



MONITORING MODE EFFECTS IN A SURVEY OF CONSUMER BUYING BEHAVIOUR

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Abstract: In an effort to increase response rates and control survey costs, survey designers have come to increasingly consider mixed mode survey designs. However, the impact of differential administration by mode is less clear for ongoing data collection efforts that are primarily designed for a single mode of administration, where alternative modes have emerged over time upon respondent. This is the case for the Consumer Expenditures Quarterly Interview Survey, a personal visit household survey with a non-ignorable percentage of cases interviewed by telephone. This research draws on six months data to assess variation in mode of administration and evaluate the size of mode effects in key survey estimates. The results of the study suggest that mode itself matters less than does the respondent behavior typically associated with mode. While telephone interviewing may impact the quality of Consumer Expenditures data collected relative to that of personal visit interviewing.

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1. Introduction

Mixed-mode survey designs represent an appealing option for survey designers interested in increasing response rates and controlling survey costs. A well-planned mixed-mode design incorporating personal visit and telephone/ direct interviewing, for example, has the potential to benefit from the superior data quality associated with personal visit interviewing for non-sensitive topics, the lower costs and greater operational efficiency of telephone interviewing, and the higher overall response rates generally found when allowing for more than one mode of response (Rogers, 1976). However, achieving this optimal outcome can be quite challenging. Over the years, the relationship a company develops with the customer has become a key point for competitive advantage and one of the main elements for the survival in the marketplace. The implementation of what is called Customer Relationship Management proved successful in many cases, but failed in many others. Concepts such as retention, satisfaction, loyalty and acquisition became part of the vocabulary in many organization

and their understanding and measurement became a synonym of success.

When evaluating a possible transition to a mixed mode design, researchers concluded that key estimates from personal visit and telephone interviews were not equivalent, even after controlling for demographic differences. The researchers expressed significant concerns about adopting a mixed-mode design for their survey (Wessel, et al., 2000). Similarly, staff from the Survey of Income and Program Participation expended years of research before successfully moving to a mixed-mode design (Allen, 1993; Huggins, 1994; King, 1995; Nelson, et al., 2001).

Ultimately, the optimization of response rates and cost efficiencies in a mixed-mode design must be balanced against the overall impact on the quality of key survey estimates. Evidence in the literature suggests that mode effects, or the systematic response pattern differences attributable to respondents being interviewed in different modes, can be minimized through careful attention to instrument design and strict adherence to survey protocol (e.g., see Martin, et al., 2007; Wessel, et al.,

2000). Nonetheless, the lower response rates, higher coverage error, faster-paced interviews, and larger measurement error¹ of telephone interviewing relative to personal visit interviewing can be a cause for concern (Groves & Kahn, 1979; Groves, 1989; Hochstim, 1967). Analysis of consumer buying behaviour as a concept has grown quickly over the year, but the idea of creating or developing models that are more acceptable and understandable is still in need. As a result, domain knowledge will be used as part of the data mining process in order to develop the models for strategy development. When evaluating the relationship of customer with the wholesaler or retailer, concept that can only be used as part of an analytical approach are customer live time value which incorporate frequency, recency and the customer dropout process (churn).

This altogether correspond to the estimated present value of the customer's future purchasing pattern, its cash flows, involving elements such as costs, revenue, discount rate and time horizon (Berger and Nasr, 1981; Jain and Singh, 2002; Malthuse and Blattberg, 2005). Another important aspect is retention rate, or conversely, probability of churn. As emphasized by Kim et. al. (2006) and Horang et. al. (2004), it is necessary to consider the churn probability in the evaluation of customer buying behaviour, instead of only looking at past profit history.

However, there is little available information that would clearly indicate how the wholesalers, retailers are implementing consumer buying behaviour analytical predictions. There are many formulas and approaches to these predictions, but, most research is done in an academic environment, most often in partnership with the wholesalers. It is necessary to understand how wholesalers view this type of analysis, and also, how the type of predictions could be more understandable for decision making and strategy definition.

