

# Using data driven economic evaluation in health systems to inform resource allocation decisions



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# Outline

- Economic evaluation
- Policy decisions
- Types of evidence
- Statistical modelling
- Decision analysis

# What is economic evaluation?

Funding constrained

Costs <sub>1</sub> Benefits <sub>1</sub>	Costs <sub>2</sub> Benefits <sub>2</sub>	Costs <sub>3</sub> Benefits <sub>3</sub>
Costs <sub>4</sub> Benefits <sub>4</sub>		
Costs <sub>5</sub> Benefits <sub>5</sub>	Costs <sub>6</sub> Benefits <sub>6</sub>	
Costs <sub>7</sub> Benefits <sub>7</sub>	Costs <sub>8</sub> Benefits <sub>8</sub>	Costs <sub>9</sub> Benefits <sub>9</sub>
Costs <sub>10</sub> Benefits <sub>10</sub>	Costs <sub>11</sub> Benefits <sub>11</sub>	Costs <sub>12</sub> Benefits <sub>12</sub>
Costs <sub>13</sub> Benefits <sub>13</sub>		
Costs <sub>14</sub> Benefits <sub>14</sub>	Costs <sub>15</sub> Benefits <sub>15</sub>	
Costs <sub>16</sub> Benefits <sub>16</sub>	Costs <sub>17</sub> Benefits <sub>17</sub>	Costs <sub>18</sub> Benefits <sub>18</sub>
Costs <sub>19</sub> Benefits <sub>19</sub>		
Costs <sub>n</sub> Benefits <sub>n</sub>		

New intervention



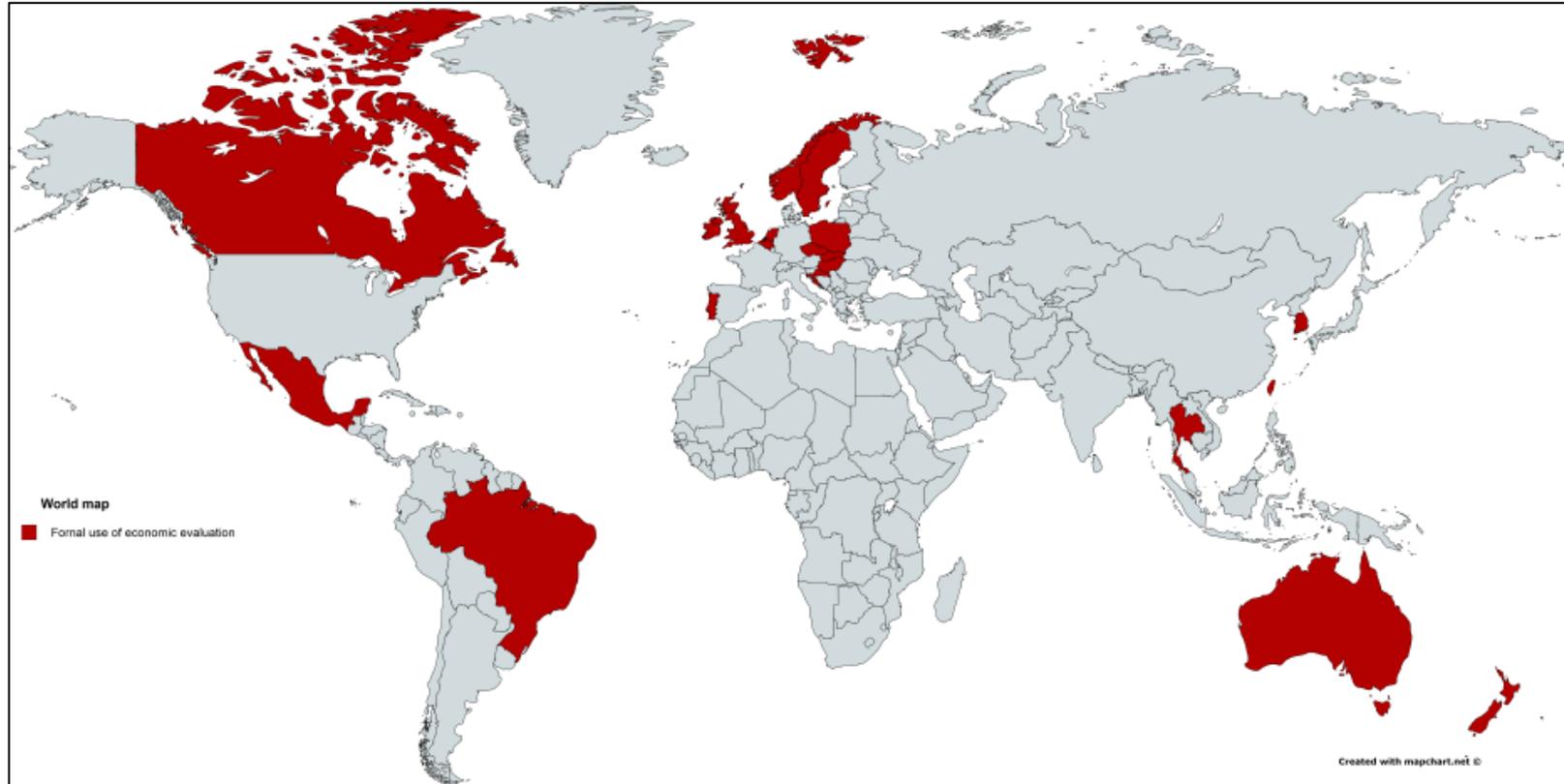
Displaced intervention(s)



