APPENDIX B
TAXONOMY METHODS

TAXONOMY METHODS

In order to make predictions about property values and what factors cause them to differ among geographic areas, it is first necessary to understand the nature of housing markets and the variation in factors which may affect property values. Classification of areas by type is a first step. The reasons for classification are well-stated in an article by Green et al. (1967) which quotes Sokal, an entomologist:

> "Classification is one of the fundamental concerns of science. Facts and objects must be arranged in an orderly fashion before their unifying principles can be discovered and used as a basis for prediction. Many phenomena occur in such variety and profusion that unless some system is created among them, they would be unlikely to provide any useful information."

Numerical taxonomy is a term used for classification using mathematical techniques based on multiple dimensions, as described by Green. Here, we used techniques of numerical taxonomy to define city and tract types in the Bay Area and to assign cities and census tracts to categories. The procedures used provide a formal basis for selection of a stratified sample of census tracts used in the survey and regression analyses.

Cluster and Factor Analysis

Cluster analysis was used to group cities and tracts in the Bay Area according to type. The purpose of cluster analysis is to identify "similar" entities where the entities may be defined in terms of a vector of characteristics. Unlike techniques such as discriminant analysis (Green, Frank, and Robinson, 1967), it is not known in advance how many "natural groupings" of the data exist or to which groups entities belong. Thus, the cluster analysis both defines types and assigns entities to types.

The intuitive notion of a cluster is a group of entities in which individuals are more similar to each other than to the entities of other clusters. "Similarity" is a subjective judgment by its nature. Thus, clustering is basically a subjective, rather than objective, set of procedures.

Steps in a cluster analysis are: determination of variables to use in cluster analysis, determination of the scaling and weighting of these variables, determination of a measure of similarity, choice of a computational technique, and determination of a desired number of clusters using the technique. As Green et. al. (1967) note, the success of a cluster is determined by its ability to predict behavior of the entities involved in the clustering.

Several alternative objective measures of similarity have been utilized: distance measures, correlation measures, and similarity measures based on the number of attributes for which entities are alike. The most

usual measure is based on Euclidean distance, i.e., if x_{ij} denotes the level of attribute i (for example, median income) possessed by entity j (for example, a tract), the distance between tracts j and k over all attributes is given by

$$d^2_{kj} = \Sigma_i (x_{ij} - x_{ik})^2$$

The distance of an entity to the center of the cluster to which it belongs is given by

$$d^2_{iC} = \Sigma_i (x_{ij} - v_{i,c})^2$$

where $v_{i,C}$ denotes the mean value of attribute i for cluster C. Clearly, this distance measure is related to standard deviations.

The distance between cluster centers C and D is given by

$$d^2_{CD} = \Sigma_j (v_{j,C} - v_{j,D})^2$$

If the variance-covariance matrix is diagonal, then this distance measure is directly related to a test of equality of a vector of means by Hotellings' T^2. Such a test could be used to test whether two groups differed according to their mean characteristics.

The squared error (SE) associated with a set of clusters $[C_k]$ of the data is given by

$$SE = \Sigma_{C_k} \Sigma_{j \in C_k} (x_{ij} - v_{i,C_k})^2$$

This error decreases as the number of clusters increases.

It is clear from the definition that scaling will affect the distance measure. For example, if tract median income and population growth rate are two variables to be used in clustering and income is in thousands while growth rate is in decimals, then income will dominate the definition of similarity. If many variables are used, some of which are highly correlated, then more weight will be given to the sets of variables for which there are more correlated measures.

A suggested procedure to correct for both the scaling and correlation problems is first to use factor analysis on the variables used in clustering. This produces a smaller set of variables (factors) which are maximally uncorrelated, and have unit variance and mean zero. An added advantage of factor analysis is that the fewer number of variables involved makes it easier to describe the clusters which are produced.

Past Studies

The procedure of factoring and clustering was used by Tryon (1955, 1968) to cluster the tracts in San Francisco. Based on data from the 1940

Census, Tryon utilized 33 variables to produce 3 factors. The factors used in this study were interpreted as family life, socioeconomic achievement, and assimilation (ethnic mix). These factors produced eleven clusters of tracts from 243 tracts of San Francisco and East Bay. It was shown that clustering based on the 1940 Census was highly predictive of neighborhood clusters in 1950; also the clusters were highly predictive of voting patterns in the Roosevelt presidential election, voting in local elections, and voting concerining taxation.

In a study by Green, Frank, and Robinson (1967), 88 cities were clustered into 18 types. A set of 14 city characteristics were reduced to two factors, "city size" and demographic composition. The purpose of this study was to select test markets; as they describe, cities most typical of each cluster can be identified using the closest to the cluster centers.

Another study by Kernan and Bruce (1972) suggested use of cluster analysis at the tract level for a sample design to analyze consumption pattern differences within a community. They suggest use of clustering based on variables important to sampling. They used six socioeconomic variables to produce five clusters from 17 tracts in Hamilton County.

These past studies which performed analyses similar to the type performed here support the usefulness of the clustering technique. Also the type of factors used and the number of clusters produced in these studies provide some guideline for this study. As these studies illustrate, the appropriate number of clusters to be produced by a computational method is not based on an objective criterion; the appropriateness depends on the type of predictions which are to be made from clustering.

Computation

There are several routines available for clustering. One type is hierarchical. This method starts with each entity in its own cluster. (The sum of squared errors is initially zero.) The closest two entities are then grouped; the next closest entity is then assigned to a group and so on. One criticism of this approach (Everett) is that entities which are poorly classified at an early stage may not be reassigned. Another problem is that it may be computationally difficult when the number of entities is large.

Here, we have chosen to use a nonhierarchical procedure. In this approach, the initial cluster contains all entities (for maximal total squared error initially). This cluster is then "split" into two clusters, four clusters, etc. Clusters may also be recombined ("lumping"). The program used is called ISODATA (Duds and Hart) and was written at SRI. "It allows as many splitting and lumping operations as desired and so allows the researcher to explore alternative groupings. Another advantage of this type of approach is that it can handle large numbers of entities. The total squared error of clustering is reduced as the number of clusters increases through splitting. To determine an appropriate number of clusters, the total squared error may be plotted against the number of

groups . When the relation between error and number of groups becomes "flat," there is little more explanatory power to be gained by continuing to differentiate groups.

