Pick-Pocketing on the Railway: Targeting Solvable Cases
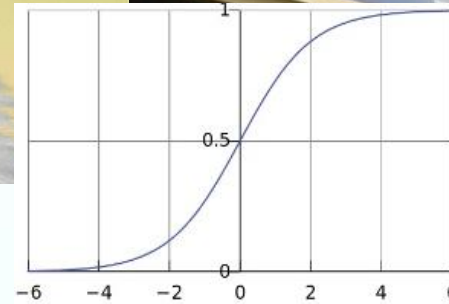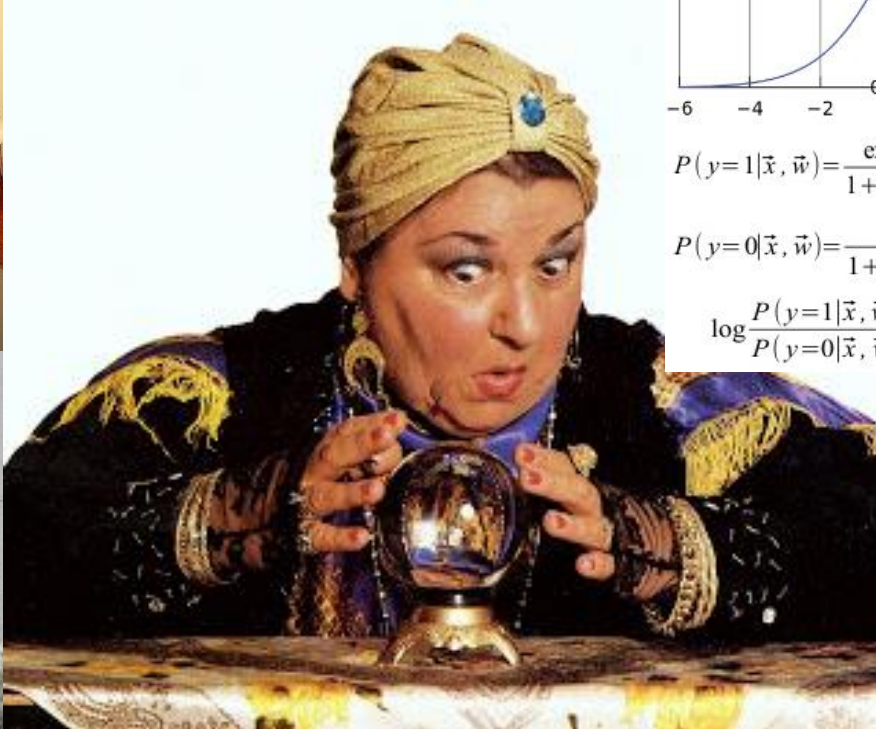
Steff Sharp – a/Head of Strategic Assurance & Planning, British Transport Police
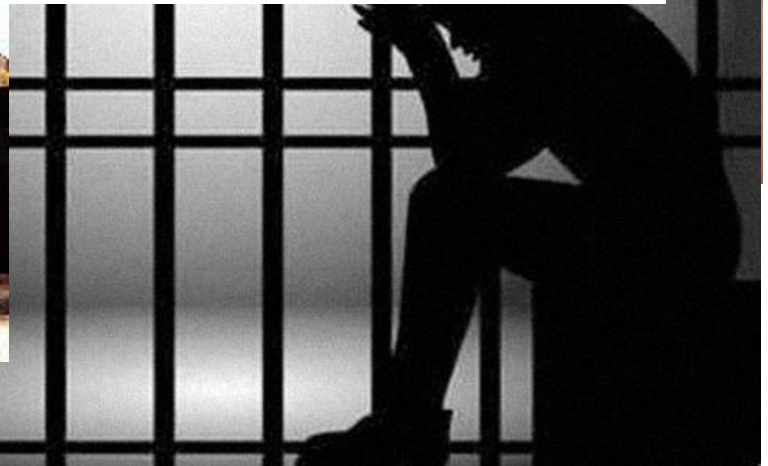
Research Questions

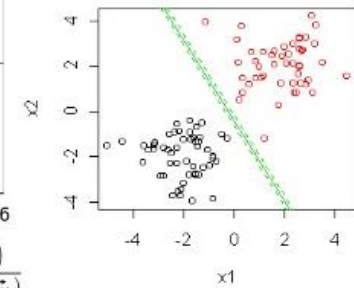R1: Which factors available upon initial assessment indicate a greater likelihood for solving pick-pocketing offences?

