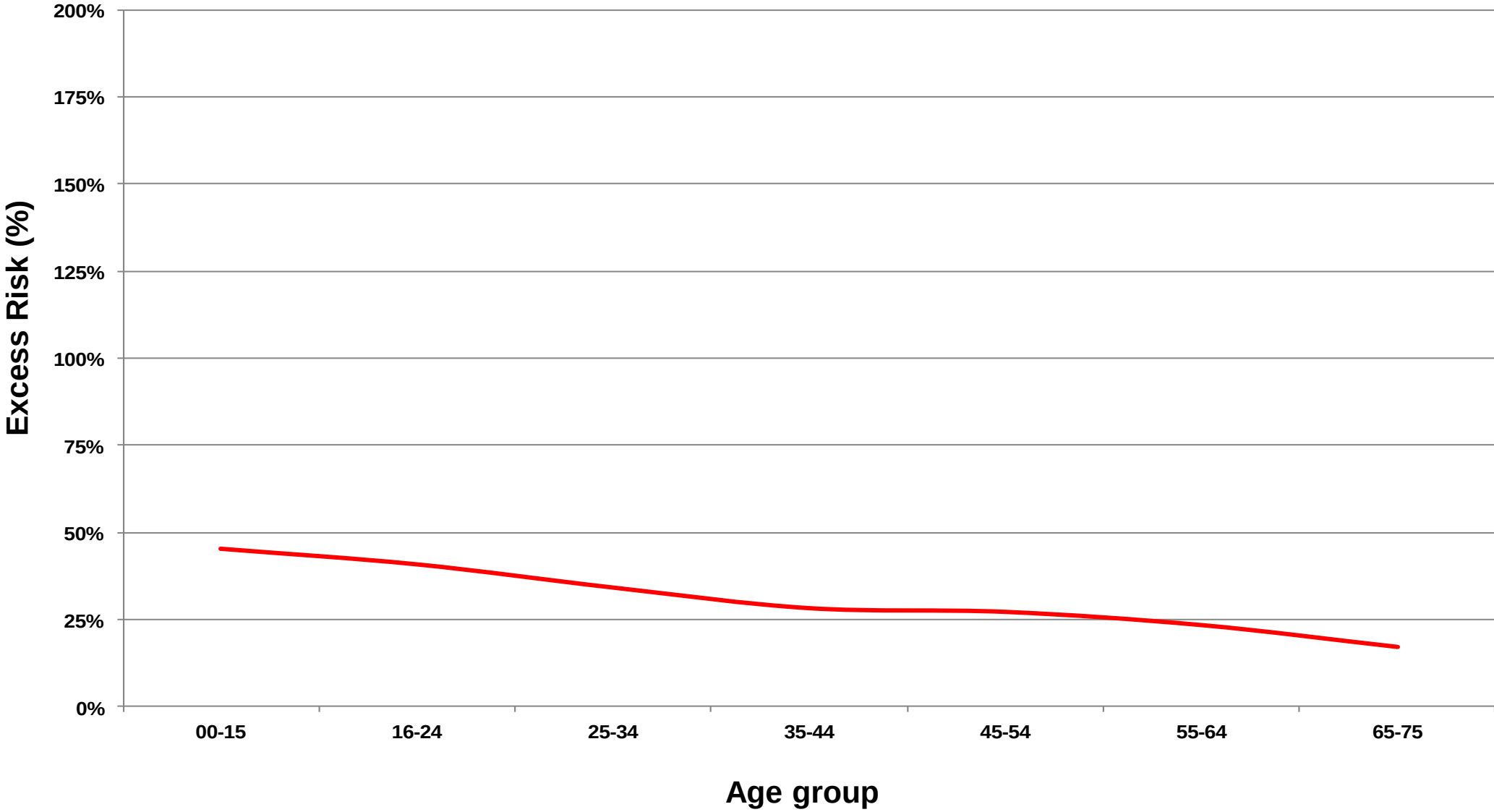
- Epilepsy X
- Diabetes X
- Severe sight defects X
- Down Syndrome X
- Cardiomegaly √

