



Hearing Industry Perspectives for EU funded Hearing Research in Europe



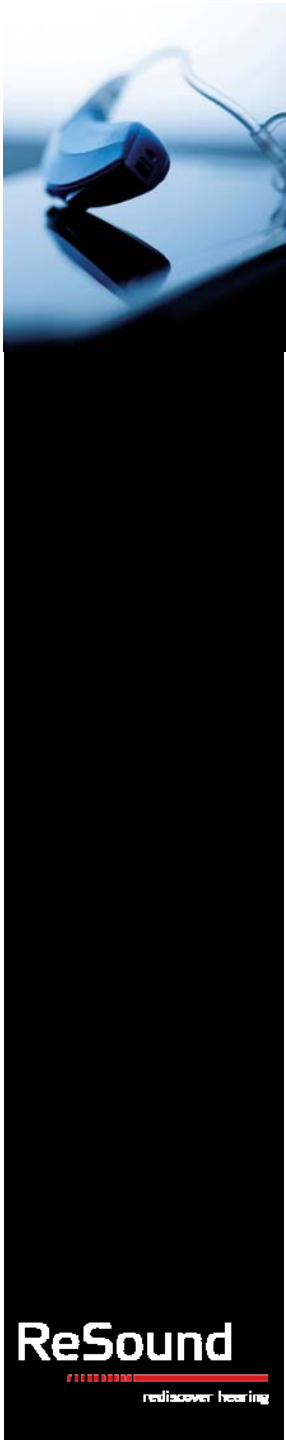
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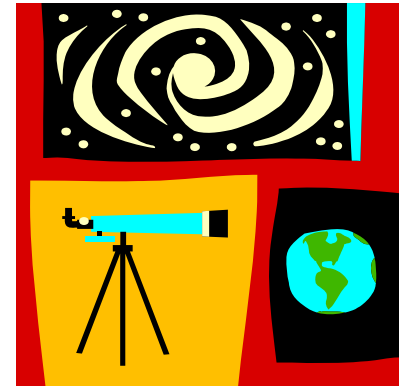
The Hearing Aid Industry in Europe

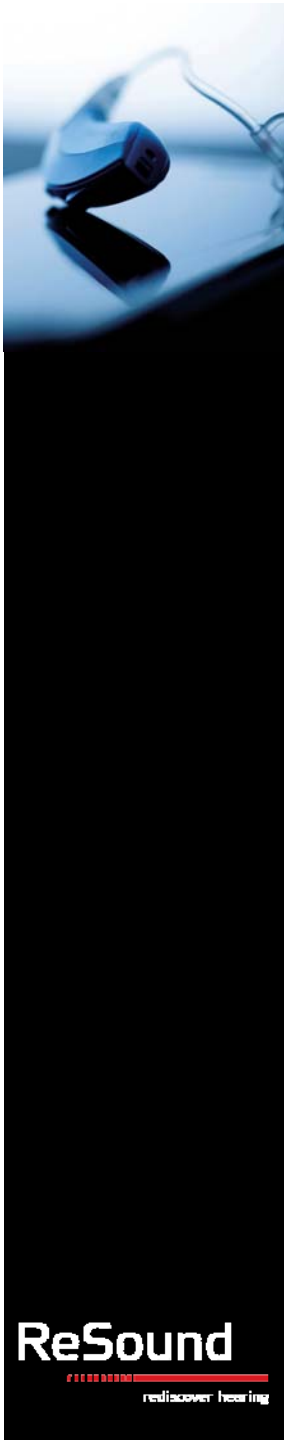
- **5 out of 6 major hearing aid manufacturer are in Europe**
 - **GN ReSound (DK)** - ReSound, Beltone, Interton
 - **Siemens (D)** – Siemens, Rexton, AudioService
 - **Sonova (CH)** – Phonak, Unitron
 - **Widex (DK)** – Widex
 - **William Demant (DK)** – Oticon, Bernafon
 - **Several minor players – mostly local**
- **1 other significant hearing aid manufacturer Starkey is in the USA**
- **Strong research is a key factor for keeping the industry in Europe**



Hearing Industry & Research

- **Total annual revenues:** (est.) € 3.000 mill.
- **Typical R&D spending:** (% of Revenues) 7 %
- **Total industry R&D budget:** € 210 mill.
 - Only a smaller fraction of the R&D expenses is for basic research
 - Most is used for product development
 - Chip sets
 - Algorithm & Software
 - Mechanical systems
- **More effort is needed in basic research**





Research areas

Hearing Industry Specific

- Auditory research
 - Basic psychoacoustics
 - Hearing impairment
 - Audiology/diagnostics
 - Linguistics
- Acoustics
 - Electro-acoustics
 - Transducers
- Signal Processing
 - Audibility restoration
 - SpeechNR improvement
 - Environmental adaptation
- User profiling
 - Psychology