**Do the benefits gained outweigh the opportunity costs?**

# Policy context

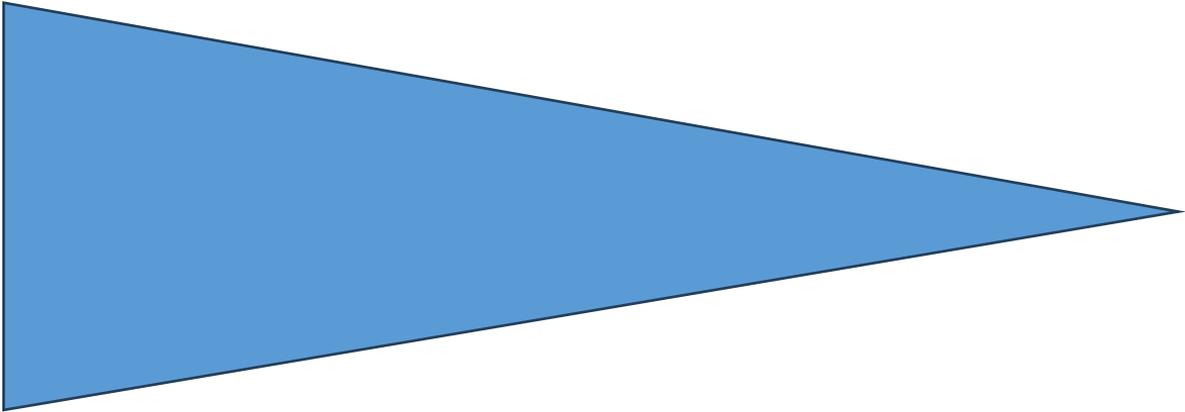
Routine use of economic evaluation in medicines 'HTA'



