

**eTable 1:** Scenarios investigated as sources of measurement error in mobile phone use <sup>a</sup>.

Scenario	Description	Key parameters
1	<b>Differential systematic and differential random error</b> with $Y \sim N(X + \tau_{status} + \gamma_{status}X_{c,status}, \sigma_{T_{status}}^2)$ , where $\tau_0 = \gamma_0 = 0$ for controls, $\tau_1$ and $\gamma_1$ varying for cases varying for cases, and $\sigma_{T_1} = k * \sigma_{T_0}$ , $k \in \{1, 1.1, 1.2, 1.3, 1.6\}$ and $\sigma_{T_0}$ fixed	$\tau_1, \gamma_1$ and $\sigma_{T_1}$
2	<b>Differential random error with greater random error among cases than controls</b> with $Y \sim N(X, \sigma_{T_{status}}^2)$ where $\sigma_{T_1}^2 = k * \sigma_{T_0}^2$ , $k \in \{1, 1.1, 1.2, 1.3, 1.6\}$ and $\sigma_{T_0}$ fixed	$\sigma_{T_1}$
3	<b>Differential systematic over estimation of mobile phone use among cases</b> and fixed random error with $Y \sim N(X + \tau_{status} + \gamma_{status}X_{c,status}, \sigma_T^2)$ where $\tau_0 = \gamma_0 = 0$ for controls, $\tau_1$ and $\gamma_1$ varying for cases, while $\sigma_T$ is fixed	$\tau_1$ and $\gamma_1$
4	<b>Non-differential random error</b> with $Y \sim N(X, \sigma_T^2)$ where $\sigma_T$ varying	$\sigma_T$

<sup>a</sup> In scenarios 1-3 where differential errors between cases and controls are introduced, two sets of parameters were defined: one for the controls (indexed by the lowercase 0) and one for the cases (by the lowercase 1). All scenarios are based on the main generic equation:  $Y \sim N(X + \tau + \gamma X_c, \sigma_T^2)$  where  $\tau$  denotes the average value of the error T (between the observed Y and the true exposure X),  $\gamma$  is the slope reflecting the strength between the error-prone and the true exposure X (with the mean of X;  $X_c$ ), and  $\sigma_T^2$  is the variance of the T.

**eTable 2:** Means and standard deviations (SD) of mobile phone use data: self-reported, operator-recorded and log-ratio of self-reported to operator-recorded data; by study and exposure metric (number and duration of calls). Interphone validation studies.

	N	Number of calls			Durations of calls		
		Mean	SD	Ratio; mean (SD)	Mean	SD	Ratio; mean (SD)
<b>Study 1<sup>a</sup></b>							
Operator-recorded	690	4.25	1.13	-0.09 (1.04)	4.80	1.36	0.38 (1.30)
Self-reported	690	4.16	1.36		5.17	1.75	
<b>Study 2<sup>b</sup></b>							
<b>By status</b>							
Controls: Operator-recorded	296	4.46	0.96	-0.21 (0.97)	4.86	1.12	0.33 (1.23)
Controls: Self-reported	296	4.25	1.25		5.19	1.57	
Cases: Operator-recorded	212	4.44	0.94	-0.21 (1.03)	4.90	1.09	0.34 (1.30)
Cases: Self-reported	212	4.23	1.36		5.24	1.71	
<b>Overall</b>							
Operator-recorded	508	4.45	0.95	-0.21 (0.99)	4.87	1.11	0.33 (1.26)
Self-reported	508	4.24	1.30		5.21	1.63	

<sup>a</sup> Vrijheid M et al. (2006).

<sup>b</sup> Vrijheid M et al. (2009).

**eTable 3:** Log-ratios of self-reported to operator-recorded by study, country and exposure metric (number and duration of calls). Interphone validation studies.

	N	Number of calls		Durations of calls	
		Ratio		Ratio	
		Mean	SD	Mean	SD
<b>Study 1<sup>a</sup></b>					
<b>By country</b>					
Australia	44	0.06	0.82	0.33	0.97
Denmark	46	-0.22	0.62	0.29	0.97
Finland	78	0.07	0.78	0.48	1.22
France	70	-0.10	0.95	0.47	1.29
Germany	75	-0.24	1.15	0.03	1.48
Israel	41	-0.10	1.01	0.36	1.35
Italy	89	0.10	1.01	0.78	1.17
New Zealand	20	-0.87	0.94	-0.35	0.88
Norway	46	-0.79	0.88	-0.58	1.16
Sweden	46	-0.16	0.95	0.44	1.23
UK North OP*	91	0.47	1.30	0.96	1.47
UK North SMP*	44	-0.49	0.84	0.06	0.95
<b>Overall</b>	690	-0.09	1.04	0.38	1.30
<b>Study 2<sup>b</sup></b>					
<b>By country</b>					
Australia	192	-0.44	0.97	0.26	1.18
Canada	131	-0.08	0.95	0.46	1.2
Italy	185	-0.05	1.00	0.32	1.36
<b>Overall</b>	508	-0.21	0.99	0.33	1.26

<sup>a</sup> In the UK-North study, two separate studies were carried out: one using only software modified phones (SMP) and one using only mobile phone operators' records (UK North OP).

<sup>a</sup> Vrijheid M et al. (2006).

<sup>b</sup> Vrijheid M et al. (2009).

**eTable 4:** Simulation results of measurement errors in mobile phone use on risk estimates for each decile under the alternative hypothesis ( $H1$ ;  $OR^* = 1.3$ ) with the presence of a real effect; by scenario along with the true estimator. Duration of calls.