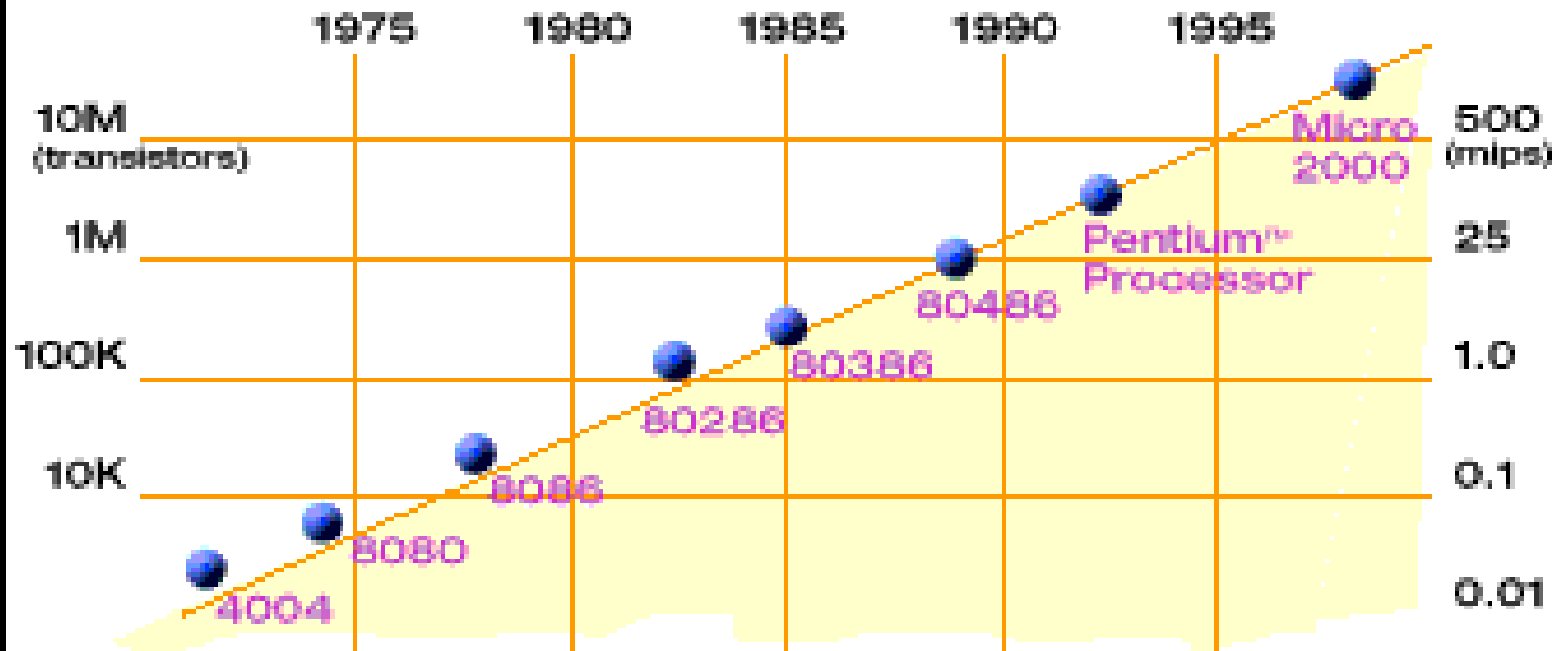
Driven by other industries

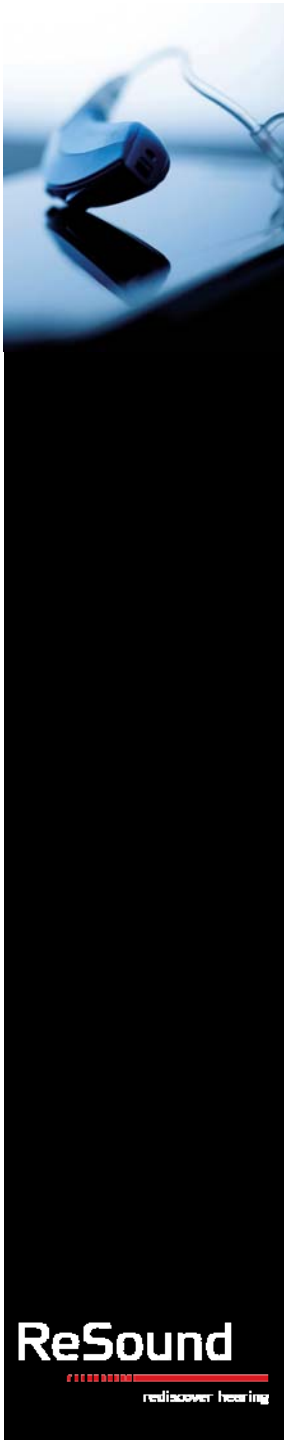
- Low power DSP
 - Converters
 - DSP cores
- Materials
 - Plastics
 - Structural analysis
- Wireless connectivity
 - Low power RF
 - Data reduction and encoding
- Power Supplies
 - Rechargeable batteries



Technology continues to develop

- Digital hearing aids are made today using the same technology as most other consumer electronics
- Moores law will secure more and better signal processing
- More new products with shorter intervals





What is the status for hearing aids in general ?

- Hearing aids as we know them have evolved and improved over the last 50-60 years
- The number of users has grown very considerably over that period
- But hearing aids are still only used by a fraction of those who could benefit
- Stigma is an often used explanation for non-use
- Performance can still be improved

