



June 7, 2004

MEMORANDUM FOR      Documentation

From:                      ATUS Nonresponse Analysis Team (*Signed*)

Subject:                    ATUS Response Rates Analysis Results (ATUS-09)

For questions about the attached analysis, please contact Tamara Adams (301-763-7880) or Harland Shoemaker (301-763-4275).

Attachment

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## American Time Use Survey Response Rates Analysis

### Executive Summary

The ATUS Response Rate Analysis group was formed to examine the operational data collected from the American Time Use Survey in an attempt to determine why the response rate for the survey dropped between its pre-fielding phase (November-December 2002) and its production phase, which started in January 2003.

There were several hypotheses related to refusals and noncontacts the group wanted to test:

- The more experienced interviewers have lower refusal rates, and as inexperienced interviewers replaced experienced interviewers on the survey, the response rate dropped
- The refusal rate varies by day of week and/or time of day and making calls at these times causes a higher refusal rate
- Too few call attempts are being made, resulting in a high noncontact rate, which leads to a higher nonresponse rate.
- Call attempts are not being made at optimal times of the day for contacting respondents
- The call scheduler is not reattempting to contact busy signals quickly enough, resulting in lost opportunities to contact the respondents

The group also performed logistic regression analyses to see if relationships exist between demographic and operational variables, whether or not the respondent was contacted, and whether or not the respondent refused.

The group also examined the performance of individual interviewers by constructing statistical control charts for their refusal rates by month to see if consistently high-performing or low-performing interviewers could be identified, compared to the average response rate for all interviewers. The thought here was that consistently high-performing interviewers could be debriefed in order to find out which interviewing techniques they use might be useful for other interviewers to adopt.

A summary of our analytical results follows.

#### Refusals

**Interviewer Effect** – The hypothesis that higher refusal rates are being caused by new interviewers doing more work and more experienced interviewers doing less work is not supported by the data:

- We found no appreciable differences in overall refusal rates by different interviewer types, except for supervisors.
- The group contributing the most to the overall refusal rate varies across month.
- There was no relationship between years of experience interviewing and the refusal rate for an interviewer.

**Day of the Week/Time of Day Effect** – For 3 of the 7 months of data we looked at, cases attempted on Thursdays, Fridays, or Saturdays had higher refusal rates than those attempted on other days of the week. There seems to be a spike in refusal rates at the 10 am, 2 pm, and 9 pm time periods for many of the months we examined.

**Missing CPS Income** – Logistic regression analysis of refusal rates showed that cases missing the CPS family income variable were more likely to be ATUS refusals than cases where the CPS family income variable was not missing.

### Noncontacts

**Day of the Week/Time of Day Effect** – We found considerable variation in the number of call attempts by time of day (respondent time), with fairly low valleys at 10am and 6pm, and fairly high peaks at 9am, 12 noon, 5pm, and 7 pm. This is most likely related to how the call scheduler operates. The noncontact rate does not vary appreciably across time of day, however. In looking at number of attempts by JTC time, we found a high peak at 9 am and a significant drop off after 7 pm.

**Reattempting after a Busy** – Calls resulting in busy signals appear to be re-attempted within one hour, with about 20 percent of these calls resulting in a contact.

**Logistic Regression Analysis** – Logistic regression analysis of noncontact rates showed that in most months we are less likely to contact people in the morning and during the weekdays. Younger people and black people were less likely to be contacted. The presence of the CPS family income variable was not a significant predictor of contact.

## 1 Introduction

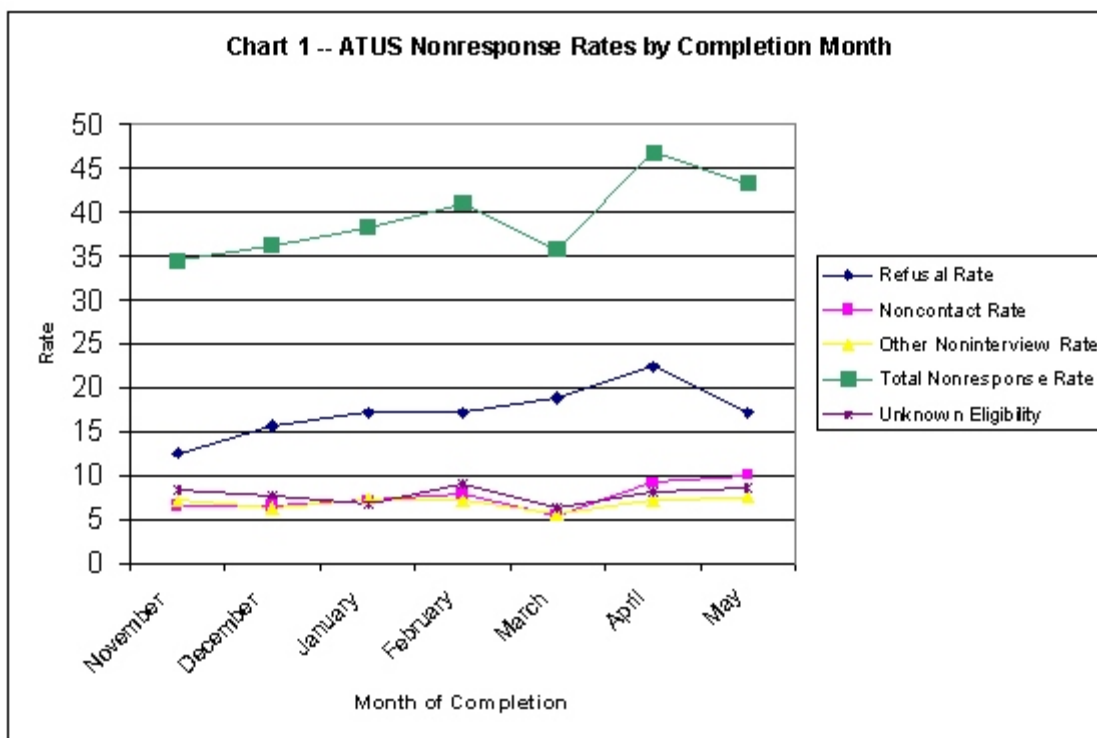
The American Time Use Survey (ATUS) is designed to give estimates of how people use their time each day in the United States. The ATUS had a dress rehearsal and pre-fielding period in September-December 2002. In January 2003, the ATUS entered its production phase. In that time, with the exception of March, the response rates have dropped (see Table 1). In addition, there is a large difference between noncontact rates and refusal rates (see Chart 1). Refusals are generally a larger part of the nonresponse; however, the proportion of the nonresponse accounted for by refusals varies from month to month. This analysis is aimed at trying to uncover what may be causing the drop in response rates between pre-fielding and production.

<b>Table 1 – Response Rate by Completion Month<sup>1</sup> for the American Time Use Survey</b>	
<b>Month</b>	<b>Response Rate<sup>a</sup></b>
November	65.4
December	63.9
January	61.7
February	58.9
March	64.1
April	53.1
May	56.7

<sup>a</sup> Response rate calculated using AAPOR Response Rate 2

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<sup>1</sup>There are two different months that a case is assigned in the ATUS. The *panel month* is the month for which the case is selected. This month is two months after the case retires from CPS. The *completion month* is the month in which the case is completed. Cases are weighted according to their completion month.



