

## AN EXPERIMENTAL PROJECT TO IMPROVE THE REPORTING OF SELECTED COSTS IN THE 1980 CENSUS

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This paper summarizes an experimental project conducted as part of the Research, Evaluation and Experimental (REX) Program in conjunction with the 1980 Census.

Organizationally, the paper is divided into several parts. An introductory section is followed by general results and conclusions, followed by detailed findings. The methods and limitations of the study are then presented. A mention of some directions for future research concludes the paper.

### I. INTRODUCTION

Average monthly costs of gas and electricity and yearly costs of water and fuel have been obtained from renter-occupied housing units during past censuses. The reported amounts appeared in printed reports as part of gross rent tabulations (contract rent plus utilities and fuels if paid separately from rent.) In the 1980 census, utility costs were collected for both renter-occupied and owner-occupied units. The latter appeared in tabulations as a component of shelter costs for homeowners.

A 1970 Census Evaluation Study and some evaluations conducted in Travis County, Texas and Oakland, California during 1980 census pretests indicate that estimates of the average monthly cost of gas and electricity are subject to relatively large response biases (net overreporting) and that the size of the bias varies considerably from area to area. The impact of these errors is dampened somewhat when combined with other items to form gross rent and shelter cost statistics, since the other data components tend to be more accurately reported. For certain types of housing units, e.g., owner-occupied units without a mortgage, the effect of errors in utility cost estimates is more pronounced. Also, as utility costs increase in the future, the effect of these errors may have more impact on gross rent and shelter cost estimates. In addition, utility costs appear on data tapes produced by the Bureau that are being increasingly utilized by data users.

These previous evaluation studies have provided information on the magnitude of errors, but they do not provide much information on methods for reducing errors. This paper presents the results of one method tested during the 1980 census, which might be used to reduce response bias.

Since many utility companies have computerized billing systems, it appeared that a way of reducing errors in utility cost reporting would be to have the utility companies furnish their customers with an average bill for the 12 months prior to the census and include this average cost with the most recent utility bill provided prior to Census Day. The Utility Cost Study was designed for the 1980 Census in a small number of areas to evaluate the potential gains in accuracy of this procedure. The study had two purposes:

Primary.--To test whether providing households with their actual average utility cost prior to the 1980 Census would improve the quality of utility cost data reported in the census. Although utility cost information does not appear directly in printed reports, it forms an important component of shelter costs and gross rent tabulations.

Secondary.--To evaluate availability of and access to utility company administrative records for content evaluation.

### II. RESULTS AND CONCLUSIONS

Results.--Study results were computed for the notified respondents and those not notified, by the following types of occupancy:

- All occupied units
- Owner-occupied units
- Owner-occupied mortgaged units
- Owner-occupied nonmortgaged units
- Renter-occupied units

Comparisons were made for each group of the entire sample (71,362 households) and separately for each of the ten utility companies servicing the seven cities in the study. The eleventh utility company's CAL varied, requiring separate processing (see footnote 4 on p. 12).

Although both groups of respondent households (those notified of actual costs and the control group) overreported their utility costs, provision of the statement of the costs just prior to the census reduced the degree of overstatement considerably.

For all occupied units, the difference between the net overreporting (census response minus utility company report) of the notified group and that of the control group was significant for average monthly costs for both electricity and gas. For electricity the difference was \$2.86 (\$.44)<sup>1/</sup> and for gas the difference was \$6.63 (\$.63). The difference in degree of overstatement was significant for both electricity, 9.5% (2.3%), and gas, 25.8% (2.7%). Thus the data indicate that there was a significant improvement in the reporting of average monthly costs for both electricity and gas when the customers were previously given this information by their utility companies.

The results varied from city to city, but since the utility companies selected their own sample, notified their customers in different ways, and prepared their customer address listings in different formats, care must be taken not to attribute these differences solely to their geographic locations. Table 1 presents the average actual and reported utility costs, by type of company.

Conclusions <sup>2/</sup>.--Overall, census respondents tended to overreport their cost of gas more than they overreported their cost of electricity. Also renter-occupied households tended to overreport their cost of gas and electricity more than owner-occupied households (based on percent differences for notified respondents). For electricity the improvement resulting from the notification was 22.3% for renters and 35.9% for owners. The notified census respondents still overreported their cost by 15.2% for owners and 26.0% for renters. For gas the improvement was 28.7% for renters and 48.3% for owners. However, the notified census respondents still overreported their cost by 29.7% for owners and 41.2% for renters.

