

A model for monitoring Pre-hospital & Emergency Department factors contributing to road ambulance use

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Mater ambulance study

- **Model for surveillance of ambulance activity**
- **Detects inappropriate use**
- **May be used to promote appropriate ambulance utilisation**

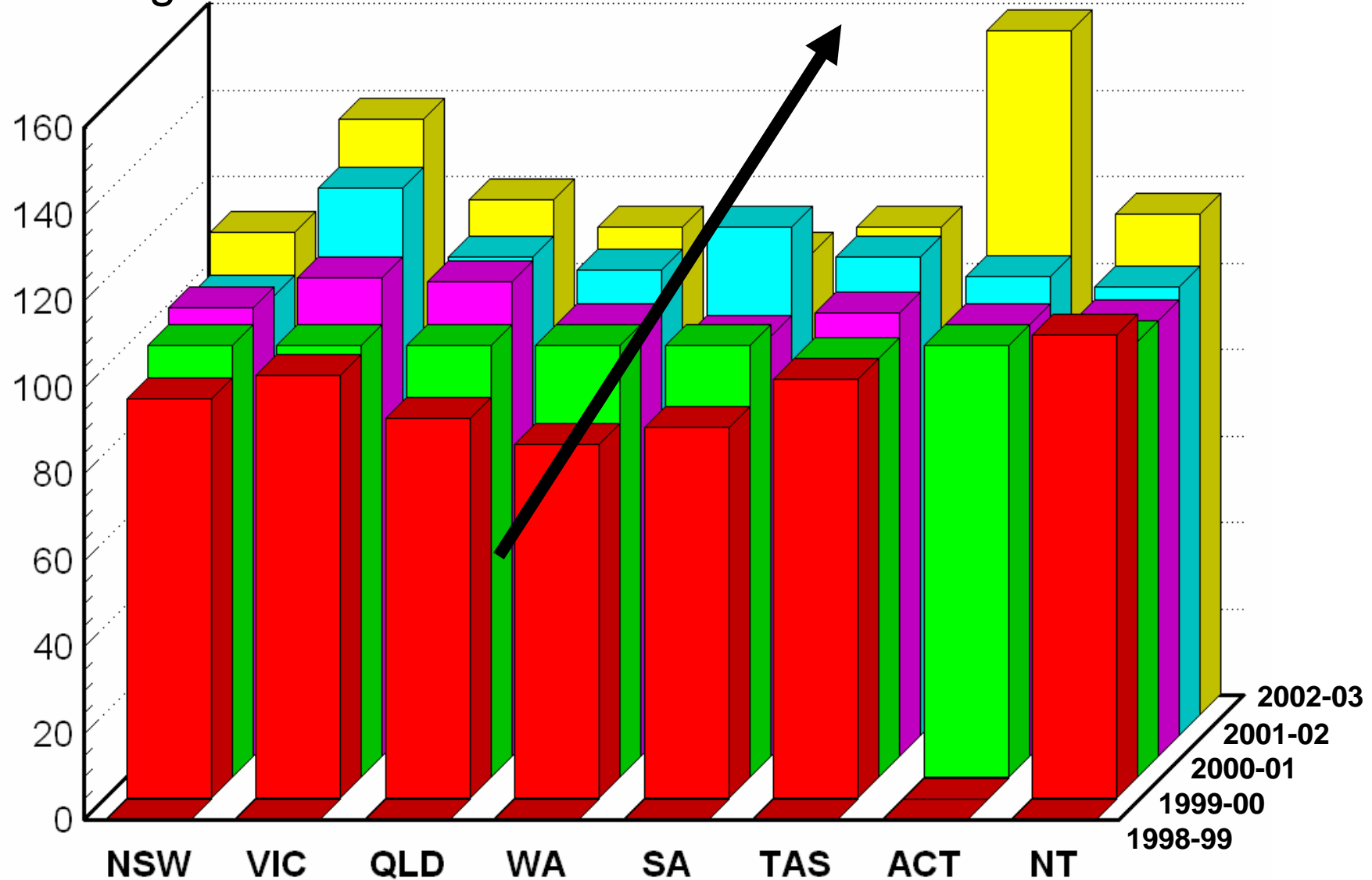


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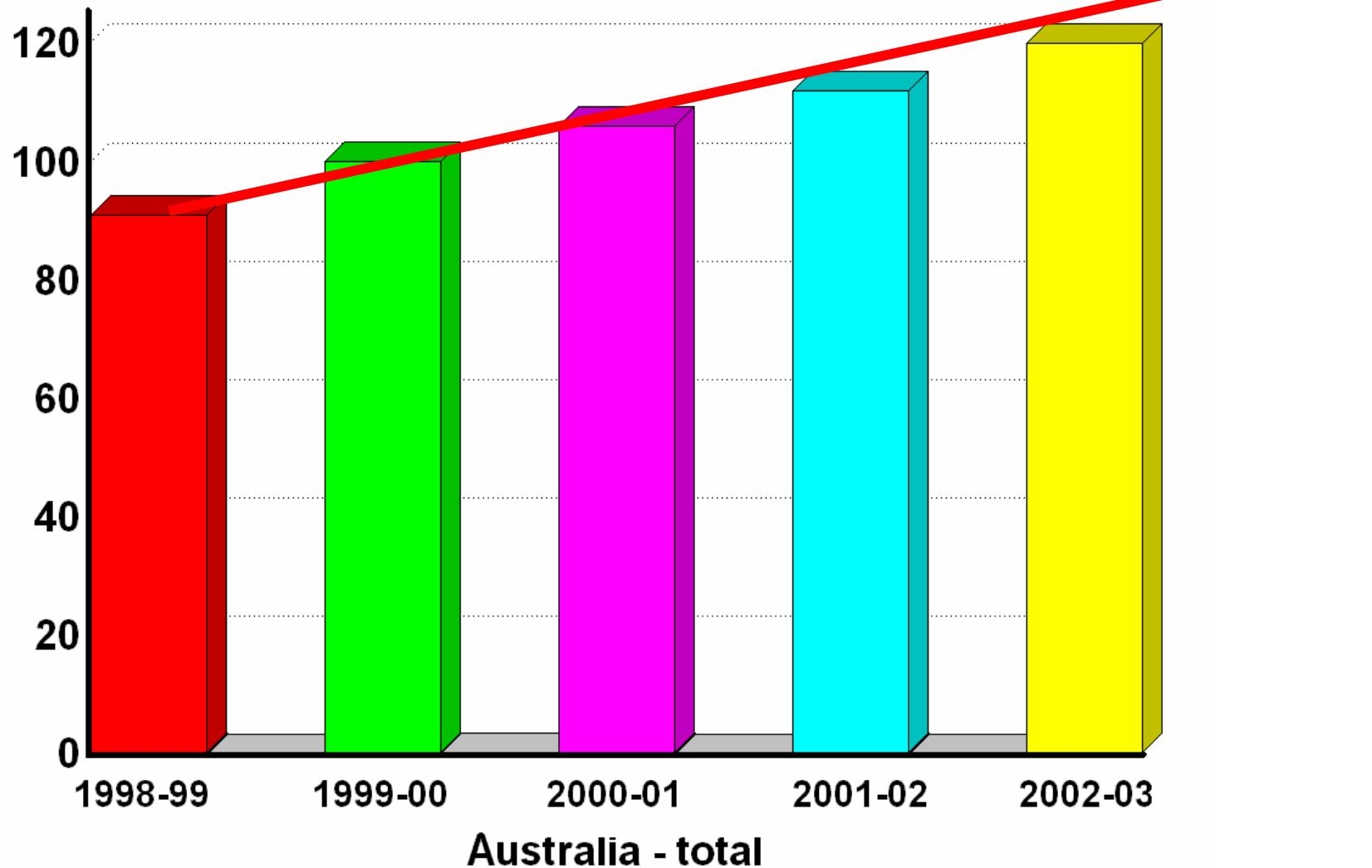
Ambulance funding 1998-2003

