

# Understanding Non-Response and Reducing Non-Response Bias

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**Cathie Marsh Memorial Seminar  
2009**



1.

# Motivation I

Paradigm of random sampling

Theory of population inference

Assumptions do not hold in presence of non-response

Possibility of approximating the assumptions with suitable adjustment

Assessment of whether adjustments are suitable is rarely satisfactory

Context of non-probability sampling

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2.

## Motivation II: Random Sampling Context

Increasing difficulties to obtain / maintain response rates

Associated increasing costs / effort

Response rate as quality indicator: Public / user perception

Non-response error

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3.

## Non-Response Error

Survey response as a deterministic vs. probabilistic process

Deterministic model (Groves 1989):

$$E(y_R - Y_T) = (Y_R - Y_T) = \left( \frac{(N_T - N_R)}{N_T} \right) (Y_R - Y_{\tilde{R}})$$

Where  $Y_T = \frac{N_R Y_R + N_{\tilde{R}} Y_{\tilde{R}}}{N_T}$ ;  $N_T = N_R + N_{\tilde{R}}$

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4.

## Non-Response Error II

Probabilistic model (Bethlehem 2002):

$$E(y_R - Y_T) = \frac{\text{Cov}(y_i, \rho_i)}{\bar{\rho}}$$

Where  $\rho_i$  is the participation propensity of unit  $i$ .

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5.

## Non-Response Error III

Under either model, the realised error due to non-response is:

$$\Rightarrow (y_R - y_T) = \left( \frac{(n_T - n_R)}{n_T} \right) (y_R - y_{\tilde{R}})$$

The aim of the survey researcher should be to seek effective ways to minimise both components, noting that

- the components are not independent;
  - the second component is estimate-specific.
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6.

## Trends

Declining response rates

Increasing cost and effort of maintaining/achieving response

Increasing concern regarding non-response

Increasing interest in alternatives to traditional approaches

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7.

## Current Issues / Themes in NR Research

Tailoring (Groves & Couper 1998)

Responsive designs (Groves & Heeringa 2006)

Use of paradata (Couper & Lyberg 2005)

Distinctiveness of longitudinal surveys (Watson & Wooden 2009; Couper & Ofstedal 2009)



8.

## ESRC Survey Design and Measurement Initiative

One response to the above trends

A main focus is on reduction of non-response and of non-response bias  
(not on adjustment)

“...project(s) addressing this area are expected to undertake research into why and how people do or do not co-operate with surveys in order to facilitate the development of more effective techniques for maximising response rates and minimising non-response bias.”

ESRC SDMI Specification

Four out of seven SDMI projects focus on non-response issues

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9.

## “Understanding Non-Response and Reducing Non-Response Bias” – SDMI Project

### Project Team

ISER, Essex: **Peter Lynn**  
Annette Jäckle  
Heather Laurie  
Laura Fumagalli

ISER/ GESIS: Annelies Blom

NatCen: **Gerry Nicolaas**  
Jennifer Sinibaldi (Rebecca Taylor)  
Sarah Tipping

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## Sub-Projects

1. Review: Framework of factors affecting NR bias
  2. Effects of marginal response efforts on NR bias
  3. Links between field processes and NR bias: using call data
  4. Effects of design features on NR bias
  5. Design features to reduce attrition on longitudinal surveys
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11.

