Effects of call patterns on the likelihood of contact and of interview in mobile CATI surveys

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Abstract

Despite the acknowledged influence of call patterns on contact and response rates in telephone surveys, this relationship is scarcely investigated in mobile CATI surveys. This paper evaluates the effect of call patterns on the likelihood of making contact and of obtaining an interview in a mobile CATI survey and thus furthers the understanding of the potential of mobile phones as a survey mode. Findings reveal that the likelihood of making contact and of obtaining an interview is not uniform across days of the week or times of the day – Tuesdays and Wednesdays are the worst days to make contact and obtain cooperation; weekends are good for successful callbacks. Additionally, longer time lags between consecutive calls do not favour the likelihood of contact or of interview and it is very difficult to interview mobile phone numbers with a call history with many "voicemail" and "rings but no answer" outcomes.

Keywords

likelihood of contact, likelihood of interview, Mobile phones, Surveys

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Introduction

The high rates of telephone coverage achieved in the 1970s allowed the development and widespread adoption of telephone surveys in the United States and subsequently in Europe (Couper 2011). In the 1990s, the technology of computer assisted interviewing enabled researchers to implement methods of call scheduling that made surveys more cost-efficient and allowed faster fieldwork completion (CATI- Computer-Assisted Telephone Interviewing). We are currently moving away from the telephone coverage configuration that allowed telephone surveys to be the dominant mode for collecting survey data for so many years. Across Europe there is evidence that the percentage of households equipped with a fixed phone is falling; in the EU27 countries, it declined from 73% in 2007 (European Commission 2007) to 68% in 2014 (European Commission 2014). Simultaneously, the percentage of households with mobile phone access is on the rise and has now reached over 90% (European Commission 2014). Additionally, mobile-only households (i.e., households that rely exclusively on mobile phones for their communications and do not own a fixed phone) have become commonplace. In Finland, Czech Republic, Slovakia and Latvia, for example, the percentage of mobile-only households exceeds 70% and there seems to be an unequivocal trend towards the widespread generalization of the phenomena in other countries (European Commission 2014). The United States follows this trend: in 2010, 26% of U.S. adults lived in mobile-only households but this had risen to 44% by 2014 (GfK 2014).

The spread and increased use of mobile communications technology has led to the increased use of mobile phone surveys in studies designed to be representative of the general population, either supplementing or even replacing fixed CATI surveys. In the United States, mobile phones are being used for about half of all CATI surveys and the percentage is significantly higher in emergent markets (Roberts 2015). There is however little research into how to use mobile phones efficiently to collect survey data. Telephone survey methods and practices have been created for fixed phones (e.g. Groves *et al.* 1988) but adaptations must be made to cater for the specific features of mobile phones. Mobile phones are typically personal devices (mostly with single users (Carley-Baxter et al. 2010)) that people nearly always carry with them. Additionally, most mobile users keep their mobile phones turned on all day (Carley-Baxter et al. 2010, ZuWallack 2009). In theory, at least, this pattern of mobile phone usage suggests that mobile phones make respondents available for large portions of the day, which tends to favor both the likelihood of contact and of interview in surveys (Weeks et al. 1980, Brick et al. 1996). On the other hand, the circumstances surrounding the person at the moment of the call – such as a noisy environment, the presence of other people – may mean he/she refuses to cooperate. Moreover, many people consider receiving a call from strangers to be an invasion of their privacy (Pew Research Center 2010) and often reject such calls or refuse cooperation.

From a survey methodology point of view, mobile CATI surveys are still at an infancy stage. Researchers have begun the process of optimizing mobile calling methods but there is much work to be done. A logical starting point is to use the methods developed for fixed CATI surveys and explore which adaptations should be made for the specificity of mobile phones (Reimer et al. (and , respectively)2012). Our study contributes to this topic by evaluating call outcomes and call patterns in the context of a mobile CATI survey. We use the term mobile CATI survey to denote an interviewer-administered telephone interview conducted in a CATI facility where the respondents answer using a mobile phone.

In fixed CATI surveys, it is recognized that call scheduling, i.e., days and times of the calls, number of callbacks, days and times of callbacks, time lag between calls, has a great influence on the probability of making contact and of gaining cooperation (Hansen 2008). Although this is to some extent applicable to mobile CATI surveys, previous work has shown that calling strategies that maximize the likelihood of contact and of interview for fixed CATI surveys may not be the most effective for mobile CATI surveys. For example, Montgomery et al. (2011) and Reimer et al. (2012) identified significant differences in best times to make first calls for fixed and mobile CATI surveys.