## 2 Background

### 2.1 ATUS Sample Design

The ATUS uses the Current Population Survey (CPS) sample as a frame. Respondents to the CPS in their eighth month in sample are eligible for the ATUS. After restratifying these households, a sample size of approximately 3,400 households is randomly selected each month for interviewing. In this sample, we oversample households with minorities and households with children. Then, a designated person (DP) age 15 or older from the household is randomly selected as the person whom will be interviewed. Four panels are randomly created, one for each week of the month. The sample is also randomized by day, with 50 percent of the sample chosen to report about Monday through Friday and 50 percent of the sample chosen to report about Saturday and Sunday.

### 2.2 ATUS Data Collection

Respondents are notified that they have been selected for inclusion in the ATUS with an advance letter and pamphlet. Respondents are included in the ATUS two months after their household is out of the CPS (e.g., if a household's final interview for CPS is in November, then the members of that household are eligible for ATUS in January). If a phone number is available from the CPS, the Jeffersonville Telephone Center (JTC), a computer-assisted telephone interviewing (CATI) center run by the U.S. Census Bureau, calls the household the day after their designated response day to obtain a report about their response day. If a phone number is unavailable from

the CPS, the respondent is sent an inactivated debit card for \$40 and asked to contact the JTC to complete their interview, at which time the debit card is activated for the respondent.<sup>2</sup> If the case is not completed during the first day, it remains active for seven additional weeks; the day of the week about which the sampled person is to report does not change.

Since the majority of the cases are outbound cases attempted by the JTC, we concentrate on those cases in this analysis. The JTC attempts calls in four call blocks throughout the day and is required to make at least one call in each call block until contact is made with each household (see Table 2). An automated call scheduler is used in production; during pre-fielding, JTC managers manually scheduled the calls.

<b>Table 2 – Call Blocks in the ATUS (Time in JTC Time)</b>
9AM-11:59AM
12PM-4:59PM
5PM-8:59PM
9PM-12AM

### 2.3 *Nonresponse in the ATUS*

Nonresponse can be divided into three main categories (Groves and Couper, 1998):

- Refusals – These are cases where the interviewer contacts the household and someone, not necessarily the DP, refuses to complete the interview. Refusals can happen after the interview begins, but tend to happen very early in the contact.
- Noncontacts – These are cases where JTC cannot contact the household. These can be due to barriers; such as answering machines, caller ID, call butlers, and other impediments; or can be due to having an incorrect phone number, no answer at the household, no one home, or other factors.
- Other – These are cases where an interview cannot be completed due to a language barrier and other design features of the survey.

Chart 1 shows that the main contributor to the ATUS high nonresponse are the refusals. However, noncontacts also contribute to the overall nonresponse. ATUS is unusual in that it uses expired CPS sample. Therefore the respondents have already been contacted eight times in the past 16 months by the Census Bureau for a survey. In addition, the ATUS must be conducted on the designated day, rather than at any time during the week. Also, proxy responses are not allowed.

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<sup>2</sup>The average completion rate for incentive cases from January through May was 33.8 percent.

Applying theories of nonresponse, we know that refusals can be caused by interviewers (Groves and Couper 1998). We also know that noncontacts are not caused by interviewers, but rather are caused by an interaction of number of attempts, time of attempts, and respondent behaviour (Groves and Couper 1998). Due to these theories, we will study refusals and noncontacts separately in the ATUS.

### 3 *Limitations*

Other than the coefficients for logistic regression models, there are no significance tests or implied statistical comparisons in this analysis. We do not conduct statistical tests because we are looking for patterns that may point to methods to reduce the ATUS nonresponse rates.

### 4 *Results*

Because they have different causes, we will examine refusals separately from noncontacts. This will allow us to analyze various causes of the ATUS nonresponse problem. However, we will not examine other noninterviews (language barriers, etc.) because these are caused by limitations in the data collection procedures.

#### 4.1 *Refusals*

We will examine refusals assuming contact since a respondent cannot refuse until contacted. Below, refusal rate means the following:

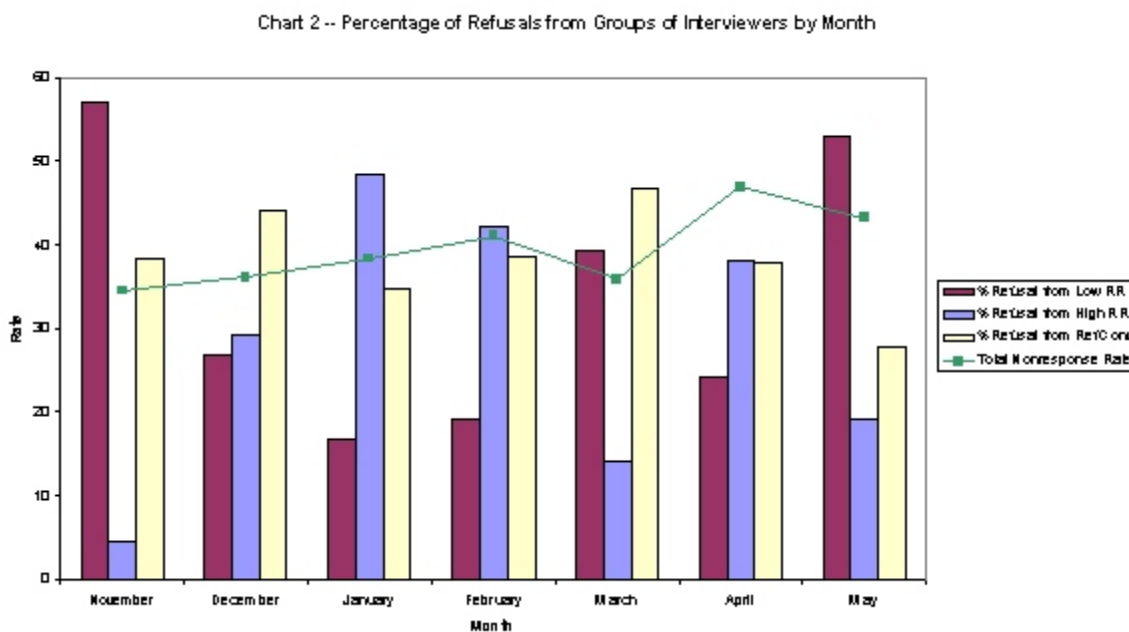
$$\text{Refusal Rate} = \frac{R}{I + P + R}$$

where  $I$ =Interview,  $P$ =Partial Interview, and  $R$ =Refusal

Note that  $\text{Refusal Rate} = (1 - \text{Cooperation Rate})$  from AAPOR.