Impact on Gross Rent and Shelter Costs.--A primary interest in collecting utility costs lies in their importance for estimates of "Gross Rent" and "Shelter Costs." The findings of net overstatement in the utility cost components of these variables are of greater concern when they cause serious impact on the accuracy of the "composite"

variables themselves. Gross rent and shelter costs are the items shown in 1980 publications.

The term "gross rent," as used here, includes monthly payments for contract rent, electricity, gas, water and other fuels.<sup>3/</sup> The "gross rent from utility company" data consists of the addition of record check amounts for electricity or gas with the census response amounts for the remaining components (rent, water and other fuels). On the other hand, the "gross rent from census reports" comprise totals from census responses.

Shelter costs for homeowners include monthly mortgage payment (if mortgaged), monthly cost for utilities, water, other fuels, real estate taxes, and fire and hazard insurance payments. Utility costs are usually a proportionately larger share of total shelter costs for owner-occupied units that are not mortgaged than for mortgaged units. Thus, errors in utility costs can have more impact on shelter costs for nonmortgaged units.

Mortgaged households did a better job of reporting their cost of electricity than the non-mortgaged households. For electricity the improvement resulting from the notification was 45.3% for mortgaged households and 16.3% for non-mortgaged households, although the notified census respondents still overreported their cost of electricity by 11.9% for mortgagers and 22.9% for nonmortgagers. There was no significant difference between mortgaged and nonmortgaged households when reporting the cost of gas. For gas the improvement was 46.8% for mortgagers and 53.1% for nonmortgagers. The overreporting was still 29.6% for mortgagers and 28.5% for non-mortgagers.

Providing customers with their average monthly cost of electricity did make a significant improvement in estimating the shelter costs of owner-occupied and mortgaged units, but there was no improvement extended to estimating the shelter cost of homeowners with no mortgage and only some evidence that the improvement was significant for estimating the gross rent for renters (based on percent differences). However, providing customers with their average monthly cost of gas did make a significant improvement for both the shelter cost of homeowners, and gross rent for renters (based on percent differences). The fact that providing customers with their average monthly utility costs would have made an improvement in the Census Bureau's reporting of shelter costs and gross rent for cities included in this study, indicates that we should begin to explore the possibility of having all utility companies provide this information to their customers prior to the 1990 Census.

Use of Utility Company Records.--Several of the utility companies initially approached to participate in the study could not do so because of the timing for notification, or because their records were not computerized. Of those that did participate, several did not meet the guidelines suggested so that extensive preparatory work was necessary before the Customer Address Listing (CAL) could be used. (A more complete discussion of this subject is covered in the "Methods" Section.)

However, the matching and transcription went even more smoothly than anticipated, leading to the conclusion that administrative records can be

successfully used for data content evaluation, especially for specific data characteristics.

### III. DETAILED FINDINGS

For owner-occupied units, the difference between the notified group difference and the control group difference was significant for both electricity and gas. For electricity, the difference was \$3.13 (\$.53) and for gas the difference was \$7.51 (\$.75). The difference in degree of overstatement was also significant-for electricity it was 9.3% (2.2%), and for gas it was 27.9% (3.1%). When comparing shelter costs for owner-occupied units, there was a significant difference in degree of overstatement for electricity 1.1% (.4%); for gas the difference was significant 2.8% (.5%).

For owner-occupied units with a mortgage, the difference between the groups was significant for both electricity, \$4.09 (\$.67), and gas, \$7.24 (\$.96). The difference in degree of overstatement was significant for both electricity and gas, for electricity it was 10.5% (2.2%), and for gas it was 26.1% (3.4%). For shelter costs, the difference in degree of overstatement was significant for both electricity, 1.1% (.2%), and gas, 1.9% (.4%).

For owner-occupied units with no mortgage, the difference between the groups was not significant for electricity \$1.31 (\$.95), but was significant for gas \$8.38 (\$1.32). There was no significant difference in degree of overstatement for electricity, 6.0% (4.8%), but there was a significant difference for gas, 31.7% (5.8%). For shelter costs, there was no significant difference in degree of overstatement for electricity, 1.0% (1.3%), but there was a significant difference for gas 7.3% (1.3%).