As previous research on other survey modes suggests (e.g. Massey et al 1996, Groves and Couper 1998, Stec et al. 2004), when investigating call pattern effects, it is pertinent to distinguish between: (a) different call outcomes (contact, interview, refusal, non-contact), and (b) first calls and subsequent calls. In our study, we are interested in identifying calling protocol features of a mobile CATI survey that increase the likelihood of making contact and of obtaining an interview. We explore which timing periods are best when making first call attempts, and which call history factors most affect the probability of making contact and obtaining an interview in calls after the first dial. Given the small body of research about mobile CATI surveys, our study does not have strong theoretical predictions about the expected effects of call scheduling. Whenever pertinent, we draw a parallel with fixed CATI surveys.

Hypotheses

Considerable research has been conducted on the best times to make contact and obtain peoples' cooperation in surveys. In household interview surveys, the relative success of a call is dependent on the at-home times of households. Specifically, the likelihood of finding someone at home is greater in the evening hours and on weekends (Weeks et al. 1980) and therefore these tend to be the best periods to make contact. Groves and Couper (1998) show that approximately half of the first calls yield a contact in household surveys but this figure rises to nearly 60% if the call is made in the evening (after 6 pm) or during the day on weekends. For fixed CATI surveys, contact rates tend to be higher on week nights (after 5 pm) than they are during weekday mornings and afternoons when many respondents are at work (Brick et al. 1996, Massey et al. 1996, Groves and Couper 1998, Stec et al. 2004, Montgomery et al. 2011). Weekend calling often results in higher contact rates than weekday daytime calling (Massey et al. 1996, Stec et al. 2004). In mobile CATI surveys, there is evidence that contact rates are more consistent across timing periods than they are for fixed CATI surveys (Montgomery et al. 2011, Brick et al. 2007, Yuan et al. 2005). Even so, the Code of the American Association for Public Opinion Research (AAPOR) suggests that mobile phone "calls should be attempted on different days of the week and times of the day" to increase the likelihood of contact and of interview (AAPOR–Article on Calling Protocols 2008). Similarly, the Code for Mobile Research of the European Society for Opinion and Market Research (ESOMAR) states that "researchers should observe the same calling hours as for fixed-line phone surveys" (ESOMAR 2011, 2012). Additionally, family time occupation is not uniform across days and hours of the day which is likely to influence people's availability to take mobile phone calls and to agree to an interview. For example, Tuesdays and Wednesdays tend to be the busiest days for the working population and Sundays and Saturdays the least occupied. In terms of timing, workers are usually on the home-work-home commute between 7.30 and 8.30 am and between 5.30 and 7 pm, they are in their work place between 10.30 am and 5.30 pm, and are usually at home after 7 pm (European Commission 2004, p.32). Thus, for mobile CATI surveys we hypothesize:

Hypothesis 1A: The timing period of first calls affects the likelihood of contact

Hypothesis 1B: The timing period of first calls affects the likelihood of interview

Although good survey practice involves attempting to complete the survey based on the sample initially drawn, it is well known that a 100% response rate is never achieved with a single call attempt to sample units. The number of callbacks to non-contacted numbers varies depending on the research design, budget and the length of the fieldwork period, but it is generally accepted that the probability of making contact and obtaining an interview increases with more call attempts both in fixed CATI surveys (Schmich and Jentsch 2012, Holbrook et al. 2008) and mobile CATI surveys (Vicente and Reis 2009, Steeh et al. 2007). Literature suggests that around 12 to 15 call attempts is the optimal number for fixed CATI surveys (Srinath et al. 2001, Hansen 2008, Schmich and Jentsch 2012) but the Code of AAPOR recommends 6 to 10 calls for mobile CATI surveys because the mobile phone is a personal and private instrument and overburdening should be avoided (AAPOR–Article on Calling Protocols 2008, p.26-27); the Code of ESOMAR suggests "limiting the number and pattern of callbacks when contacting a known mobile number" (ESOMAR 2011).

