

# **Improving RDD cell phone samples. Evaluation of pre-call validation processes**

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Grant # FU 389/16-2 from German Research Foundation to Marek Fuchs

Presented at ESRA 2011  
Lausanne, Switzerland  
July 22, 2011

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# Background

## RDD cell phone numbers

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- Cell phone surveys are gaining in importance in telephone surveys due to the increasing proportion of cell phone-only households
- Usage of random digit dialing (RDD) cell phone samples as a standard method
- Problem of RDD cell phone numbers:
  - High proportion of invalid numbers
  - High proportion of numbers of unknown eligibility

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# Methods of pre-call validation

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## text messaging

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Detailed reason codes in case of failed delivery

Bulk messages

Relatively expensive (9 Cent)

Delivery-attempt up to 48 hours

Prenotification

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## number validation

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Differentiation of valid, invalid or not logged in for a longer time

Home Location Register (HLR) lookup

Inexpensive (4 Cent)

Snapshot, immediately available

No message to respondent

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# Research Questions



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## 1. Can survey costs be reduced by means of pre-call validation?

- Can contact rates and interview success rates be increased?
- Is there a reduction of the mean number of call attempts and mean call duration per interview?

## 2. How is data quality affected?

- Can response rates be calculated more reliable by decreasing the share of numbers of unknown eligibility?
- What is the proportion of false negative numbers, which are falsely excluded although being valid cell phone numbers?

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# Methods



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- Recruitment interviews for "Experimental Mobile Phone Panel" in Germany (September 2010 - January 2011)
  - Sampling according to Gabler-Häder design
  - Simulation study: n=3,275
    - Final disposition codes for all cases
    - Return codes using pre-call validation methods for all cases
  - Up to 15 call attempts
  - Response Rate (AAPOR RR3):
    - without text message: 18%
    - with text message: 19%

# Study Design

## Experimental conditions



validation process	screening condition		
	<i>no screening</i>	<i>loose<sup>a)</sup></i>	<i>strict<sup>a)</sup></i>
<b>(1) number validation</b>	-	number unknown	number unknown <i>or not logged in</i>
<i>screened out (%)</i>	0	42	64
<i>n<sub>calculation</sub></i>	1,025	599	369
<b>(2) text message</b>	-	subscriber unknown	subscriber unknown <i>or absent</i>
<i>screened out (%)</i>	0	50	70
<i>n<sub>calculation</sub></i>	1,125	557	343
<b>(3) combination (text+number validation)</b>	-	number unknown <i>or</i> subscriber unknown	number unknown/not logged in <i>or</i> subscriber unknown/absent
<i>screened out (%)</i>	0	54	74
<i>n<sub>calculation</sub></i>	1,125	523	294
<i>n<sub>total</sub></i>	3,275		

Notes: a) Simulation effects are calculated on the basis of the "no screening" condition (control condition).

