Determinants of 'Innocence'
Statistics on Innocence Project Data
JSM
August 2011

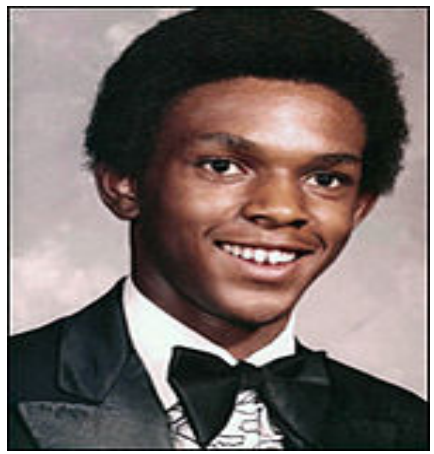
Kobi Abayomi[1] Jessica Gabel[2] Otis Jennings[3]

1:Georgia Institute of Technology 2:Georgia State University, College of Law 3: Duke University, Fuqua School of Business

Motivation

The *Sine Qua Non* of Wrongful Conviction

Timothy Brian Cole: 7.1.1960 - 12.2.1999



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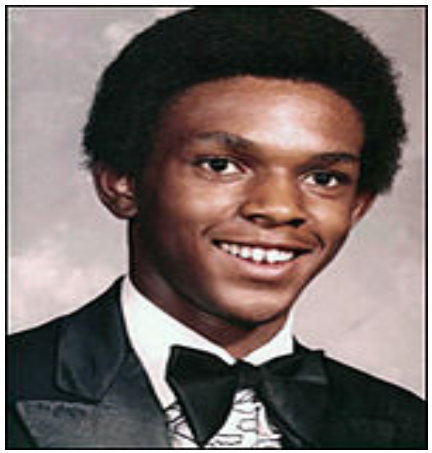

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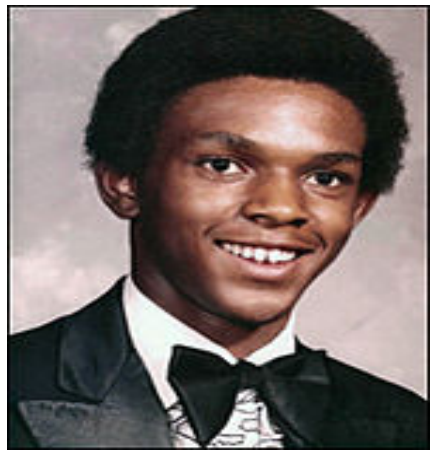

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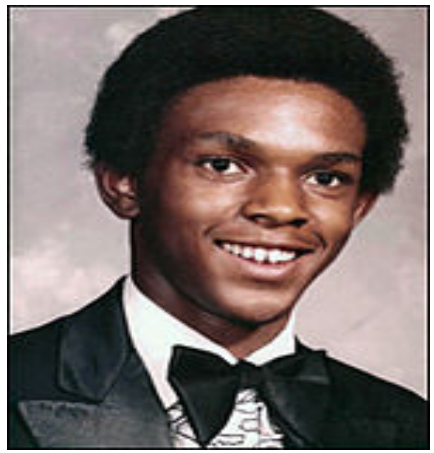

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GOAL: Assist (in particular) the Innocence Network's Exoneration Work

The Innocence Network

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- Since 1992-present 273 exonerees

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- Decentralized network of state-by-state non-profits
- Solicit and review prisoner requests for post-conviction review
- Primary *but not the sole* actors for post-conviction relief [8]

Brief Background

Exoneration

Gross et al ([7]) define exoneration more broadly as:

> *An official act declaring a defendant not guilty of a crime for which he or she had been previously been convicted.*

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The Innocence Project has focused on cases where exoneration = DNA exculpation.

Brief Background

DNA Evidence

Kaye points out the recent recasting of DNA evidence, [9]:

> *It is important to note that DNA evidence has assumed an exculpatory role relatively recently...DNA testing for identification in criminal forensics was initially critiqued as too error prone to meet a legal evidentiary standard*

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From the early to the late 1990s, the debates about DNA testing standards yielded to near-universal acceptance — partially due to technological advancement — of DNA testing as *the* definitive criminal identification tool, [10], [12] or [2]

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While DNA is vital to redress a wrongful conviction, its absence weakens cases — the vast majority of exoneration requests — where there simply is no DNA evidence available [13]