www.surveynet.ac.uk/sdmi

The screenshot shows a Mozilla Firefox browser window displaying the Survey Design and Measurement website. The address bar shows the URL <http://www.surveynet.ac.uk/sdmi/introduction.asp>. The page features a navigation menu on the left with links to SURVEY RESOURCES NETWORK, SURVEY QUESTION BANK, SURVEY SKILLS, SURVEY DESIGN AND MEASUREMENT (SDM project outputs), and SURVEY MANAGEMENT SYSTEMS. The main content area is titled "SURVEY DESIGN AND MEASUREMENT" and includes an image of a pencil writing on a grid. The text discusses the need for quality improvements in survey response rates and the ESRC's funding of six projects under the SDM initiative. It lists project outputs such as "Understanding Non-Response and Reducing Non-Response Bias" by Professor Peter Lynn, "Mixed Modes and Measurement Error" by Ms Gerry Nicolaas, "The Commodity Chain of the Household: from Survey Design to Policy Planning" by Dr Ernestina Coast, and "The Use of Scanner Technology for Collecting Expenditure Data in Mixed-Mode Social Science Surveys" by Ms Zoe Oldfield. A right-hand sidebar contains sections for "SURVEY DESIGN AND MEASUREMENT" (with a link to SDM project outputs), "Mailing list" (inviting users to join for news and events), and "News and events" (listing the Cathie Marsh Memorial Lecture on 17 November 2009 and the PPSM 1st International Conference on 12-13 November 2009). The browser's taskbar at the bottom shows various open applications and the system clock at 09:21.

**SURVEY DESIGN AND MEASUREMENT**

In an environment of increased awareness of quality issues and concern for declining response rates both nationally and internationally, there is a clear necessity to develop and improve the evidence base around techniques which may be employed to maximise response and enhance data quality.

The ESRC has responded to this challenge by funding six projects under the Survey Design and Measurement (SDM) initiative. These six projects address a range of important issues including, but not limited to: non-response bias, the use of mixed modes, the application of new technologies in the survey process, household definitions and structures, and the validity and reliability of survey questions. Additionally, a further project funded by the ESRC but not under the SDM initiative is included within the SDM initiative 'umbrella'. This is the project led by Gabriele Durrant at the University of Southampton entitled "Hierarchical analysis of unit non-response in sample surveys". Additional details, summaries of progress, links to research outputs and project web sites can be found in the list below:

[Understanding Non-Response and Reducing Non-Response Bias](#)  
Professor Peter Lynn, ISER  
[Summary of progress](#)

[Mixed Modes and Measurement Error](#)  
Ms Gerry Nicolaas, NatCen, Survey Methods Unit  
[Summary of progress](#)

[The Commodity Chain of the Household: from Survey Design to Policy Planning](#)  
Dr Ernestina Coast, London School of Economics  
[Summary of progress](#)

- **Project outputs**

[The Use of Scanner Technology for Collecting Expenditure Data in Mixed-Mode Social Science Surveys](#)  
Ms Zoe Oldfield, Institute for Fiscal Studies  
[Summary of progress](#)

**SURVEY DESIGN AND MEASUREMENT**  
▪ [SDM project outputs](#)

**Mailing list**  
Join the Survey Resources Network [mailing list](#) to find out about news and events.

**News and events**  
**17 November 2009**  
[Cathie Marsh Memorial Lecture](#)  
This year's Royal Statistical Society/Social Research Association Cathie Marsh Memorial Lecture will draw on the latest findings from the SDMI as well as wider thinking on survey non-response. Peter Lynn and Ian Plewis will be the key speakers.  
**12 - 13 November 2009**  
[PPSM 1st International Conference](#)  
A number of SDMI projects will be presenting their findings at the Priority Programme on Survey Methodology (PPSM) Conference in Bremen.  
[Older news and events](#)

## Interviewer Traits and Co-operation

Role of interviewers' experience, attitudes, personality traits and interpersonal skills in determining survey co-operation

Previous research on doorstep interactions

We measured traits, skills and attitudes simultaneously

Large sample: 845 interviewers; over 100,000 sample units

Interviewer survey linked to NatCen call record data

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## Interviewer Traits and Co-operation II

Considerable interviewer variance in co-operation rates

Interviewer experience and attitudes predictive

Traits associated with increased propensity to achieve co-operation:  
extroversion, conscientiousness, lack of agreeableness

Difference between genders largely explained by differences in traits and attitudes

Effect of experience only partially explained by differences in traits and attitudes

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## Differences between male & female interviewers