Number of calls		Deciles of exposure									
Scenario <sup>a</sup>	Scenario number	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
<b>Without error (true estimator)</b>											
Coverage	-	95.0	94.7	95.5	95.3	95.0	94.8	95.6	94.9	95.3	94.2
Power		30.3	41.9	47.2	55.2	61.7	67.2	71.6	77.2	80.5	90.2
<b>Differential systematic and random <sup>b</sup></b>	1										
Coverage		78.3	77.8	78.8	83.6	86.2	91.7	93.6	90.9	73.4	17.5
Power		18.9	10.2	14.9	24.1	32.6	49.1	67.6	87.2	97.6	99.9
<b>Differential random <sup>c</sup></b>	2										
Coverage		50.5	92.8	95.5	92.7	92.2	90.6	90.6	91.0	93.7	86.1
Power		86.0	60.0	46.1	44.9	43.8	43.0	46.9	54.2	70.0	93.2
<b>Differential systematic <sup>d</sup></b>	3										
Coverage		47.3	72.9	83.5	89.9	95.0	94.1	91.8	87.5	72.4	42.3
Power		18.1	9.0	17.5	35.5	50.0	67.1	82.6	91.7	97.3	99.7
<b>Random error <sup>e</sup></b>	4										
Coverage		82.0	92.8	92.9	93.4	94.0	93.6	94.4	94.7	92.8	82.0
Power		53.5	58.6	60.2	59.8	61.4	64.5	66.2	66.1	69.9	67.0

<sup>a</sup> In all scenarios, non-regular mobile phone users served as the reference category. The true OR ( $OR^*$ ) used for generating the model is supposed to be equal to 1.3.

<sup>b</sup> Differential random and systematic scenario: cases have greater random (10% more) and average systematic ( $\tau = 0.34$ ) error than controls, and the error increases with the level of use ( $\gamma = 0.02$ ). Random standard deviation error is set to 1.22 among controls ( $\sigma_{T_0}$ ).

<sup>c</sup> Differential random scenario; cases have greater random error than controls (average standard deviations ratio between cases and controls equal to 1.1).

<sup>d</sup> Differential systematic scenario: cases have greater average systematic error than controls (expectation  $\tau = 0.34$ ) and the error increased with the level of use ( $\gamma = 0.02$ ). Random error is kept at a constant level (of 1.28) and similar among cases and controls.

<sup>e</sup> Random error scenario: the random standard deviation  $\sigma_T$  is set to 1.22.

**eTable 5:** Scenarios of measurement errors in self-reported mobile phone use based on random/systematic and non-differential/differential errors.

<i>Scenarios</i>	<b>Non-differential</b>	<b>Differential</b>
<b>Random and Systematic</b>	-	Scenario 1
<b>Random</b>	Scenario 4	Scenario 2
<b>Systematic</b>	-	Scenario 3

**eTable 6:** Median<sup>c</sup> and standard deviations (SD) of mobile phone use data: self-reported, operator-recorded and ratio of self-reported to operator-recorded data. Untransformed (original) data; by study and exposure metric (number and duration (in minutes) of calls). Interphone validation studies.

	N	Number of calls			Durations of calls		
		Median	SD	Ratio; median (SD)	Median	SD	Ratio; median (SD)
<b>Study 1<sup>a</sup></b>							
Operator-recorded	690	76.6	139.4	0.90 (8.84)	137.9	333.6	1.52 (29.1)
Self-reported	690	76.0	262		201.3	3983	
<b>Study 2<sup>b</sup></b>							
<b>By status</b>							
Controls: Operator-recorded	296	83.4	161.5	0.82 (1.52)	130.5	296.8	1.36 (5.38)
Controls: Self-reported	296	82.2	172		183.1	1260	
Cases: Operator-recorded	212	83.8	139.2	0.87 (2.10)	138.9	323.7	1.37 (7.19)
Cases: Self-reported	212	75.8	298		176.7	1710	
<b>Overall</b>							
Operator-recorded	508	83.4	152.5	0.83 (1.79)	131.5	308	1.36 (6.20)
Self-reported	508	75.8	233.0		180.8	1466	

<sup>a</sup> Vrijheid M et al. (2006).

<sup>b</sup> Vrijheid M et al. (2009).

<sup>c</sup> Since mobile phone use data have large right-skewed distributions, medians instead of means are reported.

**eTable 7:** Means of mobile phone use measurement error (log ratio of self-reported to operator-recorded data); by country, case/control status and exposure metric (number and duration of calls). Interphone case-control validation study.

		Cases	Controls
	N	<b>Number of calls</b>	
<b>Study 2<sup>b</sup></b>			
<b>By country</b>			
Australia	192	-0.52	-0.39
Canada	131	-0.11	-0.05
Italy	185	0.04	-0.12
<b>Overall</b>	508	-0.21	-0.21
		<b>Durations of calls</b>	
<b>Study 2<sup>b</sup></b>			
<b>By country</b>			
Australia	192	0.21	0.29
Canada	131	0.26	0.60
Italy	185	0.51	0.17
<b>Overall</b>	508	0.34	0.33

<sup>b</sup>Vrijheid M et al. (2009).

**eTable 8:** Means ( $\tau$ ), slope ( $\gamma$ ) and standard deviations ( $\sigma$ ) of measurement error in mobile phone use (log ratio of self-reported to operator-recorded data); by study, case/control status and exposure metric (number and duration of calls). Interphone validation studies.