4.1.1 *High refusal rate interviewers are doing more work and low refusal rate interviewers are doing less work, so the overall response rate is going down over time.*

In Chart 2, we see that in January, February, and April, more of the refusals were completed by interviewers in the high refusal rate group than by interviewers in the low refusal rate group<sup>3</sup>. These are the months with the higher refusal rates (as indicated by the green line). However, this does not hold for March and May.



Since there is an absence of a strong pattern, we can conclude that there is not one group of interviewers having a large effect on the refusal rates month to month. In addition, only 8 of the 38 interviewers included in this analysis were consistently in the high refusal rate group or the low refusal rate group.

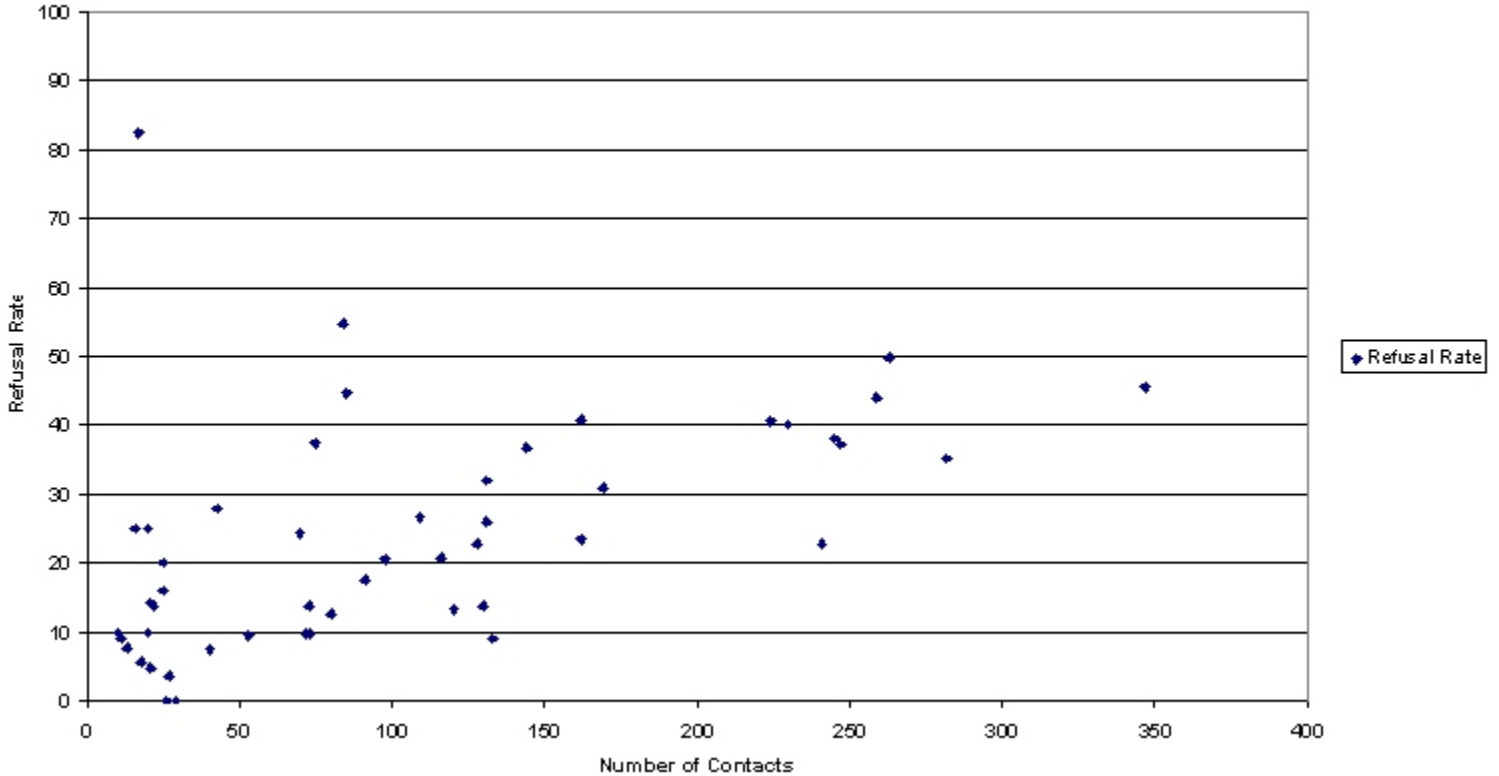
Chart 2A shows a positive relationship between number of contacts and refusal rate. The more contacts an interviewer has, the higher the refusal rate. This may be due to the fact that the interviewers who have more contacts are more frequently assigned to difficult cases that will generate more refusals.

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<sup>3</sup>*High Refusal Rate Group* means that at least 45 percent of the interviewers' cases were refusals. *Low Refusal Rate Group* means that less than 45 percent of the interviewer's cases were refusals. These cutoffs were chosen arbitrarily to divide the interviewers. They are chosen month-to-month so that an interviewer can change refusal rate group each month.



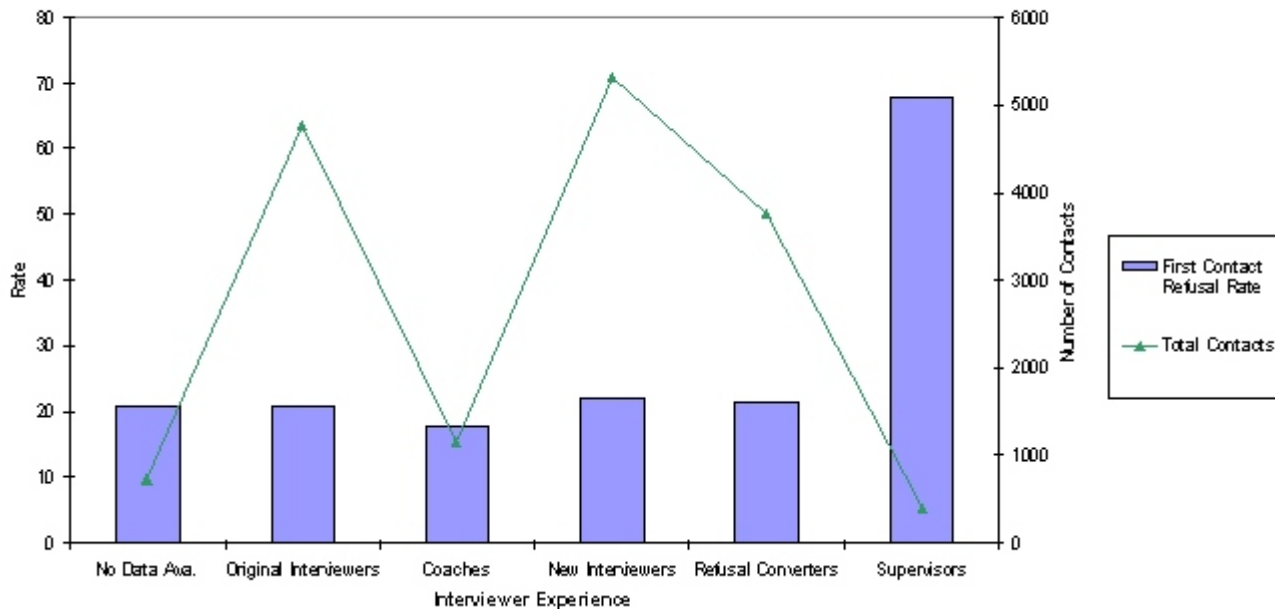
**Chart 2A-Interviewers' Refusal Rates by Number of Contacts**