- Co-operation rates:
    - Male: 55.7%, Female: 60.2%, (P=0.000)
  - Due to differences in characteristics?
  - Decompose differences in mean predicted co-operation rates between 2 groups into
    - Differences in characteristics and
    - Behaviours (coefficients and residuals)
    - See Even & Macpherson (1993) Journal of Human Resources
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## Differences between male & female interviewers

### Simulation:

- RE logit, probability of co-operation
- Full model: attitudes, experience, traits, skills + controls
- Separate model for male and female interviewers
- Predicted co-operation rates, at mean/modal values

### Predicted co-operation rates:

- Male ( $X_m, \beta_m$ ): 57%
  - Female ( $X_f, \beta_f$ ): 74%
  - Female model with male characteristics ( $X_m, \beta_f$ ): 59%
  - 15% points explained by differences in characteristics
  - Which characteristics are most important?
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## Differences between male & female interviewers

Total difference due to characteristics:

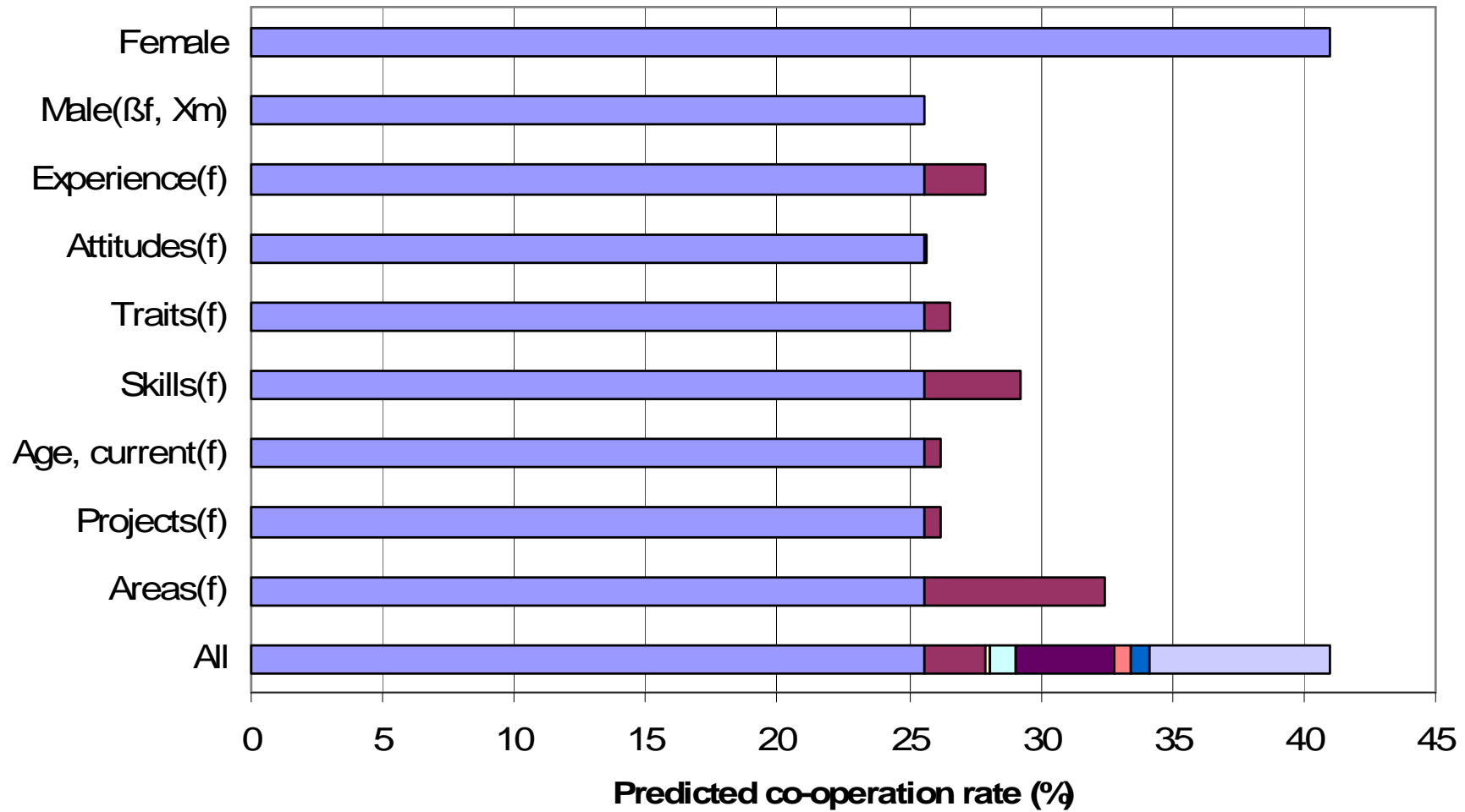
$$EXP = P(X_M, \hat{\beta}_F) - P(X_F, \hat{\beta}_F)$$