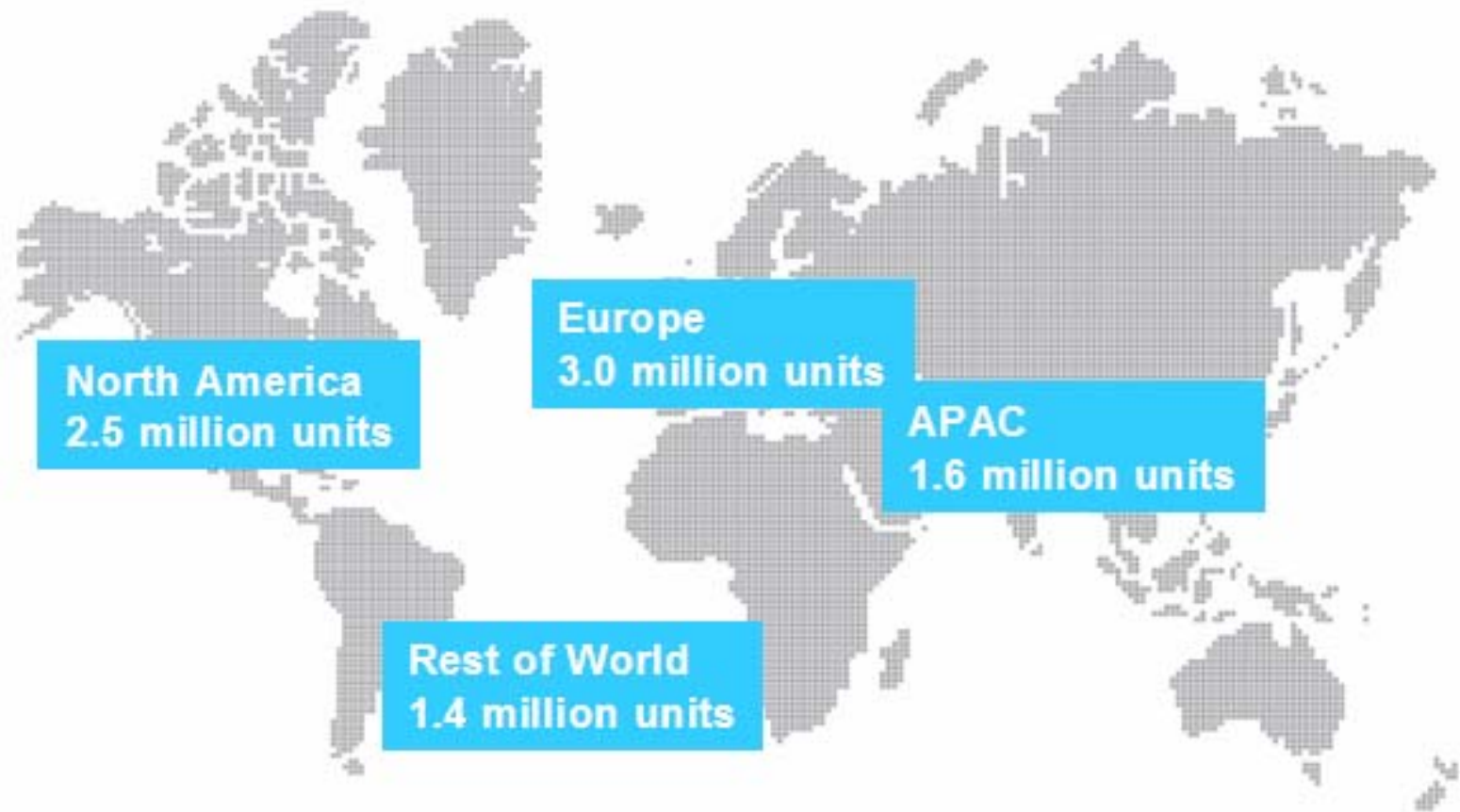
Hearing Aids help – how many have them ?

- Coverage varies greatly across the world, but only limited data is available:
 - Total sales of hearing aids per country per year
 - Basic demographics
- In order to calculate coverage assumptions must be made and more factors must taking in to account:
 - The fraction of bilateral fittings
 - The average lifetime of a hearing aid
- Coverage could be affected by factors such as:
 - Standard of living
 - Subsidies