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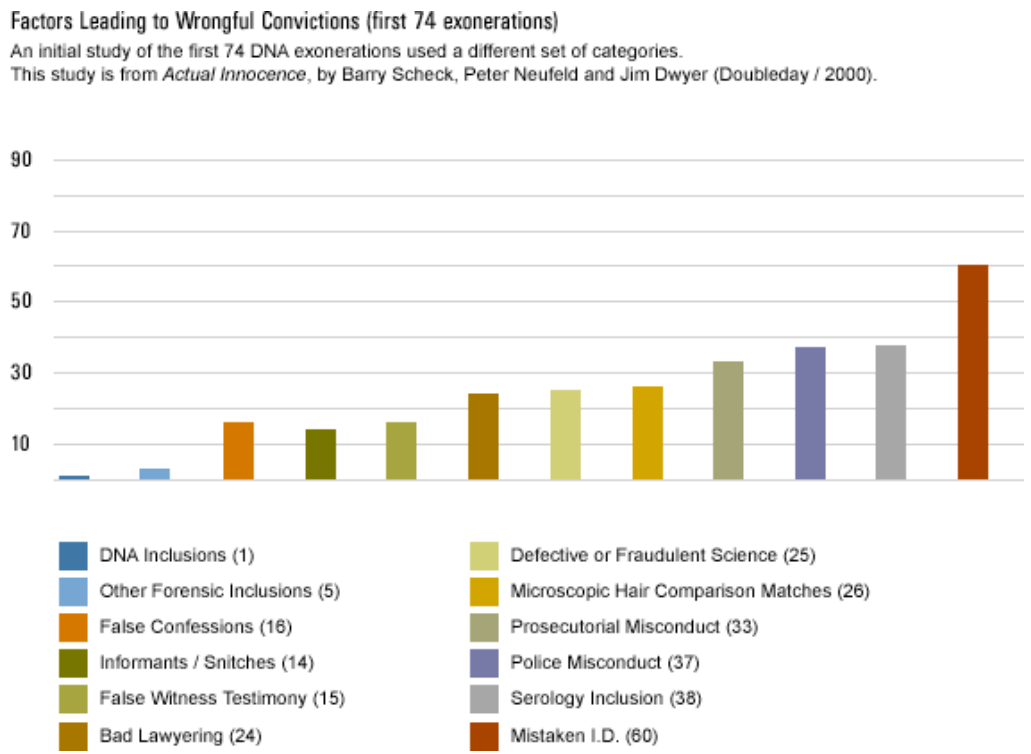

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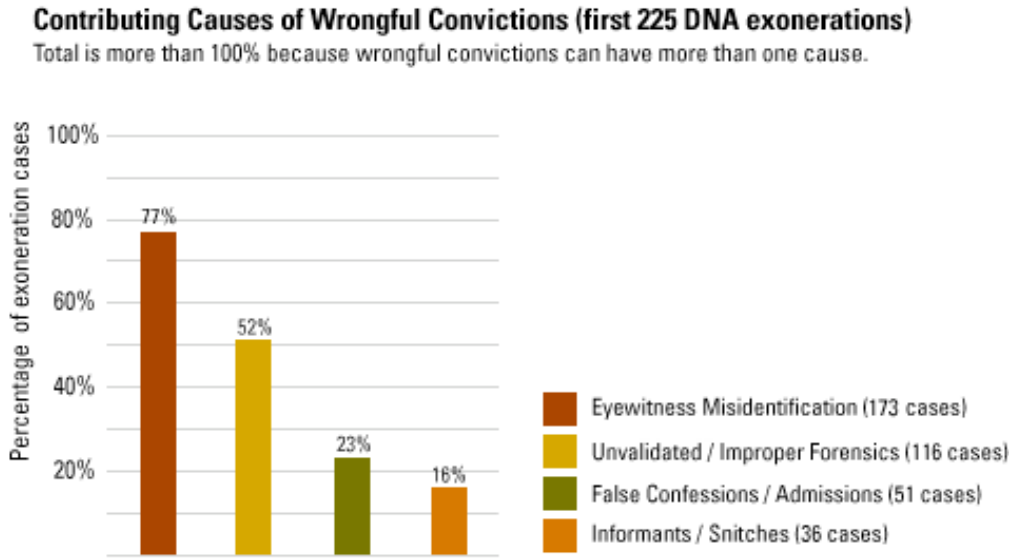

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- Recordkeeping/Coding Data: Inconsistent state by state. National level ‘clearing-house’ (NY IP) vs. State-level records.