# Results

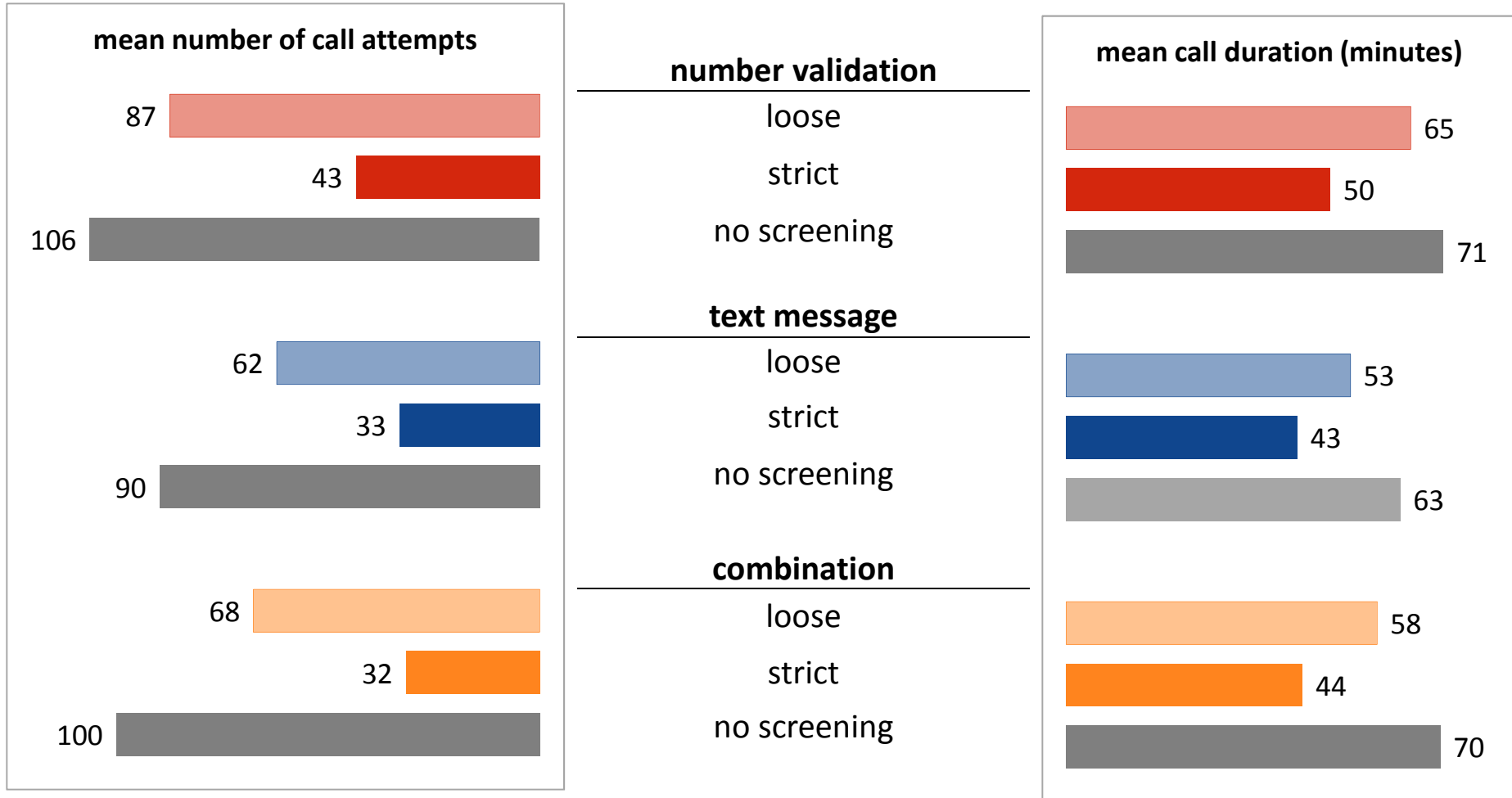
## Working number rate, contact & interview rate



validation process	screening condition		
	<i>no screening</i>	<i>loose</i>	<i>strict</i>
<b>working number rate (%)</b>			
number validation	56	91	91
text message	54	91	97
combination	53	95	98
<b>contact rate (%)</b>			
number validation	26	44	68
text message	28	54	80
combination	28	55	84
<b>interview rate (%)</b>			
number validation	6	11	17
text message	7	14	22
combination	7	14	22