The evaluation of marketing concepts from mere selling to consumer oriented marketing has resulted in buyer behaviour becoming an independent discipline. The growth of consumerism and consumer legislation emphasizes the importance that is given to the consumer. Consumer behaviour is a study of how individuals make decision to spend available resources (time, money and effort) or consumption related aspects (what they buy? when they buy? how they buy? etc.). The heterogeneity among people makes understanding consumer behaviour a challenging task to researchers. Hence researchers felt the need to obtain an indepth knowledge of consumers buying behaviour, this knowledge acted as an imperative tool in their hands to forecast the future buying

behaviour and devise strategies in order to create long-term customer relationship.

Since the early 1990s, the consumer packaged goods (CPG) industry has been moving from a manufacturing "push" to consumer "pull" strategy. The accurate prediction of consumer demand has been cited as the most critical factor in the improvement of replenishing forecasts, which directly impact supply efficiencies. Furthermore, most companies are struggling with how to implement causal techniques such as multiple linear regressions (MLR) to model and predict consumer behaviour along with short-term volume lifts associated with sales promotions. Sales forecasting methods and applications currently being implemented have been evolving from simple time series extrapolations of the past sales history to more sophisticated causal techniques such as ordinary least squares regression and applied micro-econometrics. Sales demand essentially increases as the population of the masses expanded, consuming virtually all of the supply.

Emergent Mixed Modes

The impact of mixed modes is even less clear for ongoing data collection efforts that have been primarily designed for a single interviewing mode, but in which alternatives have emerged over time upon respondent request (e.g., to be interviewed by telephone instead of personal visit). This is the case for the Consumer Buying Behaviour (CBB) Interview Survey, conducted by the Bureau of Statistics. The CBB Interview Survey is a personal visit household survey, with a non-ignorable percentage of cases interviewed by telephone. Contrary to mixed-mode surveys with an established protocol for interviewing in more than one mode, telephone interviewing in the CBB Interview Survey does not occur by design. Rather, interviewers are provided with a basic level of guidance for conducting a telephone interview in lieu of a personal visit interview. Over the years, the percentage of cases completed by telephone has fluctuated, most recently stabilizing at approximately 35 percent – a level still quite high for a survey designed to be administered in a personal visit format. In response, survey management has sought to better understand the characteristics and consequences of the survey's emergent, and unplanned, mixed-mode administration, as well as the costs and benefits of implementing a more detailed and rigidly-followed protocol for telephone interviewing.

Of particular concern for CBB Interview Survey management is that several critical components of proper CBB survey administration are

largely dependent on the physical presence of an interviewer. Such aspects of survey administration include:

(a) the survey's preference for respondents to consult financial records and purchase receipts in their reporting of expenditures,

(b) the interviewer role in aiding respondents in retrieving correct information from their records, and

(c) the effective use of an Information Booklet³ provided during the interview.

Although the manner and degree to which interviewers successfully accomplish these behaviors during personal visit interviews may vary, by definition, the physical absence of an interviewer during telephone interviews limits the ability to adhere to protocol, and is therefore thought to increase the potential for measurement error.

Consumer Buying Behaviour Surveys Program

One of the principal objectives of the CBB Surveys Program is to obtain information on the buying habits of Nigerian consumers. The CBB Surveys Program consists of two surveys. The CBB Diary Survey is designed to collect small, detailed expenditures that would be difficult for respondents to recall over an extended period of time. The Interview Survey is designed to collect less frequent, more expensive, memorable purchases, such as expenditure data that respondents can reasonably recall for a period of three months. The analysis described in this research is based on data collected on Interview Survey only.

Survey Methods

The CBB Interview Survey sample is selected on a rotating panel basis, with approximately 7,000 consumers interviewed per calendar quarter. Sampled consumer were interviewed once per day. Individual daily interviews – also called “waves” for methodological purposes – for a given customer are treated as independent observations. The data collected are used primarily to create an inventory of major household items, and for bounding purposes; that is, to prevent the reporting of buying behaviour from an indefinite past period.

