

Introducing CRITICS as a Prospective Planning Tool for Crime Prevention Evaluation Design

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Outline of Session

- An Introduction to CRITICS
- The origins of CRITICS
- Experimental Design: power vs. significance
- CRITICS in practice
- Conclusions and Implications

In evaluation design, we need to consider

- **Crime history** (how crime-prone action and control sites are)
- **Reduction** (in terms of proportional reduction in the crime problem anticipated in the action sites when compared to the control)
- **Intensity** (in terms of the number and/or strength of interventions necessary per target exposed to crime risk)
- **Time period** (that over which the action and control sites are tracked before and after implementation)
- **Immensity** (in terms of the number of *units of analysis at risk of crime* to be tracked)
- **Cost** (in terms of the unit cost per intervention) and
- **Statistical testing** (including significance level and the choice of 1-v 2-tailed testing)

Evaluation 1

- Evaluation of 'anti-bag theft clips'
- Research Design
 - One action bar and a matched control
 - Pre-test: *1st October to 8th December 2004*
 - Post-test :*9th December 2004 to 31st March 2005*
- Use of police data
- Recording within bars
- Results were mixed
- Inferring conclusions difficult
- Why?



Lessons from initial evaluation

- Reduction in action was larger than control.
- But....
 - there were few thefts (a rare event);
 - over too short a time frame;
 - with too few bars (n= 2)
- The numbers were too small to indicate a statistically significant reduction – even though it was heading in that direction.
- The findings were convincing enough to secure funding of a larger project
 - the time for planning and the available funding were much greater (as was the scope for waste)

Statistical Power ...Trip

- Power is the complement to significance
 - significance being the probability of type 1 error (false +), (rejecting a correct null hypothesis)
- Power is the probability of type 2 error (false -), (rejecting a correct alternative hypothesis)
 - In evaluation this means stating there was no effect of an intervention which was in fact effective
- Trivial?
- Lack of power foredoomed our research design to detect the significant findings
 - lack of sample size and limited time frame.

Striving for a powerful future

Currently there is **little *future* in power** – retrospective – as applied in meta-analysis or major funded evaluations.

- Yet we hold that ***power analysis in criminological research may possess greater utility when used prospectively as a planning tool for experimentation.***

CRITICS as a decision making tool

- A broader (contextual) definition of power:
 - We wanted to select sufficient action and control sites that would make the evaluation *powerful* enough to detect statistical significance if it was indeed present, without expanding the data collection and implementation tasks to an unmanageable and unaffordable degree. In this instance *the design's the thing* for the evaluation as much as the anti-theft clips under test.
 - Hence, we had to develop a framework for decision-making, and an accompanying tool, which incorporated certain key parameters and showed the effect of varying these on the likelihood of finding a statistically significant outcome, cost-effectively achieved, and which was intelligible and convincing to our designer partners.

CRITICS: a practical example

- For the anti-theft clip evaluation
 - Spreadsheet allowed us to run a variety of scenario testing through critics - implications on research design as well as clip design – cost

Table 1: Default Entry into CRITICS

Crime History	No. thefts per bar per month	7
Reduction	Reduction expected	20%
Intensity	Number of clips installed in each bar	120
Time	Timescale (before & after- months)	12
Immensity	No. action and control bars (each)	4
Cost	Cost of each clip	£3
	Cost of theft	£340
S t a t i s t i c a l Testing	Level of significance	Alpha <0.05 Two tailed

Example projection from CRITICS

Highest possible unit price for real-world cost-effectiveness	£47
Overall cost-effectiveness	+£21408
Cost of all interventions	£1440
Saving	£22848
Total crimes reduced relative to expectation based on control	67
Lower confidence limit of Odds ratio	1.00
Upper confidence limit of Odds ratio	1.56
Z score of Odds ratio	1.98
SE Log Odds Ratio	0.112
Odds ratio	1.25

Values of parameters in different scenarios

	Reduction (%)	Time scale (months)	Number of bars	Average thefts per month	Number of clips per bar	Z-score
1	20	12.00	4.00	7.00	120.00	1.98*
2	20	12.00	6.00	7.00	120.00	2.43*
3	20	12.00	6.00	5.00	120.00	2.05*
4	20	12.00	6.00	4.00	120.00	1.84
5	20	9.00	6.00	7.00	120.00	2.10*
6	20	6.00	6.00	7.00	120.00	1.72
7	10	12.00	6.00	7.00	120.00	1.17
8	10	12.00	20.00	7.00	120.00	2.13*
9	15	12.00	8.00	7.00	120.00	2.06*
10	20	12.00	6.00	7.00	500.00	2.43*
11	20	12.00	6.00	7.00	80.00	2.43*

Cost effectiveness considerations

	Reduction (%)	Time scale (mth)	No of bars	Average thefts per month	Number of clips per bar	No of thefts saved	Money saved (£1000s)	Max spend per clip
1	20	12.00	4.00	7.00	120.00	67	23K	£47
2	20	12.00	6.00	7.00	120.00	101	34K	£47
3	20	12.00	6.00	5.00	120.00	72	24K	£34
4	20	12.00	6.00	4.00	120.00			
5	20	9.00	6.00	7.00	120.00	76	26K	£35
6	20	6.00	6.00	7.00	120.00			
7	10	12.00	6.00	7.00	120.00	50	17K	£23
8	10	12.00	20.00	7.00	120.00	168	57K	£79
9	15	12.00	8.00	7.00	120.00	101	34K	£47
10	20	12.00	6.00	7.00	500.00	101	34K	£11
11	20	12.00	6.00	7.00	80.00	101	34K	£71

Conclusions and Implications

Methodological concerns

- Appropriate minimal effect size - who decides?
- using cost effectiveness as a metric for deciding target reduction
- Assumptions

Advantages of approach

- Not prescriptive nor control by acronym - *rather* an awareness raiser of the necessary issues
- Inter-relatedness

Scope for use and development

- Sequential testing procedure – ongoing analysis to assess if we are on course – break points.

References

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Odd-ratios and confidence limits for scenarios

