ASSESSING THE 1986 CANADIAN CENSUS QUESTIONNAIRE

Marie Brodeur and Don Royce
Statistics Canada, Ottawa, Ontario, K1A 0T6

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1. INTRODUCTION

This paper describes a study carried out during the 1986 Canadian Census to evaluate the performance of the Census questionnaire as a data collection instrument. Section 2 of the paper provides a brief overview of the use of self-enumeration in the Census context, pointing out the important role played by the questionnaire. Section 3 describes the objectives of the Edit Sample Study and the major uses of the results. The methodology of the study is described in Section 4, while Section 5 presents selected results. Section 6 discusses the limitations of the study. Finally, Section 7 concludes with a description of plans for further analysis of the 1986 study and potential changes to the study for the next Census in June of 1991.

2. SELF-ENUMERATION IN THE CENSUS

The modern census in most western countries makes extensive use of the technique of self-enumeration. Although the methods used to deliver the questionnaire to the respondent and to retrieve it may differ from one country to another, the use of self-enumeration is now a common element of censuses in the U.S., the U.K., Australia, Sweden, and many other countries. In Canada, self-enumeration was introduced in the 1971 Census, and is now used to enumerate approximately 98% of the population.

The advantages of self-enumeration for conducting a Census have been described in detail in a number of places (see, for example, Taeuber and Hansen, 1966). Among the chief advantages are:

1. self-enumeration is considerably less expensive than other methods, such as personal or telephone interviews;
2. self-enumeration reduces the contribution of the enumerator (the so-called correlated component) to the total survey error;
3. self-enumeration affords the respondent more privacy in responding; and
4. self-enumeration allows the respondent time to consult records and should therefore result in better data quality.

In the context of a Census, the Questionnaire is usually accompanied by a number of "support systems" for example, the use of publicity, the availability of telephone assistance service to answer inquiries from respondents, and so on. Despite this, however the use of self-enumeration still depends heavily for its success on the ability of the questionnaire to obtain complete and accurate responses requiring a minimum of follow-up. As pointed out by Platek and Royce (1982), the self-enumeration questionnaire must often, by itself, introduce the survey, motivate the respondent to cooperate and guide the respondent in completing the form. With a self-enumeration questionnaire, there is usually no second chance. If a respondent misunderstands a question, there is often no opportunity to detect the error as there might be if a trained interviewer were present.

In both the 1981 and 1986 Canadian Censuses, there are indications that this reliance on the questionnaire is increasing. Social trends such as smaller households and families where both partners work have resulted in an increased "no contact" rate during the drop-off of the questionnaires by the enumerator. The decrease in contact rates puts particular pressure on the important role the questionnaire plays in ensuring good coverage of the population.

At the same time, there are increasing demands from data users for more accurate data on more complex and sensitive social topics. For the 1986 Census, there were new questions on aboriginal status, disability and educational field of study. For the 1991 Census, there are strong requests for data on topics such as common law as well as legal marital status, volunteer work, child care, housework, race, ethnic origin, ethnic affiliation, and more detailed language data.

3. OBJECTIVES OF THE 1986 EDIT SAMPLE STUDY

The Edit Sample Study was conducted during the 1986 Census to evaluate the performance of the two main Census questionnaires: the 2A (short form) received by 80% of private households, and the 2B (long form) received by the remaining 20%. The study is based on an examination of the questionnaires at the point where they have been completed by respondents but prior to the field edit and follow-up operations. In effect, they provide a picture of the "raw data" provided by the respondents before any intervention by the enumerator. Problems noted at this point can therefore be attributed to the questionnaire.

More precisely, the objectives of the 1986 Edit Sample Study were:

1. to estimate the initial response rate for each question prior to field edit and follow-up by the Census Representative (CR); and
2. to estimate the amount of follow-up required, given the set of field edits which the CR is to apply, and to identify the principal reasons for follow-up.

The data from the study have a number of uses. First, non-response patterns can pinpoint questionnaire design problems and identify questions which caused respondents difficulty. Non-response rates can also be compared across different sub-groups of respondents. Examples of this type of analysis are presented in Section 5.

Second, estimates of the amount of follow-up required are a key component in calculating the piece-rate paid to the Census Representative. In 1986, it was estimated that about 54% of short forms and 75% of long forms required a follow-up. Follow-up on such a scale obviously has major cost implications.