3. Analysis

The analysis for this paper extends earlier work by McGrath (2005) and Verlander (2006) to address three basic areas of inquiry:

(a) the degree to which the characteristics of telephone/ direct interview customer differ from those of personal visit interview

(b) the effects of telephone interviewing on data quality and outcome measures, and

(c) whether current survey protocol or materials should be changed to accommodate the relatively high level of telephone interviewing.

Data for this research were collected during the period of January 2021 through June 2021. The overall CBB Interview Survey response rate was 68.6 percent in the first two months while it is 71.2% in March and April and 77.1 in May and June. It should be noted that the findings described below are selected from a broader series of analyses investigating mode effects in the CE Interview Survey. Although the fully detailed series of analyses could not be included for space reasons, the summary information presented here is representative of the overall conclusions reached in the broader research.

Data & Methods

The analysis file was restricted to standard wholesale outlet as well as those that are into electronic buying [e-buying] The analysis file was also limited to complete interviews with an assigned interviewing mode (interviewers assign mode by answering a post-survey assessment question). The sample size for the final analysis file was 118,698 interviews, including 73,723 e-buying and 44,975 telephone/direct interviews within the stipulated period. We used contingency table analysis and regression modeling to evaluate telephone administration rates and the relationship between mode and sample characteristics, data quality indicators, and outcome measures. Interviewing mode refers to the mode in which all, or most, of the interview was completed, as reported by the interviewer. Detailed findings by analysis domain are presented below.

4. Findings & Discussion

In reviewing this method, we found that the level of telephone administration was discovered from the record that the response rate is decreasing and increasing on weekly basis thus signifying the differing training, operational, or intrinsic socio-geographic factors associated with primary sampling units (PSUs), although we don't have evidence to point in any one direction (see table 1).

Table 1: telephone / direct interview response rate

Wholesales Outlet	Telephone / Direct interview response Rate [in percentage]
A	57
B	53
C	42
D	46
E	47
F	45
G	38
H	40
I	32
J	31
K	28
L	27

Sample characteristic by mode

We went further to examined 12 socio-demographic characteristics and found five that showed meaningful differences 10 of greater than 3 percentage points and 5 percent (see Table 2). Compared to personal visit customers, telephone interview customers were more likely to be homeowners, with a reference person11 who is female and has a college education. We also found that telephone interview CUs were less likely to have a reference person below the poverty threshold. Five of the 12 characteristics showed differences that, although sizable in percent difference, had absolute differences of fewer than two percentage points: telephone interview customers were observed to have more earners, higher income, and to be more urban, while having fewer adults over age 64 and children under 18 in the household. Two of the 12 characteristics resulted in differences of less than one percent (reference person age and customer size).

Table 2: Sample characteristics by Mode

<i>Characteristics</i>	<i>Personal Estimate</i>	<i>Visit</i>	<i>Tellephone Estimate</i>	<i>Point Difference</i>	<i>% Difference</i>
Mean Consumer Unit Characteristic					
Age of reference Person	49.2		48.8	-0.4	-0.8
Average Number in Consumer Unit Persons	2.50		2.50	0.0	0.0
Children under 18	0.67		0.65	0.0	-3.0
Persons 65 and above	0.34		0.29	-0.1	-14.7
Earners	1.30		1.40	0.1	7.7
Income before Taxes	46,076		47,732	1,656	3.6
Percent Distribution					
Urban	75.6		76.8	1.2	1.6
Homeowner	66.1		71.2	5.1	7.7
Below Poverty threshold	16.2		13.1	-3.1	-19.1
Origin	12.1		9.0	-3.1	-25.6
Female	51.0		54.2	3.2	6.3
Bachelor Degree or Higher	25.1		30.4	5.3	21.1

Data Quality Indicators

In bivariate analyses of the effect of telephone administration on estimates, we consistently found a meaningful relationship between telephone administration and data quality. Telephone interview cases tended to exhibit lower rates for “positive” data quality indicators, such as (a) use of recall aids, including financial records, purchase receipts, and the Information Booklet, (b) positive responses to screener questions¹², and (c) interview length, while exhibiting higher rates for “negative” data quality indicators such as (d) reporting of expenditures at an inadequate level of detail, (e) item nonresponse, (f) data editing, and (g) reporting of rounded values.