R2: Can the solvability of pick-pocketing be predicted by a screening model developed from analysis of the initial assessment factors?

R3: How does the predictive accuracy of this screening model compare to that of BTP's existing decision making process for case screening?

R4: During the secondary investigation, is there evidence to suggest that the volume of investigative actions would indicate a greater likelihood of pick-pocketing offences being solved?

Methodology

- **Used total population of 36,260 cases**
- **Split randomly into two equivalent groups: Analysis & Testing**
- **Using Analysis group, assessed individual factors as independent variables upon solvability**
- **Controlled for inter-variable effects**
- **Binary logistic regression – develop best fit model**
- **Introduced automatic screen-in factors**
- **Applied final equation to 'Testing' group data and assessed for predictive accuracy.**
- **Compared with current practice.**
- **Tested relationship between volume of secondary actions and solvability.**

Findings - R1

Which factors available upon initial assessment indicate a greater likelihood for solving pickpocketing cases?

Standard diff in means	Solvability Factor	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
-0.554	Suspect Gender - Male	0.296	0.087	-1.133	0.025	-1.875	0.061
-0.264	Victim Gender - Male	0.040	0.002	-0.343	-0.186	-6.601	0.000
-0.042	Phone or Other Electronic Device Stolen	0.038	0.001	-0.116	0.032	-1.119	0.263
0.016	Victim Under 30	0.040	0.002	-0.062	0.094	0.398	0.690
0.024	Location - London TfL	0.039	0.001	-0.051	0.100	0.631	0.528
0.025	Property Value over £500	0.046	0.002	-0.065	0.114	0.543	0.587
0.037	Time - Morning	0.043	0.002	-0.048	0.123	0.858	0.391
0.095	Platforms	0.071	0.005	-0.043	0.234	1.350	0.177
0.171	Vulnerable Victim	0.086	0.007	0.002	0.340	1.983	0.047
0.247	Alcohol or Drugs Involved	0.406	0.165	-0.549	1.043	0.607	0.544
0.283	Reported Within 1 Hour	0.051	0.003	0.184	0.383	5.570	0.000
0.394	Committed Range < 2 Hours	0.130	0.017	0.140	0.648	3.043	0.002
0.439	Suspect Under 30	0.182	0.033	0.083	0.795	2.416	0.016
0.502	Committed Range < 1 Hour	0.074	0.005	0.357	0.647	6.781	0.000
0.583	Committed Range < 45 Mins	0.068	0.005	0.450	0.717	8.564	0.000
0.597	Reported Within 30 Mins	0.081	0.007	0.439	0.756	7.402	0.000
0.680	Committed Range < 30 Mins	0.055	0.003	0.571	0.788	12.290	0.000
0.780	Committed Range < 25 Mins	0.051	0.003	0.679	0.880	15.228	0.000
0.826	Journey Type - Static	0.040	0.002	0.749	0.904	20.902	0.000
0.838	Committed Range < 20 Mins	0.047	0.002	0.747	0.930	17.903	0.000
0.895	Committed Range < 15 Mins	0.044	0.002	0.808	0.982	20.250	0.000
0.942	Committed Range < 10 Mins	0.042	0.002	0.861	1.024	22.665	0.000
0.963	Committed Range < 5 Mins	0.039	0.002	0.886	1.041	24.461	0.000
0.970	Intimidated Victim	0.224	0.050	0.532	1.409	4.338	0.000
0.977	Committed Range - Exact Time Known	0.038	0.001	0.902	1.053	25.419	0.000
0.992	Offence Witnessed	0.098	0.010	0.799	1.184	10.108	0.000
1.671	CCTV Available	0.041	0.002	1.591	1.751	40.818	0.000
2.498	Additional Suspects	0.193	0.037	2.120	2.877	12.948	0.000
2.762	Suspect Description	0.072	0.005	2.620	2.903	38.141	0.000
Fixed 0.536		0.009	0.000	0.517	0.554	57.530	0.000