Third, the effects of changes to the CR edit rules can be simulated. For example, the 1986 ESS showed that a complex set of procedures, requiring the CR to count the number of "non-mandatory" questions which failed edit, could be dropped.

Fourth, the questionnaires from the study provide a "first look" at Census responses and can be used to make changes to edit and imputation strategies in time for full-scale processing. In 1986, this was of particular use for new questions on education and disability where the types of responses expected were not well-known.

Finally, non-response rates provide an indication of the potential for the introduction of enumerator error in the results. Since no study to measure total variance of the Census data was conducted in 1986, the Edit Sample Study was the only source of information, albeit a very indirect one, on this component of error.

4. METHODOLOGY OF THE EDIT SAMPLE STUDY

Because the Edit Sample Study (ESS) required access to questionnaires after completion by respondents but before edit and follow-up by interviewers, the study was limited to those areas of the country where the mailback methodology is used, approximately 66%. In such areas, the questionnaires are mailed back to the office of the Census Commissioner, the direct supervisor of the enumerator. A CCD (Census Commissionner District) is formed by a group of Enumeration Areas (EAs). The questionnaires are sorted into EAs and returned to the enumerator for edit and follow-up.

This set-up made it appropriate to employ a two-stage stratified sampling design. At the first stage, Census Commissioner Districts (CCDs) were stratified by Province, Census Metropolitan Area and linguistic status. The sample of 275 CCDs was allocated to the provinces proportional to the square root of the number of CCDs in each province. Allocation to the strata within each province was done proportionnally. Within the strata, CCDs were selected by systematic sampling with probability proportional to the number of mail-back EAs that they contained. The sample size of 275 CCDs was dictated by operational and budgetary considerations.

At the second stage, households were selected within CCDs during the first five days of Census collection. For each selected CCD, a total of 10 Forms 2A and 10 Forms 2B were randomly selected from mail bags of returned questionnaires. This gave a total sample size of 5500 households, equally divided between 2A and 2B.

The information found on the Census questionnaire was transcribed onto a corresponding blank questionnaire. All entries (both coded and write-in) made by respondents were transcribed without making any correction or change, even in the case of the most obvious errors. The original questionnaires were returned to the enumerator for edit and follow-up, while the transcribed versions were sent to Head Office for further processing.

The final sample consisted of 2676 2A households and 2657 2B households. The data were weighted to account for the sample design and non-response. Estimates were produced using the software package SESUDAAN, which also provides variance estimates using a Taylor Linearization with the Random Groups method.

5. RESULTS

The most basic type of result from the Edit Sample Study is an item non-response rate for each question. As mentioned by Platek and Gray (1986), "... the size

of response (non-response) may indicate the operational problems and provide an insight into the reliability of survey data."

In the case of item non-response (the type measured by the ESS), there can be several well-known causes. First, respondents may simply miss seeing a question, either because they did not recognize it as a question or because they became lost in the questionnaire. Second, when respondents think a question does not apply to them, there is a tendancy to leave it blank. Non-response can also occur when a respondent does not understand the meaning of the question. Finally, non-response can occur when the respondent makes a conscious decision not to respond because they feel the information is none of the survey-taker's business.

The definition of response rates used in the ESS is given by the following:

$$R = \frac{P}{E}$$

Where P is the number of persons (or households) in the case of household-level questions) who responded to a question.

E is the number of persons (or households) who were eligible to answer the question.

As mentioned by Wiseman and McDonald (1980), different ways of calculating response rates can be used. Some difficulties arise with questions which follow a filter question since it is not clear whether non-respondents to the filter question are eligible to answer the questions that follow. In this case, two different non-response rates are presented. The "complement" method includes non-respondents to the filter question in the eligible population for the questions that follow, while the "direct" method excludes the filter question non-respondents.

These two methods thus give lower and upper bounds respectively for the true response rate.

Each method has its advantages and disadvantages. In the case of the complement method, if the assumption that all non-respondents to the filter question should answer the question that follows is a poor one, the response rate will be artificially low. For example, a question on the year of immigration would only apply to those who are not Canadian citizens by birth. If all non-respondents to the filter question "Are you a Canadian citizen by birth?" were assumed to be immigrants, then the value of E is probably an overestimate and the rate R is an underestimate for the question on year of immigration.