It is acknowledged that it is difficult in fixed CATI surveys to contact or interview sample units with more than five prior "busy" or "rings but no answer" outcomes (Stec et al. 2004). Mobile phones have call-blocking features that impede or postpone accessing the mobile phone user: the voice-mail can be activated and calls diverted without answering them; the mobile phone can be set on silent mode or even turned off, blocking the contact at the moment of the call. Thus, we hypothesize:

Hypothesis 2A: Previous call outcomes affect the likelihood of contact

Hypothesis 2B: Previous call outcomes affect the likelihood of interview

For fixed CATI surveys, some previous work has addressed the optimal amount of time to allow between call attempts to the same telephone number. Results are somewhat mixed, and this may be because of differences in the length of the field period and of the time lag in surveys, and in the frequency of attempts to call the same number. Stokes and Greenberg (1990) found that longer delays between first and second calls were associated with higher contact rates, while Reimer et al. (2012) found that longer time lags (six or more days) between first and second calls were less likely to yield a cooperative contact. In addition to shorter (or greater) time lag between calls, callback efficiency can rise when the timing period (day and time) of the calls varies (Kulka and Weeks 1988, Stokes and Greenberg 1990). In mobile CATI surveys, Reimer et al. (2012) found that shorter lag times result in more cooperation, although this effect was evaluated considering only the time lag between first and second calls. Thus:

Hypothesis 3A: Time pattern of callbacks affects the likelihood of contact

Hypothesis 3B: Time pattern of callbacks affects the likelihood of interview

Data and methods

Data collection

The data used for this study come from a nationwide mobile CATI survey conducted in Portugal by a market research company in its CATI facilities during May 2012. The selection of the mobile phone numbers to be dialed followed the survey company's standard procedures in studies of this size. In Portugal, there are no official lists of mobile phone numbers (or mobile phone subscribers) that can be used as a sampling frame, and mobile operators provide no information on the attribution of numbers. The sample of mobile numbers was therefore randomly generated. Mobile phones have nine-digit numbers and the first two digits – 91, 93 or 96 – identify the operator. The Portuguese Telecommunications Regulation Authority provides information about the market share of each of the three mobile phone operators in Portugal and this was used to stratify the sample into three subgroups. Within each two-digit prefix, mobile phone numbers were created by a generator of 7-digit random numbers. A total of 11,472 mobile phone numbers were dialed. Calls were made between 5pm and 10pm on weekdays and between 10am and 2pm on weekends following the ESOMAR Code that recommends survey companies avoid anti-social times in mobile CATI surveys (ESOMAR 2011, 2012). The CATI system automatically managed the dialing of numbers and callbacks. Mobile phone numbers were randomly assigned to interviewers.

One of the following disposition codes was attributed to numbers after each call: (a) completed interview; (b) partial interview, when the interview did not reach the end; (c) refusal, when the mobile phone user answered the call but refused to cooperate; (d) busy; (e) rings but no answer, when the call was not answered after 8 ring tones; (e) voice mail (message from the operator directing the caller to voice mail either immediately or after 7 ring tones); (f) temporarily unavailable (message from the operator saying "the mobile number you dialed is not available at the moment, please try later"); (g) reject the call (hang up without answering the call); (h) out of the scope (if the mobile user was less than 15 years old); (i) non-working or disabled (when an almost continuous busy signal was heard); (j) non attributed (message from the operator). In addition to the information about each call outcome, the date and time of calls are recorded automatically by the CATI system which is used in our study to describe the call history for a given number (number of calls, time elapsed between successive calls, and number of calls resulting in a specific outcome).

For the analysis, "contact" is defined as any call in which a mobile phone user was reached and includes those coded as completed interview, partial interview, refusal, and out of the scope. A "noncontact" includes cases coded as busy signal, rings but no answer, voice mail, temporarily unavailable and reject the call. An "interview" corresponds to the cases coded as "completed interview". Cases coded as non-attributed, non-working or disabled are considered "ineligible" for the purposes of this study. If a call outcome is a completed or partial interview, that number is not called back. If a call outcome is a "non-contact", that mobile number stays in the "sampling frame" and the scheduling algorithm may select it again to be called back. The survey company makes three call backs to cases coded as "temporarily unavailable" and the mobile number is then coded as "rings but no answer" if the "temporarily unavailable" status continues after the third attempt. A "refusal" is only called back with the agreement of the mobile phone user and is otherwise excluded from the "sampling frame". Numbers with a non-functional, disabled or non-attributed call outcome are immediately excluded from the "sampling frame". Ineligible numbers were considered irrelevant to our analysis and therefore excluded as our goal is to explore the determinants of "contact" and "interview". Among the 11,472 mobile phone numbers dialed, 8,083 were eligible (final disposition). The eligible numbers were called 19,890 times which means an average of almost 3 call attempts per number. The number of call attempts ranged from 1 to 15 which is the survey company's standard procedure for mobile CATI surveys.