*4.1.1.1 More experienced interviewers have lower refusal rates and as more inexperienced interviewers replace experienced interviewers, the refusal rate increases.*

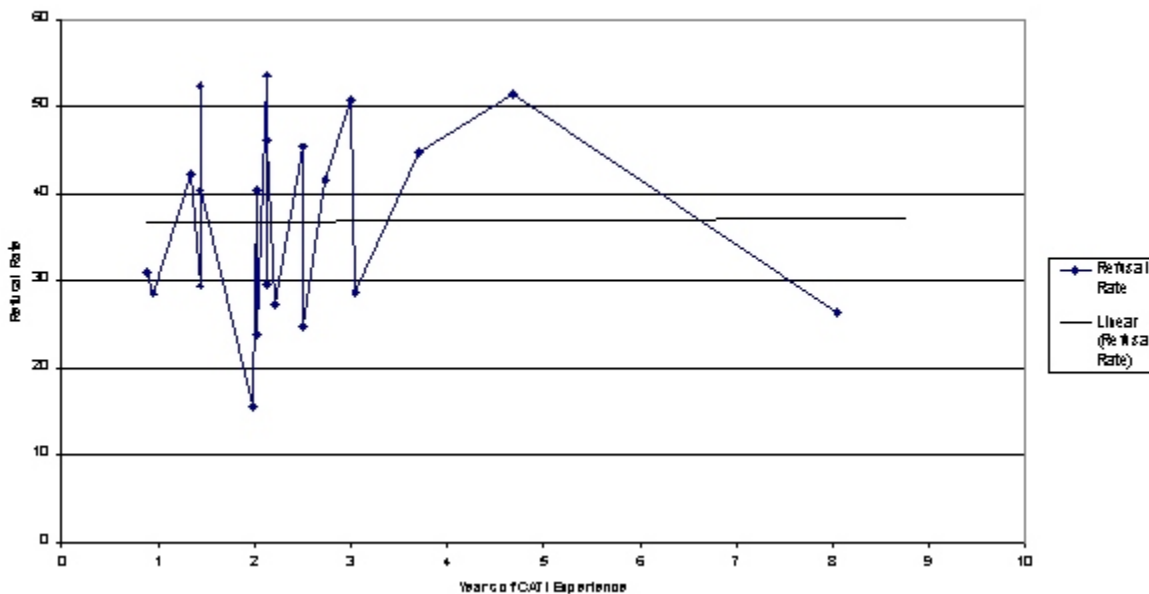
Chart 3 shows that the first contact refusal rate is fairly constant across groups, with the exception of the supervisors. This could happen if the JTC does not randomly assign cases but uses other criteria to assign more difficult cases to supervisors. Also note that the supervisors have far fewer cases assigned to them for the first contact.

Chart 3 – First Contact Refusal Rates by Interviewer Experience



In Chart 4, we see no relationship between years of CATI experience and refusal rates in the ATUS. We calculated a Pearson’s correlation coefficient between years of CATI experience and refusal rates of 0.34 that is statistically insignificant at the 10% level.

Chart 4 -- Refusal Rates by Experience on CATI



We used statistical process control charts of interviewer refusal rates by month to determine if there were certain interviewers with outlying refusal rates. The control charts showed that the majority of interviewers with rates above the upper control limit were refusal conversion specialists and supervisors. We would expect refusal conversion specialists and supervisors to have higher refusal rates because they are assigned more difficult cases. We also identified those interviewers with refusal rates below the lower control limit in case JTC would like to debrief them in order to find out some interviewing techniques they use to keep their refusal rates low.

*4.1.2 There is a day of week and/or time of day effect in that certain days and/or times have higher or lower refusal rates.*

Overall, we do not see a strong pattern for day of week or time of day effects in refusal rates.

However, if we examine Chart 5, we see that November, December, and March have overall lower refusal rates, but do not follow a day of the week pattern different from the other months. February and April have higher refusal rates for Thursday and Saturday. There is no clear trend between day and month of contact.

Chart 5 -- Refusal Rates by Attempt Month and Attempt Day

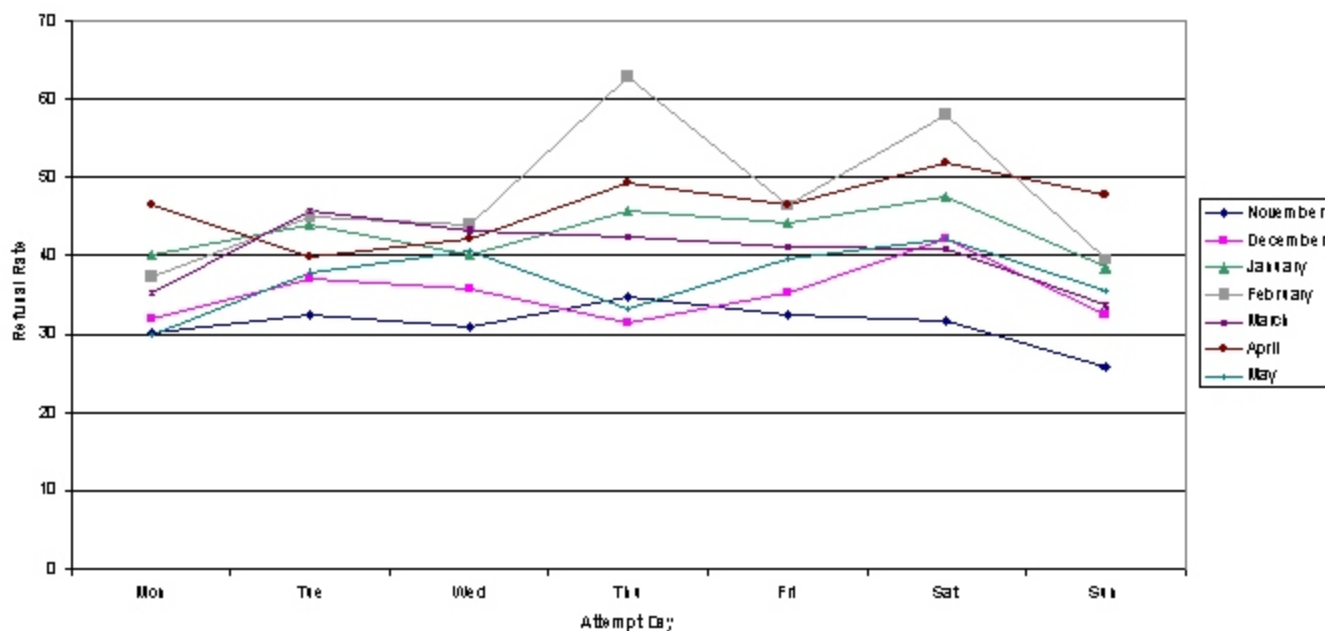


Chart 6 and Table 3 show that January, February, and April have more variable refusal rates than the other months across time of day. We see spikes and valleys at 10AM, 2PM, and 9PM. However, there is no clear trend from this chart. Chart 6A shows that there are more completed

interviews overall at 5PM, 6PM, and 7PM, where the chart measures number of completes every minute.

