

# Quasi-Experimental Designs

## Chapter 11

# Quasi-Experimentation

Quasi-experiments resemble experiments, but lack experimental control

- lack of random assignment is the key point of distinction between quasi-experiments and “true” experiments
- quasi-experiments are thus more vulnerable to internal validity threats

“There are many natural social settings in which the research person can introduce something like experimental design into his scheduling of data collection procedures(e.g., the when and to whom of measurement), even though he lacks the full control over the scheduling of experimental stimuli (the when and to whom of exposure and the ability to randomize exposures) which makes a true experiment possible. Collectively, such situations can be regarded as quasi-experimental designs.”

(Campbell & Stanley , 1963, p. 34)

# Diagramming quasi-experimental designs.

Campbell & Stanley (1963)

- X is used to indicate the treatment
- O the observation
- the order of Xs and Os indicate the temporal order of the design
- the numerical subscripts are used to indicate specific observations when there are more than one

# Quasi-Experimentation

Designs without a control group

One-group posttest-only design

X O<sub>1</sub>

- a treatment occurs and the DV is measured afterward

# Quasi-Experimentation

## Designs without a control group

### One-group pretest-posttest design

$O_1 \quad X \quad O_2$

- DV measured before and after treatment
- Harrison et al. (2004)

# Quasi-Experimentation

Designs without a control group

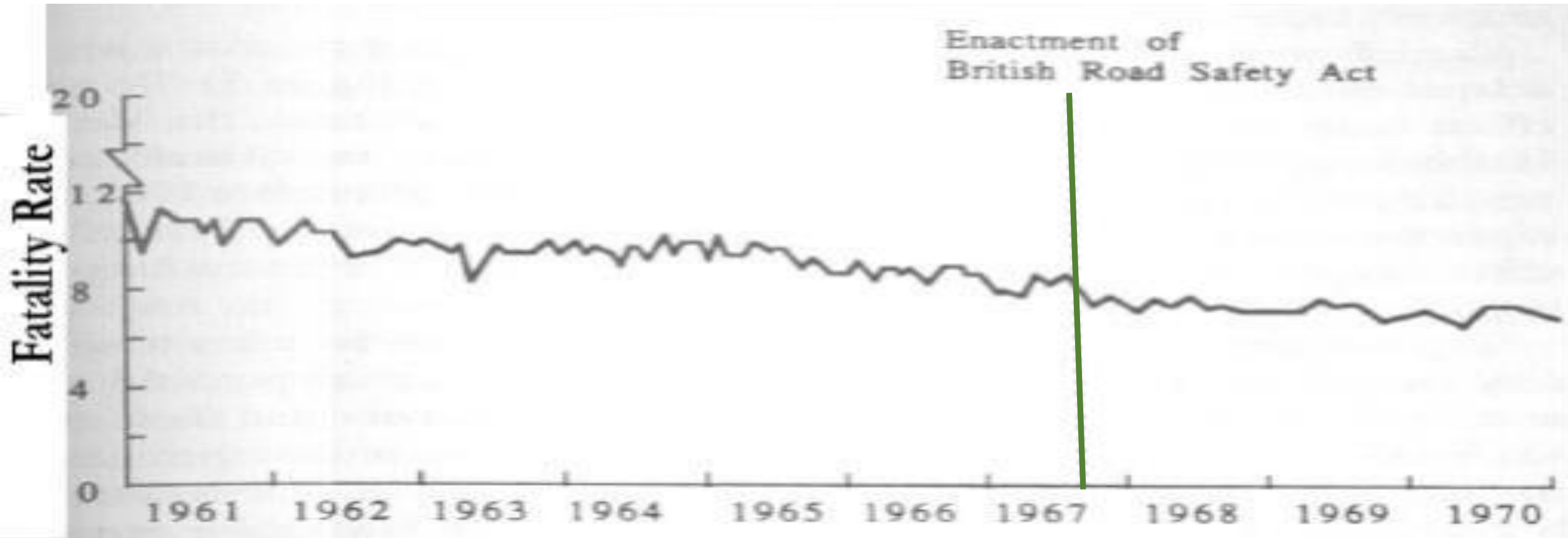
## Simple Interrupted Time-Series Design

$O_1 O_2 O_3 X O_4 O_5 O_6$

- DV is repeatedly measured at periodic intervals before and after a treatment.