Approx 8.5 mill. hearing aids sold in 2007





Hearing Aid coverage across the world

Facts	Estimates	Results
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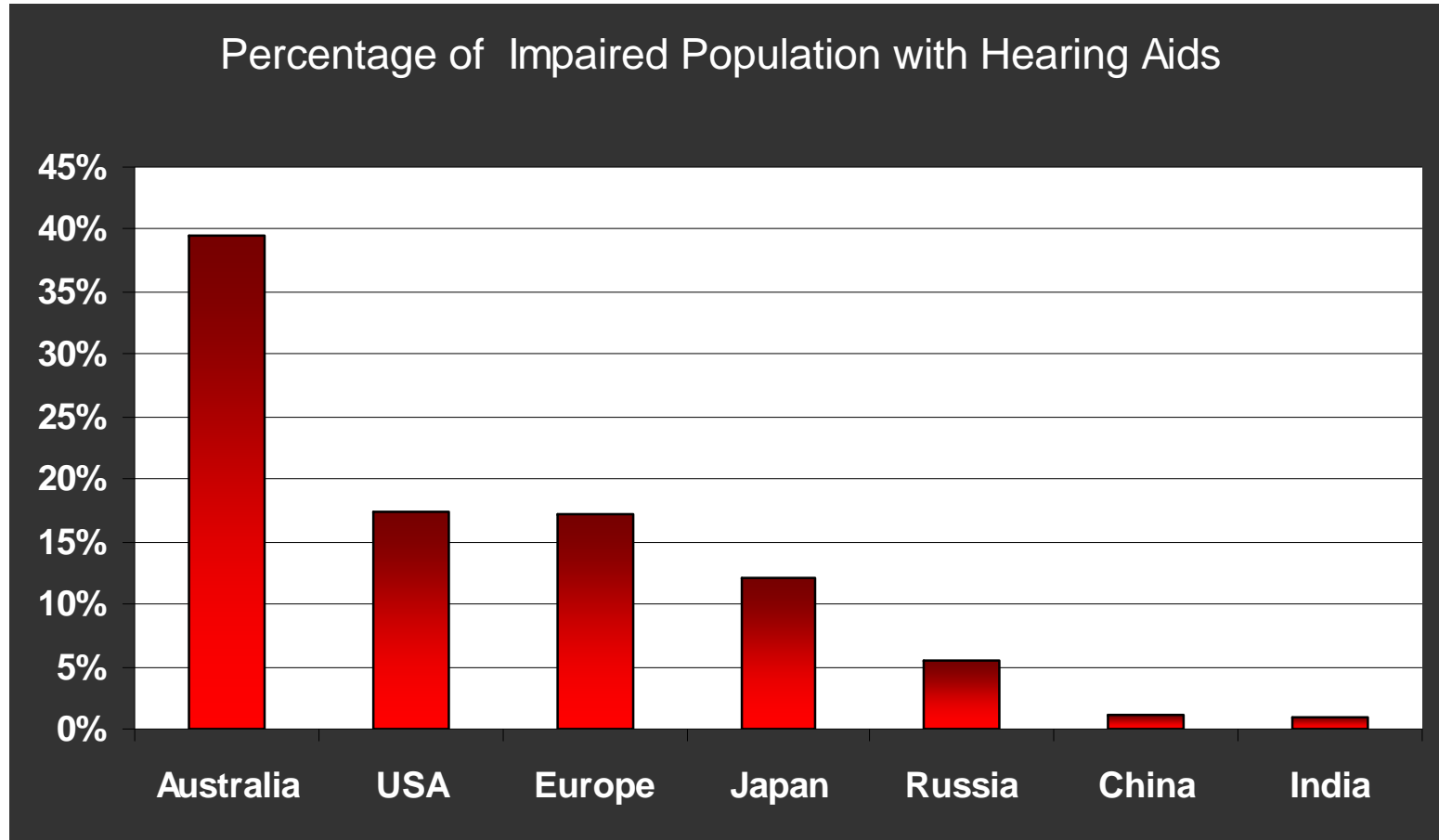
Country	Total Population- Pop	Population over age 18 Pop18	Impaired Population HI18
	Mill. (2007)	Mill. (2007)	Mill.
Australia	21,0	13,6	2,2
USA	304,0	194,3	30,9
Europe	507,6	394,4	62,7
Japan	127,0	78,4	12,5
Russia	141,0	94,4	15,0
China	1.330,0	906,0	144,1
India	1.148,0	682,2	108,5
Total	3.578,6	2.363,3	375,8



Country	Hearing Instr sold p.a.	Binaural %	People Fitted p.a.	People Using HI	Coverage Imp. Pop.	GNP per capita	Subsidy level
	HA	Bil	PF	HAU			
	*1000 (2007)	(2007)	*1000	*1000	%	\$	
Australia	320	50%	213	853	39%	37.300	4
USA	2.425	80%	1.347	5.389	17%	45.800	2
Europe	3.657	50%	2.441	9.765	16%	30.382	2
Japan	450	20%	375	1.500	12%	33.500	2
Russia	225	10%	205	818	5%	14.800	1
China	430	7%	402	1.607	1%	5.400	1
India	250	7%	234	935	1%	2.600	1
Total	7.757,0	65%	5.003,6	20.014,2	5%	8.307	