APPENDIX C

AIR QUALITY SURVEY FORM

May, 1980

AIR QUALITY SURVEY

SRI227

INTRODUCTION

Hello, I'm _____ from The Public Sector, Inc. We're conduction a survey for SRI International (formerly Stanford Research Institute) about people's impressions and attitudes about air quality in this area. As you my know, air pollution can cause health problems or affect your daily activities in a number of ways.

We would like to talk with you for about 30-40 minutes. If you participate and complete the interview, we will give you $5.00 for your time.

(IF BUSY NOW OR REFUSAL, SCHEDULE CALL BACK)

S1. Do you or does someone else living in your household own this house or is it a rental unit?

Owned house---CONTINUE
Rental Unit---TERMINATE

S2. Is the owner of this house only you, you and some one else, or only someone other than yourself?

Only you---CONTINUE
You and someone else--ASK s3
Only someone else--ASK s4

S3. Are the owners of the house all males, all females or both males and females?

All Males--- INTERVIEW EITHER MALE
All Females--- INTERVIEW EITHER FEMALE
Both Male and Female--CHECK STAMPED ID NUMBER.

IF LAST DIGIT IS ODD INTERVIEW ANY MALE.

IF LAST DIGIT IS EVEN INTERVIEW ANY FEMALE.

S4. May I speak to one of the owners of this house? IF RESPONDENT SAYS OWNERS DO NOT LIVE IN HOUSE---TERMINATE

WHEN OWNER COMES TO DOOR ASK 53.

[Q1] 1. In general, how aware would you say you are of the air quality in the city where you live? First, let me tell you a little bit about air quality: There are 2 things that go together to make air quality - visibility and health.

Visibility deals with the color of the sky and how far you can see on days without rain, fog, or clouds.

Health effects may be caused by chemicals in the air which are not necessarily visible.

(HAND RESPONDENT CARD A) Please look at this card and choose one of the categories on it for your answer.

1 Not aware at all
2 Not very aware
3 Quite aware
4 Extremely aware

2. Have you ever noticed a pollution index in a newspaper or on the radio or television?

1 No

2 Yes Could you describe what you've seen, read or heard?

(PROBE) _____

_____

(INTERVIEWER RATING OR RESPONDENT'S DESCRIPTION:)

1 Has only a vague idea
2 Has general knowledge
3 Has specific knowledge

3. Overall, how would you describe the quality of the air here in this city? Would you say it's poor, fair, good, or excellent?

1 Poor
2 Fair
3 Good
4 Excellent----SKIP TO Q.6
9 Have no idea

4. Do you think the air quality here in this city should be improved, or do you think it's okay as it is now?

1 Air quality should be improved----ASK Q.5

2 Air quality is okay as it is ---SKIP TO Q.6

9 Have no idea

5. (IFAIR QUALITY SHOULD BE IMPROVED) How strongly would you say you feel about this? (HAND RESPONDENT CARD B) Choose one of the categories on this card for your answer.

1 Not strongly at all
'2 "Not very strongly
3 Quite strongly
4 Extremely strongly

6. Visibility problems in the Bay Area may be caused by humidity or moisture in the air as well as pollutants. Here, we want to know your impressions of days when visibility problems are due to pollution.

Here are 3 sets of photographs for typical scenes around the Bay Area. This set (POINT TO THE "CLEAR" SET) shows a day on which the visibility is considered to be good. This second set (POINT TO THE "MODERATE" SET) shows a day on which the visibility is not c onsidered to be very bad but not very good either. The third set (POINT TO THE "POOR" SET) shows a day which the visibility is considered to be poor.

Thinking back over the past year, which of these sets of pictures comes closest to showing what the visibility was in this city on <u>most</u> days when it was not cloudy, foggy, or raining.

<u>MOST</u> DAYS WERE:

1 Closest to the "clear" pictures
2 Closest to the "moderate" pictures
3 Closest to the "poor" pictures

7. Now I'd like you to think about the number of days per month when the visibility in this city is like it is in <u>each</u> of these pictures. We'll start with these past winter months of December, January and February. What I'd like you to do is give me your estimates of the number of days per month--for December, January and February--when the visibility was like it is in each of these pictures. Visualize in your mind, about how often the visibility was like each of these pictures? The total should add up to 30.

(HAND RESPONDENT CARD C) You can use this card as a worksheet. First of all, on about how many days per month was it like the "poor" pictures? (ENTER ESTIMATE ON CARD) On how many days was it like these "clear" pictures? (ENTER ESTIMATE ON CARD AND DETERMINE HOW MANY MODERATE DAYS THERE

MUST BE FOR THE NUMBERS TO ADD TO 30) That leaves ___ days that are like these moderate Pictures. Does that sound right to you? (MAKE ADJUSTMENTS AS NECESSARY AND THEN PROCEED THROUGH OTHER SEASONS. ENTER NUMBERS BELOW ONLY AFTER TASK IS COMPLETED FOR ALL SEASONS.)

Now what abut the fall months of September, October and 'November? The summer months of June, July and August? The spring months of March, April, and May?

	WINTER	FALL	SUMMER	SPRING
a. Days with poor visibility	[7AW]	_____	_____	_____
b. Days with moderate visibility	[7BW]	_____	_____	_____
c. Days with no visual pollution	[7CW]	_____	_____	_____
TOTALS	30	30	30	30

8. During the day are you mostly indoors or outdoors?

1 Indoors
2 Both about the same
3 Outdoors

9. Now I'd like to ask about the visibility at your place of work if you're employed outside the home? Are you employed outside the home?

1 NO ----SKIP TO Q.12
2 YES ----ASK Q's 9-11

10. Do you work in a different city from your place of residence?

1 No
2 Yes

If yes, what city do you work in? (IF TWO JOBS, TAKE THE ONE WHERE THE RESPONDENT SPENDS MOST TIME)
CITY: _____

11. Now think about where you work. Would you say the visibility is usually better at work than at home, it is about the same or is it worse at work? (IF "BETTER" OR

"WORSE" , ASK): Would you say it is much (better/worse) at work or only somewhat (better/worse) there than at home.

1 Much worse at work
2 Somewhat worse at work
3 About the same
4 Somewhat better at work
5 Much better at work
9 Have no idea

Now I'd like to ask you some questions about your health.

12. Has a doctor ever told you that you have or had. ..(READ EACH CATEGORY) (FOR EACH CONDITION RESPONDENT SAYS "YES" TO, ASK:) Do YOU still have [CONDITION]?