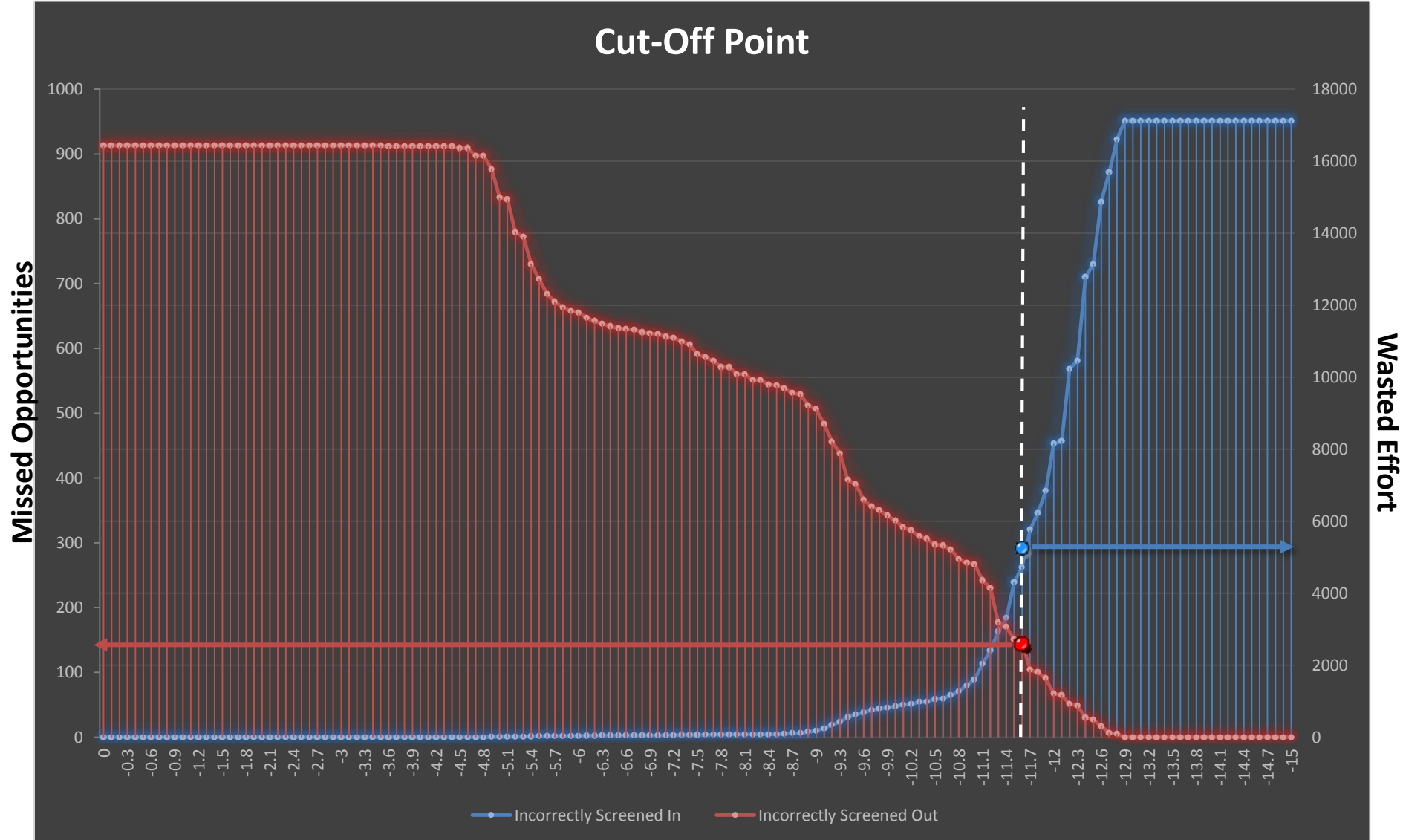Std diff in means and 95% CI

Favours Not Solved — Favours Solved
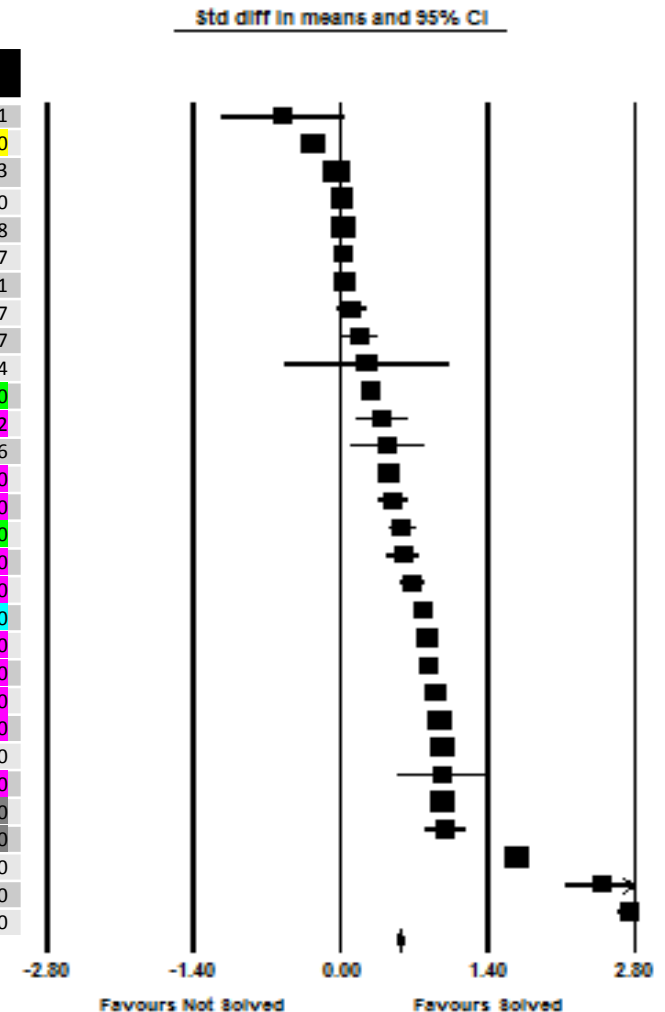
Findings – R2

Can the solvability of pick-pocketing be predicted by a screening model developed from analysis of the initial assessment factors?

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
CCTV Available?	2.058	.097	449.776	1	.000	7.827	6.471	9.466
Is stolen item a Phone or Electronic Device?	-.278	.090	9.483	1	.002	.758	.635	.904
Is the journey type Static?	.381	.102	14.107	1	.000	1.464	1.200	1.786
Is committed range within 15 minutes?	.736	.103	50.826	1	.000	2.089	1.706	2.557
Is the victim male?	-.355	.092	14.816	1	.000	.701	.585	.840
Did the offence occur on the platforms?	.310	.161	3.701	1	.054	1.363	.994	1.869
Is the victim intimidated?	1.255	.587	4.567	1	.033	3.509	1.110	11.094
Did the offence occur on the Underground?	.126	.091	1.918	1	.166	1.134	.949	1.356
Did the offence take place in the morning?	.193	.100	3.706	1	.054	1.213	.996	1.477
Is there a suspect description available?	4.010	.147	742.743	1	.000	55.140	41.326	73.571
Constant	-12.502	1.301	92.290	1	.000	.000		

logit (p) = -12.502 + (CCTV Assist x 2.085) + (Phone or Electronic Device Taken x -0.278) + (Journey Type – Static x 0.381) + (Committed Time Range within 15 Mins x 0.736) + (Victim Gender – Male x -0.355) + (Location – Platforms x 0.310) + (Victim Intimidated x 1.255) + (Suspect Description x 4.010) + (Location – London TfL x 0.126) + (Time: Morning x 0.193)