# Quasi-Experimentation

## Simple Interrupted Time-Series Design - Example



**Figure 2. British fatality rate corrected for miles driven and with seasonal variations removed. (Source: Ross, Campbell & Glass, 1970).**



# Quasi-Experimentation

## Designs with a nonequivalent control group

- it isn't possible to randomly assign participant conditions
- random assignment is used in a way that cannot be assumed confidently to create equivalent groups at the start of a study
- selection emerges as a major threat to internal validity
- selection may interact with other threats (i.e., **selection interactions**)

# Quasi-Experimentation

## Designs with a nonequivalent control group

### ***selection x history***

- participants in one group experience outside events that the other group does not.

### ***selection x maturation***

- the two groups have different maturation rates.

### ***selection x testing***

- one group experiences testing effects that the other group does not.

### ***selection x regression***

- when one group is selected on the basis of a more extreme score than another group it's likely that the group's posstest score will reflect regression to the mean.

### ***selection x attrition***

- the rate of attrition differs between the groups.

# Quasi-Experimentation

Posttest only with nonequivalent control group

X O<sub>1</sub>

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O<sub>1</sub>

- aka *static-group comparison design*
- Wood et al., 1992
- lack of pretests poses difficulties in interpreting results

# Quasi-Experimentation

Pretest - Posttest with nonequivalent control group

$O_1$  X  $O_2$

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$O_1$   $O_2$

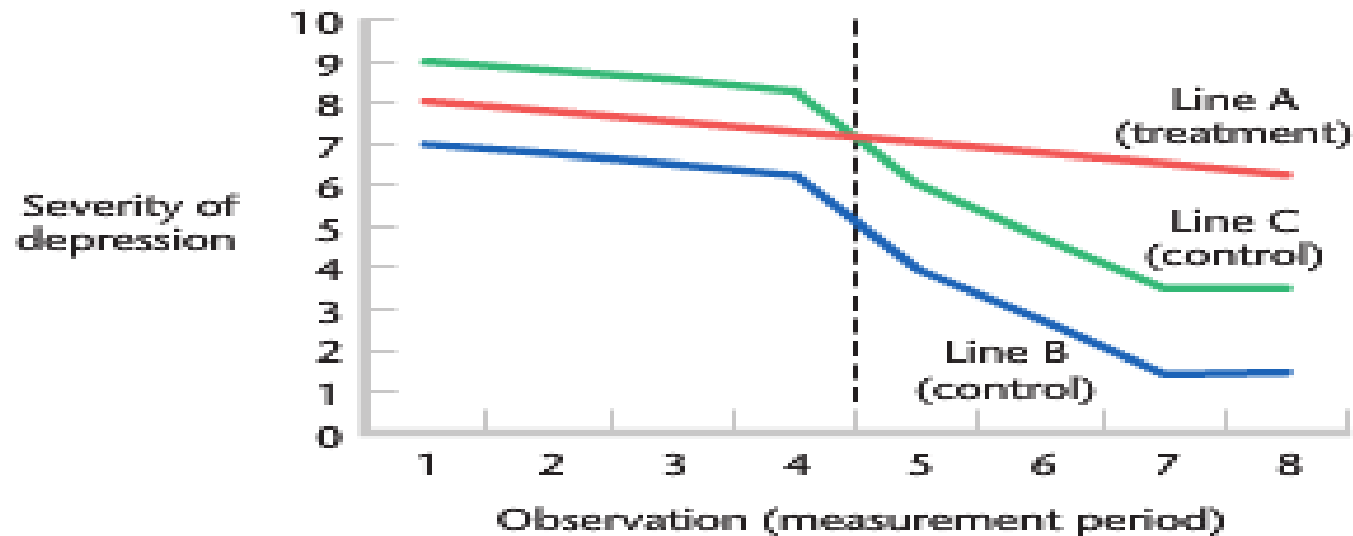
- **Viggiani, Reid, & Bailey-Dempsey (2002)**

# Quasi-Experimentation

Simple interrupted time-series with nonequivalent control group

$O_1$   $O_2$   $O_3$   $O_4$  X  $O_5$   $O_6$   $O_7$   $O_8$

-----  
 $O_1$   $O_2$   $O_3$   $O_4$   $O_5$   $O_6$   $O_7$   $O_8$



**Figure 11.7** Comparison of treatment and control groups in a hypothetical time-series design with a nonequivalent control group.