(CIRCLE ONE NUMBER FOR EACH CONDITION)

	NEVER HAD	USED TO HAVE BUT DON'T NOW	HAVE NOW
a. Asthma	1	2	3
b. Bronchitis	1	2	3
c. Emphysema	1	2	3
d. Hay Fever	1	2	3
e. Other allergies to things in the air.	1	2	3
f. Tuberculosis . . .	1	2	3

13. Has a doctor ever told you that you have or had [READ EACH CONDITION]?

	NO	YES
a. Heart disease (other than heart palpitations or a heart murmur). . .	1	2
b. A stroke.	1	2
c. Lung Cancer	1	2

14a. Within the past year or so do you remember having any [READ EACH CATEGORY] at all? (BE SURE RESPONDENT IS NOT LIMITING ANSWERS TO POLLUTION-CAUSED PROBLEMS!)

14b. (IF YES), How often did you have this - seldom, not and then, or a lot?

14c . (IF YES ON 14a), How severe were/was [CONDITION] on most occasions - would you say mild, moderate, or severe?

		14a. [Q14A1]		14b. [Q14B2] FREQUENCY			14c. [Q14C1] SEVERITY		
		No	Yes	Seldom	Now and Then	A lot	Mild	Moderate	Severe
(1)	Chest pains	1	2	1	2	3	1	2	3
(2)	Trouble breathing or shortness of breath	1	2	1	2	3	1	2	3
(3)	Headaches	1	2	1	2	3	1	2	3
(4)	Coughing or chest colds	1	2	1	2	3	1	2	3
(5)	Eye irritations	1	2	1	2	3	1	2	3
(6)	Sneezing, runny nose, or nasal congestion	1	2	1	2	3	1	2	3
(7)	Nose or throat irritations (itching, soreness)	1	2 [Q14A8]	1	2	3	1	2	3
(B)	Nausea	1	2	1	2	3	1	2	3

15. Are any of these conditions any more likely to occur on smoggy days than on days when the air is clean?

1 No---- SKIP TO Q.17
9 Have no idea, not sure---SKIP TO Q.17
2 Yes -----SKIP TO Q.16

16. Which ones? (CIRCLE ALL THAT APPLY) (DO NOT READ)

YES	NO		YES	NO	
1	2	Chest pains	1	2	Eye irritations
1	2	Trouble breathing or shortness of breath	1	2	Sneezing, runny nose, or nasal congestion
1	2	Headaches	1	2	Nose or Throat irritations (itching, soreness)
1	2	Coughing or chest colds	1	2	Nausea

17. Are there others living with you in your household or do you live alone?

1 Live with others (ASK QUESTIONS 18 & 19)
2 Live alone (SKIP TO QUESTION 20)

18. To your knowledge, has a doctor ever told any others in your household that they have or had. . .(READ EACH CATEGORY) (FOR EACH CONDITION RESPONDENT SAYS "YES" TO, ASK:) Does that person/do any of those people still have [CONDITION]? (CIRCLE ONE NUMBER FOR EACH)

		Never Had	Used to Have But Don't know	Have Now	Don't Know
a.	Asthma.	1	2	3	9
b.	Bronchitis	1	2	3	9
c.	Emphysema	1	2	3	9
d.	Hay Fever	1	2	3	9
e.	Other allergies to things in the air . . .	1	2	3	9
f.	Tuberculosis	1	2	3	9

19. As far as you know, has a doctor ever told any others in your household that they have or had [READ EACH CONDITION]?

		No	Yes	Don't Know
a.	Heart disease (other than heart palpitations or a heart murmur)	1	2	9
b.	A stroke	1	2	9
c.	Lung cancer	1	2	9

20. Do you smoke cigarettes?

1 No----- (SKIP TO QUESTION 23)
2 Yes---- (ASK QUESTIONS 21 & 22)

21. About how many cigarettes do you usually smoke per day?

1 Less than 1 pack (less than 20)
2 About 1 pack (20-30)
3 About 2 packs (31-40)
4 More than 2 packs (over 40)

22. How long have you smoked cigarettes? (HAND RESPONDENT CARD D)

1 Less than 1 year
2 1 - 2 years
3 3 - 5 years
4 6 - 10 years
5 More than 10 years

As you may know, not all air pollution is visible. There are some days when the visibility is good but the air is still polluted by chemicals that can have negative effects on health. Just the opposite happens too. Some days can look quite smoggy and yet not be very bad for your health. Of course, there are also days that both look smoggy and are bad for your health. For this reason, the Environmental Protection Agency has developed a rating system for air pollution in terms of possible health effects.

Here is a card which describes this index and the possible health effects corresponding to levels of air quality. (HAND RESPONDENT

CARD E) Not all persons are equally affected on polluted days. On the same day, some people may experience no effects while others may be severly affected.

23. On what type of day (that is a moderate day, an unhealthy day, a very unhealthy day or a hazardous day) would you first notice mild health effects?
By'mild we mean effects which are effects which are annoying but do not interfere with your normal daily activities?

notypeofday 1
moderate. 2
unhealthy . , ... 3
very unhealthy 4
hazardous 5
all types of days 6
no idea 9

24. On what type of day would you first notice health effects which would restrict your normal daily activities but not confine you to bed?

notypeofday 1
moderate. 2
unhealthy 3
very unhealthy 4
hazardous 5
all types of days 6
no idea 9

25. On what type of day would you first notice health effects which are severe enough to greatly restrict your daily activities and might possibly confine you to bed?

notypeofday 1
moderate. 2
unhealthy 3
very unhealthy 4
hazardous 5
all types of days 6
no idea 9

I'd like to show you what kind of air quality this area has. (SELECT APPROPRIATE HEALTH EFFECTS/VISIBILITY CARD) This card shows the approximate number of days at each of the health effects levels on the card you looked at a few minutes ago (POINT TO CARD E), and the approximate number of days of different visibility levels. Remember the photographs we looked at earlier, with the poor, moderate and clear visibility (POINT TO PHOTOS).

This card (HEALTH/VISIBILITY) shows that in terms of visibility you have about ____ days per year with no visual pollution, ____ days of moderate visibility, and ____ days of poor visibility. In terms of

health effects, there are about ____ clean days per year, ____ moderate days, ____ unhealthy, ____ very unhealthy, and ____ hazardous days.