Modeling likelihood of contact and of interview

Regression models are commonly used to estimate the likelihood of contact and likelihood of interview in surveys, more specifically, binary logistic regression (Groves and Couper 1998, Brick et al. 1996), OLS regression (Holbrook et al. 2008) or multinomial logistic regression (Steele and Durrant 2011). Multi-level models are an alternative approach when information is available about sample design features with clustering effects (e.g. O'Muircheartaigh and Campanelli 1999, Durrant and Steele 2009, Wagner 2009).

We adopt binary logistic regression to estimate the probability of making contact – dependent variable assuming the codes 1-"contact yes" and 0-"contact no" – and the probability of interview – dependent variable assuming the codes 1-"interview yes" and 0-"interview no". "No interview" includes cases that were contacted but refused cooperation, and cases that could not be contacted at all. When modelling the likelihood of contact and the likelihood of interview, we distinguish between first calls and subsequent calls.

As the time and day of the call is the only information available for first calls, the model of first call includes the following explanatory categorical variables: (1) DAY (seven categories) which represents the day of week of the call, and (2) TIME (five categories) which represents the time slot of the call (10am-12noon; 12noon-2pm; 5 pm-7 pm; 7 pm-9 pm; 9 pm-10 pm). The categories of DAY and TIME are included in the models as dummy variables. Tuesday and 7 pm-9 pm were chosen as the reference categories of the DAY and TIME, respectively, as the biggest percentage of eligible mobile numbers were called then (n=2743 and n=3111). In addition to main effects, the model includes interaction effects as there is evidence from fixed CATI surveys that specific combinations of day*time affect the likelihood of contact and of interview (e.g. Brick et al. 1996, Massey et al. 1996, Stec et al. 2004).

We model the likelihood of contact and of interview in subsequent calls (two to fifteen attempts) by taking data related to the call history of the numbers. The models have the following explanatory variables: (1) CALL WEEKEND which is the ratio between the number of calls made on weekends and the total number of call attempts for a given mobile phone number, (2) CALL MONDAY, CALL TUESDAY, CALL WEDNESDAY, CALL THURSDAY, CALL FRIDAY which is the proportion of calls to a mobile phone number on each week day, (3) CALL 5 pm-7 pm, CALL 7 pm-9 pm, CALL 9 pm-10 pm which is the proportion of calls to a mobile phone number on each time slot (the 10 am-12 noon and 12 noon-2 pm shifts are not included because they are implicit in the CALL WEEKEND factor), (4) TIME LAG which is the mean time elapsed between two consecutive calls to a mobile phone number, (5) BUSY which is the proportion of a mobile phone number's call outcomes that was coded as "busy", (6) VOICE MAIL which is the proportion of a mobile phone number's call outcomes that was coded as "voice mail", (7) NO ANSWER which is the proportion of a mobile phone number's call outcomes that was coded as "rings but no answer" and (8) TEMP_UNAVAILABLE which is the proportion of a mobile phone number's call outcomes that was coded as "temporarily unavailable". All factors are metric and standardized variables. Binary logistic regression coefficients were estimated using the Maximum Likelihood Method and a Stepwise approach was adopted using 0.05 for statistical significance level.

Results

The results for the likelihood of contact and of interview on first calls are shown in Table 1. Only the variables with a significant effect are presented (*p<0.05* for Stepwise entering).

Table 1: Estimated coefficients for the binary logistic model for the likelihood of contact and likelihood of interview (first calls)