For renter-occupied units, the difference between the notified and control groups when reporting utility costs was significant for both electricity, \$1.83 (\$.79) and gas \$3.52 (\$1.14). The difference in degree of overstatement was not significant for electricity, 7.6% (7.1%), but the difference was significant for gas, 15.0% (5.6%). For gross rent there was some evidence that the difference in degree of overstatement was significant for electricity, .7% (.4%), while the difference was also significant for gas, 1.5% (.4%).

The actual (utility company report) average cost of electricity ranged from \$21.49 in Stockton to \$49.24 in Beaumont. The actual average cost of gas ranged from \$15.87 in Stockton to \$35.57 in Davenport.

The average actual cost of electricity ranged from \$21.43 for a 1-person household to \$44.57 for a 5-person household, and the average cost of gas ranged from \$19.46 for a 1-person household to \$38.35 for households of 8 or more persons. For gas customers, average utility costs are directly correlated with household size, that is, costs continue to increase as household size increases. For electricity, the relationship is positive through the 5-person household, but drops somewhat above that level.

The actual average cost of electricity ranged from \$21.64 for a home worth less than \$10,000 to \$75.90 for a home worth over \$200,000, and for gas the average cost of gas ranged from \$24.16 for a home worth less than \$10,000 to \$43.81 for a home worth over \$200,000. For electrical

Table 1: Average Actual and reported Monthly Utility Costs, by type of Company

City - Utility Company	Reported		Actual	
	Notified	Not Notified	Notified	Not Notified
<b>Gas:</b>				
Davenport, Io.--Iowa-Ill. Gas & Electric.....	47.68	52.55	35.57	34.81
Little Rock, Ark.--Ark.-La. Gas.....	29.76	36.46	23.81	23.45
Macon, Ga.--Atlantic Gas Light.....	35.99	41.54	27.98	27.45
Montgomery Ala.--Alabama Gas Corp.....	38.48	48.32	27.68	29.44
Stockton, Calif.--Pacific Gas & Electric.....	22.21	29.54	15.87	16.38
<b>Electricity:</b>				
Beaumont, Tex.--Gulf States Utilities.....	54.93	56.03	49.24	44.61
Davenport, Io.--Iowa-Ill. Gas & Electric.....	33.36	35.08	29.16	28.18
Dearborn, Mich.--Detroit Edison.....	30.19	31.44	25.30	25.39
Little Rock, Ark.--Ark. Power & Light.....	42.31	41.95	35.09	34.16
Macon, Ga.--Georgia Power.....	36.61	39.62	30.49	30.41
Montgomery, Ala.--Alabama Power.....	49.95	53.92	43.01	43.58
Stockton, Calif.--Pacific Gas & Electric.....	26.10	31.69	21.49	22.20

customers in owner-occupied housing units, there is a direct relationship between utility costs and value of home, as might be expected assuming increased use of appliances and electrical energy in more affluent homes. For owners using gas, although the correlation is not as evident for all value intervals, there is some evidence of a similar relationship.

The actual average cost of electricity ranged from \$15.54 for a rental unit in the \$50-59 class to \$53.92 for a rental units in the over \$400 class, and the average cost of gas ranged from \$18.90 for a rental unit in the \$180-199 class to \$31.45 for a rental unit in the over \$400 class. However, renters do not display the same relationship as do owners when comparing cost of housing with cost of utilities.

#### IV. METHODS

Major steps involved in the utility project included:

- a. Selecting a set of prospective utility companies which covered the central city of the places selected.
- b. Contacting the companies to request participation, including computer capability.
- c. Receipt of the various CALs, and xeroxing or reformatting as required. For 2 cities this required additional indexing of the CAL prior to matching.
- d. Contacting Geography Division (of the Bureau) to obtain the list of enumeration districts for each city for sampling purposes.
- e. Arranging for storage and shipping of the census questionnaires for matching.
- f. Preparing all necessary forms and matching specifications.
- g. Conducting an in-house pretest.
- h. Supervising the matching, including professional review of possible matches.
- i. Analyzing results and preparing the study report.

Initial contacts with utility trade associations during mid 1979 elicited interest but no specific commitment of participation, although these initial contracts facilitated individual company cooperation.

Therefore, in December 1979 letters were mailed by the Census Bureau to 22 utility companies requesting their cooperation in evaluating utility costs.