26. Air quality in the Bay area could become better or worse depending on whether we undertake certain actions. Suppose we could improve air quality but it would cost money. We might pay a monthly bill to the Bay Area Air Quality Management District to improve air quality in all areas. What would you be willing to pay per month to keep the area here - as it is shown on card "AREA ____" from becoming like that in area E (which is the worst air quality in the Bay Region). Card G here gives you some ideas of amounts, but you can choose any dollar amount you wish. (PUT RESPONDENT 'S AREA CARD AND CARD # SIDE BY SIDE AND POINT OUT SIMILARITIES AND DIFFERENCES.)

I'd like you to make 3 assumptions when you do this. First, assume that you could not avoid the issue by moving away from here. Second, assume that everyone in the Bay Area would contribute to achieving air quality improvements. Third, assume that improvements would occur in all areas of the Bay Region.

(FOR AREA A:) Here is an area that has better air quality than here. (POINT OUT SIMILARITIES AND DIFFERENCES) What would you pay per month to improve the air from what it is now to what is shown on this card? (REPEAT FOR AREAS D, B, C ASKING HOW MUCH YOU PAY TO IMPROVE, LIKE BETTER CARD, OR KEEP FROM BEING LIKE WORSE CARD, AS APPROPRIATE).

Area	$Payment per month
A	[Q26A]
B	_____
C	_____
D	_____
E	_____

We would like to know what you would pay to prevent the air quality from becoming worse than it is in any area in the Bay Area today. Here is another card (HAND RESPONDENT CARD F) which shows you the air quality for an area outside the Bay Area. Please tell me how much you would pay to keep your city from becoming like area F.

Area F $Payment per month [Q26F]

27. One approach being considered to reduce current levels of air pollution is an annual inspection and maintenance program for passenger cars. In this program, all car owners would be required to take their car to an inspection station once per year. At this station, all pollution control equipment would be checked to determine if it is working properly. It is

estimated that the inspection test would cost $11. In addition, you could expect to pay an average of about $32 for repairs. However, as long as your car has pollution control devices, the maximum you would be charged for repairs would be $50 (or $61 total). The result of this program--if every car in the Bay Area were inspected--would be a 15% reduction in automobile emissions. (HAND RESPONDENT CARD H) This card summarizes what I've just said. Please read it and then tell me whether you think you would be in favor of or against this program.

1 Against _____
2 In favor RECORD REASONS FOR SUPPORT OR OPPOSITION (IF STATED):
9 Have no idea _____

Now we'd like to know about some features of your current house.

28. Is your house . . . (READ CATEGORIES)

1 A single family house (detached from other houses)
2 A duplex or triplex (two or three attached units side by side)
3 A condominium
4 Other (Please specify) _____

29. How many bedrooms and bathrooms does it have? (FILL IN)

_____ Number of bedrooms
_____ Number of bathrooms

30. Does it have a . . . (CIRCLE ONE FOR EACH ITEM)

No	Yes	
1	2	Separate family room
1	2	Separate dining room
1	2	Fireplace
1	2	Below-ground swimming pool
1	2	Garage (not a carport)
1	2	A view of the foothills or bay

31. Approximately how many square feel of living area (including halls, entry ways, etc.) does your house have? (READ CATEGORIES AND CIRCLE ONE)

1 Less that 1000 square feel
2 1000 - 1999 square feel
3 2000 - 2999 square feel
4 3000 square feet or more
9 Have no idea

32. Which one of these statements best describes traffic conditions

in your neighborhood? (HAND RESPONDENT CARD I) (CIRCLE ONE)

1 No thru traffic; my street is almost never used for thru traffic by people who don't live here

2 Light traffic; my street is occasionally used for thru traffic by people who don't live here

3 'Medium traffic; my street is frequently used for thru traffic by people who don't live here

4 Heavy traffic; my street is constantly used for thru traffic by people who don't live here

33. What form of transportation do you use most often to get to your job? (CIRCLE ONE) (Use husband's job if wife unemployed; use job farthest away if both employed.)

1 Motor vehicle (car, van, motorcycle, etc.)
2 Bus or train
3 Bicycle or walking
4 Motor vehicle + bus/train
5 Bicycle/walking + bus/train
6 Other
8 Doesn't apply: retired, unemployed, etc.

34. How much time does it take you (or spouse) to get to work? (CIRCLE ONE)

1 Less than 15 minutes
2 15 - 30 minutes
3 31 - 45 minutes
4 More than 45 minutes

35. HAND RESPONDENT CARD J) On this card are listed monthly mortgage payments. We realize that you might not remember the exact amount, but please tell me the number which most closely describes your monthly mortgage payment. (CIRCLE ONE)

01	No mortgage payments	11	$ 1000- 1199
02	$ 100 - 200	12	1200 - 1399
03	200 - 299	13	1400 - 1599
04	300 - 399	14	1600 - 1799
05	400 - 499	15	1800 - 1999
06	500 - 599	16	2000 - 2299
07	600 - 699	17	2300 - 2599
08	700 - 799	18	2600 - 2899
09	800 - 899	19	2900 - 3199
10	900 - 999	20	3200 or more

Does this amount include home insurance?

1 No

2 Yes

Does this amount include property taxes?

1 No
2 Yes

36. Approximately, what is the size of the lot your house and garage is on? (READ CATEGORIES AND CIRCLE ONE)

1 1/8 acre or less (5445 sq. ft. or roughly 50' by 100')

2 From 1/8 to 1/4 acre (5446 to 10,890 sq. ft. or roughly 50' by 100' to 100' by 100')

3 From 1/4 to 1/2 acre (10,891 to 21,760 sq. ft.)

4 More than 1/2 acre (more than 21,760 sq. ft.)

9 Have no idea

37. How would you rate the condition of your house? (READ CATEGORIES AND CIRCLE ONE)

1 Poor
2 Fair
3 Good
4 Excellent

38. What is your best estimate of the current market value of your house?

$_____ (in thousands of dollars)

999 Have no idea

39. In what year did you (or spouse) buy your house? (FILL IN)

_____

40. Approximately how many years old is your house? (HAND RESPONDENT CARD K AND CIRCLE ONE)

1 5 years or less
2 06 - 10 years
3 11 - 20 years
4 21 - 39 years
5 40 or more years
9 Have no idea

41. How many of the last 10 years have you lived in the Bay Area?

_____

In this section, we are interested in how you feel your present house compares to others you might live in. First I am going to review with you four features of your present house. (USE BLANK CARD) As I recall, you said you had ____ bedrooms, you described the traffic conditions in your neighborhood as _____, and you were minutes from work. (FILL IN BLANKS WITH APPROPRIATE RESPONSE CATEGORIES.) For the feature "Air quality", I'm going to fill in the space with "same as you have now."