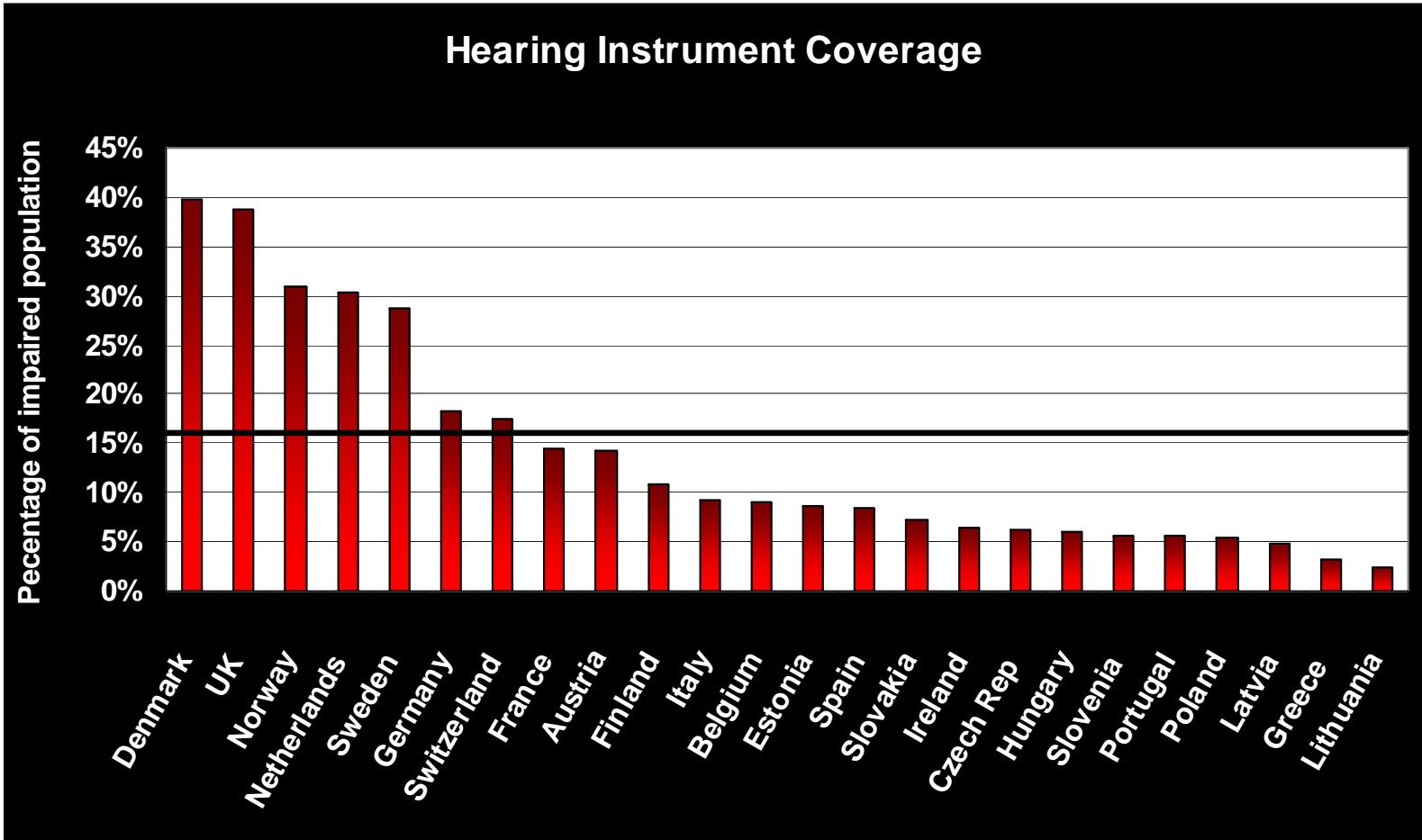


World market overview





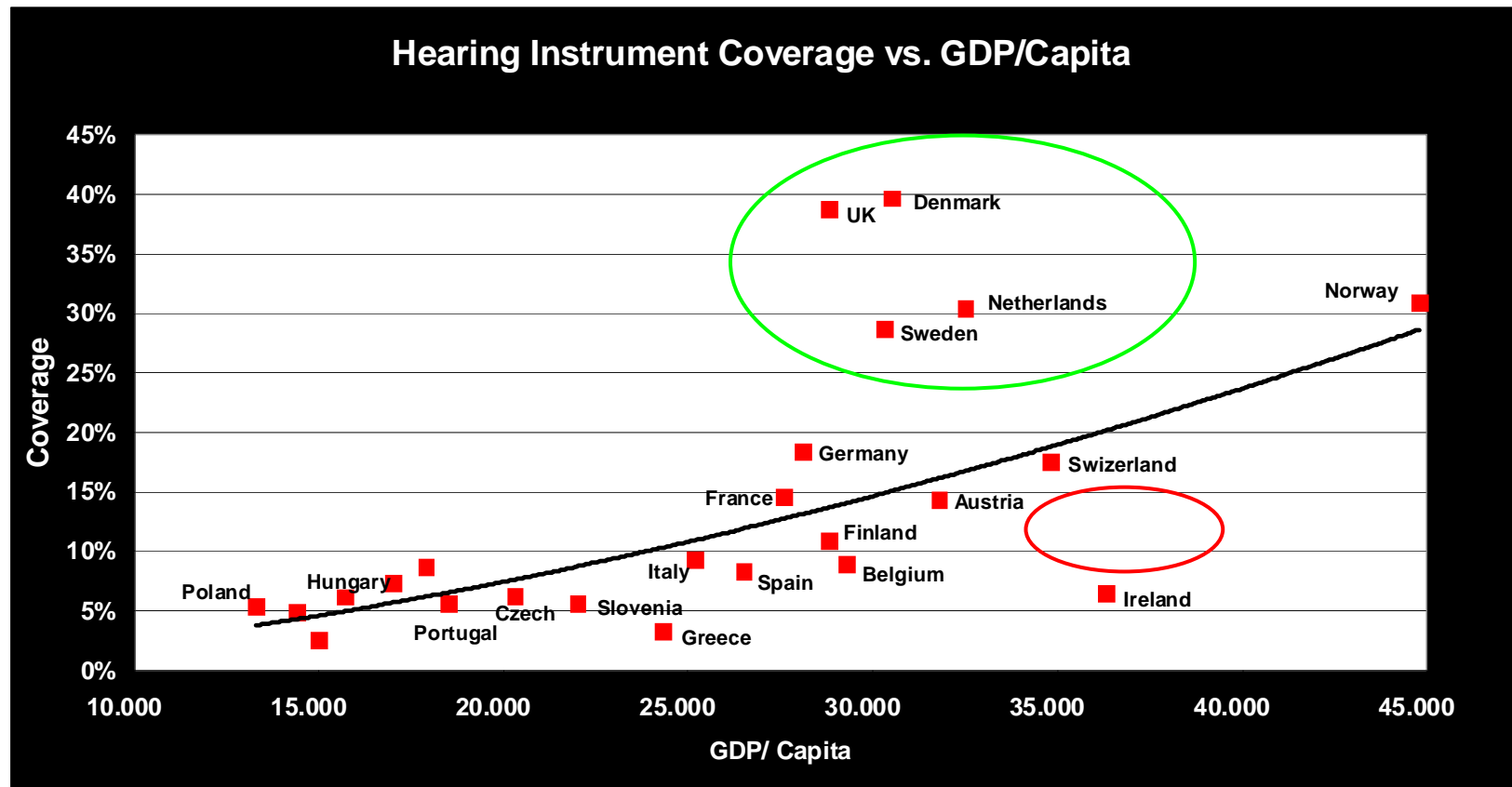
Major Regional differences in Europe