		Mean / expectation ( $\tau$ )	Slope ( $\gamma$ )	Standard deviation $\sigma$	Difference in expectation ( $\tau$ ) between cases and controls	Difference in slope ( $\gamma$ ) between cases and controls	Standard deviation ( $\sigma$ ) ratio between cases and controls
	<b>N</b>	<b>Number of calls</b>					
<b>Study 1<sup>a</sup></b>							
<b>Overall</b>	690	-0.09	-0.20	1.01	-	-	-
<b>Study 2<sup>b</sup></b>							
<b>By status</b>							
Controls	296	-0.21	-0.16	0.96	-0.0010	0.12	1.08
Cases	212	-0.21	-0.04	1.03			
<b>Overall</b>	508	-0.21	-0.11	0.99	-	-	-
		<b>Durations of calls</b>					
<b>Study 1<sup>a</sup></b>							
<b>Overall</b>	690	0.38	-0.13	1.29	-	-	-
<b>Study 2<sup>b</sup></b>							
<b>By status</b>							
Controls	296	0.33	-0.12	1.22	0.01	0.14	1.07
Cases	212	0.34	0.02	1.30			
<b>Overall</b>	508	0.33	-0.06	1.25	-	-	-

<sup>b</sup>Vrijheid M et al. (2009).



**eTable 9:** Simulation results of measurement errors in mobile phone use on risk estimates for each decile under the null hypothesis (H0) of no effect; by scenario along with the true estimator. Number of calls.

Number of calls		Deciles of exposure									
Scenario <sup>a</sup>	Scenario number	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
<b>Without error (true estimator)</b>											
Coverage	-	95.3	95.0	95.3	95.7	95.0	94.5	95.5	95.5	95.1	95.6
Type-1 error		4.7	5.0	4.7	4.3	5.1	5.5	4.5	4.5	4.9	4.4
<b>Differential systematic and random <sup>b</sup></b>	1										
Coverage		30.8	27.0	37.8	52.6	68.7	88.7	94.5	72.6	23.5	2.4
Type-1 error		69.2	73.0	62.2	47.4	31.3	11.3	5.5	27.4	76.5	97.6
<b>Differential random <sup>c</sup></b>	2										
Coverage		73.1	94.2	93.8	91.7	91.6	92.2	93.2	95.2	95.3	73.8
Type-1 error		26.9	5.8	6.2	8.3	8.3	7.8	6.9	4.9	4.7	26.2
<b>Differential systematic <sup>d</sup></b>	3										
Coverage		15.5	26.5	42.3	59.3	79.9	92.5	91.4	62.8	24.7	6.4
Type-1 error		84.5	73.5	57.7	40.7	20.1	7.5	8.6	37.2	75.3	93.6
<b>Random error <sup>e</sup></b>	4										
Coverage		89.6	95.6	94.0	93.3	93.9	93.4	94.0	94.2	94.9	89.3
Type-1 error		10.3	4.4	6.0	6.7	6.1	6.6	6.0	5.8	5.1	10.7

<sup>a</sup> In all scenarios, non-regular mobile phone users served as the reference category. The true OR ( $OR^*$ ) used for generating the model is supposed to be equal to 1.0.

<sup>b</sup> Differential random and systematic scenario: cases have greater random (10% more) and average systematic ( $\tau = 0.21$ ) error than controls, and the error increases with the level of use ( $\gamma = 0.54$ ). Random standard deviation error is set to 0.96 among controls ( $\sigma_{T_0}$ ).

<sup>c</sup> Differential random scenario: cases have greater random error than controls (average standard deviations ratio between cases and controls equal to 1.1).

<sup>d</sup> Differential systematic scenario: cases have greater average systematic error than controls (expectation  $\tau = 0.21$ ) and the error increased with the level of use ( $\gamma = 0.54$ ). Random error is kept at a constant level (of 1.01) and similar among cases and controls.

<sup>e</sup> Random error scenario: the random standard deviation  $\sigma_T$  is set to 0.97.

**eTable 10:** Simulation results of measurement errors in mobile phone use on risk estimates for each decile under the alternative hypothesis ( $H1$ ;  $OR^* = 1.3$ ) with the presence of a real effect; by scenario along with the true estimator. Number of calls.

Number of calls		Deciles of exposure									
Scenario <sup>a</sup>	Scenario number	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
<b>Without error (true estimator)</b>											
Coverage	-	93.9	93.9	95.3	95.0	94.3	94.4	95.2	95.2	94.5	95.0
Power		38.1	55.4	62.5	67.2	72.9	79.1	82.7	85.8	90.1	96.0
<b>Differential systematic and random <sup>b</sup></b>	1										
Coverage		57.2	50.6	53.1	62.8	72.1	86.4	92.4	86.4	43.0	4.5
Power		26.3	15.3	15.2	14.7	27.7	49.2	75.7	95.4	99.1	99.8
<b>Differential random <sup>c</sup></b>	2										
Coverage		52.1	92.9	94.8	92.7	91.8	90.9	89.8	91.6	94.0	85.5
Power		90.8	72.4	61.4	56.7	56.2	58.9	61.1	69.8	84.4	97.4
<b>Differential systematic <sup>d</sup></b>	3										
Coverage		36.3	44.7	56.7	69.3	80.7	91.3	93.0	80.4	43.1	10.9
Power		31.6	17.7	17.1	23.3	39.9	65.9	87.5	96.8	99.2	99.3
<b>Random error <sup>e</sup></b>	1										
Coverage		88.7	93.2	94.2	94.3	94.8	94.4	95.0	95.0	94.1	90.5
Power		65.1	70.3	72.1	74.6	77.3	75.8	78.5	79.7	82.8	85.5

<sup>a</sup> In all scenarios, non-regular mobile phone users served as the reference category. The true OR ( $OR^*$ ) used for generating the model is supposed to be equal to 1.3.

<sup>b</sup> Differential random and systematic scenario: cases have greater random (10% more) and average systematic ( $\tau = 0.21$ ) error than controls, and the error increases with the level of use ( $\gamma = 0.54$ ). Random standard deviation error is set to 0.96 among controls ( $\sigma_{T_0}$ ).