X = typically a rejection diagnosis, √ = typically accepted, no loading

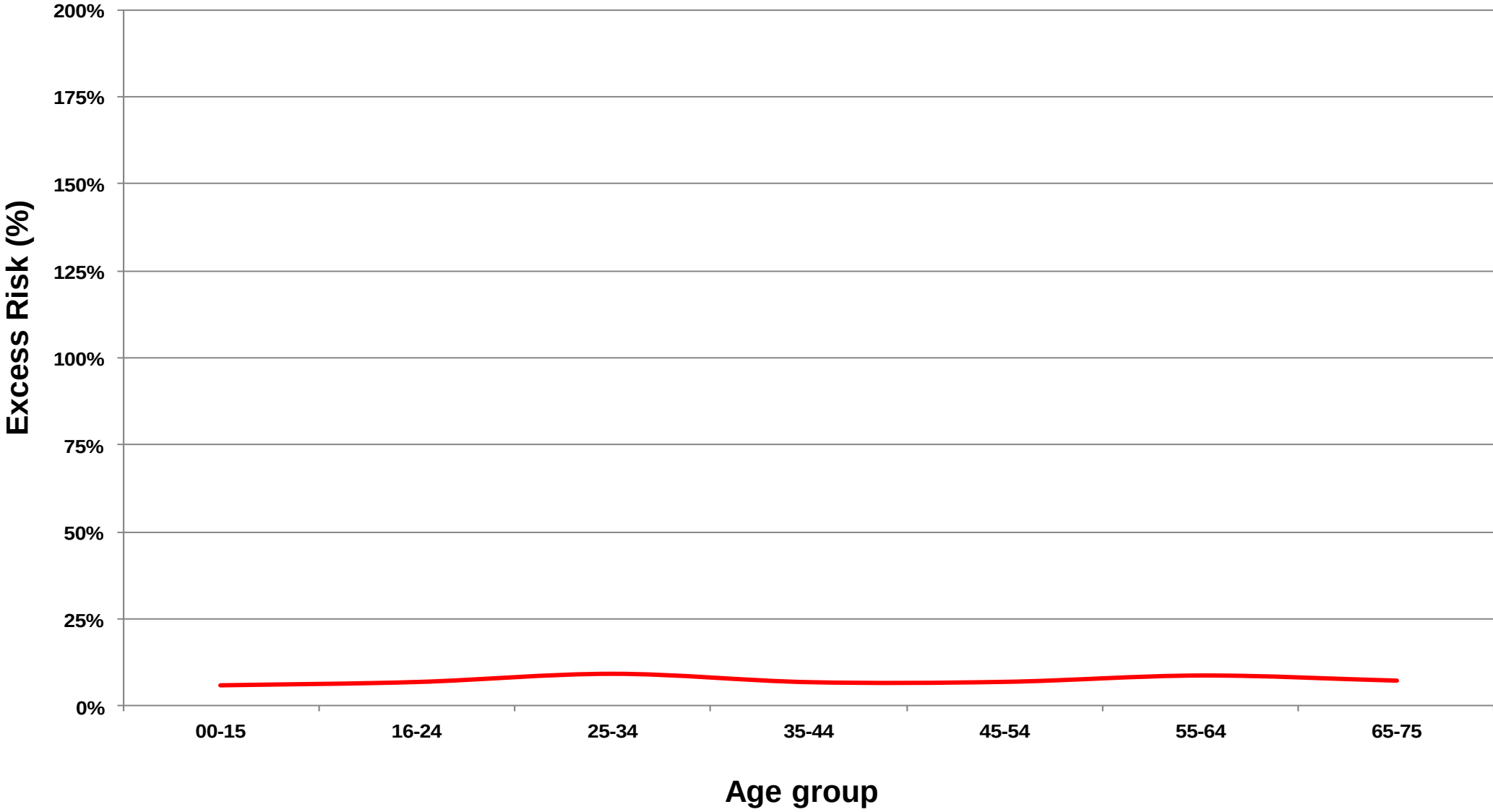
Excess Risk for Persons with Epilepsy



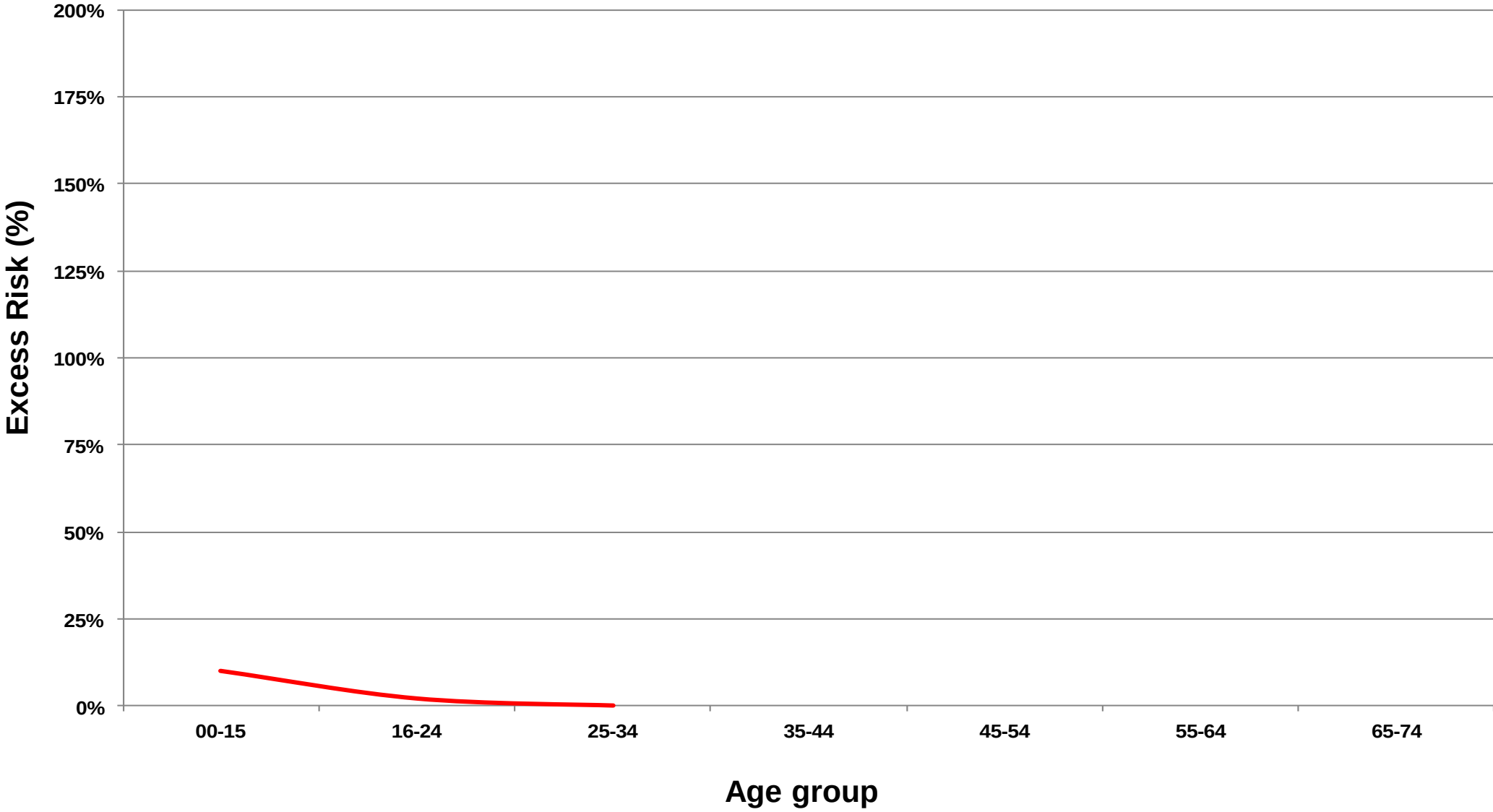
Excess Risk for Persons with Diabetes



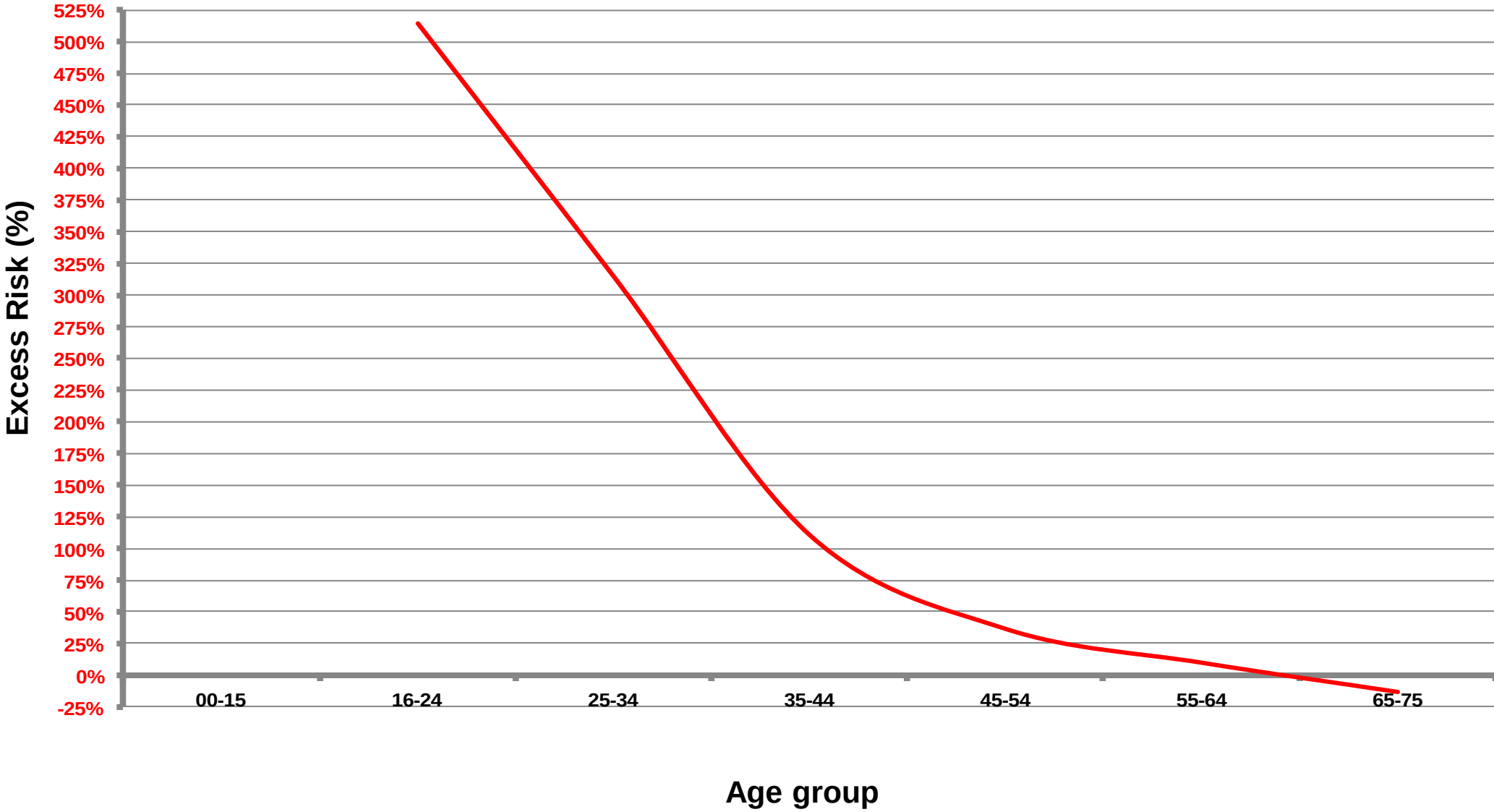
Excess Risk for Persons with
severe sight defects and blindness



Excess Risk for Persons with Down Syndrome



Excess Risk for Persons with Cardiomegaly



Summary

- health insurance data is extremely rich in information when collected and analysed in a professional manner
- this information has a high predictive value, for:
  - future morbidity (health insurance costs)
  - mortality risk
  - disability risk
  - accident probability
- underwriting can be significantly improved using this evidence
- applications in evidence-based medicine are yet to be explored

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