On the other hand, response rates under the direct method are based only on those respondents who managed to answer the filter question correctly. Thus, for a response rate calculated this way to be correct, one must assume that the probability of response for the question following the filter question is independent of the probability of response to the filter question itself. However in practice it is usually observed that self-enumeration questionnaires tend to be filled out either very well or poorly, rather than the errors being independent. The direct method is particularly problematic when the eligible population results from a complex series of filter questions.

In such cases, response rates should be interpreted with caution. It is probably better in such cases to focus on the pattern of response rates rather than on the actual value of the response rate.

5.1 ANALYSIS OF RESPONSE RATES

In terms of non-response rates, the Census questions can be divided into nine different groups. Within each group, the questions tend to be similar both in terms of the subject matter and the magnitude of the non-response rate. Table 1 provides the response rates for each question by group and method of calculation. The "other" column represents multiple and invalid responses that are usually small and negligible (except for mother tongue and ethnic origin).

From Table 1, it is seen that the basic demographic questions have very low non-response rates (between 1.6% and 5.3%). The non-response rates for language and ethnic origin are slightly higher, between 4.2% and 6.6%. Non-response rates for questions on coverage and the characteristics of the household are higher still. Also, the questions appearing later in the questionnaire (labour force and income) have higher rates of non-response. It appears that non-response increases as the respondent moves through the document, from 1.6% at the beginning to near 30% at the end with the complement method, and 20% with the direct method.

5.2 QUESTION NUMBERING

The numbering of questions within the questionnaire appears to play an important role in influencing respondents. It appears that questions that pertain to different topics but that are grouped together as parts of the same question number suffer from lower response rates than if numbered separately, as can be illustrated by questions on coverage, housing and disability.

The first example of this phenomenon can be drawn from a comparison of data from the 1986 Edit Sample Study to similar data from 1981. Table 2 presents the non-response rates to the same questions, as estimated from the 1981 and 1986 Edit Sample Studies. Because the 1981 study encountered some methodological problems, results are not available for all questions.

In 1981, the questions related to coverage were numbered separately. In 1986, they were grouped together and numbered as parts of the same question, namely questions 8 (a), (b), (c) and (d). As Table 2 shows, this change appears to have resulted in an increase in the non-response rate for three of the four questions. The increase in non-response for question 8 (d) is particularly serious. Because this question is used to identify temporary residents, a higher non-response rate could lead to higher undercoverage. A similar pattern is found with question 12. For questions 13 (d) to 13 (i) the increase in non-response rates from 1981 to 1986 is even more pronounced.

A second example comes from a new question in 1986 on disability. The question, number 20, was split into two parts labelled (a) and (b). Question 20 (a) itself contained three sub-parts which were not numbered at all. The result was that the non-response rate increased from 6.5% for the first sub-part to 14.5% for the second sub-part and 12.4% for the third sub-part. The non-response rate then decreased slightly to 10.4% for question 20 (b). The fact that the highest non-response rate occurred with the second of the three sub-parts of 20 (a) is probably due to the fact that it asked respondents about activity limitations at work or school, and thus did not apply to some persons. Even though a "Not applicable" box was provided, some respondents to whom this sub-part did not apply simply left it blank.

5.3 "GO TO" INSTRUCTIONS

Complex questionnaire design are usually obtained with extensive use of skip-patterns or "go to" instructions. As mentionned by Wiseman and McDonald, complex questionnaire design may result in item non-response because the respondent is confused. However, it is difficult to find any discussion in the literature about the impact of skip-patterns in a self-enumeration questionnaire.

The first major "go to" instructions of the Census questionnaire is the filter question to determine people aged 15 years old and over. Questions on the labour force have several skip-patterns. The result is that non-response varies from 1.5% to 18.6% using the direct method and from 10.2% to 79.7% using the complement method.

As a particular example, question 25 (a) identifies persons who did any work last week. Those who worked are asked to skip to question 27, while those who did not are asked to continue with questions 25 (b) - 25 (e) and 26. However as Table 1 shows, the non-response rates for 25 (b), (c) and (d) are considerably higher than for 25 (a) itself. This pattern is true regardless of whether the direct or complement method is used. Thus, the "go to" instruction would appear to have disturbed the respondent, resulting in confusion and leading to higher non-response following the "go to" instruction.