Cut-Off Point

Missed Opportunities / Wasted Effort

Incorrectly Screened In — Incorrectly Screened Out

PICKPOCKETING CASE-SCREENING CALCULATOR

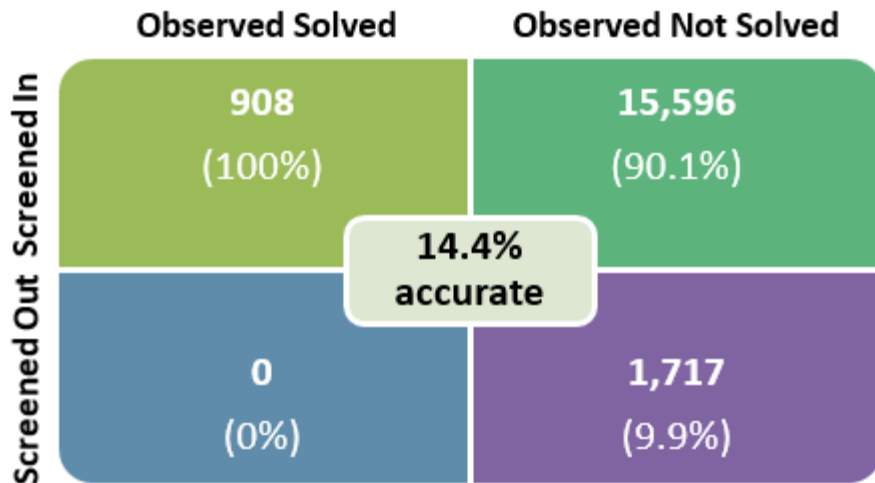|	
Did the crime occur on TfL jurisdiction?	No
Was the crime static as opposed to on a moving train?	No
Did the crime happen on the Platforms?	No
Did the crime happen in the morning? (06:00-11:59)	Yes
Does the victim identify as male?	No
Is the victim flagged as intimidated?	No
Was the property stolen a phone or other electronic device?	No
Is there CCTV available?	Yes
Is there any kind of suspect description available?	No
Did the crime happen within a time range of 15 minutes?	Yes

Is the value of stolen property £5,000 or over?	No
Is there a named suspect associated with the crime?	No
Is there a reputational risk associated with not investigating?	No

SCREEN IN

BRITISH TRANSPORT POLICE

... and how does the predictive accuracy of this screening model compare to that of BTP's existing decision making process for case screening?
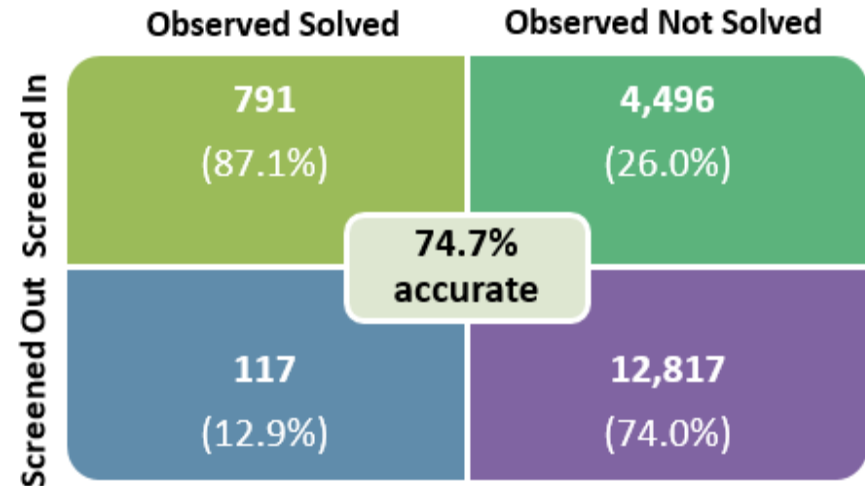
Current BTP Process