	Contact[a]				Interview[b]		
Variable	*β*	Std Error	*p-value*		*β*	Std Error	*p-value*
DAY (ref: Tuesday)			*0.000*				*0.000*
Sunday	+0.216	0.135	*n.s*		+0.394	0.192	*0.041*
Monday	+0.765	0.114	*0.000*		+0.990	0.153	*0.000*
Wednesday	+0.145	0.142	*n.s*		–0.021	0.230	*n.s*
Thursday	+0.663	0.102	*0.000*		+0.880	0.140	*0.000*
Friday	+1.003	0.108	*0.000*		+0.888	0.154	*0.000*
Saturday	+0.824	0.096	*0.000*		+0.647	0.144	*0.000*
DAY*TIME#			*n.s*				*0.004*
Sunday*10am-12noon	+0.356	0.190	*n.s*		+0.304	0.263	*n.s*
Monday*5pm-7pm	–0.128	0.144	*n.s*		–0.544	0.205	*0.008*
Monday*9pm-10pm	–0.075	0.165	*n.s*		–0.369	0.230	*n.s*
Wednesday*5pm-7pm	+0.032	0.184	*n.s*		–0.127	0.310	*n.s*
Wednesday*9pm-10pm	–0.310	0.213	*n.s*		+0.383	0.299	*n.s*
Thursday*5pm-7pm	+0.268	0.144	*n.s*		+0.142	0.189	*n.s*
Thursday*9pm-10pm	–0.242	0.148	*n.s*		–0.513	0.212	*0.016*
Friday*5pm-7pm	+0.049	0.137	*n.s*		+0.295	0.182	*n.s*
Friday*9pm-10pm	–0.171	0.163	*n.s*		–0.153	0.232	*n.s*
Saturday*10am-12noon	–0.054	0.122	*n.s*		+0.121	0.175	*n.s*
Intercept	–1.702	0.053	*0.000*		–2.782	0.081	*0.000*

#TIME reference category: 7pm-9pm; (a) Nagelkerke R^2=0.038; (b) Nagelkerke R^2=0.030.

Although a high percentage of cases is correctly classified by the models – 77% for the likelihood of contact model and 90.5% for the likelihood of interview model – the goodness of fit Nagelkerke R^2 indicator is low – less than 5% in both models. Nonetheless, the DAY has a significant effect on both outcomes ($p<0.001$) and the DAY*TIME interaction has a significant effect on the likelihood of interview ($p<0.01$).

Table 2 presents the estimates for the likelihood of contact and of interview for calls attempts made after the first call. Only the variables with a significant effect are presented ($p<0.05$ for Stepwise entering).

Table 2: Estimated coefficients for the binary logistic model for the likelihood of contact and likelihood of interview (>=2 calls)

	Contact[a]				Interview[b]		
Variable	*β*	Std Error	*p-value*		*β*	Std Error	*p-value*
CALL WEEKEND	+0.737	0.106	*0.000*		+0.417	0.055	*0.000*
CALL MONDAY#	-	-	*n.s*		+0.136	0.052	*0.009*
CALL TUESDAY##	–0.308	0.117	*0.009*		-	-	*n.s.*
CALL THURSDAY	+0.423	0.091	*0.000*		+0.328	0.058	*0.000*
CALL FRIDAY* CALL 9pm-10pm##	+0.176	0.073	*0.016*		-	-	*n.s.*
TIME_LAG	–2.179	0.114	*0.000*		–0.967	0.070	*0.000*
TEMP_UNAVAILABLE	–4.829	0.201	*0.000*		–1.351	0.077	*0.000*
BUSY	–5.006	0.213	*0.000*		–1.744	0.117	*0.000*
NO ANSWER	–7.409	0.286	*0.000*		–2.213	0.097	*0.000*
VOICE MAIL	–8.132	0.308	*0.000*		–2.555	0.110	*0.000*
Intercept	–1.496	0.096	*0.000*		–2.883	0.086	*0.000*

Not significant for the likelihood of contact model; no estimates are presented because the factor did not enter the model; ## Not significant for the likelihood of interview model; no estimates are presented because the factor did not enter the model. (a) Nagelkerke R^2=0.894; (b) Nagelkerke R^2=0.430.

A high percentage of cases is correctly classified by the models – 96.5% for the likelihood of contact model and 87.3% for the likelihood of interview model. In addition, the goodness of fit Nagelkerke R^2 indicator is 0.894 for the contact model and 0.43 for the likelihood of interview model.

Conclusion/Discussion

The findings support Hypothesis 1A and 1B. The day of the call is a significant factor to explain the likelihood of contact and the likelihood of interview (*p<0.001*) and the day*time interaction has a significant effect on the likelihood of interview (*p<0.01*). Mondays, Thursdays, Fridays and Saturdays are better than Tuesdays (the reference category) for making contact (*p<0.05*). Mondays, Thursdays, Fridays and Saturdays are better than Tuesdays for gaining cooperation (*p<0.05*); however, calls made on Mondays between 5pm and 7pm ($\hat{\beta}$=-0.544) or on Thursdays between 9pm and 10pm ($\hat{\beta}$=-0.513) reduce the likelihood of interview. Wednesday was not significantly different from Tuesday either for making contact or obtaining an interview; Wednesday and Tuesday performed worse than the other days.