From questions 25(a) to 31(b), respondents have to follow a total of nine "go to" instructions. Detailed analysis from the study have shown that elderly, retired and not in labour force people in particular get more confused. Even though an experienced interviewer may be familiar with skip-patterns, they should be avoided in a self-enumeration questionnaire.

5.4 COMPARISONS OF FORMS 2A AND 2B

Table 3 presents response rates for the 100% questions, broken down by the form on which they appeared on. In general, non-response rates are higher when a question appears on a long form than when the same question appears on a short form. The differences in Table 3 are statistically significant. There are several possibilities for this difference. First, because the long form takes longer to complete, respondents may be tempted to rush and thus make more mistakes. Second, the detailed instructions for each question appear on the short form itself, whereas with the long form they are included in a separate guidebooklet.

Another interesting difference was the finding that the rate of multiple response to the mother tongue question was higher on the short form (4.3% for the 2A compared to 3.2% for the 2B). Subsequent research with focus groups suggested that respondents to the short form were using the mother tongue question as a proxy for ethnic origin, whereas long form respondents could report their origins in a separate question.

5.5 OTHER RESULTS

Non-response rates were also compared for the two official languages (English and French) in which the questionnaires are distributed, and for different age groups. In the case of language, it was found that non-response rates were generally higher on the French version of the questionnaire. The reasons for this are unknown.

For age groups, the population over 65 years of age had higher than average non-response rates,

particularly to the more difficult questions on labour force and income.

6. LIMITATIONS OF THE EDIT SAMPLE STUDY

The study of the type of non-response rates measured in this study can provide excellent insights into the behaviour of respondents when faced with a self-enumeration questionnaire. Careful analysis can identify many of the weaknesses in a questionnaire. For example, from the 1986 study we have learned that skip instructions should be avoided as much as possible, and where they are unavoidable they must be made very prominent. As the population ages, we must also expect an increase in non-response rates unless measures are taken to counteract this trend.

Like any study, however, the Edit Sample Study has its limitations. First, non-response rates provide no information concerning errors of response. Response errors may often be more serious than non-response, since the latter can at least be identified and reduced by follow-up.

The study is also limited to those areas where the mail-back methodology is used because in other areas with pick-up and canvasser collection it is impossible to intercept questionnaires after completion by respondents but before edit by the enumerator.

Third, the study is also limited to those questionnaires which are mailed back by respondents. Approximately 10-15% of households in mail-back areas do not mail back their questionnaires and must be followed up by telephone or in person. The Edit Sample Study results do not apply to this group of total non-respondents.

Finally, the study is subject to both sampling and non-sampling errors, the latter including primarily transcription, coding and keying. While evaluation of these operations indicated that these errors were relatively minor in most cases, ways of reducing these errors should be considered if the study is repeated in 1991.

7. FUTURE WORK

More detailed analysis of the 1986 Edit Sample Study is planned as details of the 1991 Census are finalized. One area that has not yet been fully explored is an analysis of the principal reasons for follow-up. If, for example, it were found that a few questions were responsible for a very high proportion of the follow-up, then efforts could be concentrated on lowering the non-response rate to these questions. This could result in major cost savings in the data collection operation.

A second possibility is to use the Edit Sample Study to evaluate the effectiveness of the three coverage questions (8b, 8c and 8d) on the questionnaire. The ESS sample could be used to identify which questionnaires should have been followed up because of these questions. The final questionnaires could then be accessed and the number of persons added could be estimated.

Should the study be repeated for the 1991 Census, a number of extensions could be contemplated. For example, the sample could be used as the basis for studying how well CRs carried out the edit and follow-up instructions. Those households requiring follow-up could be identified from the ESS, and they could be contacted by telephone to see if in fact they were followed-up by the CR. The psychological value alone of such a check may be worthwhile.

Second, the Edit Sample Study could be extended to include a re-interview component. Respondents could be interviewed to determine why they answered (or did not answer) as they did, and errors of response as well as non-response could be investigated in one overall study.

Another extension of the study could be to examine the same sample of questionnaires at later points in the Census process. By comparing data at later stages, such as after follow-up, after manual processing, and after data capture, the effect of these other operations on the data could be assessed.