Now I'm going to hand you several cards with the same features, namely number of bedrooms, traffic condition, commute time to work and air quality, but with different levels. (HAND Respondent FIRST CARD) For example, whereas your house is located ____ minutes from work, this card shows that the house you might live in is located ____ minutes from work. (CHOOSE A CHARACTERISTIC ON WHICH THE RESPONDENT'S HOUSE AND THE FIRST CARD DIFFERS.)

Please think of these cards as alternative features for your own house. Do not think of them as houses you might have to move somewhere else to live in.

I'd like you to sort these cards into three piles"

1 "better than my present house"
2 "about the same as my present house"
3 "worse than my present house"

(PUT "HEADING" CARDS DESIGNATING THREE FILES ON TABLE OR FLOOR FOR RESPONDENT.)

42. For each of these cards which you judge as "better", please rank them form most preferred to least preferred. (ALLOW RESPONDENT TIME TO RANK CARDS. DO NOT ALLOW TIES IN DOLLAR VALUES IF POSSIBLE) Now we'd like to know how much more per month you would be willing to add to your current monthly mortgage payment to live there. Please give us an answer which comes closest to what you feel you can actually afford to pay within the limits of your current income. (HAND RESPONDENT CARD L) Which dollar amount on this card represents how much more you would be willing to pay each month in addition to your current mortgage payment. Please feel free to use amounts not listed on the card (for example, $25) if they come closer to what you'd actually pay. Let's begin with your most preferred house. How much more would you be willing to pay for that one? (FOR ALL CARDS OF SAME DOLLAR VALUE, ASK:) Are you sure those are all worth the same? ENTER RANK ORDER AND DOLLAR AMOUNT NEXT TO CARD NUMBER. REPEAT FOR ALL CARDS IN "BETTER" STACK.)

43. For each of the cards you judge as "worse", please rank them form most preferred to least preferred (ALLOW RESPONDENT TIME TO RANK CARDS. DO NOT ALLOW TIES IN DOLLAR VALUE IF POSSIBLE) Now we'd like to know how much less per month than your current

monthly mortgage payment you'd be willing to pay to live there. (HAND RESPONDENT CARDM) Which dollar amount on this card represents the amount you would require be subtracted from your current mortgage on the card if they come closer to what you'd actually pay. Also notice that this card includes a category called "would not live in this house at any price" which you should use as an answer if the house of the card is completely unacceptable to you. (FOR ALL CARDS SAME DOLLAR VALUE ASK:) Are you sure those are all worth the same? (IF RESPONDENT HAS NO MORTGAGE PAYMENT, ASK:) If someone paid you to live there, how much would they have to pay you per month? (USE CARD L)

44. Now, for the cards you judge as "the same", please rank them from most preferred to least preferred. As a result of ranking these houses, do you think upon reconsideration that there are any which are better than your current house? (IF YES,) How much more would you be willing to add to your current monthly mortgage payment to live there? (ENTER RANK ORDER AND DOLLAR AMOUNT NEXT TO CARD NUMBER) As a result of ranking these houses, do you think upon reconsideration that there are any which are worse than your current house? (IF YES,) How much less per month would you be willing to pay to live there? (ENTER RANK ORDER AND DOLLAR AMOUNT NEXT TO CARD NUMBER) (ENTER "S" FOR ALL CARDS JUDGED "SAME" IN COLUMN 1)

	B=Better S=Same W=Worse	Rank Order	Dollar Amount*
CARD # 1			
2			
3			
4			
5			
6			
7			
8			
9			

* Leave blank for houses judged as "same" as current house.

These next questions will be used to help us interpret your responses about air quality. As with all your other responses, these will be kept strictly confidential.

45. About how often during the past year have you engaged in each of the following kinds of outdoor activities? (HAND RESPONDENT CARD N)

	Never	Less than 1 x/month	1-4 times per month	2-3 times per week	4-7 times per week
a. Fairly strenuous outdoor activities in or near this neighborhood. For example, jogging, tennis, volleyball, heavy gardening, and so on - activities that make you breathe hard at least some of the time.	1	2	3	4	5
b. Fairly strenuous outdoor activities near where you work.	1	2	3	4	5

46. How many persons live in your household most of the time? (Please include yourself in this number.)

1 One (Respondent only)
2 Two
3 Three
4 Four
5 Five
6 Six
7 Seven or more

47. How many persons in your household are in each of the age groups shown on this card? [HAND RESPONDENT CARD O] (ENTER A NUMBER FOR EVERY AGE GROUP)

48. May I ask what your age is? Just tell me which category you are in. [RECORD BELOW IN RIGHT HAND COLUMN]

	Q.47 Number	Q.48 Respondent's Age (CHECK ONE)
a. Less than 13 years old:	_____	
b. 13 - 17 " "	_____	
c. 18 - 30 " "	_____	_____
d. 31 - 50 " "	_____	_____
e. 51 - 65 " "	_____	_____
f. Over 65 "	_____	_____
" TOTAL: _____	_____	(BE SURE TOTAL IS THE SAME AS RESPONSE TO Q.47, ABOVE)

49. What is your marital status? (READ LIST)

1 Never married
2 Married
3 Divorced or separated
4 Widowed

50. What was the highest grade you completed in school?

1 '8th grade or less
2 9th, 10th, or 11th grade
3 12th grade (completed high school)
4 1 to 4 years of college, business or technical school
5 4 years of college (completed college, bachelor's degree)
6 Some graduate work
7 Advanced degree (e.g., MBA, LL.B., master's, doctorate, etc)

51. Are you now a student, a housewife, employed, unemployed, or retired?

1 Student
2 Housewife
3 Employed ------ 1 30 or more hours per week, or
2 Less than 30 hours per week
4 Unemployed (including looking for work)
5 Retired

52. Which of the groups on this card best describes your family's total income before taxes? Just tell me the number of the right group. [HAND RESPONDENT CARD P]

01	$ 7,000 or less	06	$25,001 -$30,000
02	$ 7,001 - $10,000	07	$30,001 - $35,000
03	$10,001 - $15,000	08	$35,001 - $40,000
04	$15,001 - $20,000	09	$40,001 - $50,000
05	$20,001 - $25,000	10	More than $50,000

53. (RECORD RACE/ETHNIC GROUP: IF UNCERTAIN, ASK:) May I ask what race or ethnic group you consider yourself to be a member of?