Locations selected were small cities (approximate 1970 size: 50,000 housing units) with a single majority-utility company or combined company supplying a given utility service (gas or electricity) to all city residences. Of the companies that replied and were willing to cooperate, eleven companies serving eight cities actually participated. Arrangements were made with these companies to accumulate utility costs for their customers for the twelve months prior to the 1980 census. These companies randomly selected a sample (approximately half) of their residential customers, who were then notified of their average monthly utility costs when they received their bill in March 1980. The other half of their customers were not notified, and served as the control group for the study. Although the sampling was performed by the companies, the procedures were discussed by phone with the Research Staff or Marketing Staff of each utility company. The companies provided us with their customers address lists, (CAL's) which gave the name, address, average monthly utility cost, number of months on which the average was based, and group designation (sample or control) of each customer. Some companies provided computer printouts of their CAL, while others provided tapes from which the listings were sorted and printed. Paper copies of each CAL were made for use in matching, while the master list for each company was retained in Housing Division. Table 2 provides a summary of company sampling procedures.

Selecting the Sample.--A control list of all ED's (Enumeration Districts) for each city was obtained from Geography Division, and the EDs for each geographic area randomized for processing. We requested that all census long form questionnaires for those DO's be sent or retained in Jeffersonville for processing. Of the 268 ED's for which no long-form questionnaires were received, 260 were ZPH's (Zero Population and Housing) or had no sample (long form) questionnaires. Forms from the remaining 8 ED's could not be located.

Three forms had been prepared and printed for use in the study. The D-8087, Household Tally Sheet summarized the attempted matches, as well

as provided a tally sheet for determining when minimum sample size had been reached. Matching was by whole ED, with the desired minimum sample estimated at 2,000 cases per utility company (1,000 notified customer addresses, and 1,000 not notified). The transcription form, D-8088 contained, in addition to utility cost information from both census questionnaires and CAL's, a number of additional housing characteristics from the census. Form D-8088A, a modification of Form D-8088, was used only for Davenport and Stockton, where one company provided both utilities.

The Little Rock Pretest.--By October 1981 all preparatory work had been completed. All necessary long forms had been reserved in Jeffersonville; 3 copies of each CAL, ED control lists by DO, and blank forms, D-8087, D-8088, and D-8088A had been prepared for forwarding from headquarters to J'Ville. Matching instructions had been prepared in Housing Division and it was anticipated that matching would begin early in FY 82. However, because of unanticipated resource shortages, the timetable for a number of evaluation studies was revised, delaying the start of the processing of the utility study until early summer of 1982. Since all materials were ready and clerical staff was available at headquarters, we decided to undertake a pretest of a single city to allow us to test the clerical procedures and identify potential matching problems. In addition, this would afford an opportunity to make estimates of the workrates in order to properly plan for Jeffersonville processing. Little Rock was chosen because it contained 2 utility companies, 1 of which (the Arkansas-Louisiana Gas Co.) had a typical CAL, alphabetized by street name. The second CAL was arranged by account numbers which required an extensive indexing system (see section on "Limitations of the Study").

Fortunately, the CAL's for the other utility companies were in alphabetical order by street or customer name with the exception of the Atlanta Gas Light Company covering Macon, Georgia. That CAL also required indexing, but much less extensively than for Little Rock. We would provide Jeffersonville with an alphabetical street index for Macon which would reference the specific page that an address would be found. Based on the Little Rock Test, we assumed that 60-70% of attempted matches would be successful.

To determine the work rate, we tabulated Household Tally Sheets (Form D-8087), to obtain the number of ED's and questionnaires processed. Other factors which affect the work rate were derived from these tabulations, such as the percentage of questionnaires that might be:

1. Searched and matched successfully
2. Searched and not matched
3. Out-of-Scope
  - a. Did not respond to utility cost questions
  - b. Did not use or pay for utility
  - c. Group quarters or vacant units.

We processed all of the questionnaires for Little Rock, (7,895 questionnaires from 171 ED's), but at predetermined cutoff points we computed estimates of the difference between the sample and control groups and of the standard errors. These estimates provided guidelines for the size of sample that would be needed for processing the

rest of the utility companies in Jeffersonville. The results indicated an acceptable sample size of 1,000 notified and 1,000 not notified, with a preferred sample size of 1,500 each.

Jeffersonville Processing.--Matching and transcription of the remaining cities <sup>6/</sup> was begun in Jeffersonville in June 1982, was completed, and keyed by the end of September. Procedures prepared by Housing Division required address and household match, as well as a quality control procedure for search, match, and transcription. By the end of December a data file had been created from the transmitted tapes, edited, and was ready for computer tabulation and analysis.