# Quasi-Experimentation

## Switching Replication Designs

- one group receives a treatment while a nonequivalent group does not receive a treatment
- however, it is *then* exposed to treatment at a later time
- can be used with both pretest-posttest and time-series designs

# Quasi-Experimentation

Pretest-posttest design with switching replication.

$O_1$  X  $O_2$   $O_3$

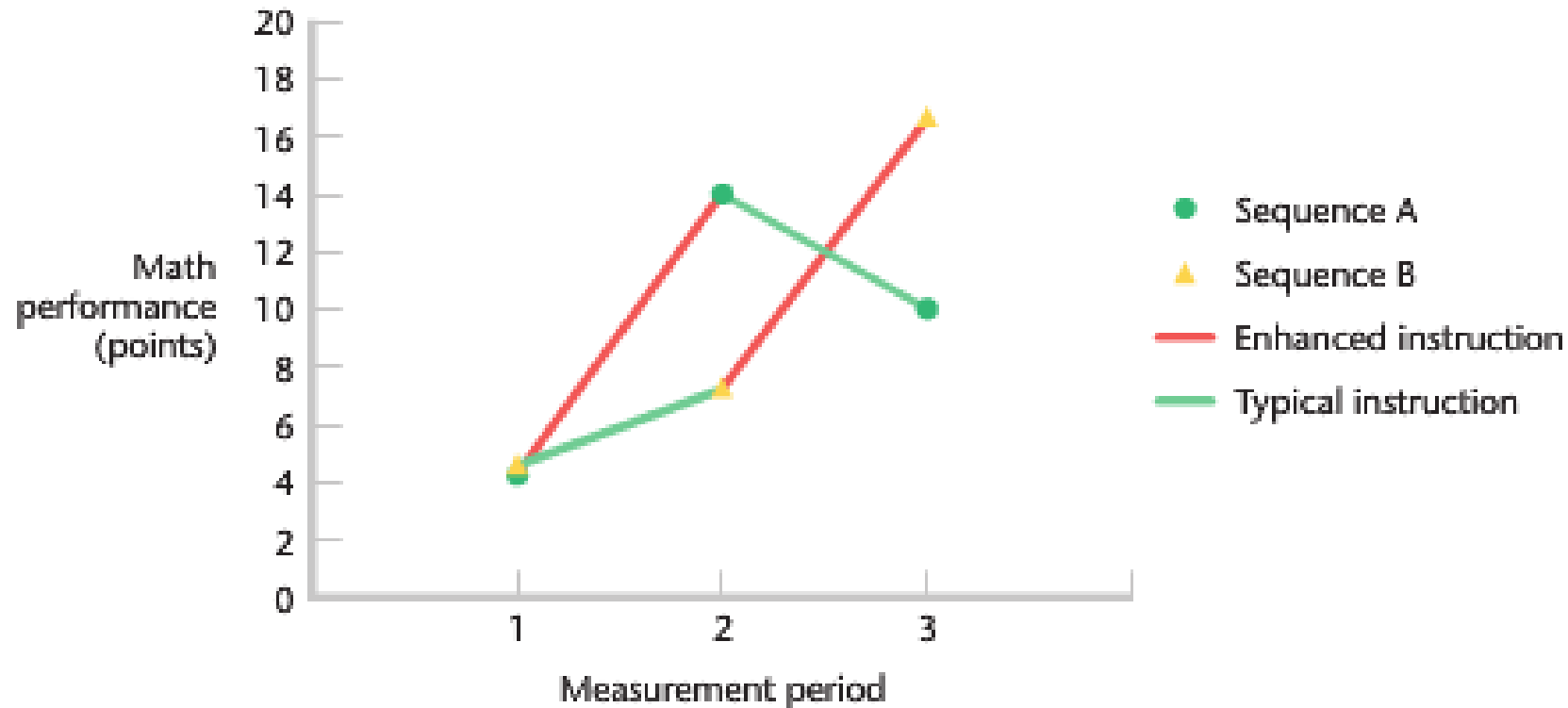
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$O_1$   $O_2$  X  $O_3$

- aka delayed treatment design/ or lagged-groups design

# Quasi-Experimentation

## Switching Replication with Treatment Removal



**Figure 11.10** A switching replication with treatment removal. In both the initial treatment group (sequence A) and delayed treatment group (sequence B), students with math learning disabilities exhibited more math improvement when they received enhanced rather than typical instruction. (Adapted from Bottge et al., 2007.)