# Results

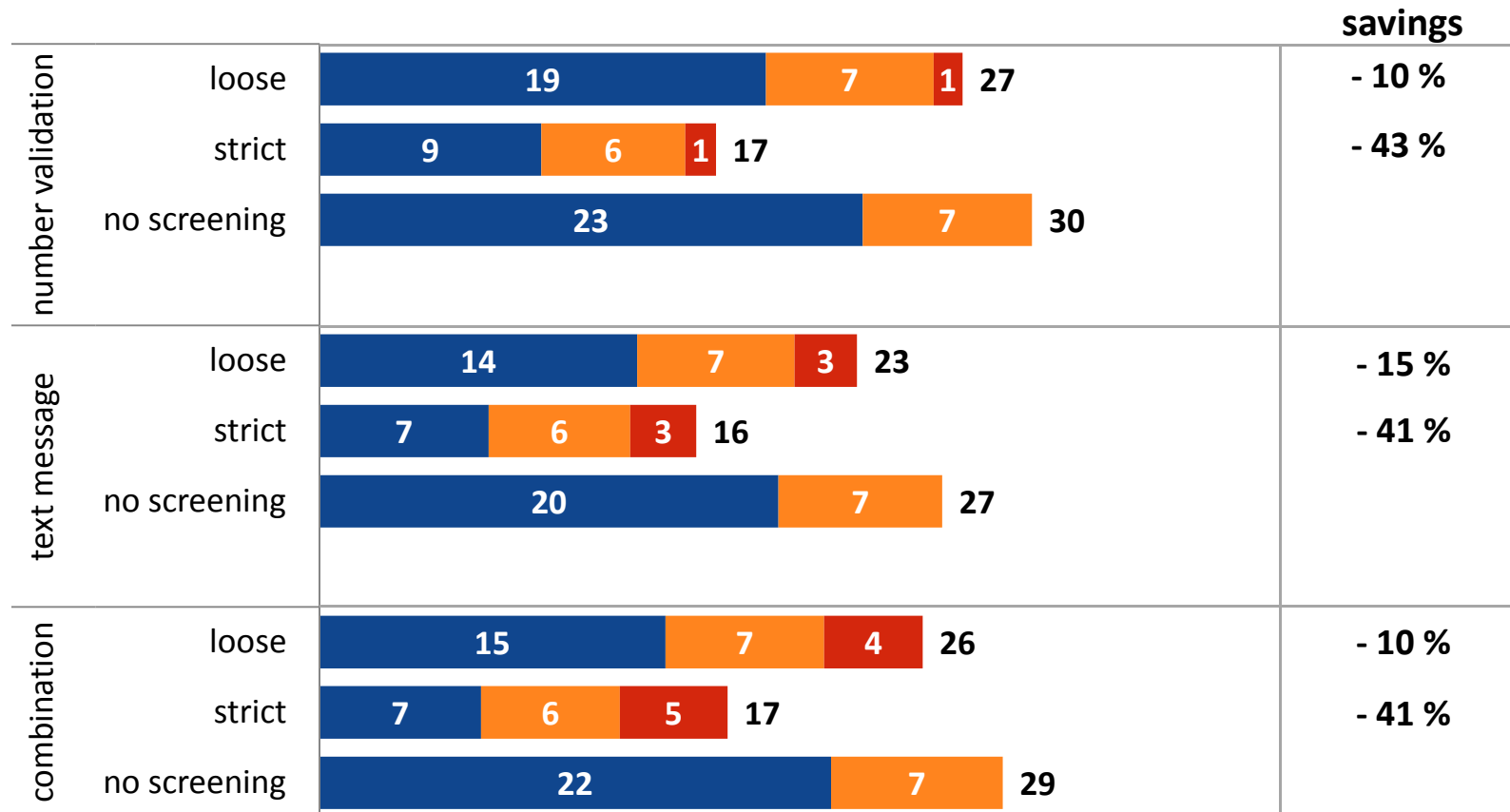
## Call attempts & duration per completed interview