Funding index



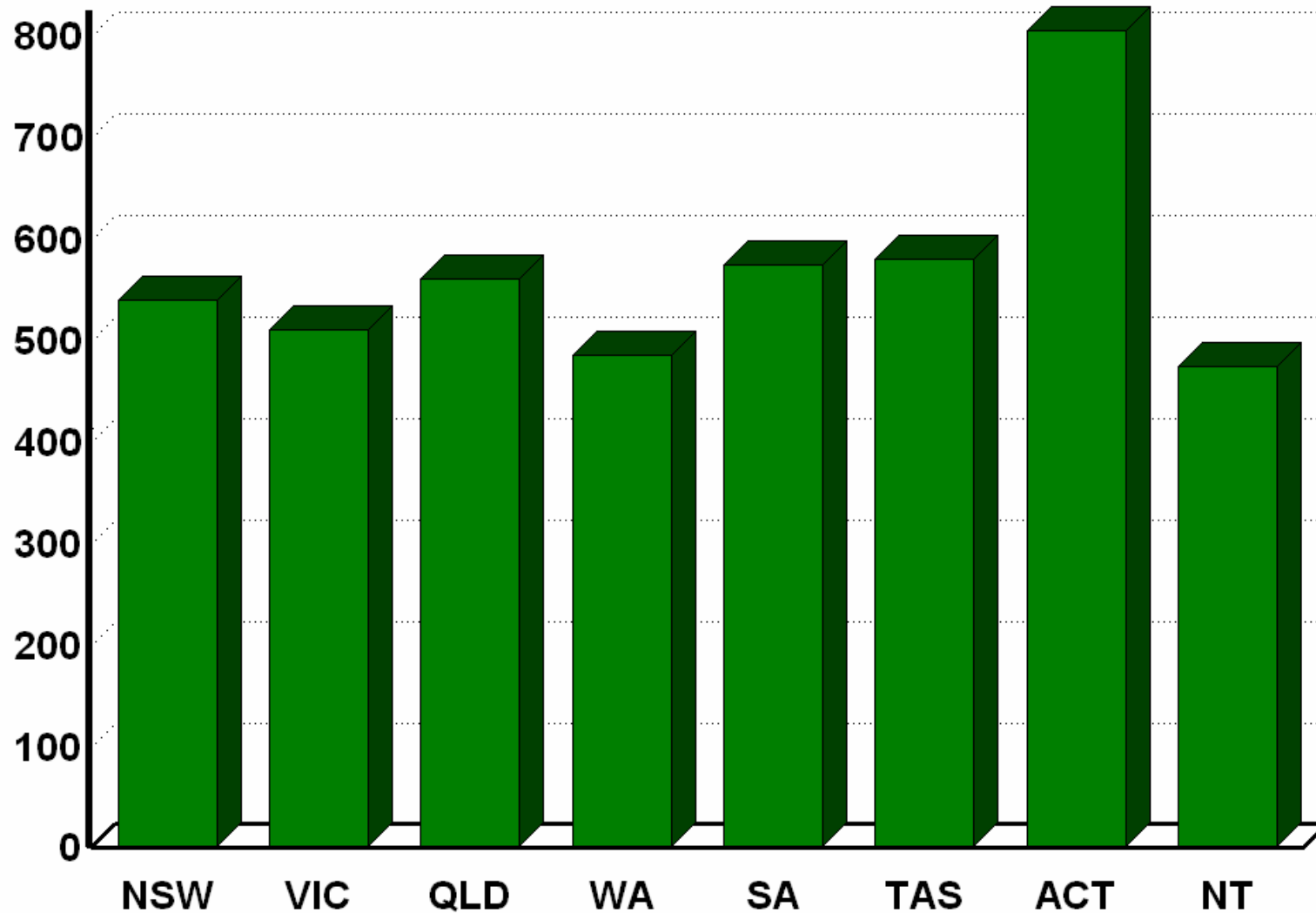
Ambulance funding 1998-2003

Funding index



Cost per patient transported 2002-03

\$ per patient transport



Cost per patient transported 2002-03

\$ per 1000 people



Ambulance expenditure 2002-03

\$ per 1000 people



Non emergency ambulance transport

	NSW	VIC	QLD	WA	SA	TAS	ACT	NT	Aust
1999-2000	164613	177958	166518	61289	43401	6208	4144	4512	628643
2000-2001	247304	203994	181721	65109	50311	7045	4874	-----	760358
2001-2002	248708	220515	199789	66472	49078	8603	5070	-----	809818
% increase	51.1	23.9	20.0	8.5	13.1	38.6	22.3	56.7	28.8

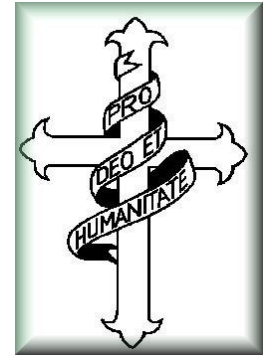
Emergency & urgent ambulance transport

	NSW	VIC	QLD	WA	SA	TAS	ACT	NT	Aust
1999-2000	490577	272857	252473	72659	85773	34667	14927	13062	236995
2000-2001	461637	275219	269500	71984	116417	32570	16436	-----	1243763
2001-2002	491123	291896	306423	78831	124027	34752	18156	-----	1360563
% increase	0.1	7.0	21.4	8.5	44.6	0.2	21.6	17.6	10.0

Comparative expenditure increases 1999 - 2002

“True” emergencies **10.0%**

NON emergent **28.8%**



Mater Ambulance Study



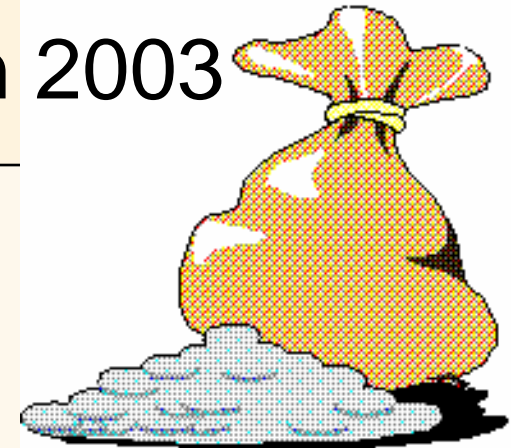
BACKGROUND

Variables can be identified that influence requests for ambulance transport

- Increased age
- Higher illness acuity
- Greater need for admission
- Distance of hospital from home
- Non business hours and weekends
- Ambulance fees not charged to user

BACKGROUND

Change to ambulance funding in 2003



Prior to June 2003 :

- User pays
- Family subscriptions = “insurance”

July 2003 onwards:

- Ambulance funder by community “levy”
- No direct charges for users.