**Table 3 – Average Absolute Differences from the Mean for Hourly Refusal Rates by Month**

Month	Average Absolute Difference
November	3.85
December	4.48
January	7.13
February	10.42
March	6.57
April	4.70
May	5.70

Chart 6 -- Refusal Rates by Month and Time of Day

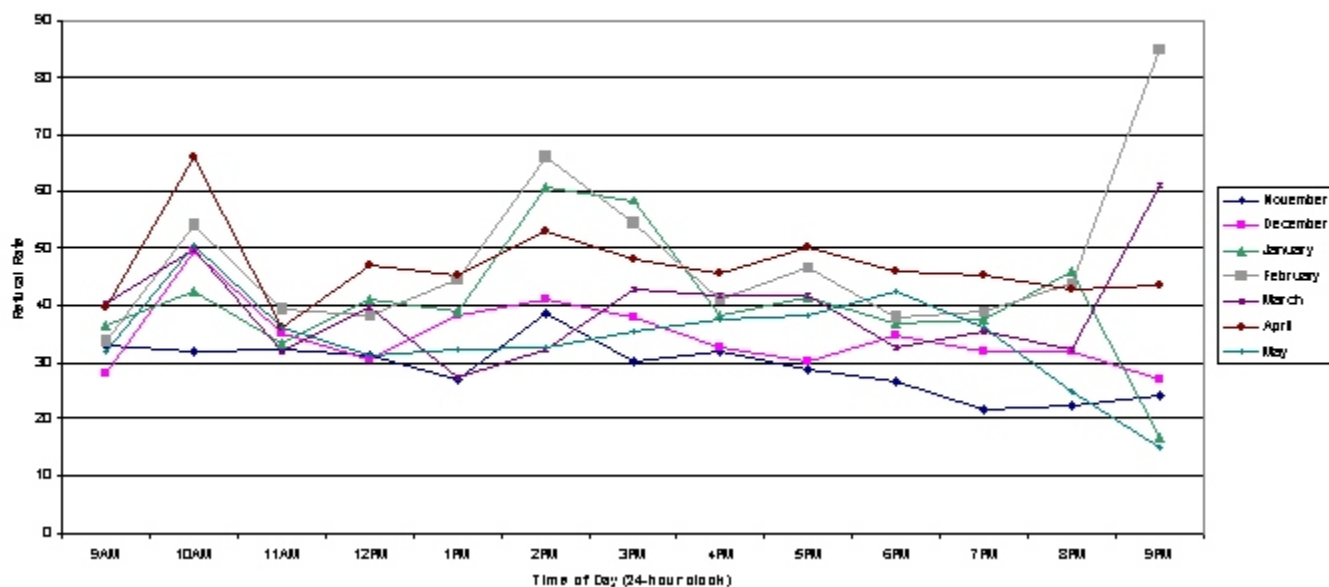
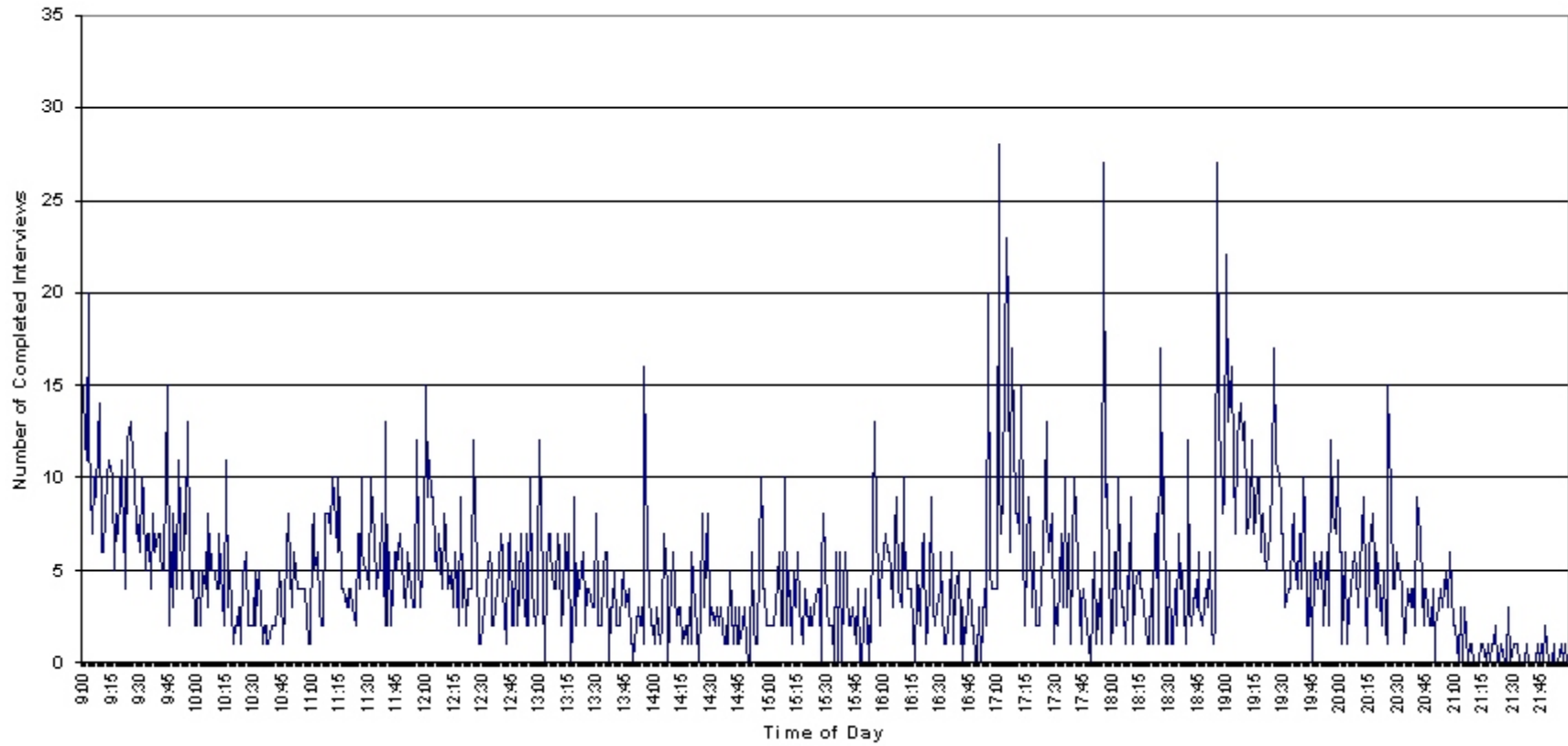


Chart 6A -- Number of Completed Interviews by Time of Day



### 4.1.3 *Logistic Regression Analysis*

Table 4 presents the coefficients from a logistic regression predicting refusals. In this model, a coefficient that has a significant positive value means that cases with that characteristic are more likely to be a refusal, holding all other factors constant. Similarly, a significant negative value means that cases with that characteristic are less likely to be a refusal, holding all other factors constant. We have two separate models with the same covariates – one model with cases from November-December (the pre-fielding period) and one model with cases from January-May (the production period).