The results showed a consistent association between telephone interviews and lower data quality relative to personal visit interviews. Interestingly, subsequent multivariate analyses of interview length, controlling for sample characteristics and use of recall aids, suggest that the use of recall aids is the more powerful predictor of data quality differences, rather than mode alone (see Table 3). This finding with respect to the importance of recall aids is further supported in the discussion of outcome measures.

Table 3: Use of Recall aid by Mode

<i>Personal visit/ Direct interview</i>					<i>Telephone interview</i>			
Use of Recall Aids	Obs	% of total cases	Median interview length	% increase over none	Obs	% of total cases	Median interview length	% increase over none
<i>None</i>	17,693	25.0	50.1	-	27,174	63.6	47.1	-
<i>Information book only</i>	25,626	36.2	60.4	20.5	4,684	11.0	51.2	8.5
<i>Record use only</i>	6,756	9.6	66.6	33.0	8,383	19.6	61.2	29.7
<i>Information book and Record use</i>	20,641	29.2	77.4	54.4	2,479	5.8	66.9	41.9
<i>Overall</i>	70,716	100.0	63.3	-	42,720	100.0	51.5	-

5. Conclusion

Five key findings from the analysis have important implications for the future direction of the CBB Interview Survey:

a. A persistent negative relationship was observed between telephone interviewing and seven indirect indicators of data quality.

b. Lower rates of recall aid use were reported for telephone/ direct interview respondents.

c. Recall aid use was found to improve reporting overall but had more of an impact in e-buying interviews.

d. Telephone interviewing itself was found to have less of an impact on driving differences in key survey estimates than whether recall aids were used during the interview.

Overall, these findings suggest that while telephone interviewing may impact the quality of data collected relative to that of personal visit interviewing, there are clear steps that survey management can undertake to maximize mode equivalence and minimize mode effects.

6. Recommendations

Based on these findings, we recommend exploring means of encouraging higher use of recall aids in both modes – for example, through a mailable version of the Information Booklet, or a more user-friendly checklist for records and receipts. For the future, we also recommend assessing sensitivity to mode on a question-by-question basis, rather than at an aggregate survey level. The finding that different types of questions are affected by mode in different ways supports the notion that mode effects are a question-by-question issue, *not* a survey-level issue.

References

- [1]. Allen, T. M. (1993). “Analysis of Cost and Performance Changes since the Introduction of Telephone Interviewing.” Internal Census Bureau memorandum, February 26th.
- [2]. Akomolafe, A. A and Awogbemi, C.A. (2017): Evaluation of Demographic Pattern of Asthma Patients in Nigeria: Insight from a Multilevel Analysis. *The Pacific Journal of Science and Technology*. 18(2) 292 - 304.