METHODS

SETTING

- Urban adult public ED within 5 km of Brisbane CBD
- Limited trauma
- Tertiary O&G (exclusive provider for southside of Brisbane)

METHODS

- Data: All ED attendances for each of the years 2002 & 2004 (55397 patients)
(ie: the year before and after the introduction of the Community Ambulance charge by the Qld Government in 2003)
- Ambulance users vs non ambulance users compared
- Ambulance utilisation analysed w.r.t.
 - 2002 with 2004
 - Age
 - Illness acuity
 - Need for admission
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STATISTICS

- Chi squared testing
 - 2002 vs 2004
 - ambulant vs non ambulant
- Multivariate logistic regression
 - Hypothesised variables for ambulance utilisation (age, acuity, need for admission, distance of hospital, non business hours)
- Path analysis model
 - Analysis of the cascading inter-relationships between variables that lead to ambulance use.

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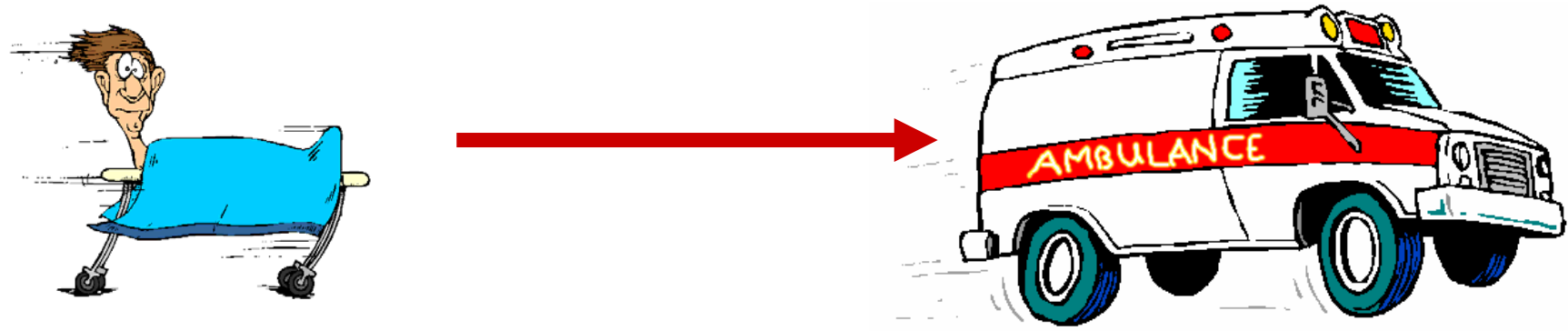
STATISTICS

Predictor variable	Adjusted odds ratio	95% CI	Correlation Coeff	Standard Error	Z	P value
Night (8pm-8am)						
Weekend						
Age > 60						
>10 km from hospital						
Requires admission						
High acuity						
Year 2004						
Female						
CONSTANT						

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Logistic Regression Analysis

Predictor variable	Adjusted odds ratio	95% CI	Correlation Coeff	Standard Error	Z	P value
Night (8pm-8am)	1.5295	1.4540 – 1.6091	0.425	0.0259	16.4359	< 0.001
Weekend	1.0419	0.9884 – 1.0982	0.041	0.0269	1.5267	0.127
Age > 60	1.4175	1.4013 – 1.4340	0.349	0.0059	59.3342	< 0.001
>10 km from hospital	1.1490	1.0957 – 1.2049	0.139	0.0242	5.7312	< 0.001
Requires admission	2.2793	2.1619 – 2.4031	0.824	0.0270	30.5411	< 0.001
High acuity	2.0198	1.9456 – 2.0934	0.721	0.0183	38.3786	< 0.001
Year 2004	1.1455	1.1188 – 1.1729	0.136	0.0120	11.2764	< 0.001
Female	1.1305	1.0778 – 1.1855	0.123	0.0243	38.3786	< 0.001
CONSTANT	---	---	-274.19	24.1296	-11.3631	< 0.001



Path analysis

Cascading interactions of factors leading to ambulance transport

Three LEVELS in a sequence of cascading events.

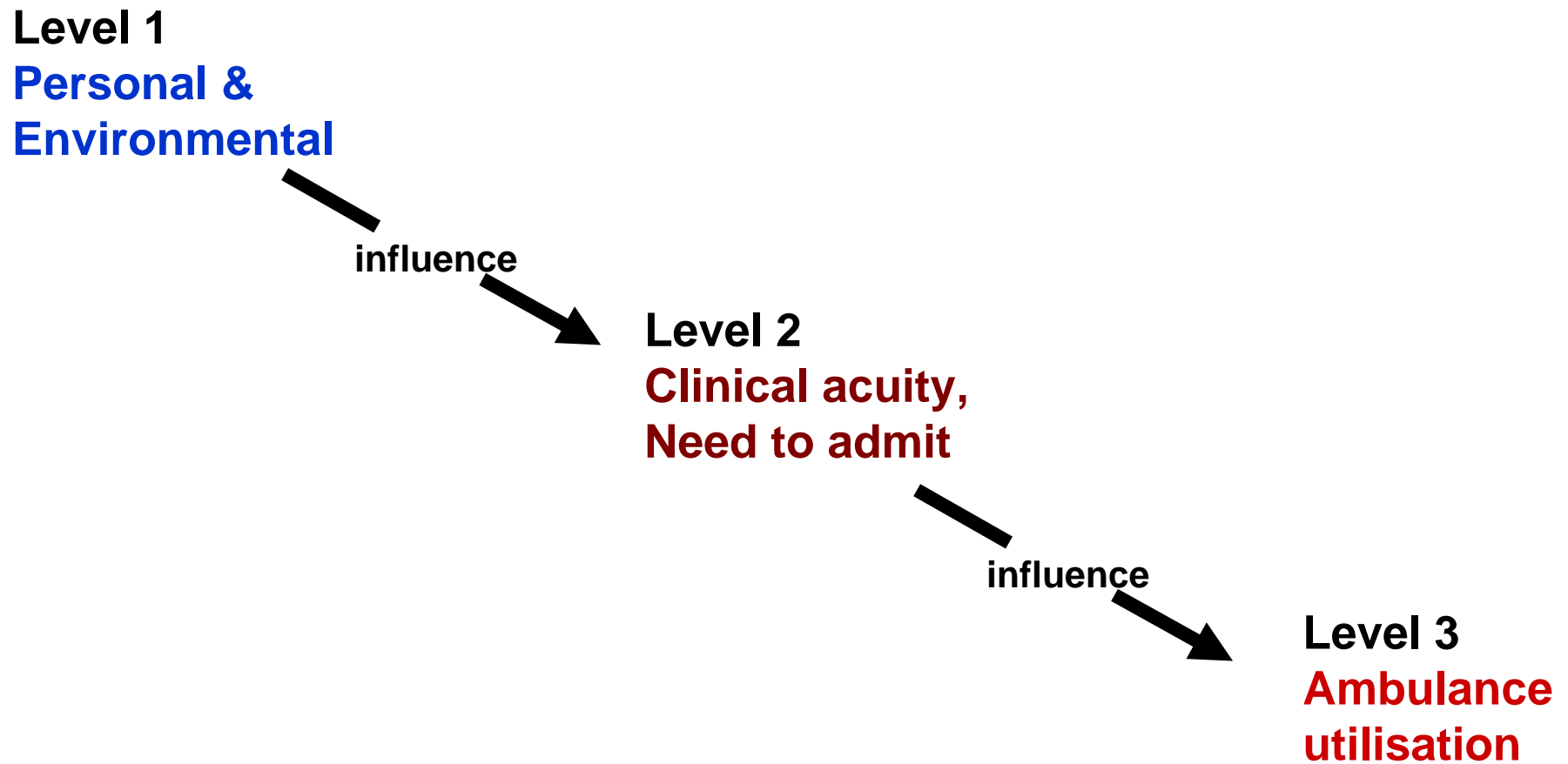
Level 1
**Personal &
Environmental**

influence

Level 2
**Clinical acuity,
Need to admit**

influence

Level 3
**Ambulance
utilisation**



Three LEVELS in a sequence of cascading events.