#### V. LIMITATIONS OF THE STUDY

The utility study was intended to be a controlled study on the effect of providing notification of average utility cost information to customers to improve their reporting of this data on their census questionnaire. Initially, the intention was to select cities not only of a given size and a single utility company (of each utility type) for purposes of manageability, but also to secure a geographic distribution. Because of time and budget constraints, all eleven utility companies that agreed to participate did so because they already had the computer capability to provide us with the information we requested; more of these are located in the South than we had intended, perhaps leading to lower average costs than occur in other areas.

Following initial agreement by the utility companies to participate, several phone conversations took place between the Bureau project manager and the research, marketing, or accounting staff of the utility relative to sampling procedures, project requirements, and cost.

The guidelines sent to the utility companies asked that about 30,000 households be included in the study, with half of them to be notified of their average cost. Some utility companies took this literally and excluded customers by subsampling (either randomly or by first excluding delinquent cases or customers of less than 12 months) down to about 30,000 households. Others provided their entire customer address list, divided into notified and nonnotified groups. (see Table 2).

As shown in Table 2, for some companies there is considerable difference between the 1980 count of housing units and the CAL total. Variations are due to census definitional classification of housing units; the fact that multi-unit structures containing master meters were omitted from the utility list; and the project guidelines which indicated a desired sample size of approximately 30,000 (15,000 notified and 15,000 not notified customers). After analyzing the results of the matching operation, we realized that one utility company did not randomly divide its customers into the two groups, but limited the notified group to only 12 month customers, and the not notified group included 12 months and less than 12 months customers.

Listings from the computer tape for the Alabama Gas Company were inadvertently lost during reformatting. Following an extensive geographical search, using Bureau ED maps and the address list furnished by the electric company serving the same households, the Project Manager decided to retain this company's data in the

Table 2. CAL Sampling Summary

Utility Company	1980 HU's	CAL	Comments
Alabama Gas.....	67,417	16,627 (24.7%)	Tape Demand-Data Lost-Reported 46,389 Listings 5/
Alabama Power....	67,417	49,990 (74.1%)	Excluded delinquent cases
Ark.--La. Gas....	64,674	29,374 (45.4%)	Subsampled 2/3 of Customers
Ark. Power & Light.....	64,674	60,800 (94.0%)	Had to create alphabetical street index because CAL's were not in order
Atl. Gas Light...	44,391	33,089 (74.5%)	
Commonwealth Edison.....	54,674	48,983 (89.6%)	Excluded customer names Excluded delinquent cases Excluded 318 separate metered water heater accts.;
			Excluded less than 12 months service
Detroit Edison...	35,692	29,806 (83.5%)	Excluded households of less than 12 months service
Ga. Power.....	44,391	28,724 (64.7%)	Excluded delinquent cases
Gulf States Utilities.....	47,065	30,000 (63.7%)	Excluded less than 12 months service (for notified group)
Iowa--Ill. Gas & Electric.....	40,299	28,289 (70.2%)	Excluded customers with mailing address different from service address; Excluded budget payment plans
Pacific Gas & Electric.....	61,315	48,033*(73.4%)	Excluded less than 12 months service

\*45,033 listings but some customers listed twice, gas on one line, elec. on another line - often notified of average cost for one utility but not of the other.

study. Distribution of certain housing characteristics related to use of utilities, such as tenure, housing unit type, size of unit and size of household, were considered in making that decision (see Table 2 and footnote 5).

For the Gulf State Utilities Company, the matching results for the notified and not notified customers does not show the same similarity as for the other companies. Upon rechecking the results, we realized that the Customer Address List provided separately for notified and not notified groups were not identical, as one group had excluded service of less than 12 months.

The guidelines also proposed a suggested statement that could appear on the bill or enclosure to alert the customer to the use of the information. Some utility companies changed the wording of the message or used a separate mailing.

Finally, the specification asked that the customer address information be given in either a printed list, computer cards, or magnetic tape. Some utility companies gave us magnetic tape, one of which was completely damaged (causing one city to be dropped from the study), and another partially damaged (causing loss of data for one city's gas customers, see Table 2.) Other magnetic tapes were reformatted and printouts generated by Housing Division. The format of several submissions presented difficulties. For one city, for example, the house number was dropped, requiring the use of a city directory to complete the address. Some listings required more extensive preparatory work. For 2 utility companies, the listings were arranged by account number; an indexing system had to be devised prior to attempting to match.