Another important extension for 1991 would be to include rural areas and the Census of Agriculture questionnaire. For the 1991 Census, the mail-back methodology will be extended to rural areas and that the Census of Agriculture will be collected through mail-back. An Edit Sample Study would be of great value in assessing the success of such a change.

In summary, the Edit Sample Study, while it has certain limitations, is a valuable tool in assessing and improving the performance of the Census questionnaire. This study has demonstrated the importance of such factors as, questionnaire length, order of questions, numbering of questions and the clarity and placement of instructions in affecting respondent comprehension and behaviour.

TABLE 1: Response Rates by Questions for Each Method

Question Number	Subject	Complement Method			Direct Method		
		NR	SR	Other	NR	SR	Other
			%			%	
2	Relationship Person 1	3.2	96.0	0.8	-	-	-
3	Date of birth	1.6	98.4	0.0	-	-	-
4	Sex	5.3	94.7	0.0	-	-	-
5	Marital Status	4.9	94.9	0.2	-	-	-
6	Mother Tongue	3.2	92.6	4.2	-	-	-
7	Aboriginal Status	11.4	88.6	0.0	-	-	-
8 (a)	Person responsible Hhld	9.1	90.6	0.3	-	-	-
8 (b)	Number of persons	14.2	85.8	0.0	-	-	-
8 (c)	Persons left	25.5	74.5	0.0	-	-	-
8 (d)	Temporary Residents	21.4	78.6	0.0	-	-	-
9	Tenure	15.1	84.8	0.1	-	-	-

TABLE 1: Response Rates by Questions for Each Method

Question Number	Subject	Complement Method			Direct Method		
		NR	SR	Other	NR	SR	Other
			%			%	
10	Year of construction	8.9	91.0	0.1	–	–	–
11	Number of rooms	6.4	93.6	0.0	–	–	–
12 (a)	Main type of heating	7.5	90.1	2.4	–	–	–
12 (b)	Main energy used	8.4	91.0	0.6	–	–	–
13 (a)	Electricity payments	13.6	85.3	1.1	–	–	–
13 (b)	Energy payments	28.8	70.6	0.6	–	–	–
13 (c)	Municipal payments	28.6	70.8	0.6	–	–	–
13 (d)	Rent	16.5	82.4	1.1	6.7	92.8	0.5
13 (e)	Mortgage	15.6	84.2	0.2	6.6	93.3	0.1
13 (f)	Taxes (1)	33.0	67.0	0.0	11.9	88.1	0.0
13 (g)	Taxes (2)	17.6	82.3	0.1	2.8	97.2	0.0
13 (h)	Price	19.4	80.6	0.0	6.4	93.6	0.0
13 (i)	Condominium	21.4	78.6	0.0	12.0	88.0	0.0
14	Place of birth	4.4	95.3	0.3	–	–	–
15	Citizenship	5.1	93.6	1.3	–	–	–
16	Year of immigration	25.0	75.0	0.0	5.7	94.3	–
17	Ethnic origin	6.6	66.3	27.1	–	–	–
18	Language at home	4.2	91.3	4.5	–	–	–
19	Bilinguism	4.8	94.9	0.3	–	–	–
20 A1	Limited home	6.5	93.4	0.1	–	–	–
20 A2	Limited school	14.5	85.2	0.3	–	–	–
20 A3	Limited activities	12.4	87.5	0.1	–	–	–
20 B	Handicap	10.4	89.6	0.0	–	–	–
21 (a)	School grade	8.8	91.0	0.2	–	–	–
21 (b)	University grade	13.9	85.8	0.3	–	–	–
21 (c)	Other institution	9.9	89.7	0.4	–	–	–
22	Diplomas	9.1	69.0	21.8	–	–	–
23	Major field of study	29.7	67.4	2.8	–	–	–
24	Migration	7.1	89.9	3.0	–	–	–
25 (a)	Number of hours worked	10.3	89.1	0.6	–	–	–
25 (b)	Lay-off or absent job	35.3	64.7	0.0	19.5	80.5	0.0
25 (c)	New job	32.0	68.0	0.0	15.2	84.8	0.0
25 (d)	Look for work	32.1	67.4	0.5	15.9	83.7	0.4
25 (e)	Availability	67.8	32.1	0.1	5.6	94.2	0.2
26	Last time work	27.1	72.4	0.5	9.7	89.6	0.7
27 (a)	Industry (1)	18.8	78.7	2.5	6.5	91.0	2.5
27 (b)	Industry (2)	18.8	76.9	4.3	6.5	89.3	4.2
28	Industry (3)	10.2	67.4	22.4	1.5	78.0	20.5
29 (a)	Occupation (1)	10.4	80.9	8.7	1.5	93.4	5.1
29 (b)	Occupation (2)	10.2	72.9	16.9	1.5	84.5	14.0
30 (a)	Paid work	20.1	79.6	0.3	7.3	92.4	0.3
30 (b)	Self-employment	79.7	20.3	0.0	18.6	81.4	0.0
31 (a)	Number of weeks worked	18.9	81.1	0.0	6.5	93.4	0.1
31 (b)	Full or part-time	20.3	79.6	0.1	3.3	96.6	0.1
32 (a)	Wages and salaries	20.8	78.2	1.0	–	–	–
32 (b)	Non-farm self-employment	41.4	58.4	0.2	–	–	–
32 (c)	Farm self-employment	42.3	57.5	0.2	–	–	–
32 (d)	Old Age Pension	37.6	61.4	1.0	–	–	–
32 (e)	Government Pension Plan	38.9	60.3	0.8	–	–	–
32 (f)	Unemployment Insurance	39.4	59.8	0.8	–	–	–
32 (g)	Other income	39.8	59.3	0.9	–	–	–
32 (h)	Dividend of Interest	34.8	64.1	1.1	–	–	–
32 (i)	Retirement pensions	41.1	58.5	0.4	–	–	–
32 (j)	Other sources	42.8	56.9	0.3	–	–	–
32 (k)	Total income	27.0	72.1	0.9	–	–	–