<sup>c</sup> Differential random scenario; cases have greater random error than controls (average standard deviations ratio between cases and controls equal to 1.1).

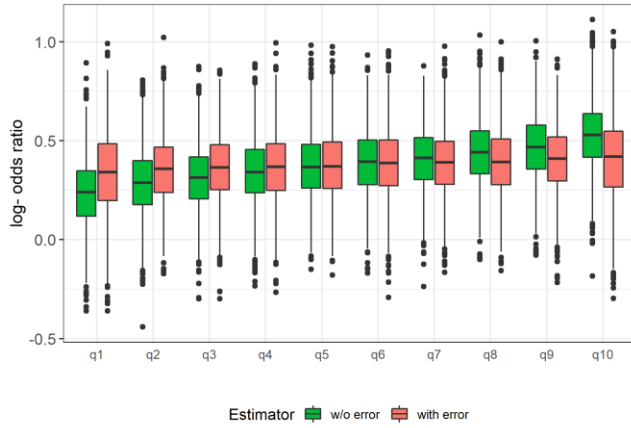
<sup>d</sup> Differential systematic scenario: cases have greater average systematic error than controls (expectation  $\tau = 0.21$ ) and the error increased with the level of use ( $\gamma = 0.54$ ). Random error is kept at a constant level (of 1.01) and similar among cases and controls.

<sup>e</sup> Random error scenario: the random standard deviation  $\sigma_T$  is set to 0.97.

**eFigure 1:** Boxplots (over 5000 replicates) of (log-) risk estimates associated with deciles of exposure under the presence of a real effect ( $H_1$ ;  $OR^* = 1.3$ ) for different scenarios<sup>a</sup>. Duration of calls. True (green) and naïve (pink) estimators.

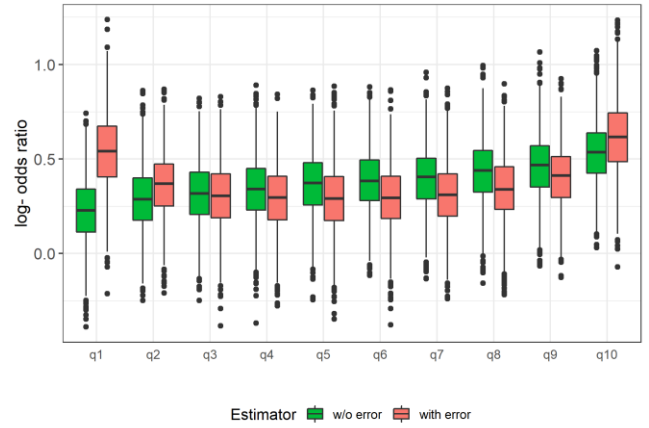
**A Non differential random error: under  $H_1$  (DurationCalls)**

OR = 1.3 ; Error ( $\tau = \gamma = 0 \mid \sigma_{\tau_{cases}} = \sigma_{\tau_{controls}}$ )



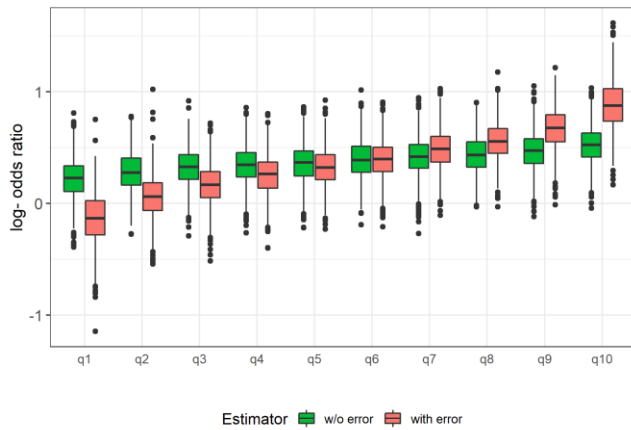
**B Differential random error: under  $H_1$  (DurationCalls)**

OR = 1.3 ; Error ( $\tau = \gamma = 0 \mid \sigma_{\tau_{cases}} = 1.1 \sigma_{\tau_{controls}}$ )



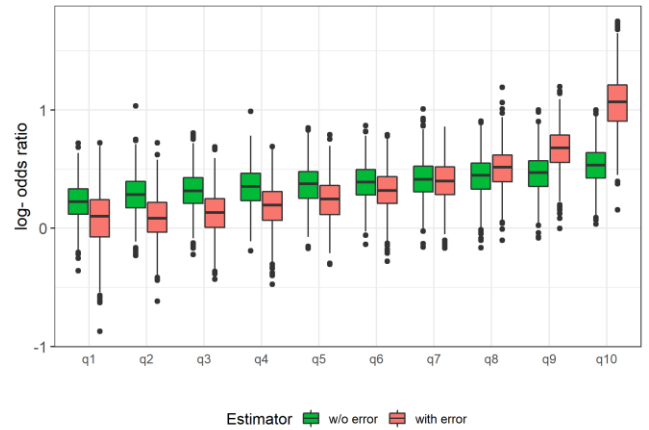
**C Differential systematic error: under  $H_1$  (DurationCalls)**

OR = 1.3 ; Error ( $\tau_{controls} = 0, \tau_{cases} = 0.34 \mid \gamma_{controls} = 0, \gamma_{cases} = 0.02 \mid \sigma_{\tau} = 1.28$ )



**D Differential systematic and random error: under  $H_1$  (DurationCalls)**

OR = 1.3 ; Error ( $\tau_{controls} = 0, \tau_{cases} = 0.34 \mid \gamma_{controls} = 0, \gamma_{cases} = 0.02 \mid \sigma_{\tau_{cases}} = 1.1 \sigma_{\tau_{controls}}$ )