1 Caucasian or white (not of Spanish-speaking origin)
2 Black
3 Asian
4 Hispanic or Spanish-speaking origin
5 Other (Please specify:) _____

54. [RECORD SEX OF RESPONDENT:]

1 Male
2 Female

IN CASE MY SUPERVISOR WISHES TO VERIFY MY WORK MAY I PLEASE HAVE YOUR FIRST NAME AND PHONE NUMBER?

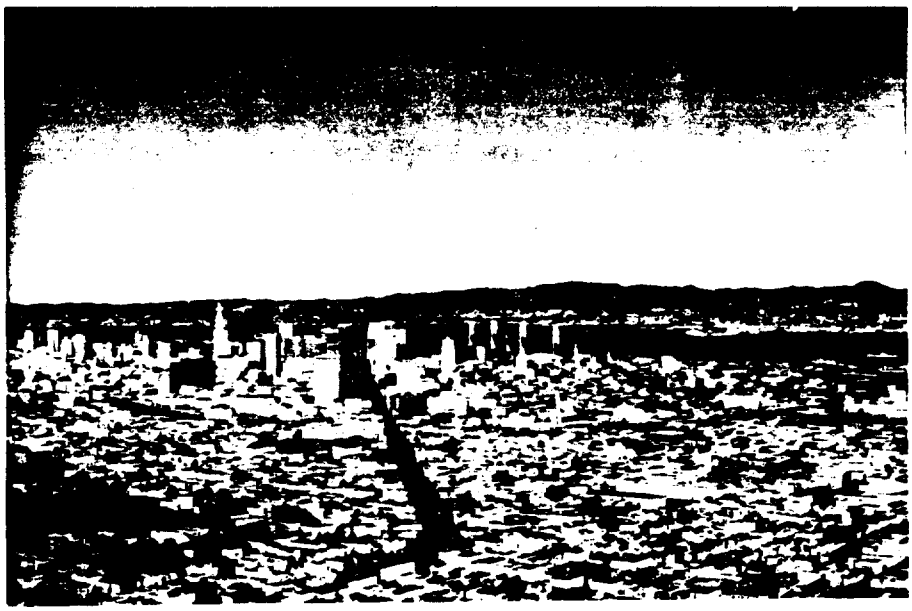
_____

_____

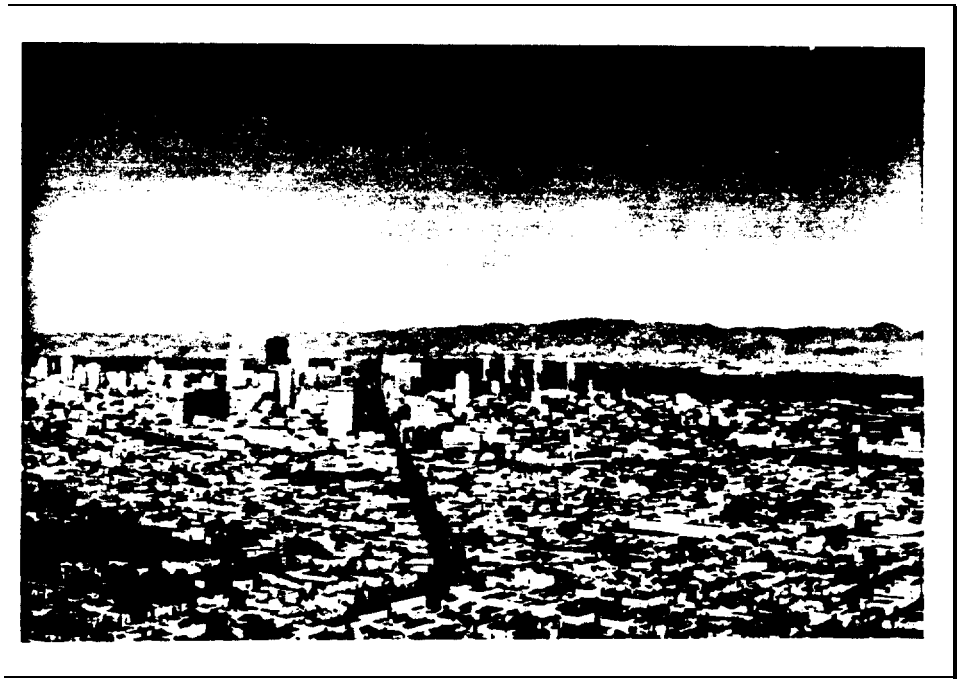
THANK YOU VERY MUCH FOR PARTICIPATING IN THIS SURVEY.

HAND RESPONDENT FEE AND LEAVE. FILL OUT RECORD SHEET IMMEDIATELY.

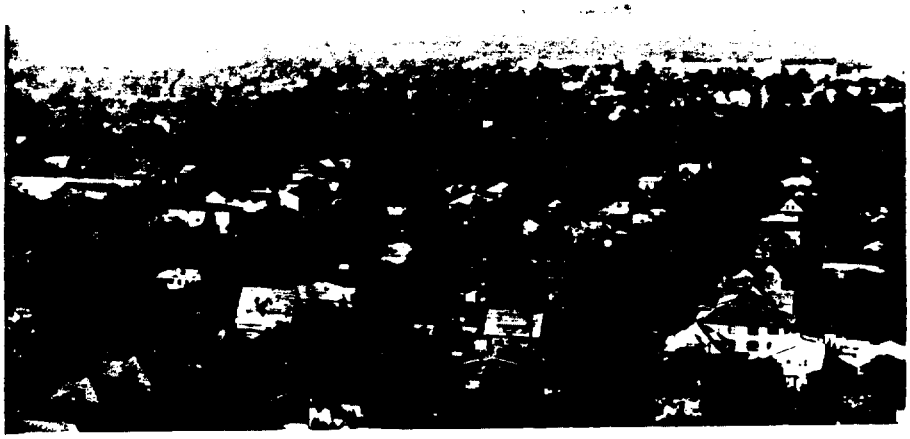
clear



moderate



poor



CARD C

DAYS PER MONTH OF DIFFERENT VISIBILITY LEVELS

VISIBILITY:	Win ter: (Dee;'J~n, Feb)	Fall: (Sep, Ott, Nov)	Summer: (June, July, Aug)	Spring: (Mar, Apr, May)
Poor days	_____	_____	_____	_____
Moderate days	_____	_____	_____	_____
Clear days	_____	_____	_____	_____
TOTALS :	30 days	30 days	30 days	30 days