# Results

## Costs per completed interview (in Euro)

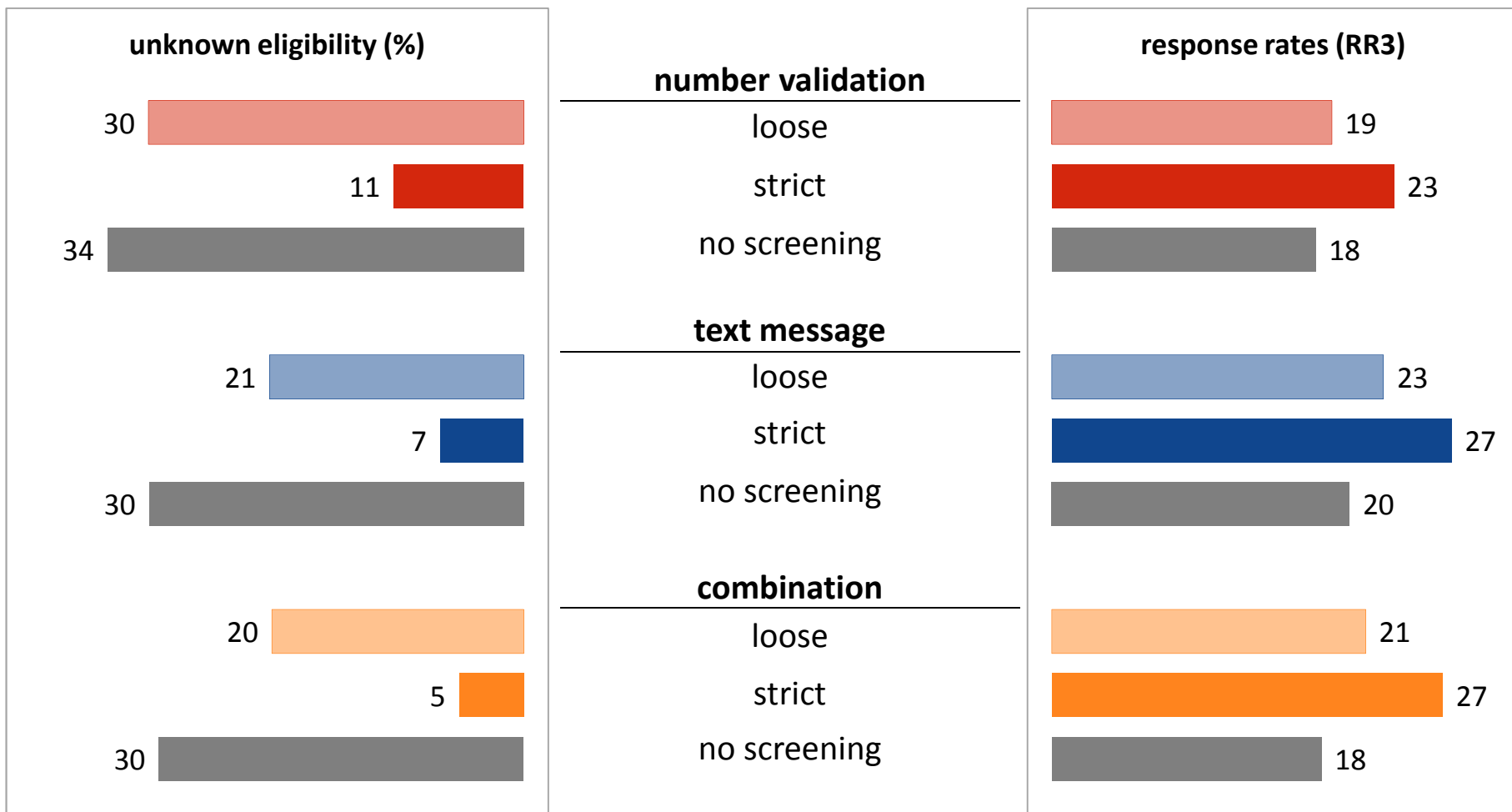


■ direct labor costs<sup>1)</sup> ■ telephone connect charges ■ pre-call validation costs

Note: 1) Costs for interviewer and supervisor.

# Results

## Percent of "unknown eligibility" & response rates



# Results

## False negative rate

screening condition	false negatives % (N)	final disposition codes (AAPOR) (%)			
		interview	eligible, non- interview	unknown eligibility, non- interview	not eligible
<b>number validation</b>					
loose	4 (22)	-	0.5	3	-
strict	41 (232)	0.7	2	38	-
<b>text message</b>					
loose	17 (106)	0.7	1	15	0.3
strict	46 (281)	1	4	40	0.5
<b>combination</b>					
loose	17 (103)	0.5	3	14	-
strict	52 (311)	2	8	42	0.2

Note: Calculations are based on the control conditions.