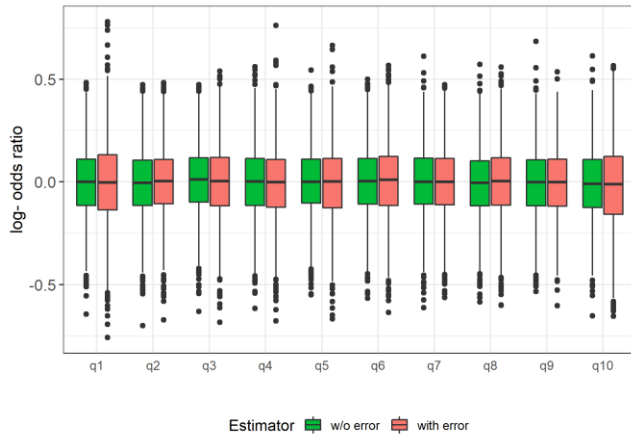
<sup>a</sup> In all scenarios, non-regular mobile phone users served as the reference category. The true OR ( $OR^*$ ) used for generating the model is supposed to be equal to 1.3.

Scenarios were; differential random and systematic scenario: cases have greater random (10% more) and average systematic ( $\tau = 0.34$ ) error than controls, with the error increases with the level of use ( $\gamma = 0.02$ ) and the random standard deviation error is set to 1.22 among controls ( $\sigma_{\tau_0}$ ) (**D; Scenario 1**); differential random scenario; cases have greater random error than controls (average standard deviations ratio between cases and controls equal to 1.1) (**B; Scenario 2**); differential systematic scenario: cases have greater average systematic error than controls (expectation  $\tau = 0.34$ ) with the error increased with the level of use ( $\gamma = 0.02$ ) and the random error is kept at a constant level (of 1.28) and similar among cases and controls (**C; Scenario 3**); random error scenario: the random standard deviation  $\sigma_{\tau}$  was set to 1.22 (**A; Scenario 4**).

**eFigure 2:** Boxplots (over 5000 replicates) of (log-) risk estimates associated with deciles of exposure (total number of calls) in the absence of an effect ( $H_0$ ;  $OR^* = 1.0$ ) for different scenarios<sup>a</sup>. True (green) and naïve (pink) estimators.

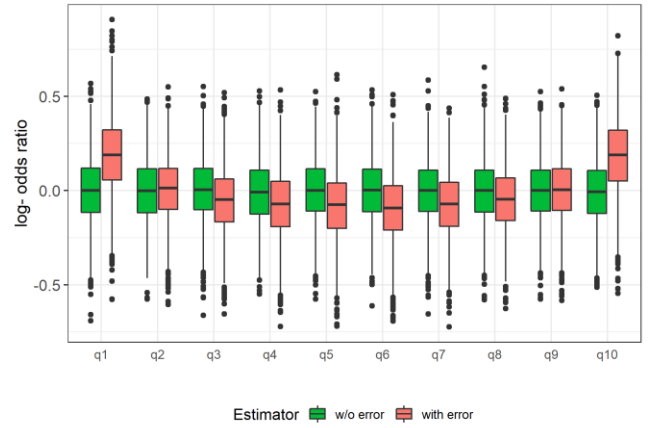
**A Non differential random error: under  $H_0$  (NumberCalls)**

OR = 1 ; Error (  $\tau = \gamma = 0 \mid \sigma_{\tau_{cases}} = \sigma_{\tau_{controls}}$  )



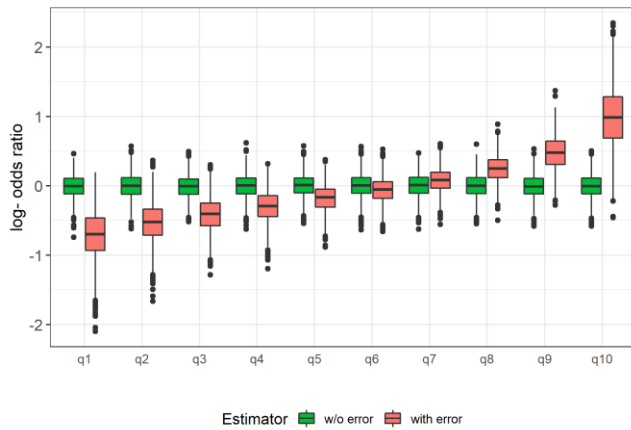
**B Differential random error: under  $H_0$  (NumberCalls)**

OR = 1 ; Error (  $\tau = \gamma = 0 \mid \sigma_{\tau_{cases}} = 1.1 \sigma_{\tau_{controls}}$  )



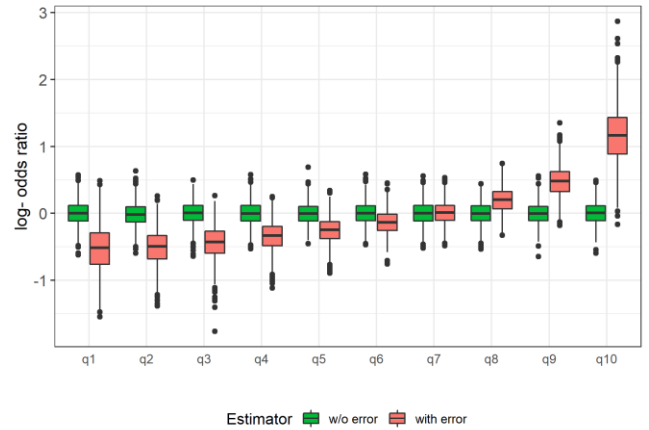
**C Differential systematic error: under  $H_0$  (NumberCalls)**