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Methodology

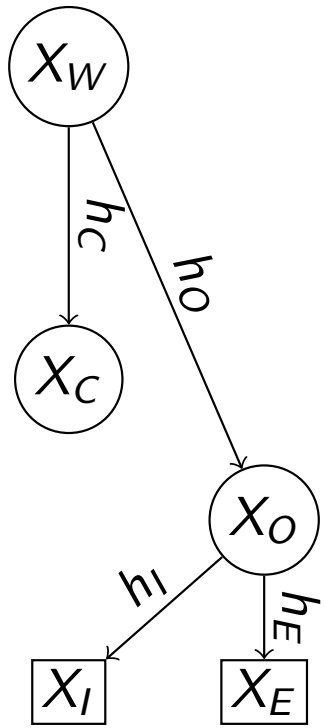

Figure: Multistate Hazard Model for Exoneration Data: X_W - Letter received; X_C - Case Closed; X_I - Case Inculpated; X_E - Case Exonerated.

The Data

State	No. Ever in State	Entries to State X_W	X_C	X_O	X_I	X_E
X_W	3717		2491	558	-	-
X_C	2490	-	-	-	-	-
X_O	558	-	-	-	95	7
X_I	95	-	-	-	-	-
X_E	7	-	-	-	-	-

Figure: The GIP data

The Data

State	No. Ever in State	Entries to State X_W	X_C	X_O	X_I	X_E
X_W						
X_C						
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Figure: The NCAIC data...still processing

Methodology

Exploit length of time in ‘state’...

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...in the presence of covariates

- False Confession?

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- Snitch?

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- Snitch?
- Race Black?
- Victim White?

Following [14] ([11]) approximate this with 'conditional' proportional hazard curves, on 'left-truncated' data

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Cox proportional hazards

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$$h_j(t) = h_0^j exp\{\beta^T \mathbf{Z}^j\} \tag{1}$$

...in the presence of covariates $\mathbf{Z}$

- $Z_1^j = 1$ False Confession? Yes.

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Cox proportional hazards

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- $Z_2^j = 1$ Snitch? Yes.

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- $Z_1^j = 1$ False Confession? Yes.
- $Z_2^j = 1$ Snitch? Yes.
- $Z_3^j = 1$ Race Black? Yes.
- $Z_4^j = 1$ Victim White? Yes

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- $Z_1^j = 1$ False Confession? Yes.
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- $Z_4^j = 1$ Victim White? Yes
- $Z_5^j =$ Duration in previous state

Only Z_5^j is really 'time-varying'

Methodology

$$h_0^j \equiv h_0$$

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Z	coef	exp(coef)	sig?
Confess?	0.36	1.03	*
Snitch?	-.59	.55	
Black?	-.093	.91	
Victim White?	-.16	.85	**
Duration in Prev. State	1.02	2.76	

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Interpretation? Initial review process? Unclear interpretation since 'hazard' (death) means something different in between different states.

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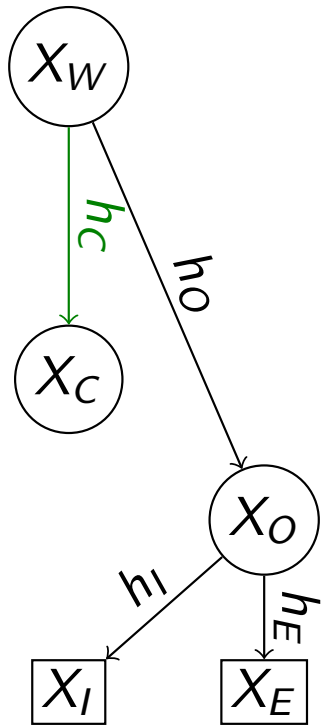

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Z	coef	exp(coef)	sig?
Confess?	-0.49	0.61	**
Snitch?	0.0053	1.005	
Black?	-.081	.92	*
Victim White?	-.003	.99	
Duration in Prev. State	0.609	1.83	

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Interpretation? Cases selected because of 'false confession' claim in intake are more quickly dispensed of. Some cases may 'linger' but then closed anyway.