- [3]. Akomolafe, A. A., Olatayo.T.O. and Akinyele, A.A (2015): Survey Error; Its Implication on Research and Possible Remedies. *Journal of Mathematical Theory and Modeling* 5 (4), 154-162.
- [4]. Akomolafe, A. A., Akinyele, A. and Oladimeji, O.O (2015): Consumer Purchase Behaviour in a Frequently Bought Product Category: Investigation and Measure of Brand Loyalty. *Journal of Marketing and Consumer Research*. (10) 155-160.
- [5]. Akomolafe, A. A., Ojo, J.F and Olatayo, T.O (2012): Counting your Customer: Customer Buying Behaviour Data Analysis of Frozen Foods market in Nigeria. *Journal of Advancement in Physical Science*, 4(3) 101-106.
- [6]. Aquilino, William (1994). "Interview Mode Effects in Surveys of Drug and Alcohol Use: A Field Experiment." *The Public Opinion Quarterly*, Vol. 58, No. 2. (Summer, 1994), pp. 210-240.
- [7]. Consumer Expenditure Interview Survey Public Use Microdata Documentation (2005). U.S. Department of Labor.
- [8]. de Leeuw E.D., van der Zouwen J. (1988). "Data quality in telephone and face to face surveys: a comparative metaanalysis." In: Groves RM, Biemer PP, Lyberg LE, Massey JT, Nicholls WL II, Waksberg J, eds. *Telephone Survey Methodology*. New York: Wiley: 273:99.
- [9]. Groves, R. and Kahn, R. (1979). *Surveys by Telephone: A National Comparison with Personal Interviews* (Academic Press, 1979)
- [10]. Hochstim, J.R. (1967). "A critical comparison of three strategies of collecting data from households." *Journal of the American Statistical Association*. 1967;62:319:976-989.
- [11]. Huggins, V. J. (1994). "Effect of Telephone Interviewing on Type A and Record Usage Rates." Internal Census Bureau memorandum to S. L. Durant, September 20, 1994.
- [12]. King, K. E. (1995). "SIPP 1986-1993: Monitoring the Effects of Telephone Interviewing - for Analysis of Type A and Type D Noninterview Rates." Internal Census Bureau memorandum, February 16, 1995.
- [13]. Krieger, S. (2007). "2006 Response Rates for the Diary and CE Interview Surveys." Internal Bureau of Labor Statistics memorandum to D. Swanson, June 19, 2007.
- [14]. Martin, E., J. Childs, T. DeMaio, J. Hill, C. Reiser, E. Gerber, K. Styles, and D. Dillman. (2007). "Guidelines for Designing Questionnaires for Administration in Different Modes." U.S. Census Bureau, Washington, DC 20233.
- [15]. McGrath, D. (2005). "Comparison of Data Obtained by Telephone versus Personal Visit Response in the U.S. Consumer Expenditures Survey." Paper presented at the Joint Statistical Meetings of the American Statistical Association.
- [16]. Nelson, C. (2001). "Survey of Income and Program Participation Users' Guide (Supplement to the Technical Documentation)." Westat. 3rd Edition Washington, D.C.
- [17]. Rogers, Theresa (1976). "Interviews by Telephone and in Person: Quality of Responses and Field Performance." *The Public Opinion Quarterly*, Vol. 40, No. 1. (Spring, 1976), pp. 51-65.
- [18]. Schmittlein, David C., Donald G. Morrison and Richard Colombo (1987), "Counting Your Customers: Who Are They and What Will They Do Next?" *Management Science*, 33 (January), 1-24.
- [19]. Sheskin, D.J (2004) handbook of Parametric and Nonparametric statistical procedures 3rd edition, USA: Chapman of Hall/CRC.
- [20]. Sprole, G.B. and Kendall, E.L. (1986), A Methodology for Profiling Consumers' Decision Making Styles. *The Journal of Consumer Affairs*, 20(2), 267-279.
- [21]. Thomas, L.C. Edelman, D. and Crook j. (2002) Credit Scoring and its application Philadelphia PA: SIAM- monographs on Mathematical Modeling and computation.
- [22]. Uwe, Dullick, Franz Hackl, Berhhard Weiss and Rudolf Winter-Ebmer (2008), National Centre for Econometric Research (NCER). Working Paper Series.
- [23]. Van Gestel, T. (2005) Transversal back testing guidelines for PD :LGD and CCF models Based II and credit-Risk modeling workshop, university of Southampton.
- [24]. Van Gestel, and Keller.K.L (2007). Brands and Branding: Research Findings and Future Priorities. *Marketing Science*, 25(6)740-759
- [25]. Venkate San, R and Kuman, V. (2004) A customer lifetime value framework for

- customer selection and resources allocation strategy. *Journal of marketing* 68, 106-125.
- [26]. Verlander, R. (2006). "Survey Mode Effect on Data Quality: Telephone vs. Personal Visit." Internal BLS Analysis. Wessel, Christina, Wendy Rahn, and Tom Rudolph (2000). "An Analysis of the 1998 NES Mixed-Mode Design."

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