# Results

## Bias due to false negatives

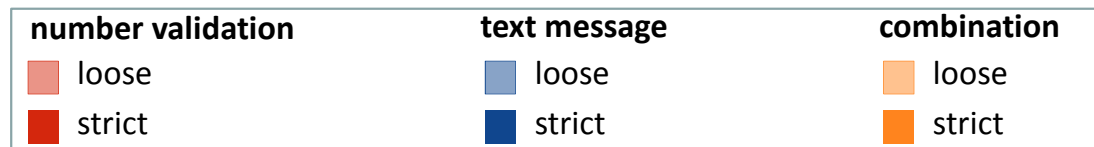
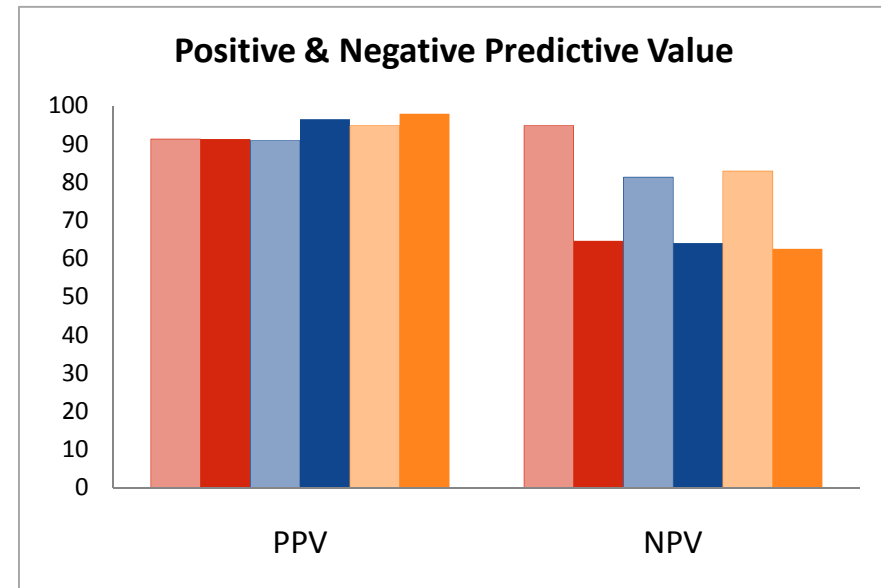
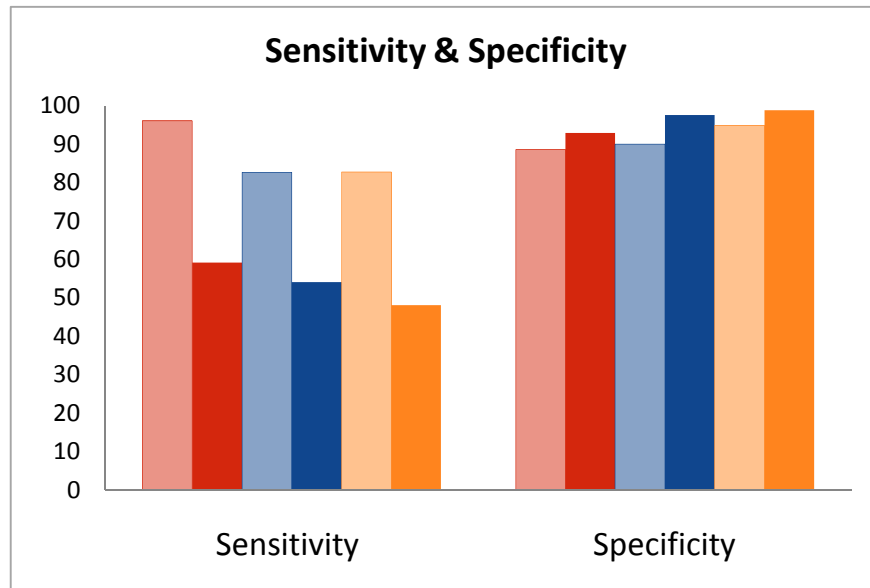


screening condition	false negatives % (N)	Bias due to false negatives			
		age		gender	
<b>number validation</b>					
loose	4 (22)	0.6	<i>n.s.</i>	0.0	<i>n.s.</i>
strict	41 (232)	0.4	<i>n.s.</i>	0.9	<i>n.s.</i>
<b>text message</b>					
loose	17 (106)	0.6	<i>n.s.</i>	0.3	<i>n.s.</i>
strict	46 (281)	0.4	<i>n.s.</i>	0.6	<i>n.s.</i>
<b>combination</b>					
loose	17 (103)	0.5	<i>n.s.</i>	1.3	<i>n.s.</i>
strict	52 (311)	1.0	<i>n.s.</i>	2.9	<i>n.s.</i>

Note: Calculations are based on the control conditions.

# Results

## Efficiency evaluation



➡ Low sensitivity affects data quality negatively (due to many false negatives)

➡ Low PPV affects survey costs negatively (due to many false positives)

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# Summary



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1. Increase of the percentage of valid cell phone numbers in the field up to 90% or even more
  
  2. Decrease of the interviewers' workload
    - Fewer call attempts per complete
    - Lower mean call duration per complete
  
  1. Reduction of unknown eligible numbers
    - Increase of response rates
  
  2. False negative rate rises drastically with increasing strictness of screening condition
    - Seems to produce non-significant biases

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# Conclusions



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- Number validation and text messaging are both appropriate methods to increase the percentage of working numbers in the field
  - The additional costs for a combination of number validation and text message are not justified
  - In the *loose* screening condition, number validation displays only moderate improvements but few false negatives
  - Which of the *strict* methods should be favored?
    - ➔ Given a comparable efficiency, it is a matter of whether contacting prior to fielding the numbers is desired or not



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**Thank you.**

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