	Observed Solved	Observed Not Solved
Screened In	908 (100%)	15,596 (90.1%)
Screened Out	0 (0%)	1,717 (9.9%)

14.4% accurate

Screens in 90.6%
136,565 Hrs Wasted Effort
Total Cost = £3.036M

Predictive Screening Model

	Observed Solved	Observed Not Solved
Screened In	791 (87.1%)	4,496 (26.0%)
Screened Out	117 (12.9%)	12,817 (74.0%)

74.7% accurate

Screens in 29.8%
39,408 Hrs Wasted Effort
Total Cost = £998K

Next 5 years...
97,157 Hrs back
Or £2.037M

Findings – R4
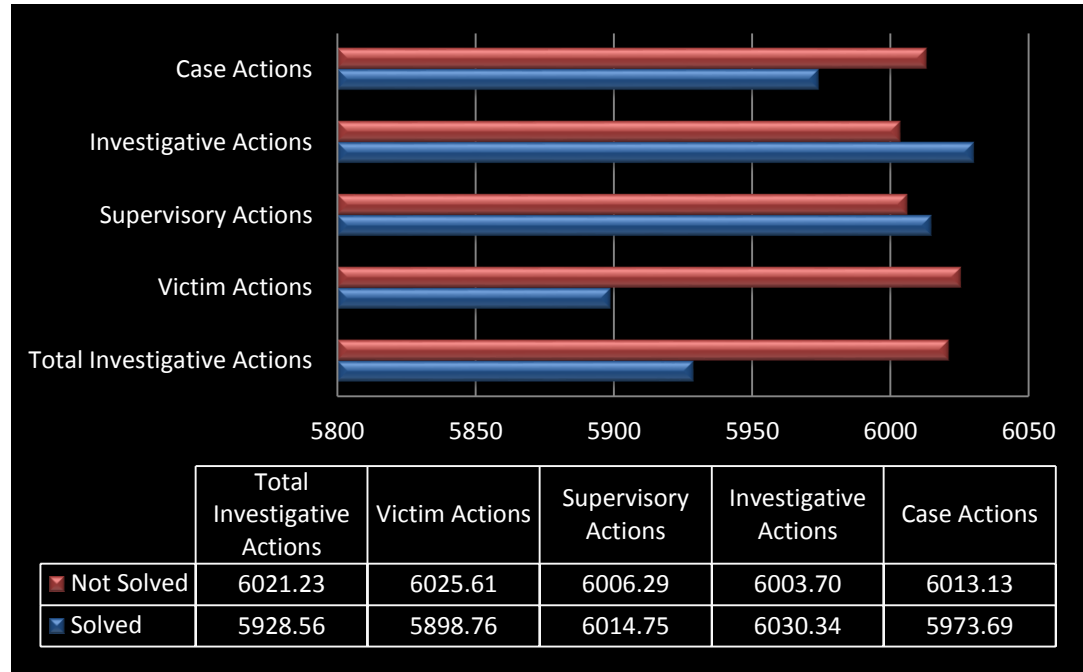
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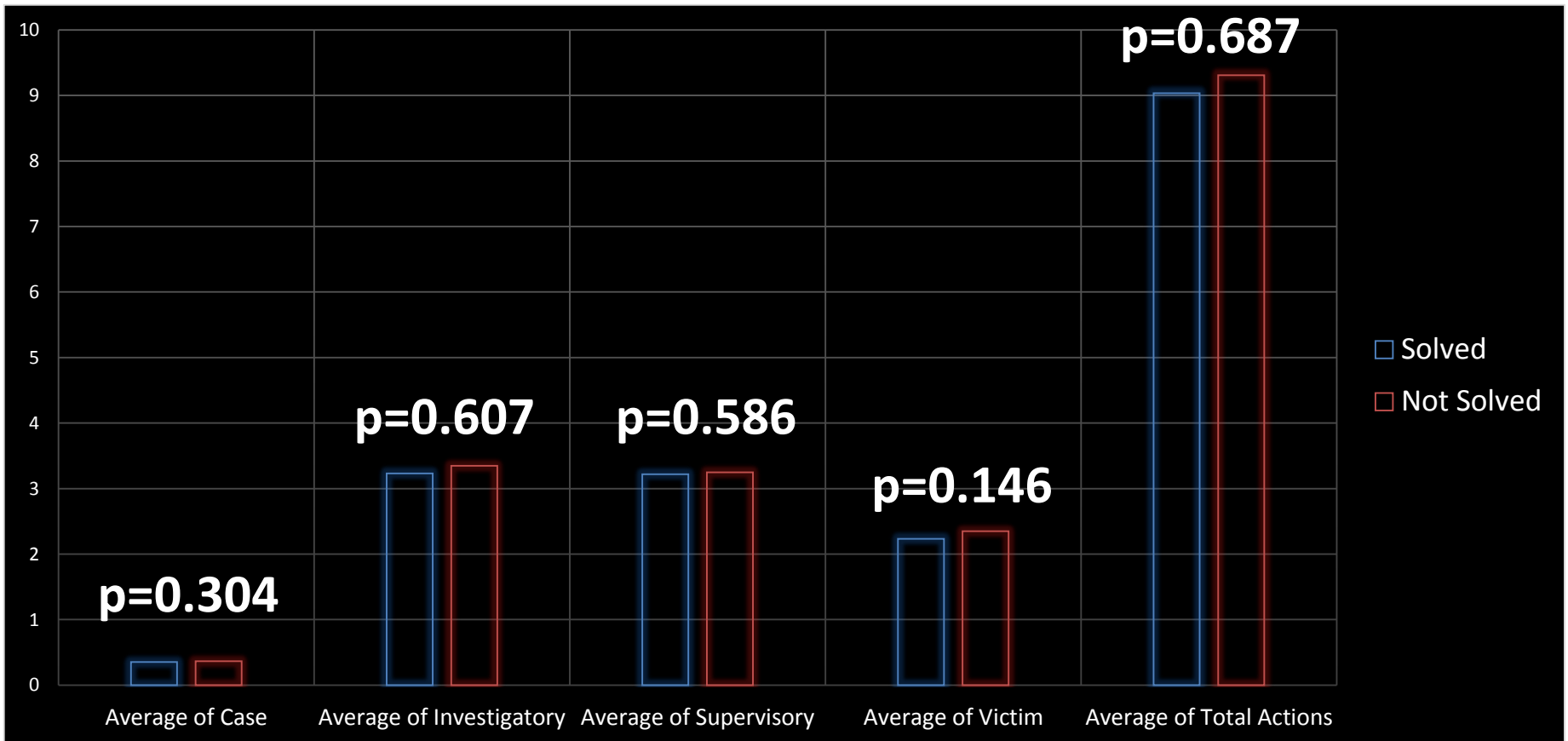
Findings – R4