# Issues in Non-equivalent Control Group Designs

## Regression & Matching

	Pre-Test	Intervention	Post-Test
Experimental Group	$O_1$	X	$O_2$
Control Group	$O_1$	----	$O_2$

	Pre-Test	Intervention	Post-Test
Experimental Group	25	Apply Reading Programme	25
Control Group	25	----	29

B/C of Matching on PreTest:

Experimental Group:  $25 \text{ [pretest]} + 4 \text{ [due to tx]} + (-4) \text{ [due to rtm]} = 25 \text{ [posttest]}$

Control Group:  $25 \text{ [pretest]} + 0 \text{ [due to tx]} + (+4) \text{ [due to rtm]} = 29 \text{ [posttest]}$

# Program Evaluation

- assesses the need for as well as the design, implementation, and effectiveness of a social intervention
- evaluation sponsors
- stakeholder

# Example Programme Evaluation

## The Perry Preschool Project

- began 1962
- aimed at raising cognitive ability for impoverished preschoolers
- evaluation of 123 poorest children small Midwestern US city
  - five birth cohorts: 1958 – 1962
  - low SES
  - programme entry – IQ 70 -85
  - children divided into either control group or treatment (received at preschool)
  - long-term follow-up

# Example Programme Evaluation

## The Perry Preschool Project – Treatment/Intervention

- delivered during preschool years
- participants 12.5 hr/week classroom intervention
- parents 1.5 hrs/week (for 30 weeks)

## Validity Issues

- participants matched into equal IQ pairs
- use quasi-randomization to achieve gender and SES equality
  - Tx: n = 58   Control: n = 65
- limited attrition – 121 of 123 complete interviews through to 19
- control group deals with threats to internal validity like development and history

# Program Evaluation:

## Needs Assessment

- determines whether there is a need for a social program, and if so, what is required to meet the need
- acquire data from a wide range of sources
  - census data
  - surveys of existing programmes
  - survey of residents

# Program Evaluation:

## Program Theory and Design Assessment

- rationale for designing a program in a particular way – theoretical and empirical justification

# Program Evaluation:

## Process Evaluation

- is program implemented as intended?
- aka program monitoring
- conduct formative evaluation
- programme audit

### The Perry Preschool Evaluation

- monitoring of treatment protocol

# Program Evaluation:

## Outcome Evaluation

- deals with assessing program (treatment) effectiveness
- involves **summative evaluation**

### **Possible Issues**

- Resistance & Bias of Participants
- Random Assignment
- Assessment of Multiple Outcomes
- Contamination