# Policy context

Decisions routinely informed by evaluation

Frequency



Branded  
drugs

Medical  
devices

Surgical  
procedures

Public  
health

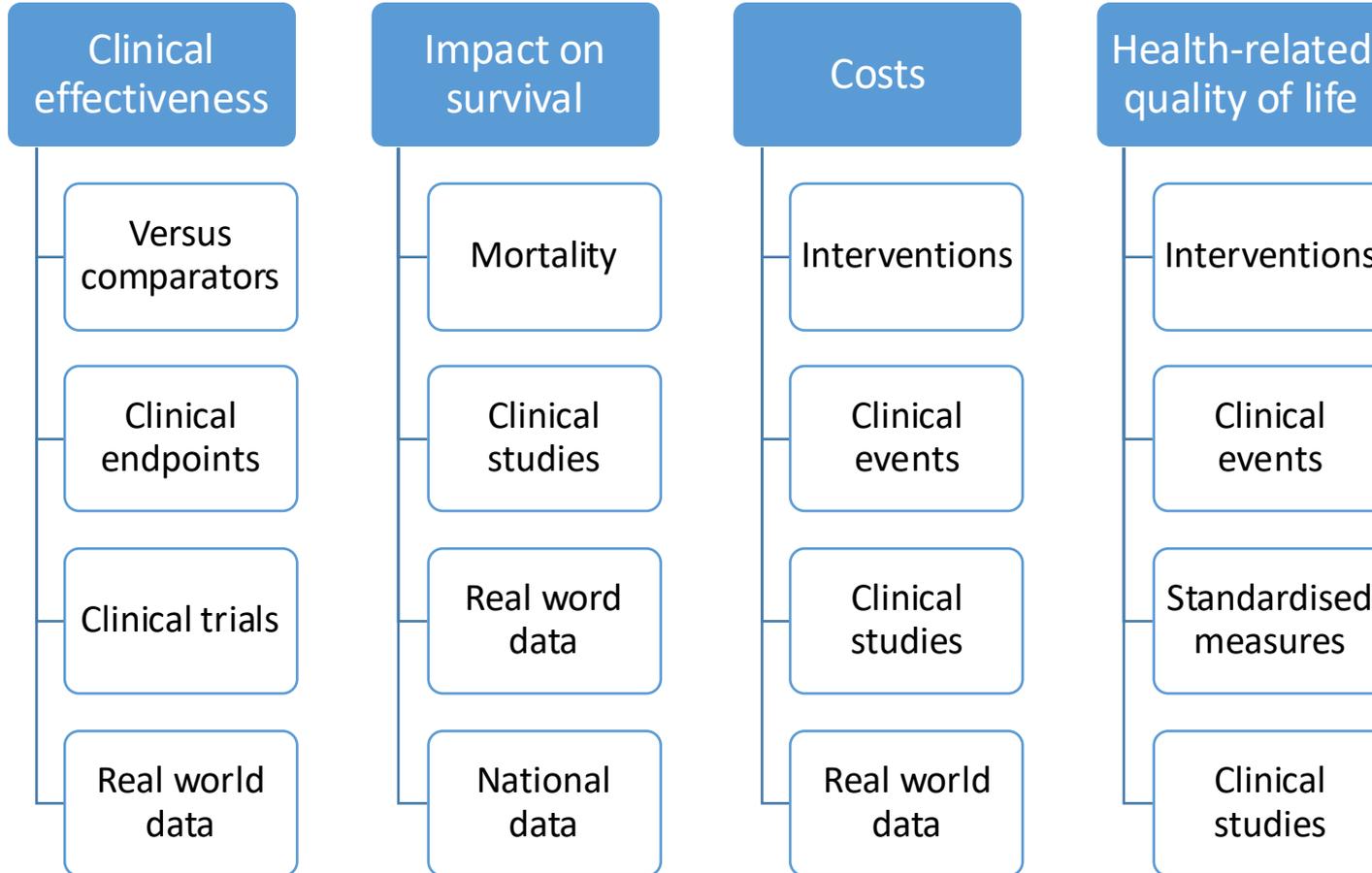
Service  
development

Infrastructure  
investment

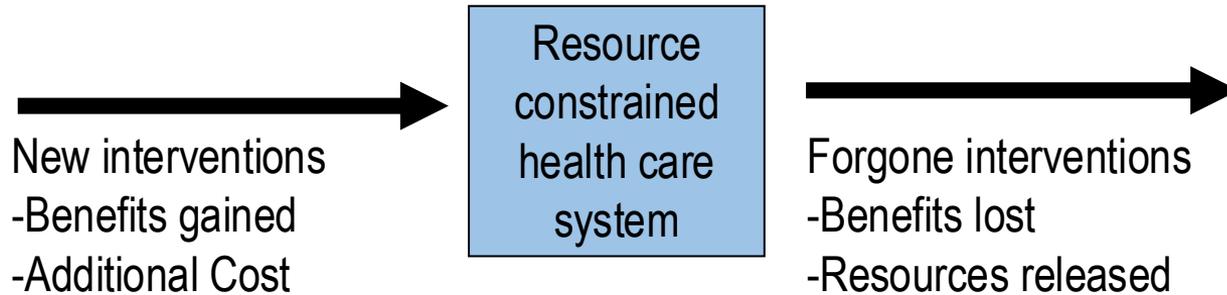
System  
reform

Staffing  
levels

# Driving economic evaluation with data



# Opportunity costs always apply



System	Funding	Increased spend	Benefits lost	Mechanisms	Reference
England	Single system, constrained funding	£15,000	1 QALY	Waiting lists, services changed, staffing changes	Claxton 2023
Australia	Pluralistic, more flexible funding	\$28,000	1 QALY	Co-pays, premiums	Edney et al 2018

# From data to analysis: statistical modeling (1)

**Table II.** Results from the two Weibull functions relating to early and late failures from the Swedish Registry

	Early failures			Late failures		
	hazard ratio	SE	p-value	hazard ratio	SE	p-value
Spectron	0.669	0.179	0.133	0.261	0.100	0.000
Age	0.996	0.007	0.599	0.964	0.005	0.000
Male gender	1.292	0.173	0.056	2.157	0.235	0.000
Gamma	0.485	0.030		1.454	0.069	

**SE** = standard error.

- Multi-variable regression to estimate 'parameters'
- Causal inference
- Study design
- Machine learning