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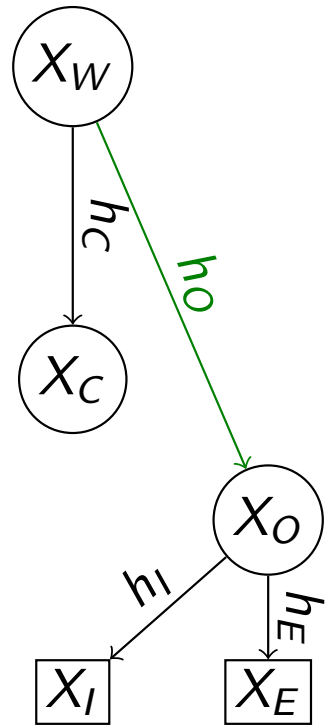

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Z	coef	exp(coef)	sig?
Confess?	0.0181	1.02	
Snitch?	0.418	1.51	
Black?	-.1809	.83	
Victim White?	0.06	1.06	
Duration in Prev. State	0.522	1.685	***

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h_0^j, $j = O$

Z	coef	exp(coef)	sig?
Confess?	0.0181	1.02	
Snitch?	0.418	1.51	
Black?	-.1809	.83	
Victim White?	0.06	1.06	
Duration in Prev. State	0.522	1.685	***

Interpretation? Cases actually worked. Duration in X_W = *letter received* significant implies cases wait awhile?

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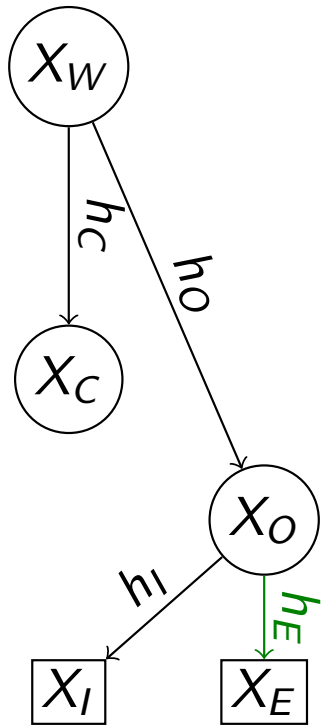

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Z	coef	exp(coef)	sig?
Confess?	0.917	1.02	*
Snitch?	-0.037	0.963	
Black?	-0.326	0.722	***
Victim White?	0.053	1.065	
Duration in Prev. State	0.00323	1.003	

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h_0^j, $j = E$

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Confess?	0.917	1.02	*
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Interpretation? All the GIP exonerees are black thus far.

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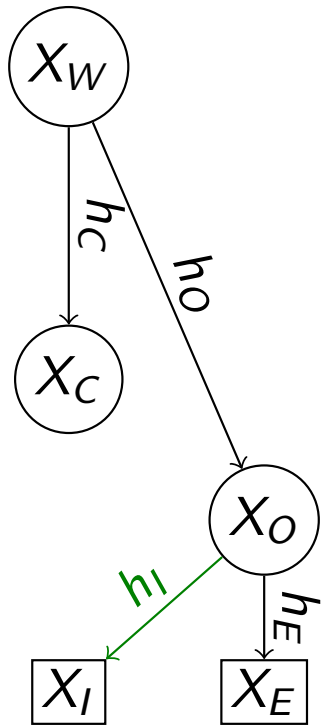

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Z	coef	exp(coef)	sig?
Confess?	0.024	1.024	
Snitch?	-0.066	1.069	
Black?	-0.0571	1.058	
Victim White?	0.0573	1.059	
Duration in Prev. State	0.973	2.646	**

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h_0^j, $j = I$

Z	coef	exp(coef)	sig?
Confess?	0.024	1.024	
Snitch?	-0.066	1.069	
Black?	-0.0571	1.058	
Victim White?	0.0573	1.059	
Duration in Prev. State	0.973	2.646	**

Interpretation? The longer cases waited in the previous state, the longer it took to inculpate. Problems processing cases efficiently?

Bayesian

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- $\beta_j \sim ?$

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- $(\sum_j \alpha_j h_0^j)\ exp\{\beta_j \mathbf{Z}^j\}; \alpha_j \sim ?$

Copula for Markov Process

Bayesian

- $\beta_j \sim ?$
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Copula for Markov Process

- Following [3] and [1] $(A * B)(x_1, x_2) = \int_0^1 \frac{\partial A(x_1,t)}{\partial x_2} \cdot \frac{\partial B(t,x_2)}{\partial x_1} dt$

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- then $C_{X_1X_3} = C_{X_1X_2} * C_{X_2X_3}$ equivalent to CK equations

Other

Bayesian

- $\beta_j \sim ?$
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Other

- Processing NC(CAIC) data
- *Really* useful $\pi(s|H(t)) = \mathbb{P}(X = X_E\ in\ s > t|H(t))$, $H(t) = (H_j(t) = \{Z^j; x_1, ..., x_t\}$

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