The most complex CAL was not in order by street or customer name, instead it was divided into 20 sections. Each section was subdivided into customers notified and not notified. Each subsection was in ZIP code order but it was possible for a ZIP code to appear in all 40 subsections. In addition, if a street was in 4 different ZIP codes, it was possible that the street would appear in 4 places within the same subsections. This was one of the factors that led to the decision to conduct a pretest (see earlier section of this report.) One company omitted the customer names, causing separate processing procedures (See footnote 4).

The variable that may have affected the study results was the rewording and placement of the census message. The other changes resulted in some lost data, affected matching and transcription results and timing, and possibly affected individual city results to some degree; overall, however, the effect on study findings and conclusions was not great.

#### VI. DIRECTIONS FOR FUTURE RESEARCH

Although there were costs incurred by several utility companies in participating in the study, three companies provided the requested information at no cost to the Bureau. We recommend contacting the Utility Trade Associations to begin developing an address list of the utility companies across the nation. These companies might then be surveyed to see if they have the capability to provide this information, are willing to participate, and what their estimate of expenses would be. The results of this survey would enable us to determine the extent of coverage possible in the 1990 Census and whether the

improvement in reporting shelter costs and gross rent would be cost efficient.

An alternative might be consideration of a small similar study for a 1990 pretest site, in which we recommend inclusion of a statement on the questionnaire advising respondents to consult their utility bills, since it appears many utility customers overlooked the notices provided by the utility companies.

An alternative method of improving the Census Bureau's reporting of shelter cost and gross rent would involve regression analysis of various household characteristics. We recommend that a test be undertaken utilizing 1983 National AHS data to derive a regression equation. That equation would later be used to predict 1985 shelter cost and gross rent that would be compared to the reported shelter cost and gross rent from the 1985 National AHS. If the regression equation proves to be successful in predicting shelter cost and gross rent, we would recalculate the equation using 1989 National AHS data to update the equation in order to predict shelter cost and gross rent in the 1990 Census.

Results of such research efforts might lead to questionnaire (or instruction sheet) rewording, or a qualifier to data use in published reports. An alternative outcome might be the dropping of utility cost questions if availability of administrative records or regression modeling might prove more effective data sources.

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#### NOTES AND REFERENCES

Bureau of the Census Results Memoranda:

[1] The estimated sampling errors are shown in parenthesis throughout this report. The Statistical Package for the Social Sciences (SPSS) was used to compute the statistics presented in this paper.

- [2] All the comparisons that follow are between notified and non-notified respondents, for each utility. The difference between the two utilities (gas and electric) may not be significant in every instance.
- [3] Costs of "water" and "other fuels" tend to be included in contract rent more frequently than costs for electricity and gas.
- [4] The CAL for the city of Rockford, Ill., (Commonwealth Edison) contained addresses only, therefore household matching was not possible. Address matches for this city were transcribed in Housing Division and the results issued as a supplementary report to the original study.
- [5] By comparison with CAL from Ala. Power, and with basic housing characteristics such as tenure, we were able to determine that lost units were distributed across the sample.
- [6] See footnote 4.
- [7] 1970 Census Preliminary Results Memorandum No. 28:  
Aquilino, Robert and William Davie, "Gross Rent Study: Accuracy of Reports of Average Monthly Utility Costs for Rental Households, April 25, 1972
- [8] 1976 Census of Travis County, Texas Results Memorandum No. 14:  
Fronczek, Peter J., "Accuracy of Reports of Average Monthly Utility Costs (Gas and Electricity) for Owner and Renter Households", March 18, 1977.
- [9] 1977 Census of Oakland, California Results Memorandum No. 37:  
Koons, David A., "1977 Census of Oakland, California--Accuracy of Reports of Utility Costs for Occupied Households", July 20, 1979
- [10] 1980 Census Preliminary Evaluation Results Memorandum No. 59:  
Tippett, Janet and Takei, Richard, "Evaluation of Reporting of Utility Costs for Selected Cities," August 31, 1983.
- [11] 1980 Census Preliminary Evaluation Results Memorandum No. 72:  
Tippett, Janet and Takei, Richard, "Evaluation of Reporting of Utility Costs--Rockford, Illinois supplement," March 16, 1984