Difference due to individual characteristic  $r$ :

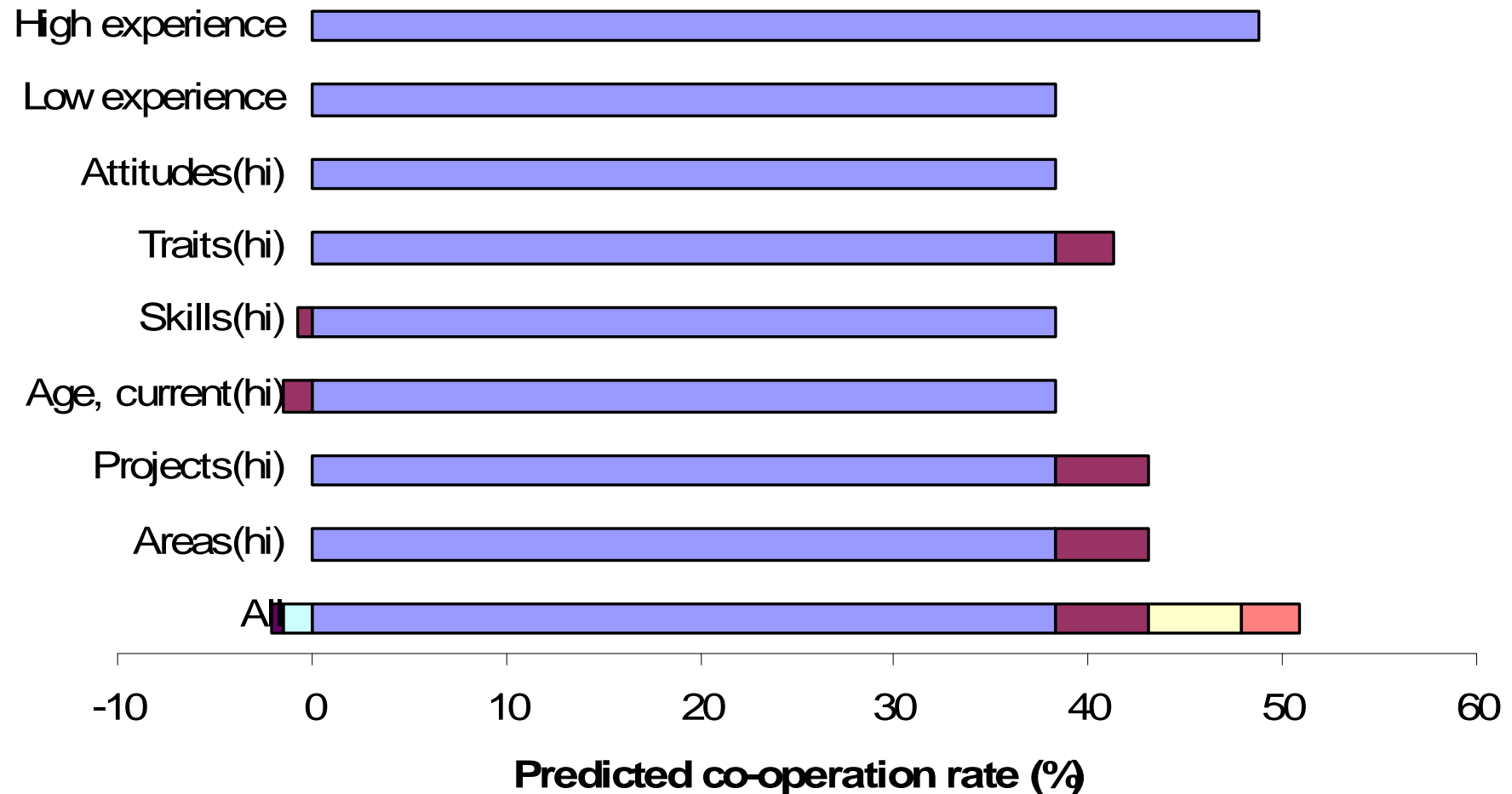
$$EXP_r = \left[ P(X_M, \hat{\beta}_F) - P(X_F, \hat{\beta}_F) \right] \underbrace{\left[ \frac{(\bar{X}_{Mr} - \bar{X}_{Fr}) \hat{\beta}_{Fr}}{(\bar{X}_M - \bar{X}_F) \hat{\beta}_F} \right]}$$