CARD D

1 Less than 1 year

2 1- 2 years

3 3- 5 years

4 6- 10 years

5 More than 10 years

CARD E

Level of Air Quality	Health Effects	Likelihood of Effects and Limitations
Good	No health effects	None
Moderate	Eye irritation	Affects few persons
Unhealthful	Eye irritation Breathing problems	Affects some persons Persons with lung or heart disease should reduce physical activity
Very Unhealthful	Eye irritation Breathing problems Coughing Headaches Reduced alertness	Affects most persons Children, elderly, and persons with lung or heart disease should stay indoors and reduce physical activity
Hazardous	Eye irritation Breathing problems Coughing Headaches Reduced alertness Nausea Possible premature death for ill	Affects almost everyone Children, elderly and persons with lung or heart disease should stay indoors and avoid physical activity. General population should avoid outdoor activity.

CARD F

1 Not likely

2 Somewhat likely

3 Quite likely

4 Very likely

AREA A (GOOD HEALTH, GOOD VISIBILITY)

HEALTH	# GOOD DAYS	294	
	# MODERATE DAYS	70	
	# UNHEALTHY DAYS	1	
	# VERY UNHEALTHY DAYS	0	
	# HAZARDOUS DAYS	0	TOTAL 365
VISIBILITY	# NON POLLUTED DAYS	335	
	# MODERATE VISIBILITY DAYS	20	
	# POOR VISIBILITY DAYS	15	TOTAL 365

P. REP B (GOOD HEALTH, MOD, VISIBILITY)

HEALTH	# GOOD DAYS	294
	# MODERATE DAYS	70
	# UNHEALTHY DAYS	1
	# VERY UNHEALTHY DAYS	0
	# HAZARDOUS DAYS	0
		TOTAL 365
VISIBILITY	# NON POLLUTED DAYS	265
	# MODERATE VISIBILITY DAYS	70
	# POOR VISIBILITY DAYS	30
		TOTAL 365

AREA C (FAIR HEALTH, GOOD VISIBILITY)

HEALTH	# GOOD DAYS	232	
	# MODERATE DAYS	130	
	# UNHEALTHY DAYS	3	
	# VERY UNHEALTHY DAYS	0	
	# HAZARDOUS DAYS	0	TOTAL 365
VISIBILITY	# NON POLLUTED DAYS	330	
	# MODERATE VISIBILITY DAYS	20	
	# POOR VISIBILITY DAYS	15	TOTAL 365

AREA D (FAIR HEALTH; FAIR VISIBILITY)

HEALTH	# GOOD DAYS	232	
	# MODERATE DAYS	130	
	# - UNHEALTHY DAYS	3	
	# VERY UNHEALTHY DAYS	0	
	# HAZARDOUS DAYS	0	TOTAL 365
VISIBILITY	# NON POLLUTED DAYS	265	
	# IODERATE VISIBILITY DAYS	70	
	# POOR VISIBILITY DAYS	30	TOTAL 365

AREA E (FAIR "HEALTH, FAIR VISI[illegible] '.,

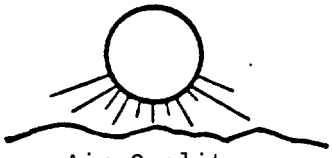
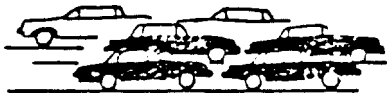
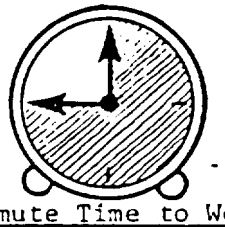
HEALTH	# GOOD DAYS	191	
	# MODERATE DAYS	150	
	# UNHEALTHY DAYS	20	
	# VERY UNHEALTHY DAYS	4	
	# HAZARDOUS DAYS	0	TOTAL 365
VISIBILITY	# NON POLLWED DAYS	265	
	# MODERATE VISIBILITY DAYS	70	
	# POOR VISIBILITY DAYS	30	TOTAL 365

AREA F (POOR HEALTH, POOR VISIBILITY)

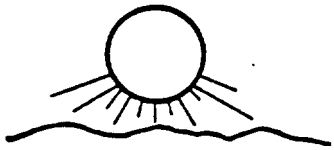
HEALTH	# GOOD DAYS	161	
	# MODERATE DAYS	140	
	# UNHEALTHY DAYS	5	0
	# VERY UNHEALTHY DAYS	12	
	# HAZARDOUS DAYS	2	
			TOTAL 365
VISIBILITY	# NON POLLUTED DAYS	205	
	# MODERATE VISIBILITY DAYS	100	
	# POOR VISIBILITY DAYS	60	
			TOTAL 365

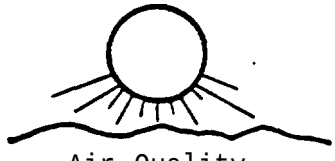
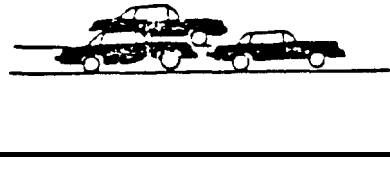
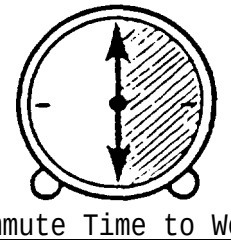
	YOUR PRESENT HOUSE
Number of Bedrooms	
Neighborhood Traffic	
Commute Time to Work	
Air Quality	

01

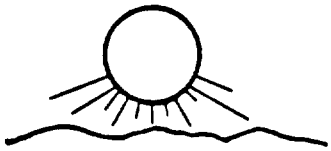
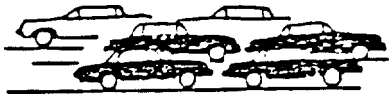
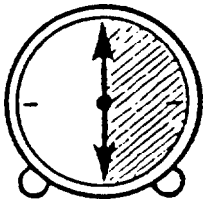
Number of Bedrooms	One more bedroom
 Air Quality	30 more days a year of excellent air quality
	Heavy traffic
 Commute Time to Work	More than 30 minutes