NR   Non-response
SR   Single response
–   Same as Complement Method

TABLE 2: Comparisons of Non-response Rates
from 1981 and 1986 ESS

Question number 1981	Question number 1986	Non-response rate 1981	Non-response rate 1986
		%	%
2	2	6.9	3.2
3	3	3.3	1.6
4	4	4.6	5.3
5	5	6.6	4.9
6	6	4.9	3.2
7	8(a)	7.1	9.1
8	8(b)	13.0	14.2
9	8(c)	27.0	25.5
10	8(d)	17.8	21.4
11	9	12.6	15.1
17	12(a)	5.2	7.5
18(a)	12(b)	5.6	8.4
20(a)	13(a)	14.2	13.6
20(b)	13(b)	24.4	28.8
20(c)	13(c)	24.8	28.6
21	13(d)	4.6	16.5
22(a)	13(e)	6.3	15.6
22(b)	13(f)	14.2	33.0
22(c)	13(g)	8.0	17.6
22(d)	13(h)	11.3	19.4
22(e)	13(i)	13.3	21.4

TABLE 3:
Non-response Rates for Questionnaires 2A and 2B

Question number	2A	2B
	%	%
2	3.4	2.3
3	1.5	1.9
4	5.0	6.4
5	4.7	6.1
6	2.8	4.5
7	10.9	13.5
8(a)	9.3	8.5
8(b)	14.0	14.7
8(c)	25.1	26.9
8(d)	21.0	22.9
9	14.7	17.2

TABLE 4
Comparisons of Non-response rates by age groups

Question	Non-response rate 15-64 years	Non-response rate 65 years and over
	%	%
25(a)	8.3	21.3
25(b)	31.7	43.2
25(c)	29.3	37.7
25(d)	28.6	39.9
25(e)	58.0	92.2
26	24.8	32.1
27(a)	14.1	67.0
27(b)	14.1	67.0
28	8.5	27.6
29(a)	8.5	27.6
29(b)	8.5	27.6
30(a)	15.2	70.3
30(b)	74.8	94.1
31(a)	14.4	65.0
31(b)	15.8	69.3
32(a)	16.8	42.1
32(b)	39.9	49.4
32(c)	40.9	50.1
32(d)	40.2	23.3
32(e)	40.6	29.9
32(f)	37.6	48.6
32(g)	38.9	44.5
32(h)	35.3	32.6
32(i)	41.7	37.9
32(j)	41.5	50.1
32(k)	26.1	31.9

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