If we compare the two models, we see that in both models there is a significant interviewer effect. All interviewers, except the supervisors, are more likely to have completions than the original interviewers. This may be due to the assignment of more difficult cases to more experienced interviewers. The supervisors are more likely to have refusals than the original interviewers. In January-May, there are more significant time of day and day of week effects than in November-December, even after controlling for interviewer effects and respondent demographics. However, the coefficients are quite small for both of these effects.

In addition, we see that those respondents who live in a household that is missing family income from the CPS reports are more likely to refuse in the ATUS than those who reported income. This could indicate that some households are more difficult to survey – missing data in the CPS could help predict refusal in the ATUS.

<b>Table 4 – Logistic Regression Coefficients from Predicting Refusal</b>				
<b>Variable</b>	<b>November - December</b>		<b>January-May</b>	
	<b>Estimate</b>	<b>P-value</b>	<b>Estimate</b>	<b>P-value</b>
Intercept	0.02	0.82	0.60	0.00***
<b>Operational Characteristics</b>				
Respondent				
CPS Designated Person	-0.04	0.22	-0.04	0.03**
Non-CPS Designated Person	---	---	---	---
Respondent Time of Day				
9-10AM	-0.33	0.00***	-0.22	0.00***
10-11AM	0.18	0.12	0.34	0.00***
11AM-12PM	0.15	0.16	-0.24	0.00***
12PM-1PM	0.01	0.94	-0.04	0.52
1-2PM	0.25	0.04**	-0.11	0.11
2-3PM	0.49	0.00***	0.19	0.01**
3-4PM	0.12	0.36	0.17	0.02**
4-5PM	0.14	0.25	0.03	0.62
5-6PM	0.04	0.70	0.21	0.00***
6-7PM	0.00	1.00	-0.07	0.25
7-8PM	-0.14	0.15	-0.01	0.82
8-9PM	-0.26	0.04**	-0.25	0.00***
9-10PM	---	---	---	---
Attempt Day of Week				
Monday	-0.05	0.41	-0.15	0.00***
Tuesday	0.18	0.05*	-0.05	0.28
Wednesday	---	---	---	---
Thursday	-0.04	0.69	0.07	0.13
Friday	0.12	0.20	0.10	0.04**
Saturday	0.06	0.49	0.20	0.00***
Sunday	-0.22	0.00***	-0.11	0.00***
Interviewer Group				
Original Interviewers	---	---	---	---
New Interviewers	-0.50	0.00***	-0.49	0.00***
Coach	-1.75	0.00***	-0.76	0.00***
Unknown	-0.06	0.73	0.43	0.00***
Refusal Converters	-0.19	0.05**	-0.22	0.00***
Supervisors	3.11	0.00***	1.73	0.00***
<b>Demographic Characteristics of the Sampled Person</b>				
Gender				
Male	-0.01	0.80	0.03	0.10
Female	---	---	---	---
Age				
15-25	-0.13	0.10*	-0.02	0.59
26-60	0.09	0.08*	0.07	0.01**
61+	---	---	---	---
Education				
Less than High School	0.01	0.92	0.12	0.00***

<b>Table 4 – Logistic Regression Coefficients from Predicting Refusal</b>				
<b>Variable</b>	<b>November - December</b>		<b>January-May</b>	
	<b>Estimate</b>	<b>P-value</b>	<b>Estimate</b>	<b>P-value</b>
High School Graduate or Some College	0.15	0.00***	0.02	0.34
College Graduate or More	---	---	---	---
<b>Race</b>				
White/Other	-0.09	0.06*	-0.26	0.00***
Black	---	---	---	---
<b>Family Income</b>				
Not Missing	-0.44	0.00***	-0.45	0.00***
Missing	---	---	---	---

\*= $p < 0.1$ , \*\*= $p < 0.05$ , \*\*\*= $p < 0.01$



## 4.2 Noncontacts

The noncontact rate is defined as:

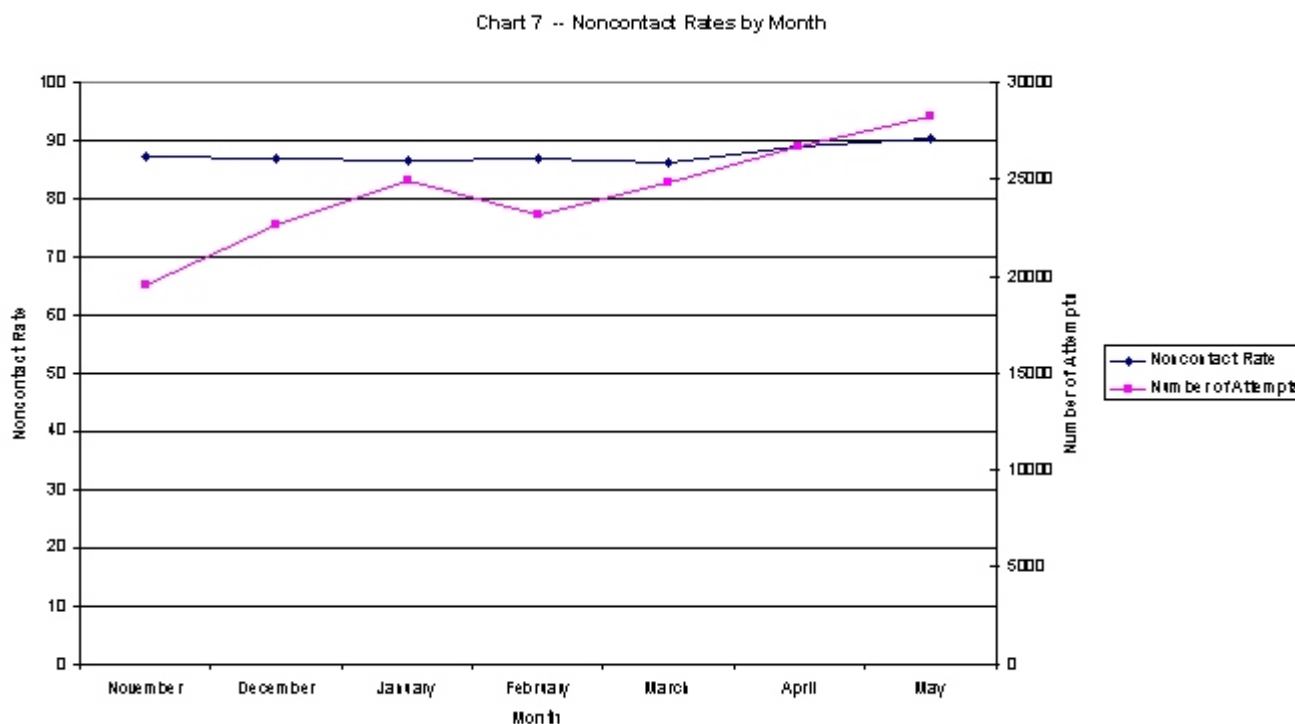
$$\text{Noncontact Rate} = \frac{NC}{I + P + R + NC + \text{Other} + \text{Unknown}}$$

where  $NC = \text{Noncontact}$

For the majority of this section (unless otherwise stated) the noncontact rate is calculated for calls, not for cases. There can be multiple calls for a case.