… for a sample which controls for those cases screened in by the model…

& Hierarchical Multiple Regression:

	Total Investigative Actions	Victim Actions	Supervisory Actions	Investigative Actions	Case Actions
Not Solved	6021.23	6025.61	6006.29	6003.70	6013.13
Solved	5928.56	5898.76	6014.75	6030.34	5973.69

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Circumstance-based (Step 1)	.620	.384	.384	.171	.384	1966.784	10	31518	.000
Circumstance & Efforts based (Step 2)	.620	.384	.384	.171	.000	1.965	4	31514	.097

Summary

- **A range of statistical tests show that a number of variables have a significant effect on the solvability of pick-pocketing**

- **By removing those highly correlated with each other, it is possible to isolate the effects of individual factors and produce a predictive model**

- **The predictive model developed offers substantial efficiencies over current practices, along with much greater accuracy**

- **Secondary investigative actions show no significant relationship with solvability**

What next?
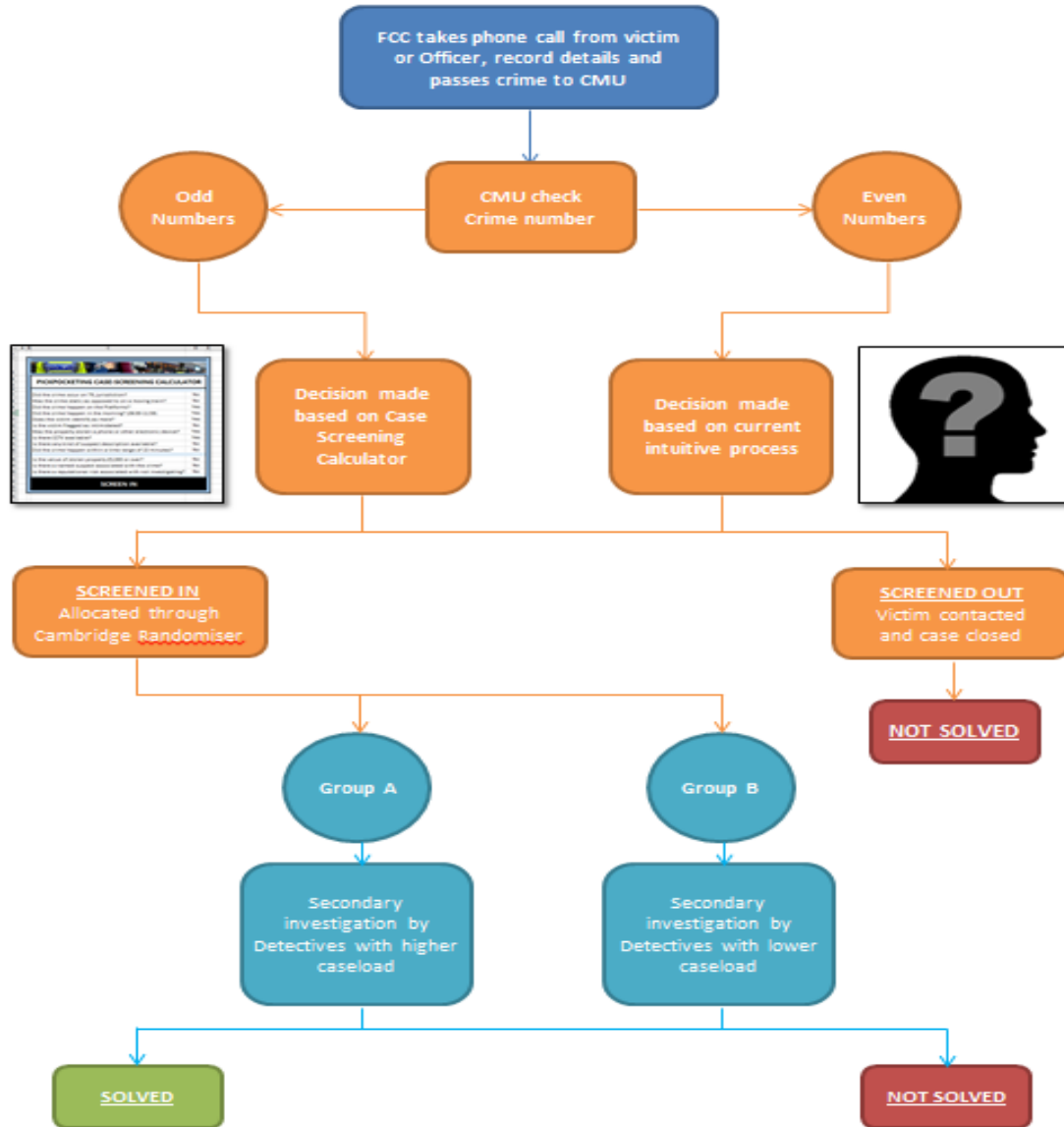
- RCT to understand practical implications and generate reliable data on secondary investigations

- Implementation for other crime types – low harm/low detection rate

- Automate. Build into NICHE.

Questions?

Thank You