weight for  $\Delta$  in distribution of  $r^{\text{th}}$  variable

# Differences between male & female interviewers



# Differences between more and less experienced interviewers



## Tracking / Tracing

Variety of possible actions to maintain or re-establish contact

Each has effects on a) costs, b) outcomes

Little is known about relative effectiveness (Couper and Ofstedal 2009)

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Variety of possible actions to maintain or re-establish contact

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Little is known about relative effectiveness (Couper and Ofstedal 2009)

Two recent studies beginning to address this:

McGonagle, Couper and Schoeni (2009) - PSID

Fumagalli, Laurie and Lynn (2009) - BHPS

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## BHPS Study

Between-wave contact information mailing:

- Address confirmation card *vs.* Change-of-address card *vs.* neither
  - Incentive: conditional *vs.* unconditional (each 2 amounts)
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## BHPS Study


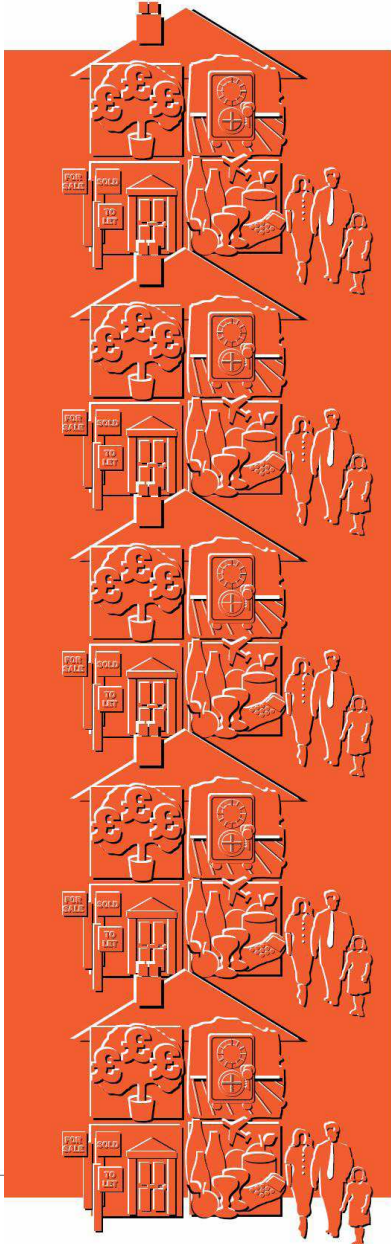
Between-wave contact information mailing:

- Address confirmation card *vs.* Change-of-address card *vs.* neither
- Incentive: conditional *vs.* unconditional (each 2 amounts)

Respondent report

- Standard *vs.* Tailored (young/ busy/ other)
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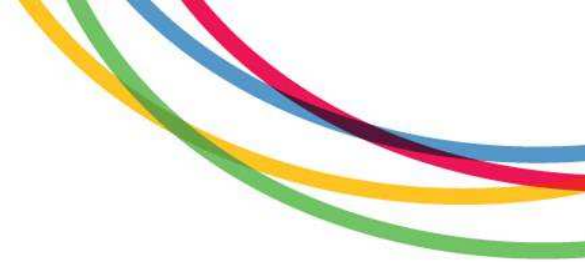
# Standard Report



**Living in Britain**

## Changing attitudes and behaviours

**Report to Respondents - 2008**




# Tailored Report (young)

it's all about
FEEDBACK U


**2008**

**FEEDBACK U**

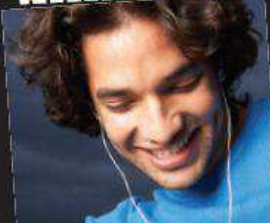
respondents report 2008




I can't imagine life without a mobile phone? I just couldn't live without mine.



University? - Definitely. I want to go into medicine so I've got to work hard...



I still live at home. Mum's great but I would like to be able to afford a place of my own




Yes, I hope to have children. But I wouldn't want more than two. Maybe only one

**Are you happy with your life overall?**

A large majority feel satisfied with life.

On a scale where '1' = not at all satisfied with life overall and '7' = completely satisfied with life 78% of you rated your lives as scoring 5 or higher and over 13% of you said you were completely satisfied with your lives overall.

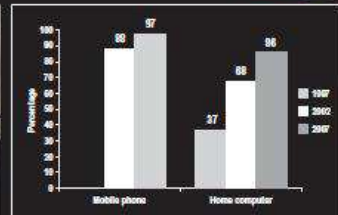
Your overall satisfaction with life in 2007



Degree of satisfaction	Percentage
1 (Not satisfied at all)	0.8
2	2.1
3	6.8
4	13.2
5	31.7
6	32.8
7 (Completely satisfied)	13.4

**The changing use of technology**

Technology is evolving fast and regular use of computers and mobile phones is becoming the norm. Almost all - 97% - of people aged 16-24 had a mobile phone in 2007, compared with 88% in 2002. Home computer use has seen a massive increase over the last decade.



Technology	2002 (%)	2007 (%)
Mobile phone	88	97
Home computer	37	88

**the under 25s - what you think**

13% said they were less satisfied than last year

97% of people aged 16-24 had a mobile phone in 2007

23.

## Return rates:

- Confirmation card, unconditional: 40.7%
  - Confirmation card, conditional: 33.6%
  - Change only card, conditional: 14.5%
  - No card: 7.0%
-

23.

### Return rates:

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### Wave 18 'untraced' rates:

- Confirmation card, unconditional: 0.19%
  - Confirmation card, conditional: 0.39%
  - Change only card, conditional: 0.07%
  - No card: 0.20%
-

### Return rates:

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- Confirmation card, conditional: 0.39%
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- No card: 0.20%

### Wave 18 Response rates

- Tailored report: 89.1%
  - Standard report: 87.8%
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## Conclusions

Much interest in NR research currently

Reduction and adjustment

Responsive designs

Tailoring of various aspects

Use of paradata

Some re-consideration of design-based vs. model-based vs. model-assisted approaches to inference

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## Forward Look

NR Research should focus on identification of actionable outcomes - which could be either in terms of reduction or adjustment

There is still much to be explored in terms of non-response reduction

User/ public perception issue maybe deserves more attention that scientific grounds alone would suggest

Survey statisticians may need to work harder to demonstrate the accuracy of survey samples, paying particular attention to differences/changes in accuracy due to falling response rates or changing response composition

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