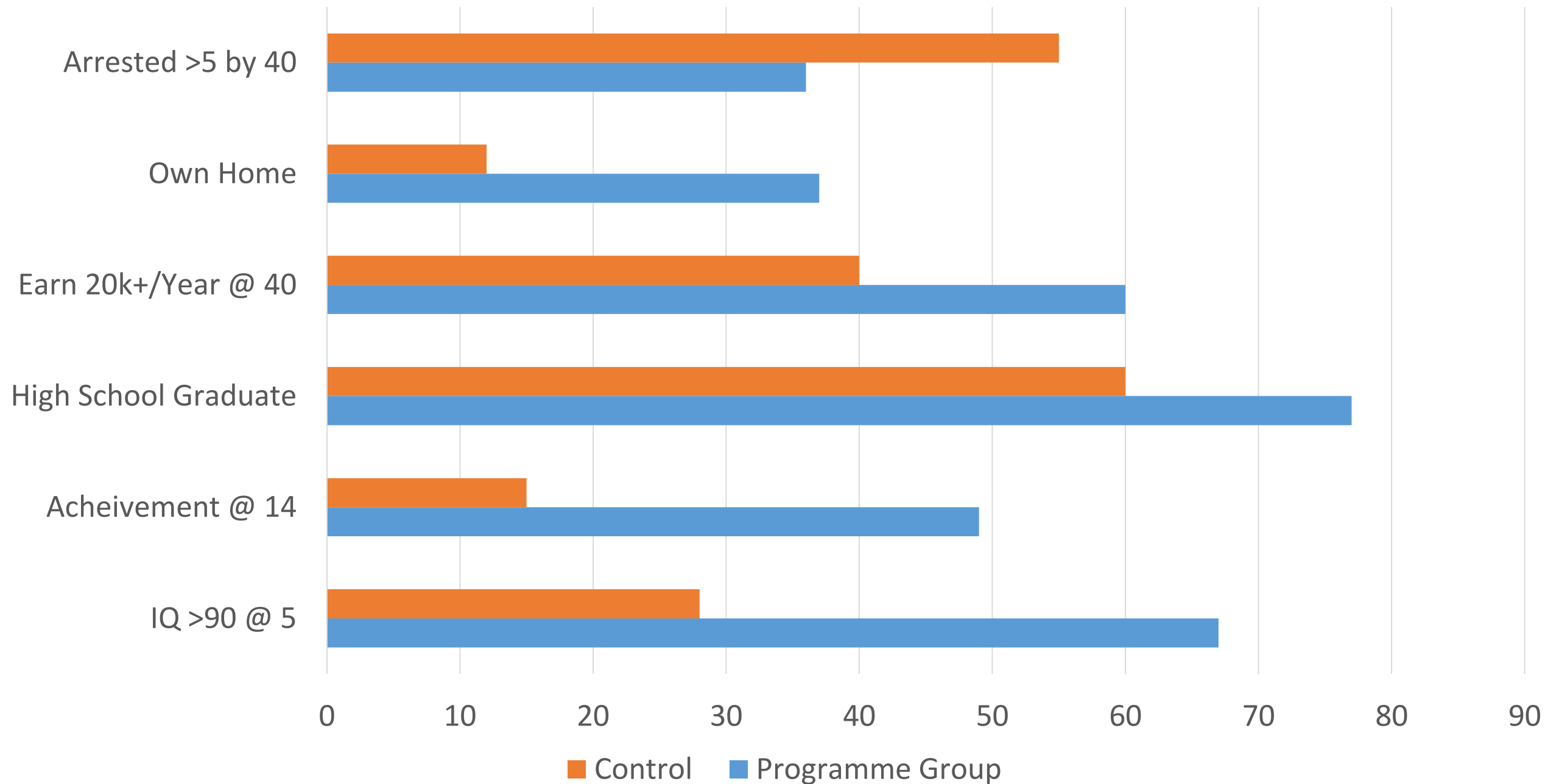
# Example Programme Evaluation

## The Perry Preschool Project – Evaluation

With 97% responding, adults at age 40 who had the preschool program had:

- Higher earnings
- More likely to hold a job
- Committed fewer crimes
- More likely to have graduated from high school

## Perry Preschool Outcomes @ 40 Years



# Program Evaluation: Efficiency Assessment

- Cost-benefit analysis of program effectiveness
  - Is the program financially beneficial?