Level 1
Personal &
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- **Determined in ED**
- **Surrogate measures of illness severity at time of ambulance request.**

Three LEVELS in a sequence of cascading events.

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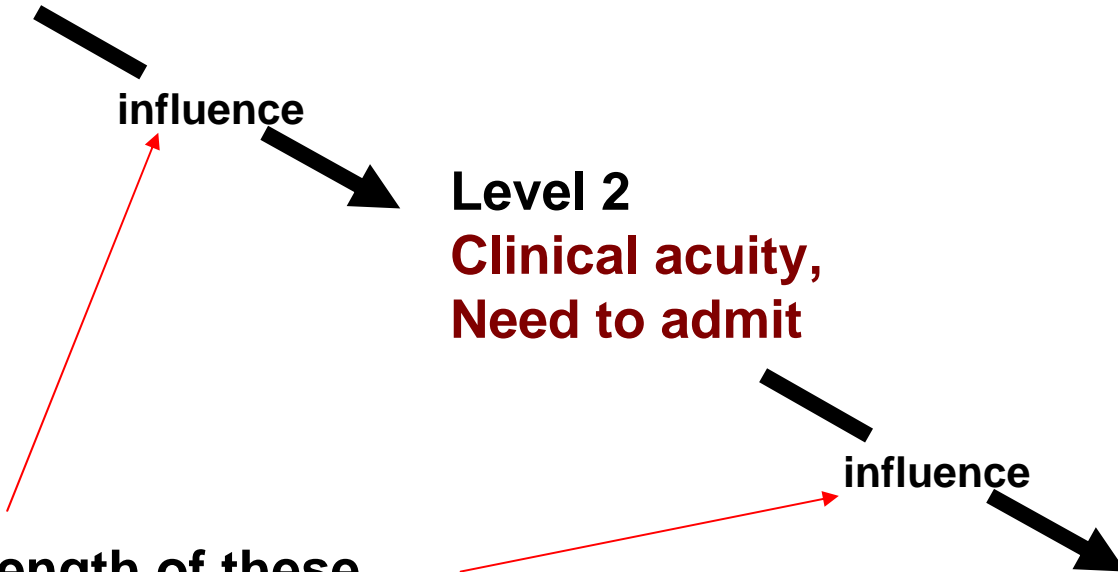
influence

Level 2
**Clinical acuity,
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influence