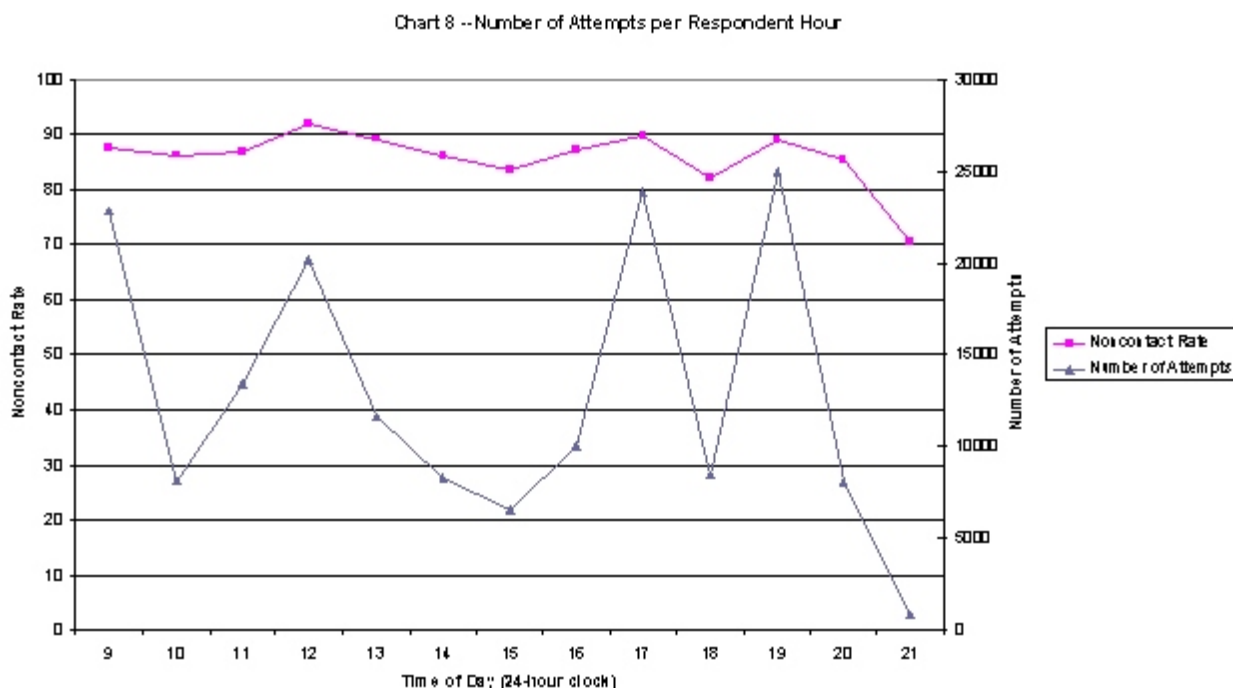
### 4.2.1 Too few attempts are being made over time, causing a higher noncontact rate.

Chart 7 shows that, with the exception of February, the number of contacts has steadily increased during the ATUS, but the noncontact rate stayed steady until April and May. However, there is not a strong relationship between the number of contacts and the noncontact rate.

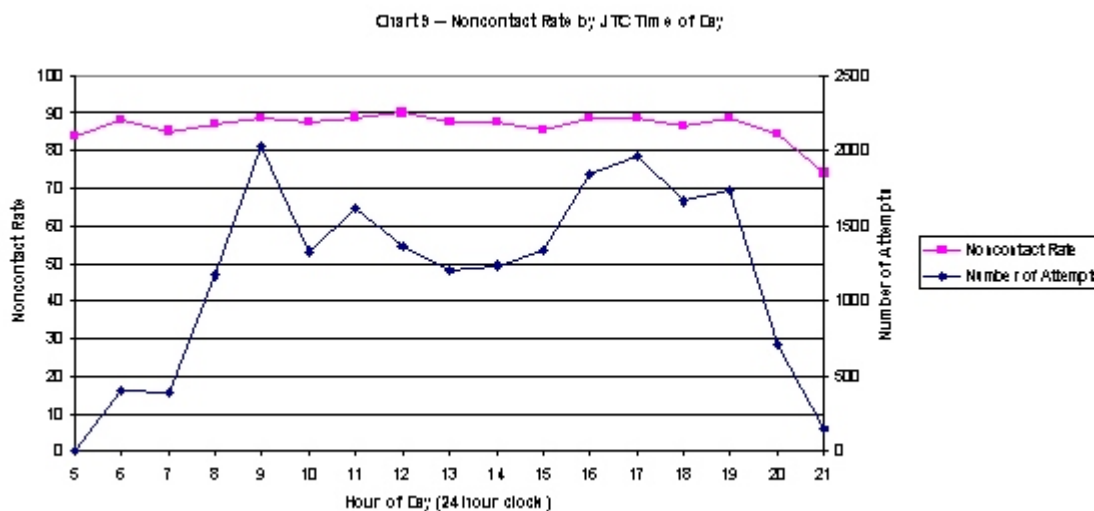


### 4.2.2 Call attempts are not being made at optimal higher-contact times, causing a higher noncontact rate over time.

Looking at the call attempts per respondent hour, we see several trends. First, we see little relationship between the number of attempts and the noncontact rate. Second, we see peaks at the 9AM, noon, 5PM, and 7PM time slots. Similarly, we see valleys at 10AM, 3PM, and 6PM. This could be due to the way the call scheduler at JTC is programmed to operate.