OR = 1 ; Error (  $\tau_{controls} = 0, \tau_{cases} = 0.21 \mid \gamma_{controls} = 0, \gamma_{cases} = 0.54 \mid \sigma_{\tau} = 1.01$  )



**D Differential systematic and random error: under  $H_0$  (NumberCalls)**

OR = 1 ; Error (  $\tau_{controls} = 0, \tau_{cases} = 0.21 \mid \gamma_{controls} = 0, \gamma_{cases} = 0.54 \mid \sigma_{\tau_{cases}} = 1.1 \sigma_{\tau_{controls}}$  )



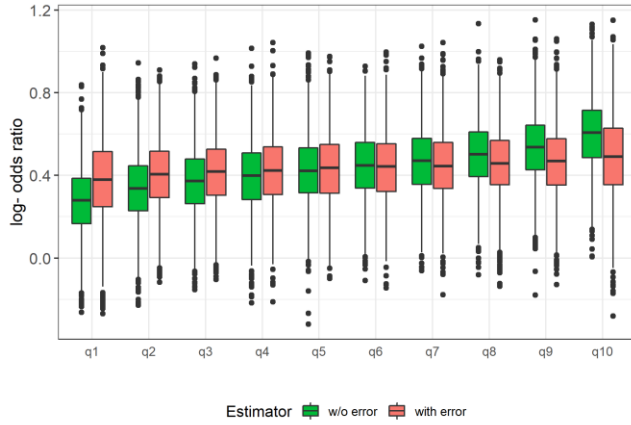
<sup>a</sup> In all scenarios, non-regular mobile phone users served as the reference category. The true OR ( $OR^*$ ) used for generating the model is supposed to be equal to 1.0.

Scenarios were; differential random and systematic scenario: cases have greater random (10% more) and average systematic ( $\tau = 0.21$ ) error than controls, with the error increases with the level of use ( $\gamma = 0.54$ ) and the random standard deviation error is set to 0.96 among controls ( $\sigma_{\tau_0}$ ) (**D; Scenario 1**); differential random scenario; cases have greater random error than controls (average standard deviations ratio between cases and controls equal to 1.1) (**B; Scenario 2**); differential systematic scenario: cases have greater average systematic error than controls (expectation  $\tau = 0.21$ ) with the error increased with the level of use ( $\gamma = 0.54$ ) and the random error is kept at a constant level (of 1.01) and similar among cases and controls (**C; Scenario 3**); random error scenario: the random standard deviation  $\sigma_{\tau}$  was set to 0.97 (**A; Scenario 4**).

**eFigure 3:** Boxplots (over 5000 replicates) of (log-) risk estimates associated with deciles of exposure under the presence of a real effect (H1;  $OR^* = 1.3$ ) for different scenarios<sup>a</sup>. Total number of calls. True (green) and naïve (pink) estimators.

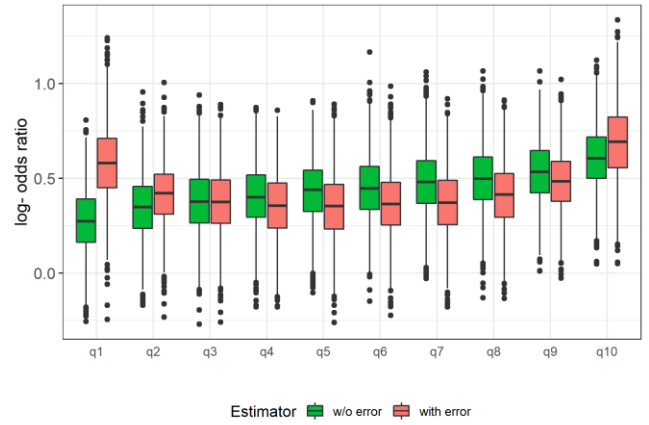
**A Non differential random error: under H1 (NumberCalls)**

OR = 1.3 ; Error ( $\mu_e = s = 0 \mid \sigma_e^{cases} = \sigma_e^{controls}$ )



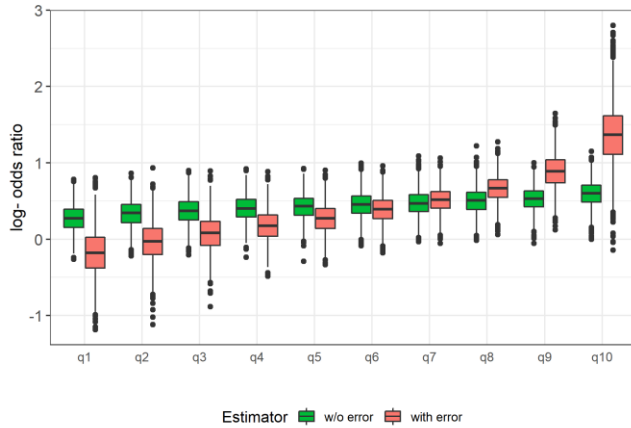
**B Differential random error: under H1 (NumberCalls)**

OR = 1.3 ; Error ( $\mu_e = s = 0 \mid \sigma_e^{cases} = 1.1 \sigma_e^{controls}$ )