Level 3
**Ambulance
utilisation**

**Relative strength of these
influences can be quantified**



**PATIENTS'
CHARACTERISTICS**

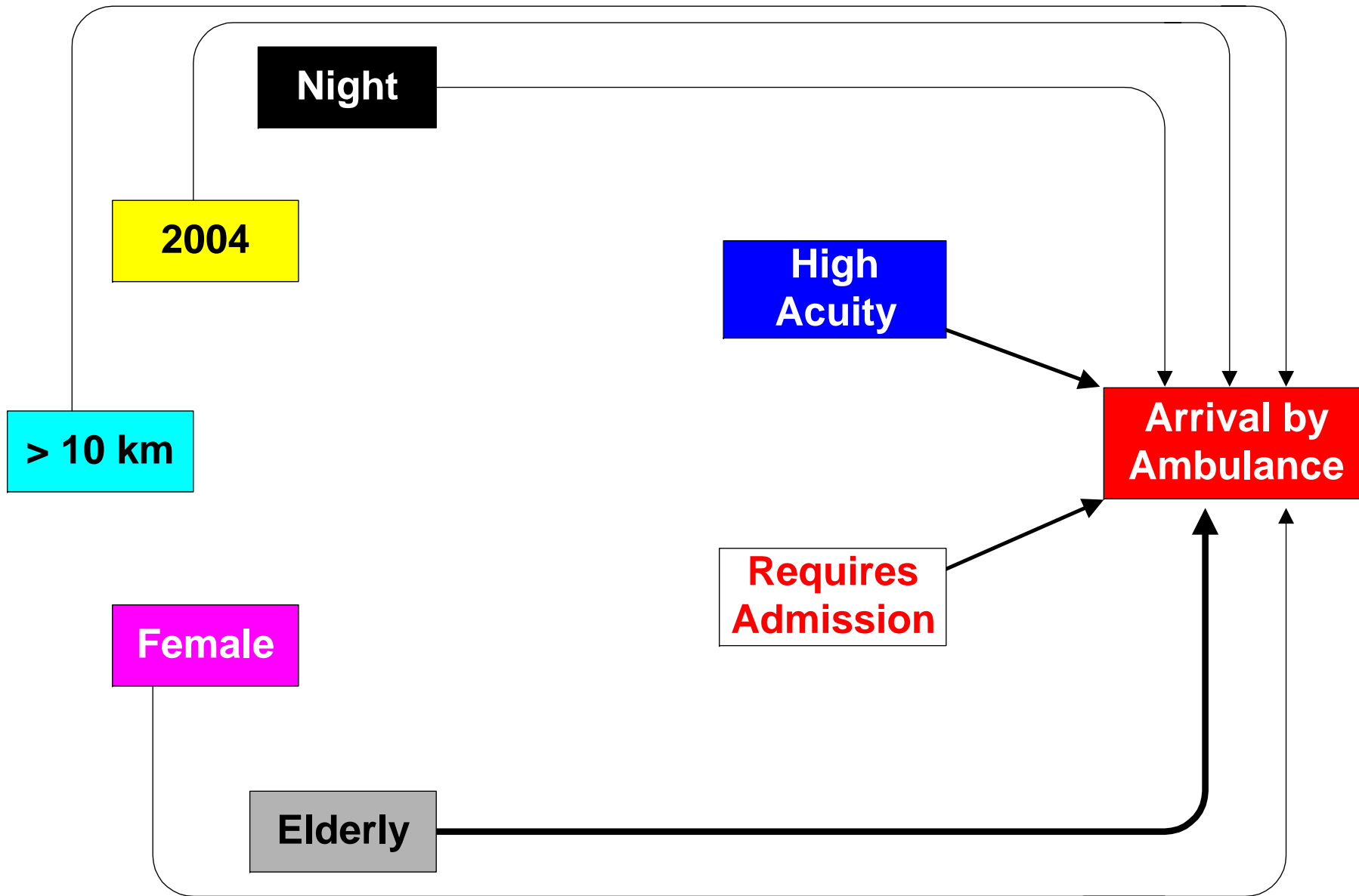
CLINICAL INDICES

OUTCOME

PATIENTS' CHARACTERISTICS

CLINICAL INDICES

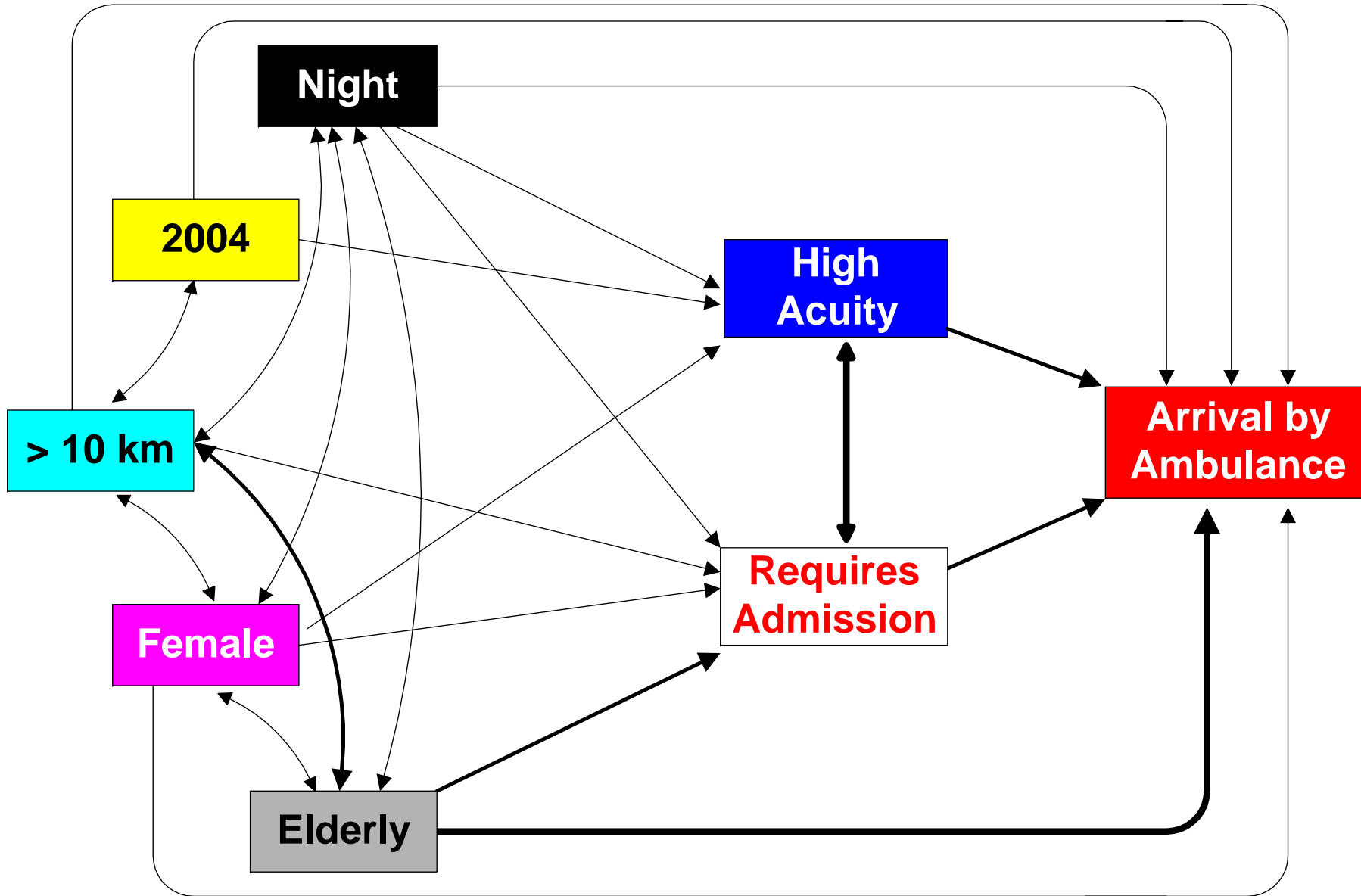