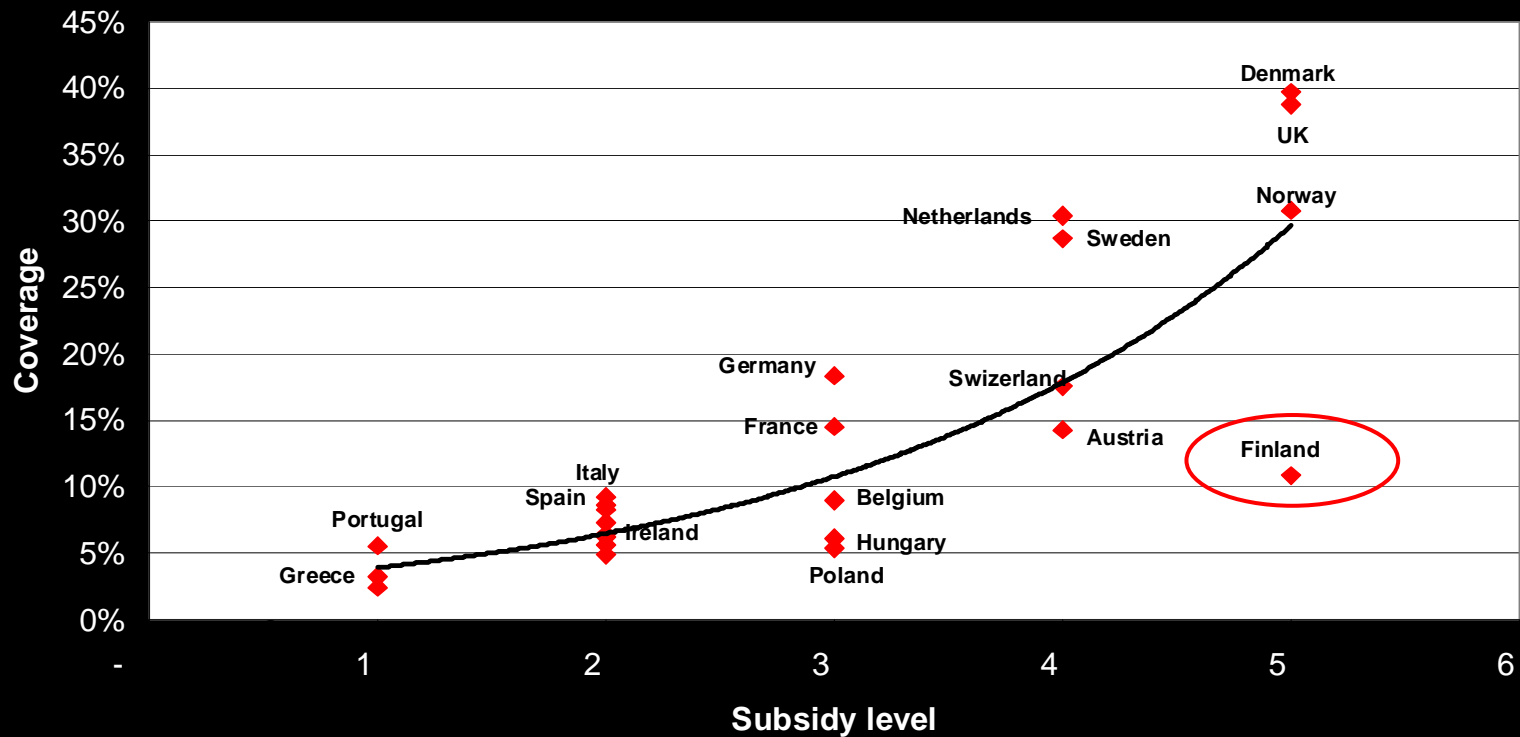
GDP - a strong driver for differences

- Gross Domestic Product (GDP) per capita correlates quite well with coverage for many countries