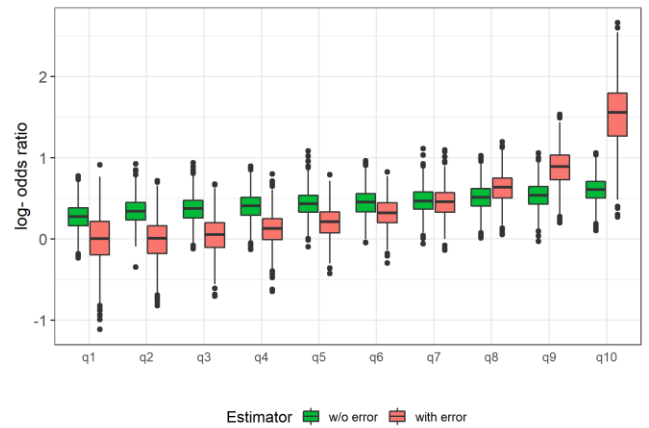
**C Differential systematic error: under H1 (NumberCalls)**

OR = 1.3 ; Error ( $\mu_e^{controls} = 0, \mu_e^{cases} = 0.21 \mid s^{controls} = 0, s^{cases} = 0.54 \mid \sigma_e = 1.01$ )



**D Differential systematic and random error: under H1 (NumberCalls)**

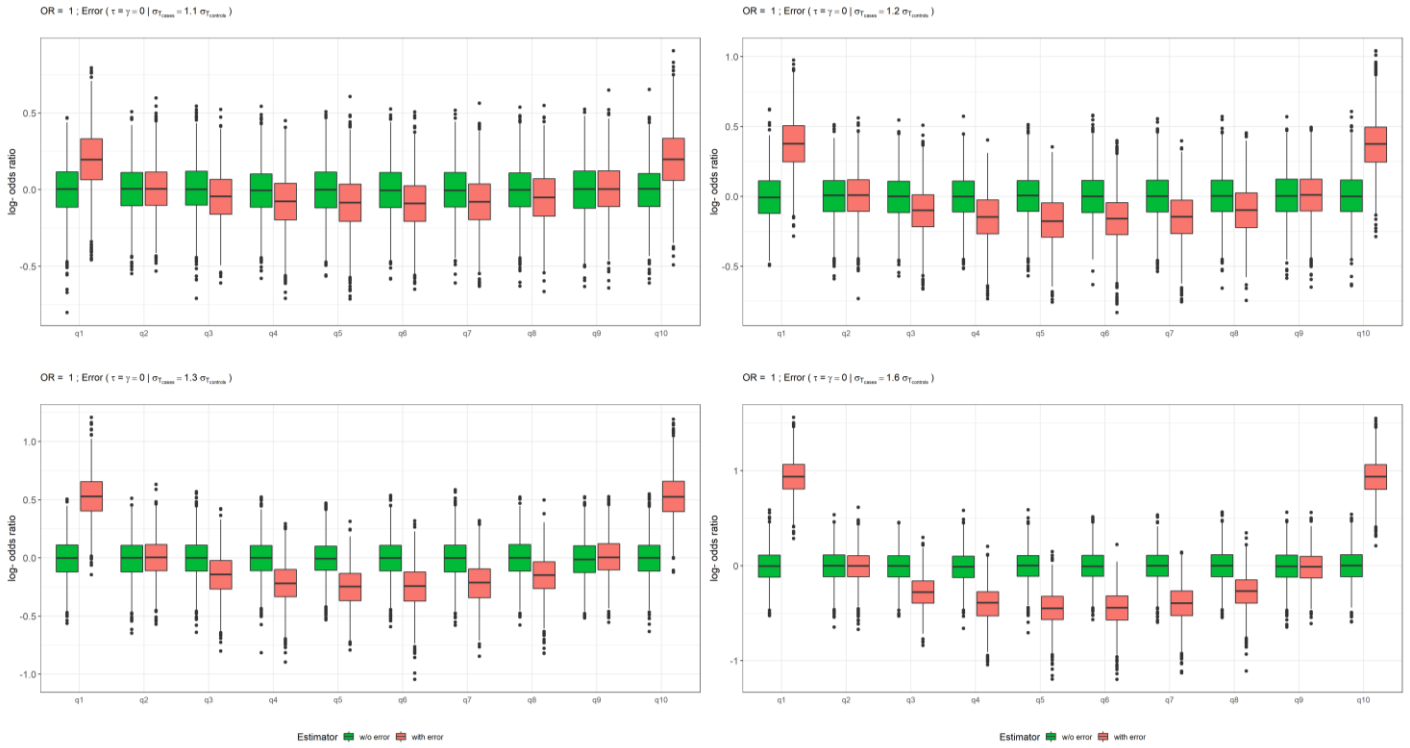
OR = 1.3 ; Error ( $\mu_e^{controls} = 0, \mu_e^{cases} = 0.21 \mid s^{controls} = 0, s^{cases} = 0.54 \mid \sigma_e^{cases} = 1.1 \sigma_e^{controls}$ )



<sup>a</sup> In all scenarios, non-regular mobile phone users served as the reference category. The true OR ( $OR^*$ ) used for generating the model is supposed to be equal to 1.3.