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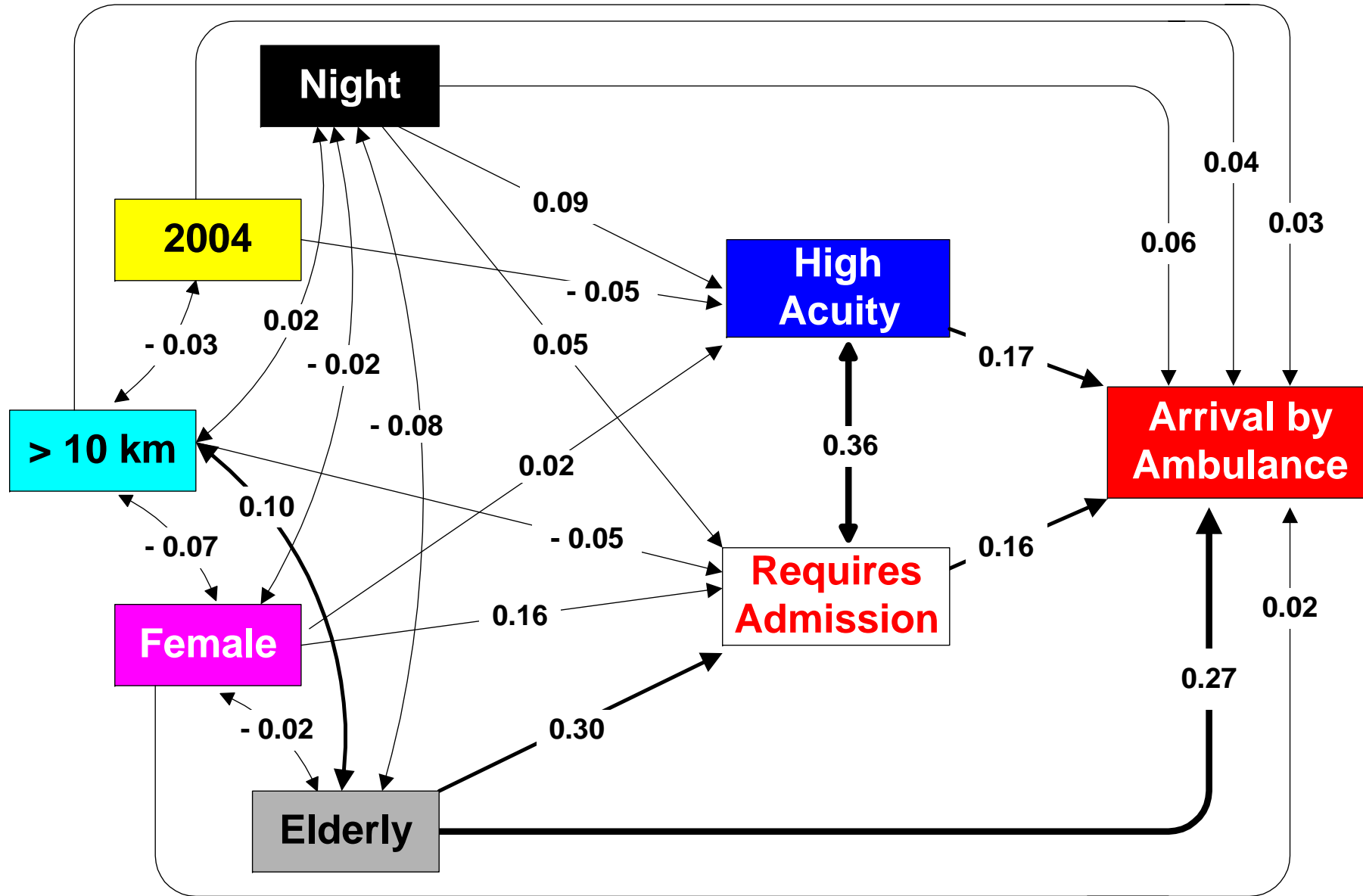
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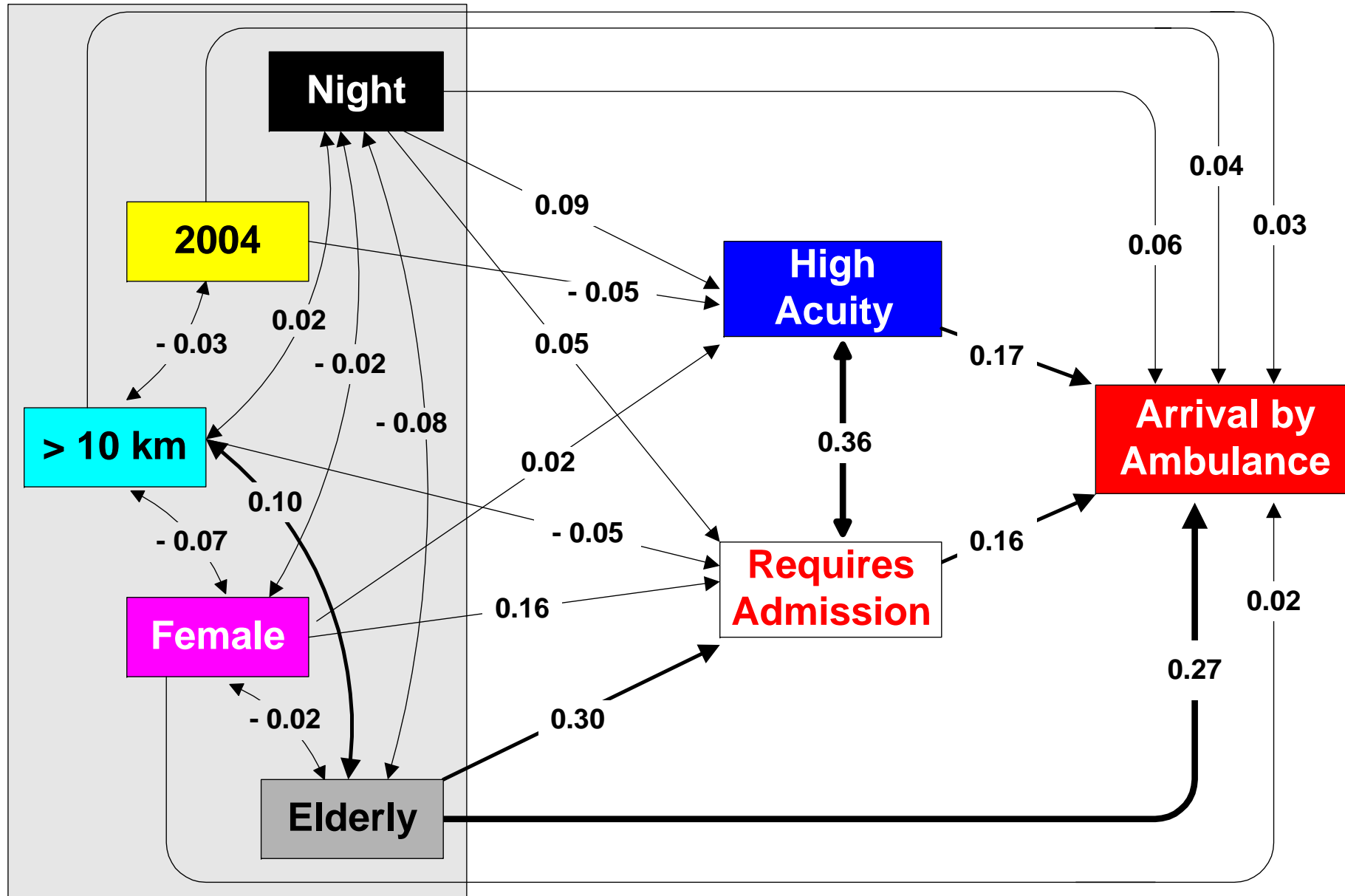
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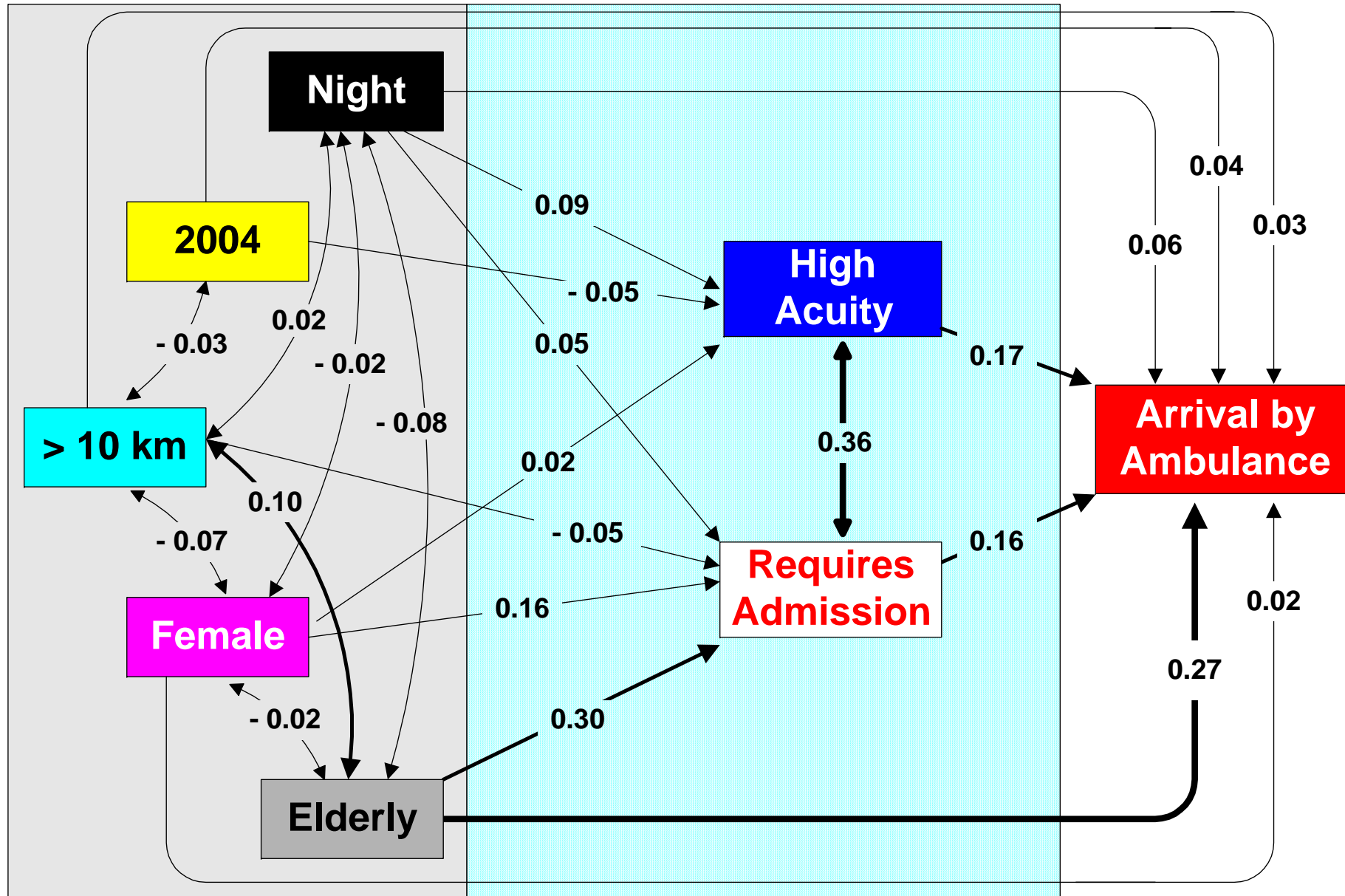