Subsidies also drive coverage

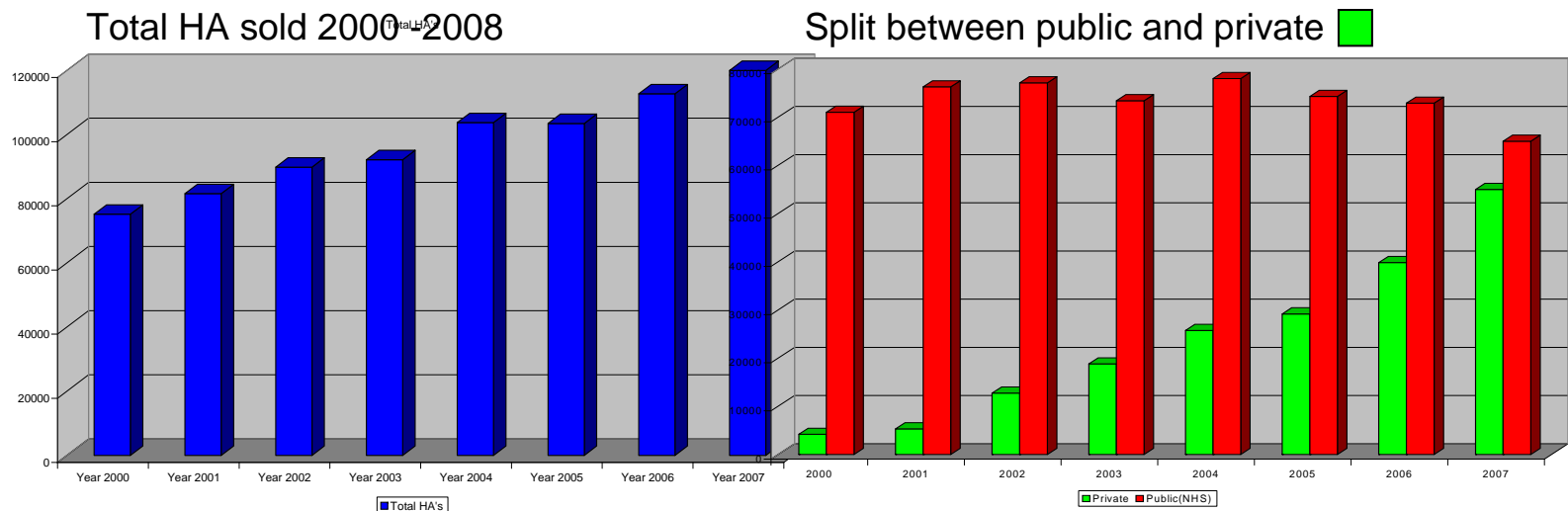
Hearing Instrument Coverage vs. Subsidy level





Case Story: Denmark

- A combination of several factors led to increased coverage in Denmark after 2001
 - Voucher for fitting in private shop instead of hospital clinic (Attractive business model) & (More accessible outlets)
 - Coverage rose from 27 % to 40 %
 - Resulted in shortage of educated staff