The findings support Hypothesis 2A and Hypothesis 2B. The likelihood of contact and of interview declines when a higher percentage of non-contact outcomes – temporarily unavailable, busy, no answer and voice mail – are found for previous calls. The decline is sharper when previous calls yield a high percentage of no answer or voice mail ($\hat{\beta}$=-7.409 and $\hat{\beta}$=-8.132; $\hat{\beta}$=-2.213 and $\hat{\beta}$=-2.555) respectively for the likelihood of contact and likelihood of interview models).

The findings support Hypothesis 3A and Hypothesis 3B. Specifically, the likelihood of contact and the likelihood of interview decreases when the average time lag between two consecutive calls increases ($\hat{\beta}$=-2.179 and $\hat{\beta}$=-0.967, respectively). Additionally, the likelihood of contact increases when a higher percentage of callbacks is made on weekends, on Thursdays and Fridays between 9 pm and 10 pm but decreases when a higher percentage of callbacks is made on Tuesdays ($\hat{\beta}$=-0.308). The likelihood of interview increases when repeated callbacks are made on weekends, Mondays and Thursdays *(p<0.01).*

These outcomes reveal that the likelihood of making contact and obtaining an interview in mobile CATI surveys is not uniform across days of the week or times of the day; this indicates that the omnipresence of mobile phones does not mean that their users are permanently and immediately available to take calls and grant interviews. However, the calling pattern favoring contacts and interviews was found to be very similar; this suggests that people take mobile phone calls when they are willing to maintain a conversation because otherwise they would reject the call or leave the phone ringing without answering it. The great challenge in mobile CATI surveys is therefore finding the best timing to make contact because, once contact is made, there is a strong probability of gaining cooperation. Our study presents evidence that Mondays, Thursdays, Fridays and Saturdays are good days for making first calls while Thursdays and weekends are good days for making callbacks. Tuesday was not efficient either for first calls or callbacks. The fact that some days are better than others to make contact and gain people's cooperation is probably related to time occupation, i.e., how people spend their time. For the working population, Tuesdays and Wednesdays tend to be the days when people work most, while Sundays and Saturdays are less taken up with professional activities (European Commission 2004, p.32). Available time is therefore a strong conditioner of potential respondents' willingness to be interviewed.

Greater time lags between call attempts is suggested as a strategy to raise callback efficiency in fixed CATI surveys (Kulka and Weeks 1988, Stokes and Greenberg 1990). In our study, the average time lag between calls ranged from less than one hour to nearly 19 days and did not exceed 24 hours for nearly 50% of the mobile phone numbers. The outcomes suggest that the longer the average time lag between successive calls, the more difficult it was to make contact or obtain an interview, indicating that mobile phone users' contactability and availability changes more rapidly than that of households. Whereas making contact in fixed CATI surveys is very dependent on the person arriving home, in mobile CATI surveys it depends on a change in the individual's situational context from one when the call is not noticed or cannot be taken to one in which the individual can engage in an interview; this can happen within short time periods. This outcome is in line with Reimer et al. (2012) who found that shorter lags between first and second dials favor the likelihood of obtaining a cooperative contact. This is good news for companies, especially when implementing surveys with tight deadlines.

It is important to note that although calls were scheduled from 10 am till 10 pm, they only covered a 4-hour slot on weekends and a (different) 4-hour slot on weekdays. This might explain why the time of calls did not have a significant effect on call outcomes in either first or subsequent calls. Although the assessment of the schedule's effect on call outcomes might have been limited by the schedule used, we believe the research benefits from adhering to the real practice of market research companies i.e. restricting calls to certain time shifts in the day. Additionally, it should be noted that whereas the 10 am–10 pm time range is generally used in Portugal, this is often not the case in North America and Northern Europe where 9am to 9pm or 9.30pm is common (Dennis et al. 1999, Roy and Vanheuverzwyn 2002, Yuan et al. 2005). Nevertheless, the findings remain valuable to researchers as they reveal a nonignorable link between call scheduling and outcomes of mobile phone calls.

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