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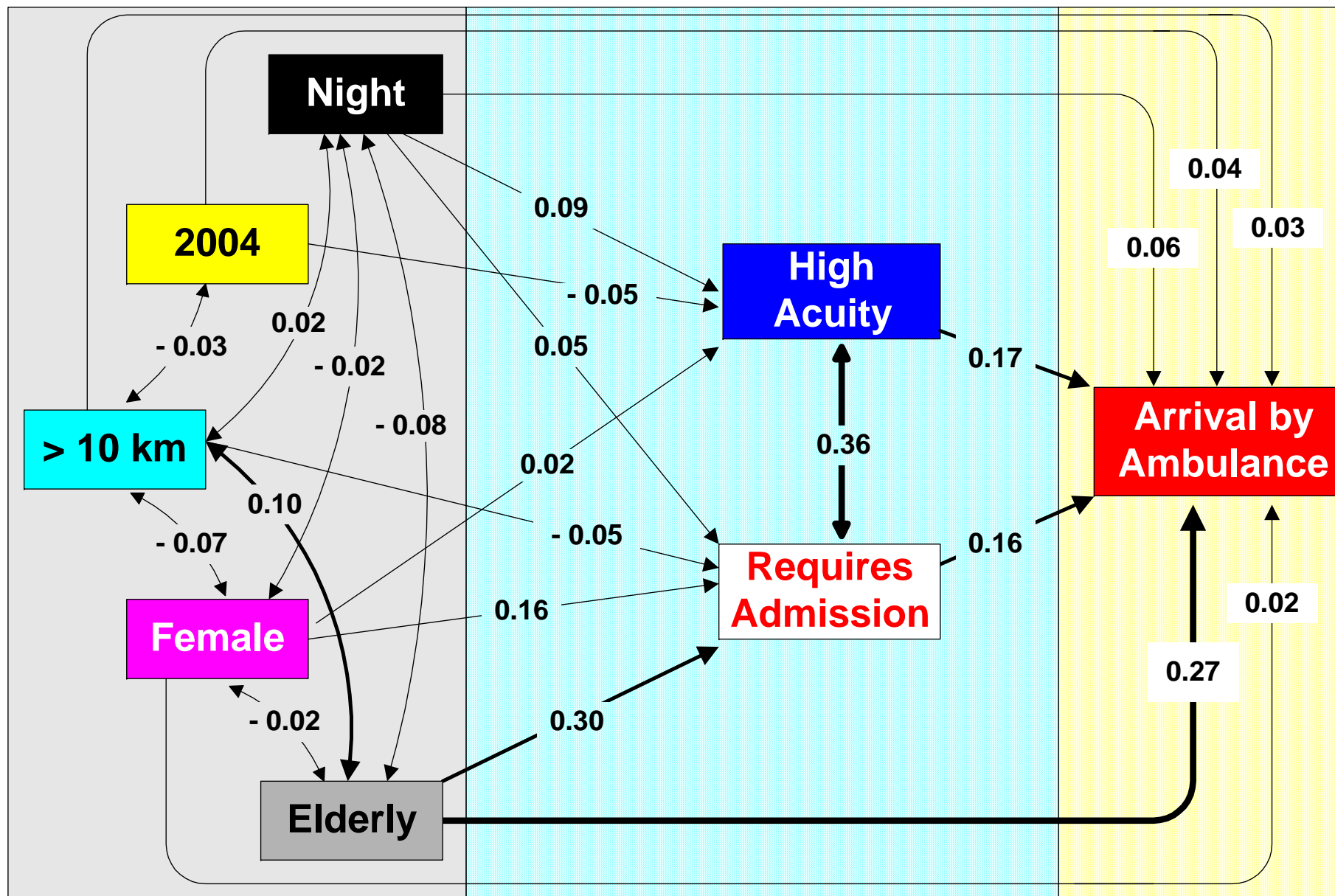
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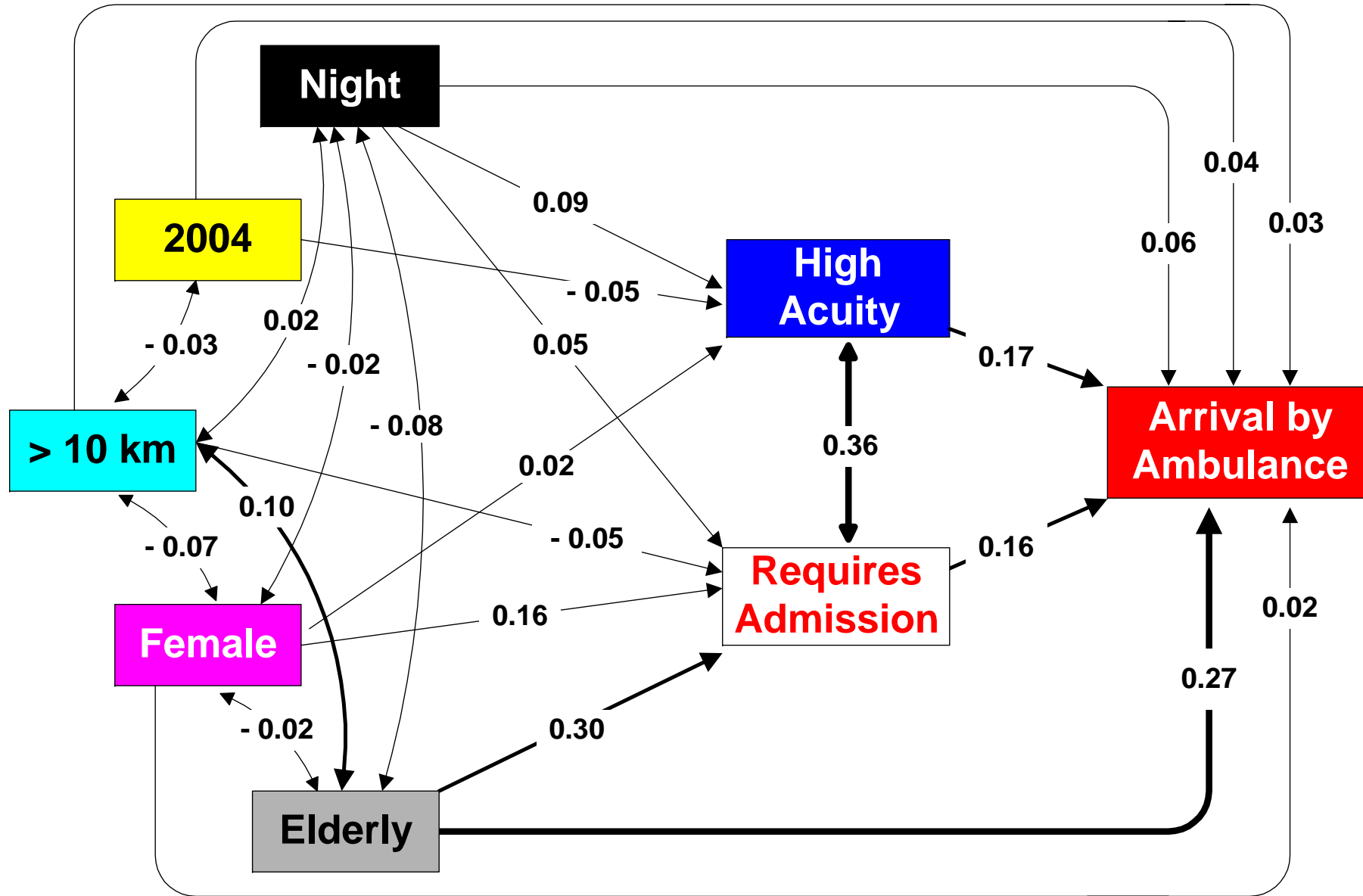
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PATH ANALYSIS