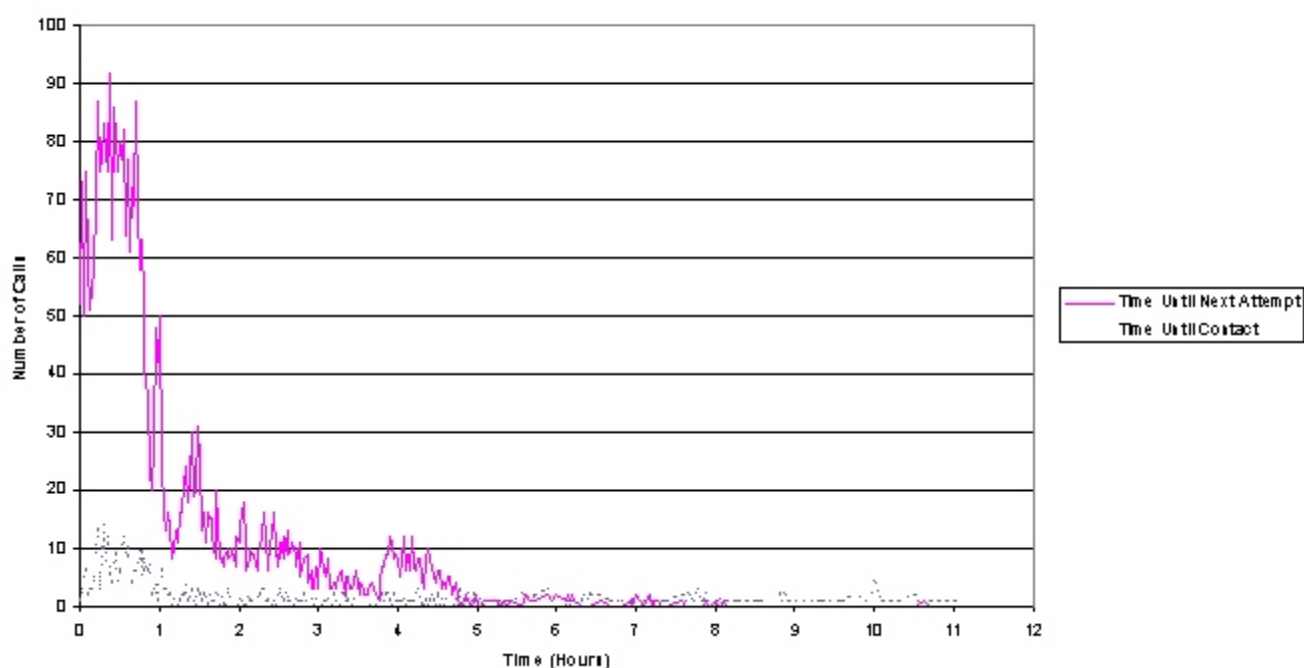
Next if we examine the number of attempts per JTC hour (the hour the call was attempted at the JTC) we also see some peaks and valleys with similar contact rates. Therefore, we can conclude that if the number of attempts were more constant, then we may see more contacts being made throughout the day. We also see a sharp drop in attempts at 8 PM and later (data for 9PM to midnight are not shown here).



#### 4.2.3 *The call scheduler is not reattempting busy signals quickly when we suspect that a person is home.*

The majority of busy calls are reattempted within 1 hour of the busy signal (see Chart 10). Approximately one-fifth of these results in a contact, which is more than one would expect choosing a random time since the overall contact rate for this survey is low. This concurs with the theory that we would expect someone to be at home soon after a busy signal and should reattempt contact.

Chart 10 -- Number of Calls by Time Until Next Attempt and Next Contact After a Busy Signal



#### 4.2.4 *Logistic Regression Analysis*

In the logistic regression analysis below, we are predicting contact. Therefore, a positive coefficient means a household with those characteristics is more likely to be contacted, holding all other covariates constant. Likewise, a negative coefficient means a household with those characteristics is less likely to be contacted. We have two models with the same covariates – one for pre-fielding (November-December) and one for production (January-May).

Table 5 shows that in January through May, people are less likely to be contacted in the morning. This could be due to the fluctuating call patterns that we saw previously. Next, we notice that in both prefielding and production, people were less likely to be contacted during the week than on weekends, most likely due to at home patterns. When we examine the demographic

characteristics, we see that answering the CPS family income question is not highly significant in both models as it was in the model predicting refusals. This is not unexpected since missing data could be showing a tendency to not want to answer rather than being difficult to contact. In addition, we see that younger people and black people are less likely to be contacted. Younger people are more likely to be out of the house at jobs during the majority of the day.

## 5 *Conclusions and Recommendations*

Based on our results, there is not a simple solution that would raise the ATUS response rates. However, from this analysis, we can see patterns that may assist in designing a solution. These include:

- **Using CPS interview characteristics to pre-determine difficult cases** – Households missing the CPS income variable are more likely to be refusals. This may indicate a general trend towards reluctance to participate in a survey. Therefore, these cases could be targeted and sent to refusal conversion specialists from the start. Alternatively, a measure of reluctance could be developed based on several missing variables within the CPS that could indicate a household's reluctance to participate.
- **Call patterns during the day** – The number of attempts during the day are variable with the same contact rate. Since the contact rate is currently constant throughout the day, we may see more contacts if we have a more equal number of calls spread throughout the day.

6      *References*

Groves, Robert M and Couper, Mick, *Nonresponse in Household Surveys*, John Wiley and Sons, 1998.

<b>Table 5 – Logistic Regression Coefficients from Predicting Contact</b>				
	<b>November - December</b>		<b>January-May</b>	
<b>Variable</b>	<b>Estimate</b>	<b>P-value</b>	<b>Estimate</b>	<b>P-value</b>
Intercept	-2.0545	0.0001***	-1.8799	0.0001***
<b>Operational Characteristics</b>				
Respondent Time of Day				
9-10AM	0.0662	0.1277	-0.2572	0.0001***
10-11AM	0.0739	0.1881	-0.0779	0.0457**
11AM-12PM	-0.0771	0.1137	-0.126	0.0001***
12PM-1PM	-0.3128	0.0001***	-0.7286	0.0001***
1-2PM	-0.1802	0.0011***	-0.3339	0.0001***
2-3PM	-0.1425	0.0218**	0.0585	0.1064
3-4PM	0.2077	0.001***	0.2395	0.0001***
4-5PM	0.00906	0.8734	-0.1007	0.0043***
5-6PM	-0.117	0.0091***	-0.3727	0.0001***
6-7PM	0.2522	0.0001***	0.3994	0.0001***
7-8PM	-0.0563	0.1944	-0.2868	0.0001***
8-9PM	-0.1354	0.0163**	0.2837	0.0001***
9-10PM	---	---	---	---
Attempt Day of Week				
Monday	0.0498	0.0888*	-0.0982	0.0001***
Tuesday	-0.0631	0.1382	0.0371	0.1422
Wednesday	---	---	---	---
Thursday	-0.0706	0.1079	0.0279	0.2561
Friday	-0.1174	0.0098***	-0.1168	0.0001***
Saturday	0.1132	0.0056***	0.1497	0.0001***
Sunday	0.1592	0.0001***	-0.0481	0.0156**
<b>Demographic Characteristics of the Sampled Person</b>				
Gender				
Male	-0.066	0.0001***	-0.0957	0.0001***
Female	---	---	---	---
Family Income				
Not Missing	0.0543	0.0105**	-0.0113	0.3441
Missing	---	---	---	---
Age				
15-25	-0.4351	0.0001***	-0.4719	0.0001***
26-60	-0.1635	0.0001***	-0.1987	0.0001***
61+	---	---	---	---
Education				
Less than High School	-0.0341	0.2218	0.00151	0.9267
High School Graduate or Some College	-0.0467	0.0215**	-0.0664	0.0001***
College Graduate or More	---	---	---	---
Race				
White/Other	0.2865	0.0001***	0.2902	0.0001***
Black	---	---	---	---