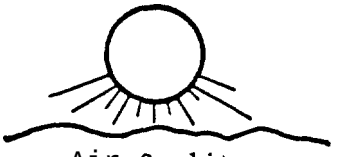
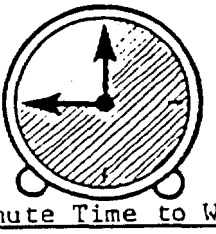
02

Number of Bedrooms	One more bedroom
 Air Quality	60 more days a year of excellent air quality
Neighborhood Traffic	Light traffic
Commute Time to Work	Less than 15 minutes

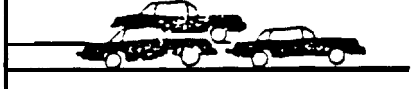
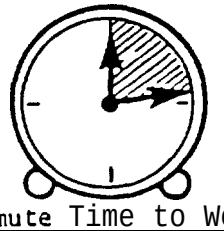
Number of Bedrooms	One more bedroom
 Air Quality	90 more days a year of excellent air quality
	Medium traffic
 Commute Time to Work	15 - 30 minutes

04

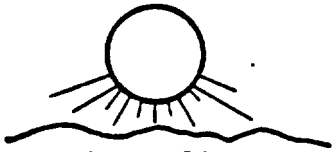
Number of Bedrooms	Same number of bedrooms
 Air Quality	60 more days a year of excellent air quality
 Neighborhood Traffic	Heavy traffic
 Commute Time to Work	15 - 30 minutes

Number of Bedrooms	Same number of bedrooms
 Air Quality	90 more days a year of excellent air quality
	Light traffic
 Commute Time to Work	More than 30 minutes

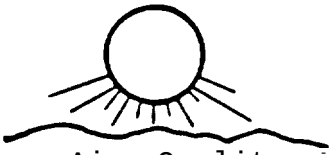
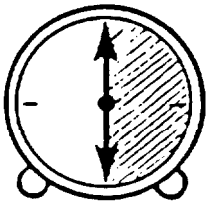
06

Number of Bedrooms	Same number of bedrooms
Air Quality	30 more days a year of excellent air quality
 Neighborhood Traffic	Medium traffic
 Commute Time to Work	Less than 15 minutes

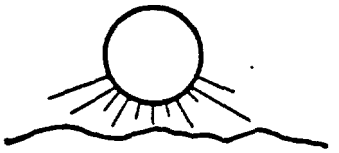
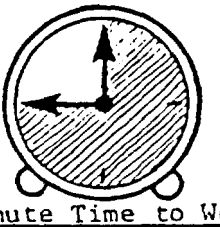
07

Number of Bedrooms	One less bedroom
 Air Quality	90 more days a year of excellent air quality
	Heavy traffic
Commute Time to Work	Less than 15 minutes

08

Number of Bedrooms	One less bedroom
 Air Quality	30 more days a year of excellent air quality
	Light traffic
 Commute Time to Work	15 - 30 minutes

09

Number of Bedrooms	One less bedroom
 Air Quality	60 more days a year of excellent air quality
	Medium traffic
 Commute Time to Work	More than 30 minutes

CARD G

HOW MUCH YOU WOULD PAY PER MONTH:

01	$0	06	$30	11	$80
02	$1	07	$40	12	$90
03	$5	08	$50	13	$100
04	$10	09	$60	14	More than $100
05	$20	10	$70		

CARD H

VEHICLE INSPECTION & MAINTENANCE PROGRAM

. All cars, to be taken to inspection station once a year.

- Cost for inspection: $11
- Average repair cost: $32

0 Maximum repair cost: $50

RESULT OF PROGRAM: 15% REDUCTION IN AUTO EMISSIONS
(if all cars in Bay Area are inspected)

CARD I

NEIGHBORHOOD TRAFFIC CONDITIONS:

1 No thru traffic; my street is almost *never* used for thru traffic by people who don't live here

2 Light traffic; my street is occasionally used for thru traffic by people who don't live here

3 Medium traffic; my street is frequently used for thru traffic by people who don't live here

4 Heavy traffic; my street is constantly used for thru traffic by people who don't live here

CARD J

MONTHLY MORTGAGE PAYMENTS:

01	No mortgage	12	$1200-1399
02	$ 100-199	13	1400-1599
03	200-299	14	1600-1799
04	300-399 .	15	1800-1999
05	400-499	16	2000-2299
06	500-599 ,	17	2300-2599
07	600-699	18	2600-2899
08	700-799	19	2900-3199
09	800-899	20	3200 or more
10	900-999		
11	1000-1199		

CARD K

1 5 years or less

2 6-10 years

3 11-20 years

4 21-39 years

5 40 or more years

9 Have no idea

	YOUR PRESENT HOUSE
Number. of Bedrooms	
Air Quality	
Neighborhood Traffic	
Commute Time to Work	

“BETTER THAN MY PRESENT HOUSE”

"ABOUT THE SAME AS MY PRESENT HOUSE"

'WORSE THAN MY PRESENT HOUSE"

CARD L

DOLLARS PER MONTH MORE THAN MY PRESENT MORTGAGE PAYMENT:

$10 more per month than my present mortgage payment

$20 more

$50 more

$100 more

$150 more

$200 more

$250 more

$300 more

$350 more

$400 more

$450 more

$500 more

$600 more

$700 more

$800 more

$900 more

$1000 more

More than $1000 more per month than my present mortgage payment

CARD M

DOLLARS PER MONTH LESS THAN MY PRESENT MORTGAGE PAYMENT:

$10 less per month than my present mortgage payment

$20 less

$50 less

$100 less

$150 less

$200 less

$250 less

$300 less

$350 less

$400 less

$450 less

$500 less

$600 less

$700 less

$800 less

$900 less

$1000 less

More than $1000 less per month than my present mortgage payment

88 Would not live in this house at any price

CARD N

1. Never

2 Less than 1 time per month

3 1-4 times per month

4 2-3 times per week

5 4-7 times per week

CARD O

AGE CATEGORY:

a. Less than 13 years old

b. 13-17 years old

c. 18-30 years old

d. 31-50 years old

e. 51-65 years old

f. Over 65 years old

CARD P

INCOME CATEGORIES:

01 $ 7,000 *or* less	06 $25,001 - $30,000
02 $ 7,001 - $10,000	07 $30,001 - $35,000
03 $10,001 - $15,000	08 $35,001 - $40,000
04 $15,001 - $20,000	09 $40,001 - $50,000
05 $20,001 - $25,000	10 more than $50,000