# Example Programme Evaluation

## The Perry Preschool Project – Cost/Benefits

### After Programme (Students 19 yrs. old)

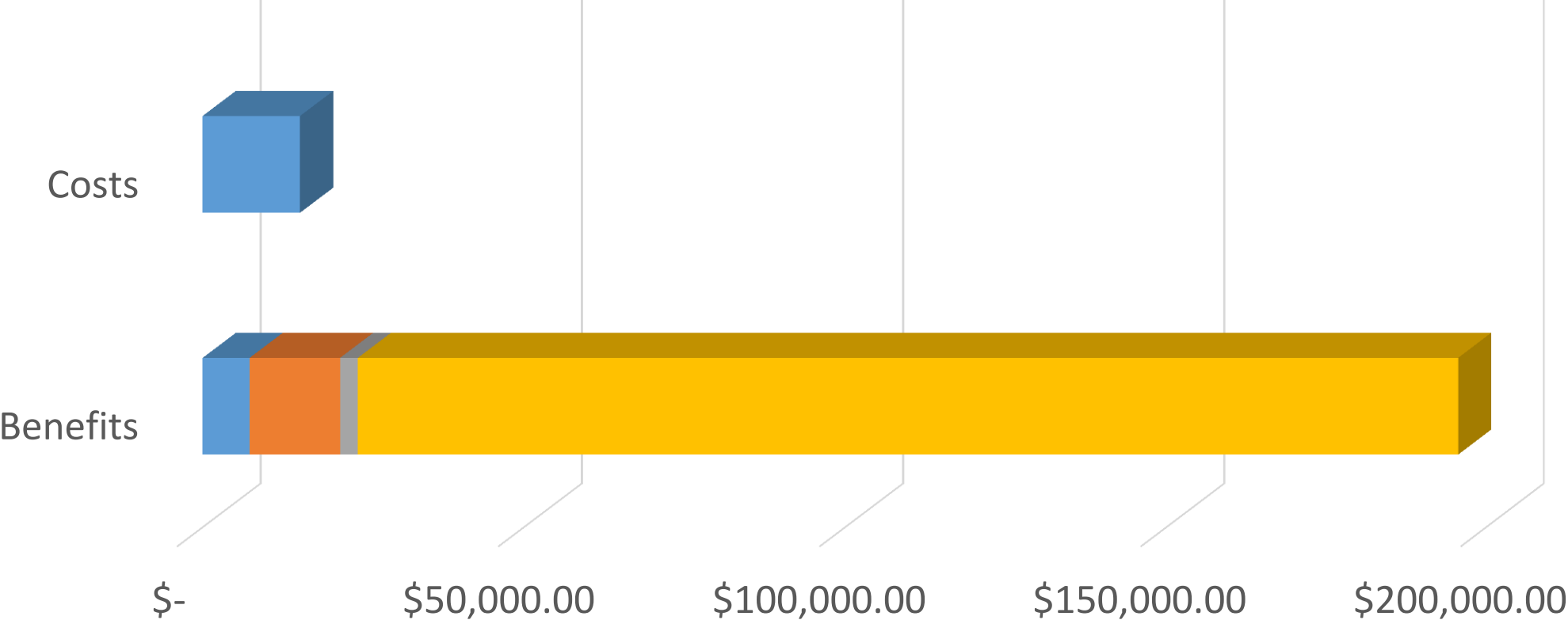
#### Cost of Programme

- \$12,720 (adjusted to 2014 dollars)

#### Benefits of Programme

- savings in child-care time for tx group
- savings in later special education
- savings in delinquent behaviour
- earning differences
- savings in welfare etc
- \$25,720 (adjusted to 2014 dollars)
  
- net savings of \$13,104/student

Perry Preschool - Cost/Benefit Analysis



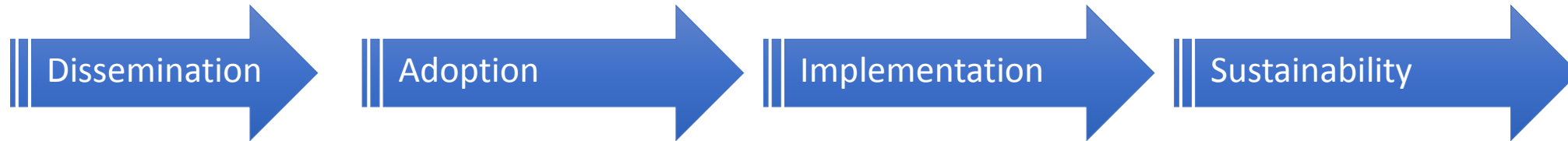
	Benefits	Costs
■ Educational Savings	\$7,303.00	\$15,166.00
■ Taxes on Income	\$14,078.00	
■ Welfare Savings	\$2,768.00	
■ Crime Savings	\$171,473.00	

■ Educational Savings    ■ Taxes on Income    ■ Welfare Savings    ■ Crime Savings

# Program Evaluation:

## Program Diffusion

- implementing and maintaining effective programs in other settings or with other groups



# Example Programme Evaluation

## The Perry Preschool Project – Programme Diffusion

- results of project appeared in many published reports and conferences
- results used to counter general belief about relative ineffectiveness of compensatory programmes