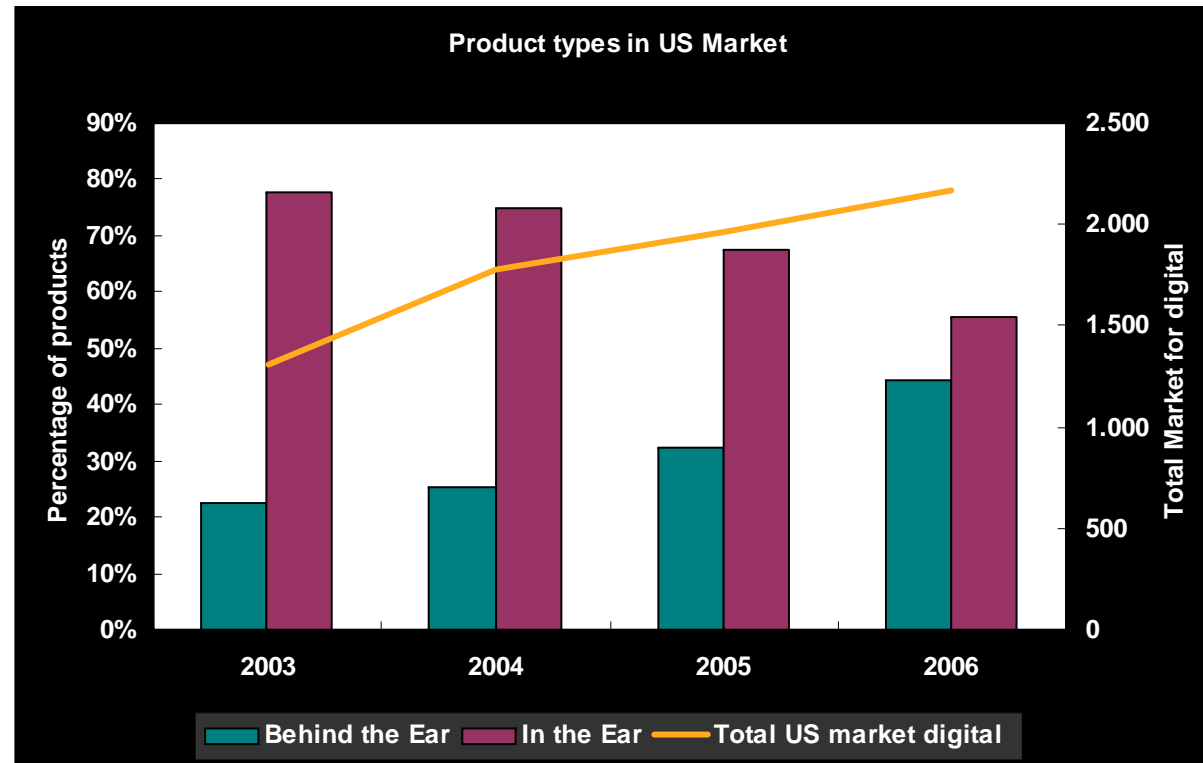


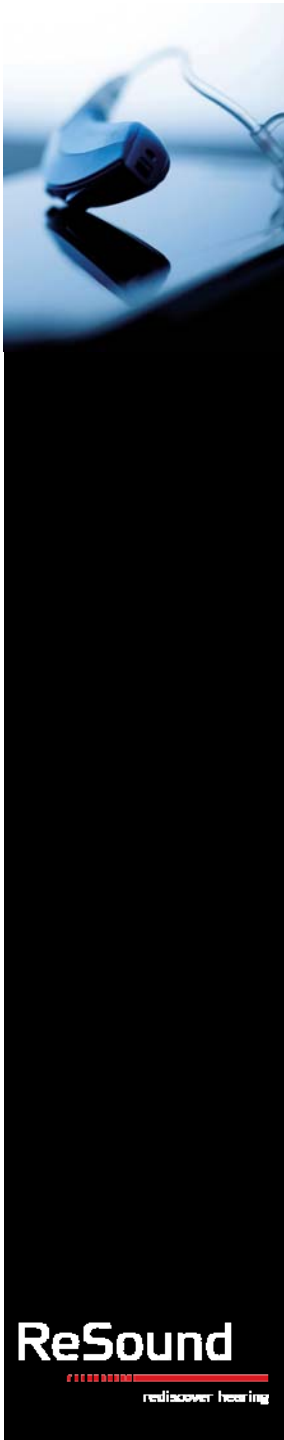


Case story: US market

- The US market has for decades been divided between custom made In-the-Ear (ITE) products (80 %) and factory made Behind-the-Ear (BTE) (20 %)
- Comfortable and small instant fit BTE's has changed the game and increased BTE usage, but
- Not significant growth in coverage

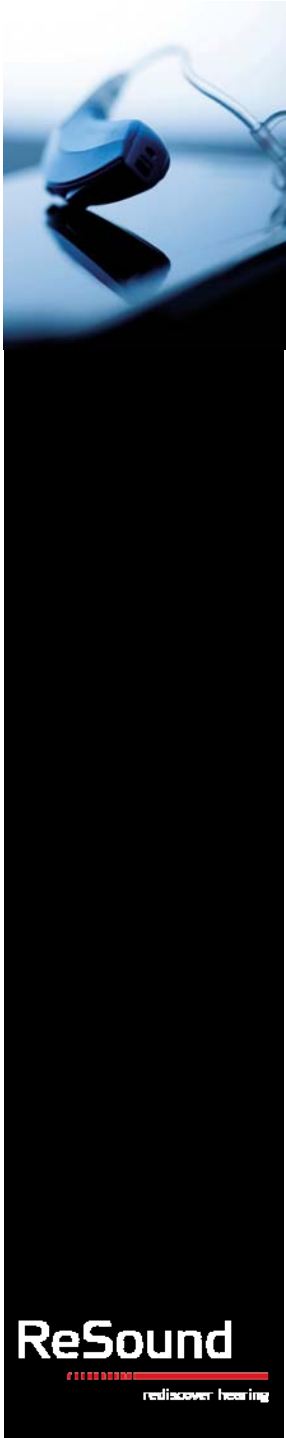
Data source: HIA statistics





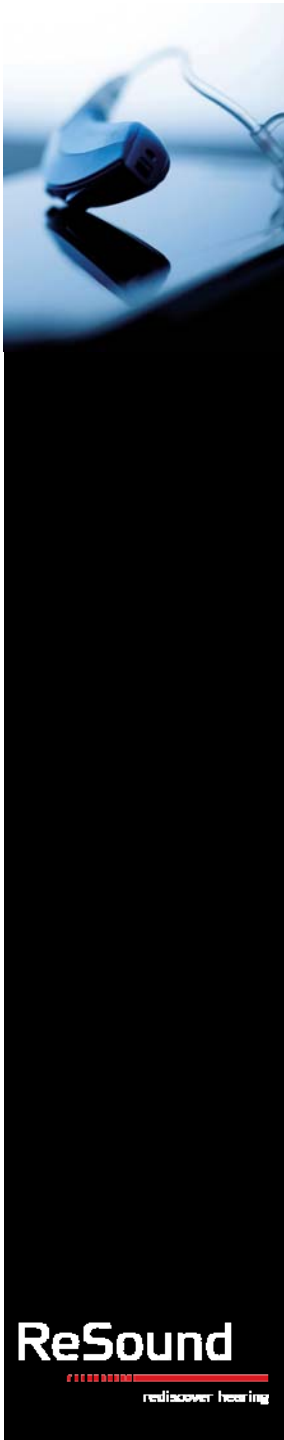
Why is more research needed ?

- Still less than 60 % of people with significant hearing loss are using hearing aids.
 - What does it take to increase coverage ?
- For many years signal processing capacity available in hearing aids was quite limited
 - Today we have 10-15 DSP MIPS at our disposal
 - What should they be used for ?
- The field of diagnostics was developed primarily from a medical perspective with focus on thresholds
- For hearing aid fitting we need detailed characterisation of super-threshold performance in several aspects as described in the Auditory profile
- New diagnostic procedures must provide value for the hearing aid fitting professionals



What further research is needed ?

- Auditory profiling is an important step towards solutions that are not only customised physically, but also truly customized from a signal processing viewpoint. More effort is needed to develop:
 - Time-efficient diagnostic procedures
 - Mapping of signal processing needs for identified groups
- Spatial hearing seems to be an important component in coping with competing noise. More effort could be used in defining:
 - Realistic spatial test scenarios
 - Spatial benefit testing for clinical use
- Public services to support hearing aid coverage
 - Wireless services
 - Internet information and self-testing



CEN 380 European standard project

- A recent effort to create a standard for:
"Services offered by Hearing Aid professionals"
- In Europe the situation between member states differs significantly from no national regulations to very organized and sophisticated systems
- If adopted the standard will set forth requirements for the following areas:
 - Education
 - Facilities
 - Equipment
 - Fitting proces
 - Quality management system
- The scope is all typical age related losses acknowledging that children, cochlear implants and multiple handicaps require further efforts