# From data to analysis: statistical modeling (2)

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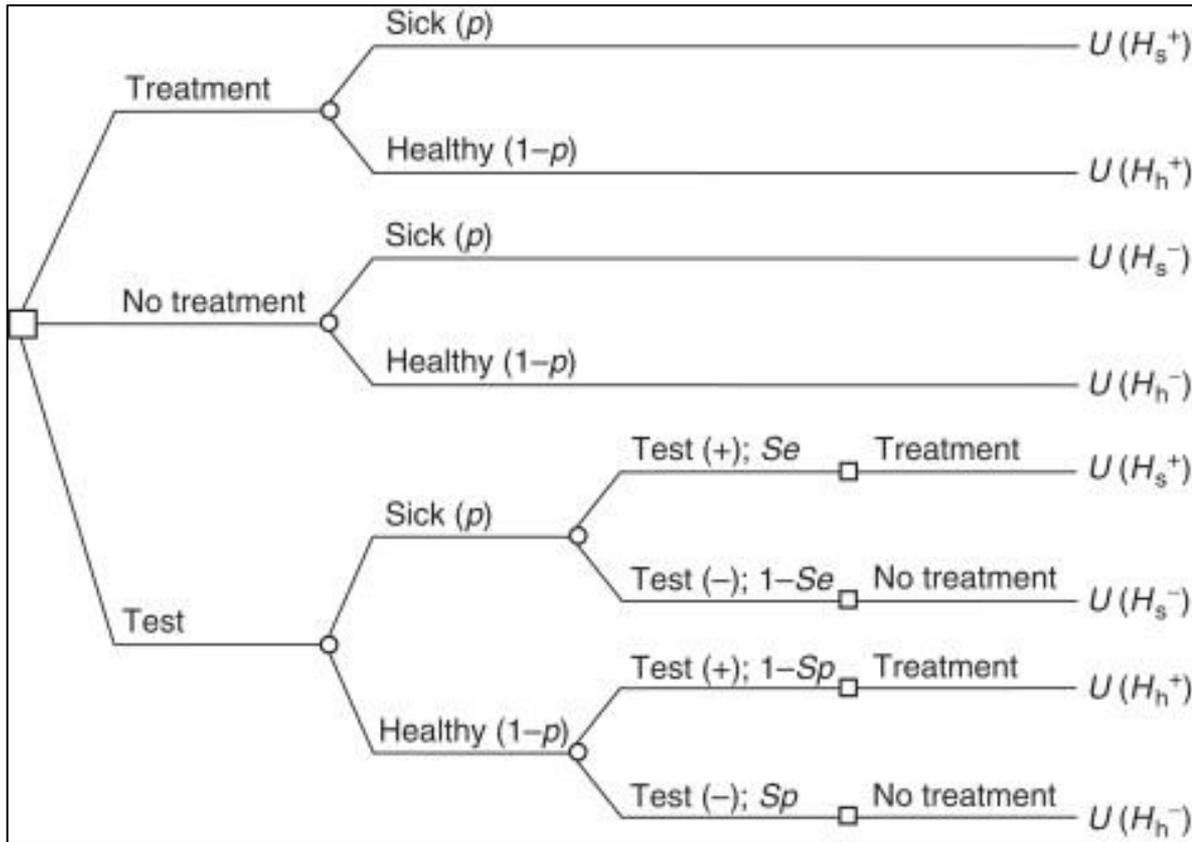
Real-world data on the incidence, mortality, and cost of ischaemic stroke in non-valvular atrial fibrillation

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**TABLE 5** Mean NHS costs in NVAf patients by treatment group with or without ischaemic stroke or major bleeding event up to 1 year post-index,<sup>a</sup> adjusted by CHA<sub>2</sub>DS<sub>2</sub>-VASc score, HAS-BLED score, and frailty

Time post-index	Mean cost/patient, £ (95% CI) <sup>b</sup>					
	Warfarin + NOAC, no event (n = 3272)	Warfarin + NOAC, with event (n = 248)	Aspirin + other antiplatelet, no event (n = 1829)	Aspirin + other antiplatelet, with event (n = 206)	No treatment, no event (n = 6161)	No treatment, with event (n = 852)
0-3 mo	£2763 (2705-2848)	£3455 (3096-3665)	£2868 (2724-2960)	£3639 (3181-4050)	£6097 (5856-6311)	£10 873 (10217-11 445)
4-6 mo	£1332 (1288-1376)	£1905 (1587-1980)	£1179 (1085-1215)	£2313 (1946-2627)	£1508 (1446-1581)	£2713 (2338-3084)
7-9 mo	£1185 (1144-1243)	£1995 (1733-2246)	£1061 (988-1117)	£2002 (1717-2331)	£1143 (1091-1205)	£2038 (1707-2282)
10-12 mo	£1140 (1090-1196)	£1812 (1512-1964)	£1044 (970-1108)	£1615 (1226-1976)	£1055 (997-1114)	£2333 (1957-2659)
Total	£6421 (6344-6604)	£9167 (8188-9538)	£6152 (5820-6200)	£9569 (8943-10 546)	£9803 (9542-10 080)	£17 957 (16927-18 270)

# From analysis to decisions: decision analysis



- Clarity on decision problem
- Explicit options
- Objective function
- Linking evidence from multiple data sources
- Uncertainty transparent

# Key messages



Resource allocation decisions need evidence on benefits and opportunity costs

Methods not used routinely outside medicines evaluation

Economic evaluation involves different types of evidence

Appropriate statistical analysis and study design needed

Decision analysis is a powerful framework

Data is not sufficient – analytical methods essential

# Thank you!



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