Linear regression coefficients are calculated for pre-specified variables.

Descriptive method to relate the cascade of sequential events leading to ambulance use.

Variables earlier in the path sequentially affect those further down the cascade.

Capable of examining interactions between all variables.

Explains cascading influence from the **personal and environmental** to the **clinical** (acuity, need for admission) which ultimately lead to request for **ambulance transport**.

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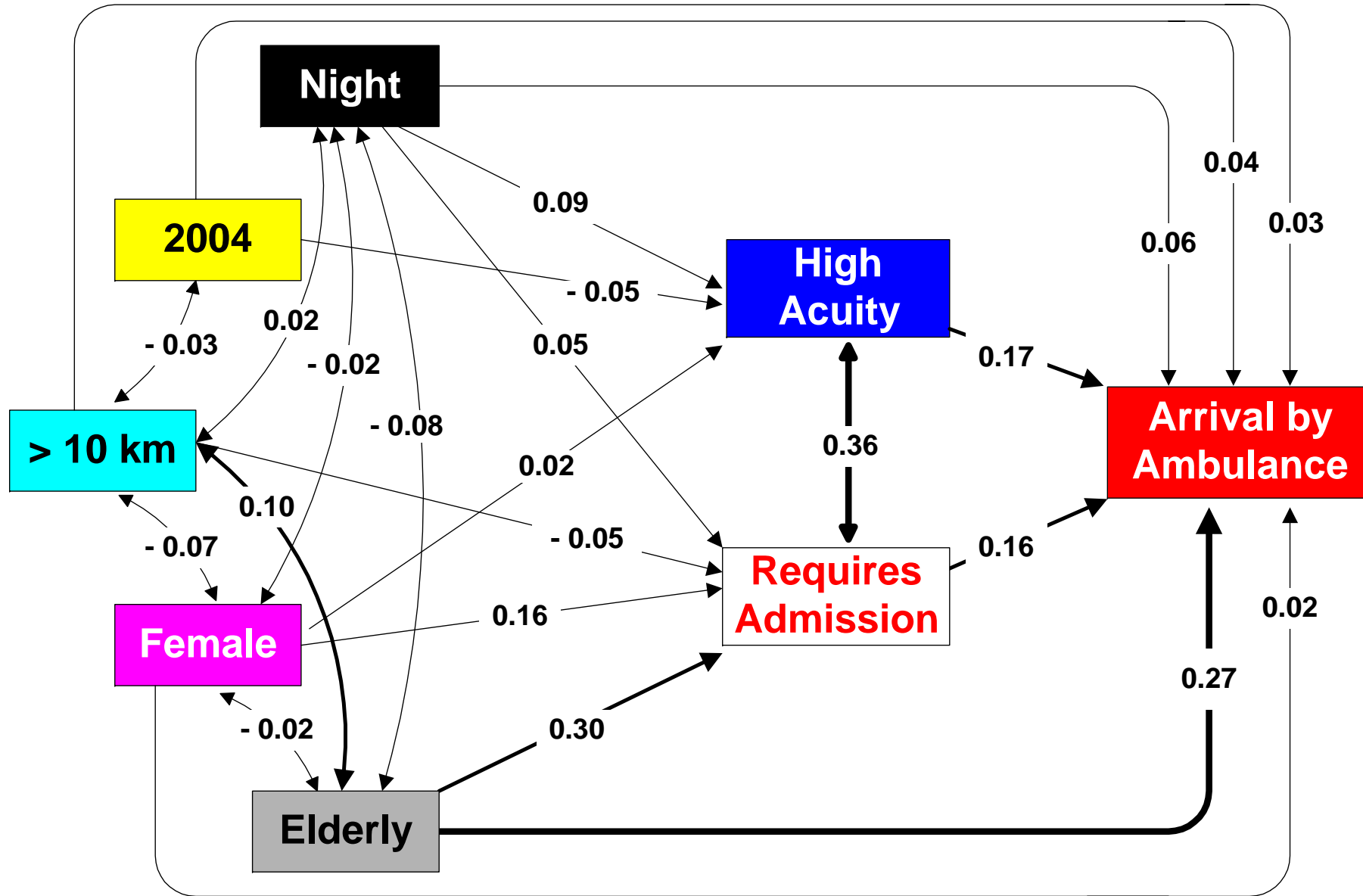
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DISCUSSION

Clinical acuity (as assessed in ED) is combined with patient demographic and other data into a multifactorial path analysis model that describes ambulance utilisation.

Statistically significant positive correlations between ambulance utilisation and:

- Increased age
- Higher disease acuity
- Likelihood of admission
- Female gender
- Night time
- Distance > 10 km from hospital

DISCUSSION

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Statistically significant positive correlations between ambulance utilisation and:

- 2004 vs 2002
- Suggests that removal of “user pays” led to increased inappropriate use of ambulance.
- Assoc. with reduced clinical acuity & need for admission

DISCUSSION

The **Path analysis tool** permits quantitative surveillance of the various factors that lead to ambulance utilisation.

Potential to optimise ambulance utilisation by strategies that modify the relative influence of these variables viz:

- Public education
- Review of Ambulance systems' Operational Policies
- Funding & finance
- Health system planning (eg: location of GPs, hospitals, health centres)

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Conclusion

- The **Mater Ambulance Study** examined the relative influence of demographic and clinical factors on ambulance utilisation.
- A **Path analysis tool** was developed that quantifies the relative influence of these factors.
- This tool may assist the development of strategies to optimise the utilisation of ambulance resources in the community.

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Questions ?