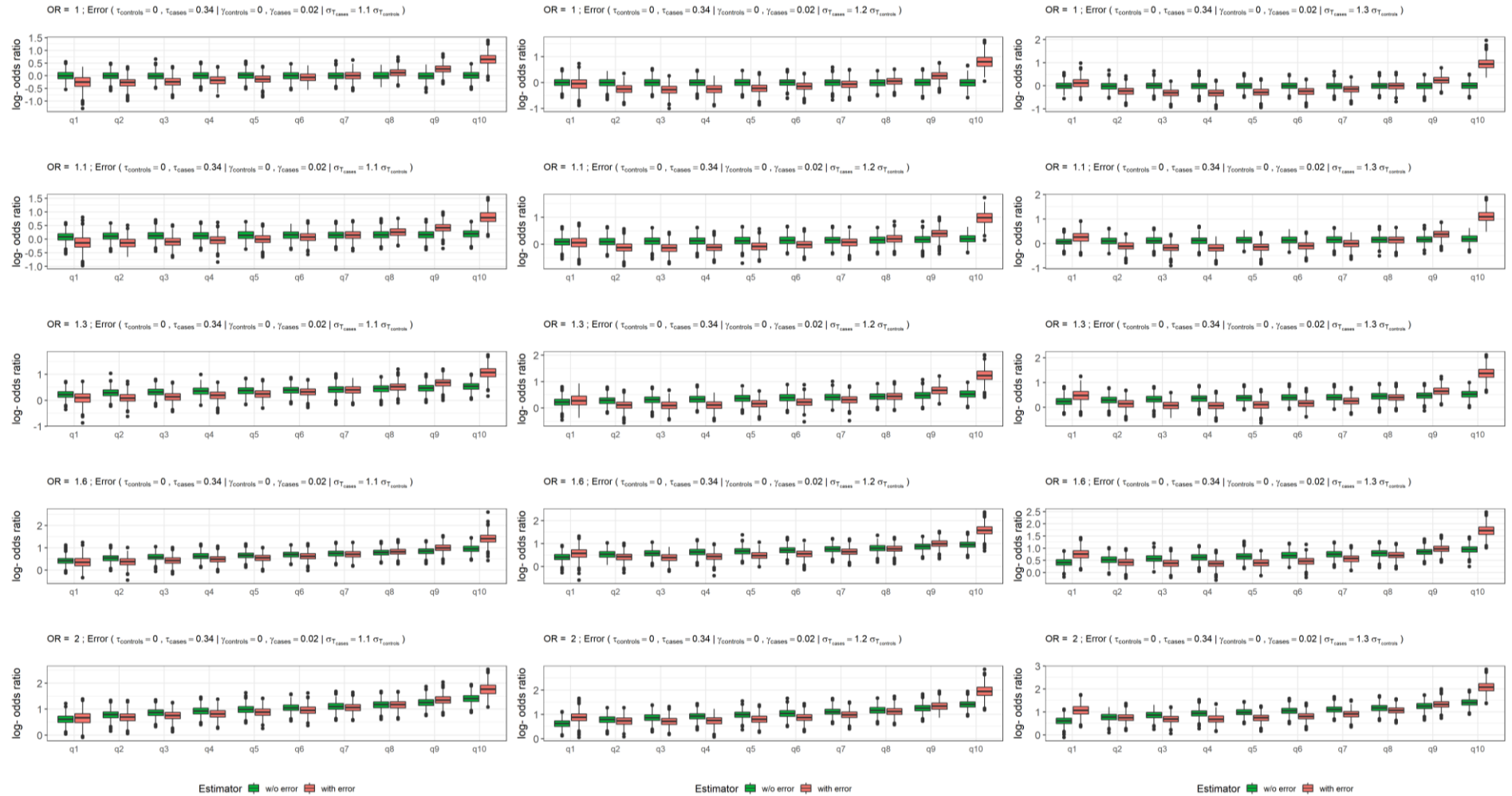
Scenarios were: differential random and systematic scenario: cases have greater random (10% more) and average systematic ( $\tau = 0.21$ ) error than controls, with the error increases with the level of use ( $\gamma = 0.54$ ) and the random standard deviation error is set to 0.96 among controls ( $\sigma_{T_0}$ ) (**D; Scenario 1**); differential random scenario; cases have greater random error than controls (average standard deviations ratio between cases and controls equal to 1.1) (**B; Scenario 2**); differential systematic scenario: cases have greater average systematic error than controls (expectation  $\tau = 0.21$ ) with the error increased with the level of use ( $\gamma = 0.54$ ) and the random error is kept at a constant level (of 1.01) and similar among cases and controls (**C; Scenario 3**); random error scenario: the random standard deviation  $\sigma_T$  was set to 0.97 (**A; Scenario 4**).

**eFigure 4:** Boxplots (over 5000 replicates) of (log-) risk estimates associated with deciles of exposure (duration of calls) in the absence of an effect ( $H_0$ ;  $OR^* = 1.0$ ) for differential random measurement error scenario<sup>a</sup> by average standard deviations ratio between cases and controls ( $k \in \{1.1, 1.2, 1.3, 1.6\}$ ). True (green) and naïve (pink) estimators.



<sup>a</sup> Non-regular mobile phone users served as the reference category. The true OR ( $OR^*$ ) used for generating the model is supposed to be equal to 1.0. Cases have greater random error than controls (from 10% (upper left window) to 60% (bottom right) more) where the random standard deviation error is set to 1.22 among controls ( $\sigma_{\tau_0}$ ) (**Scenario 2**).

**eFigure 5:** Boxplots (over 5000 replicates) of (log-) risk estimates associated with deciles of exposure by true  $OR^*$  (rows) and average standard deviations ratios between cases and controls  $k$  (columns) for both differential systematic and random measurement error scenario<sup>a</sup>. Total duration of calls. True (green) and naïve (pink) estimators.



<sup>a</sup> Non-regular mobile phone users served as the reference category. The true  $OR$  ( $OR^*$ ), in rows, varies from 1.1 to 2.0. Cases have greater random (columns, from 10% to 30% more) and average systematic ( $\tau = 0.21$ ) error than controls, with the error increases with the level of use ( $\gamma = 0.54$ ) and the random standard deviation error is set to 0.96 among controls ( $\sigma_{\tau_0}$ ) (**Scenario 1**).

**eFigure 6:** Log- odds ratios of the risk of glioma according to the lifetime cumulative hours of mobile phone use (categorized exposure in deciles, log-scale) in the main Interphone multinational case-control study. Non-regular mobile phone users are the reference category.

