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**PATTERNS OF POPULATION MOBILITY
IN TWO LARGE METROPOLISES.**

**COMPARATIVE SURVEYS
IN BOGÓTA (COLOMBIA) AND DELHI (INDIA)**

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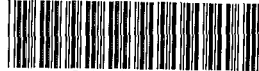
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The world-wide spread of urbanization has led to the emergence of multimillion metropolises, resulting in new urban dynamics. The question is not merely one of an increase in scale but of fundamental changes occurring in residential practices and socio-spatial restructuring. The phenomena of deconcentration and segmentation of metropolitan areas as well as the growth of satellite towns have become pronounced as spatial mobility becomes increasingly complex. Commuting and other forms of circular and temporary mobility are gaining in importance. Understanding the way cities function - a prerequisite for any attempt at town planning and management - requires a detailed knowledge of all the spatial mobility patterns and their differentiated impact on urban dynamics. Yet, knowledge on the mechanisms of temporary and circular mobility and complex systems of residence remains inadequate.

For a better understanding of current urban reality, we have, since 1992, been conducting a comparative study in two multimillion metropolises with sustained growth rates: Bogota (Colombia) and Delhi (India)¹. The former has a population of 5.5 million and the latter 9.5 million. The geographical and cultural contrast of the zones referred to reflects the diversity of the South and bring to the fore mechanisms with wider implications that can provide us with deeper insights into the dynamics currently observed in metropolises (Dupont et al, 1995).

It was felt that an analysis of migratory patterns would be particularly relevant in our study of the changes that are occurring in these two capital cities. Stress was laid on the relationships between residential mobility and daily mobility of the various social groups, and on the relationships between residential practices at the micro-level and building production and labour market at the macro-level. It was in this systemic perspective that we considered the analysis of the different forms of spatial mobility as factors of change in these cities. Such an approach to urban transformation can be adequately implemented by carrying out statistical and qualitative surveys that allow us to apprehend the different forms of spatial mobility and not only permanent migration, integrate a longitudinal perspective and consider not just individual migrants but also their family groups (Dupont, Dureau, 1994). The conceptual and methodological improvements brought about recently by several research teams working on spatial mobility helped us devise a survey method that satisfied all these principles. The present paper seeks to outline this methodology. It was applied in Bogota in 1993 and later in Delhi in 1995, with only a few modifications necessitated either by the lessons drawn from the Bogota experiment or the contextual specificity of the Indian capital. This exercise enabled us to assess the relevance of the solutions adopted.

¹ The programme "Residential practices and their impact on the dynamics and segmentation of large metropolises. Study of spatial mobility patterns of the populations of Bogota and Delhi" formed part of an agreement between ORSTOM and CNRS/PIR-Villes. In Bogota, the research, co-supervised by F. Dureau and C.E. Florez, was carried out in collaboration with CEDE (*Centro de Estudios sobre Desarrollo Económico*), *Universidad de los Andes*. In Delhi, the research, supervised by V. Dupont, was carried out in collaboration with IEG (*Institute of Economic Growth*) and the *Centre de Sciences Humaines* (CSH).

1. OBJECTIVES AND GENERAL CHARACTERISTICS OF THE SPATIAL MOBILITY SURVEY SYSTEM

The spatial mobility survey system implemented in Bogota and Delhi had the following objective: to collect information required for the analysis of the different forms of spatial mobility in relation to the absorption of the population into the labour market and their access to housing, as well as the relation between such behaviour and the changes it leads to in the dynamics of each metropolis under study. Both these aspects were analysed at two levels: global (impact on the city's spatial expansion and the process of suburbanization) and intra-urban (impact on redistribution of population within the metropolitan area, the differential dynamics of neighbourhoods, and more generally the process of spatial segmentation). For this purpose, the survey system incorporated three basic principles:

- consideration of **all forms of spatial mobility** irrespective of distance (moves to or from the metropolitan area, and moves within the same) or duration of move (permanent and temporary residential migration, as well as commuting);
- use of a **longitudinal approach** to understand how people combine various forms of mobility during their life cycle, in relation to their behaviour in the family and occupational context;
- analysis of residential strategies, viewing them not just at the individual level but also at the **family level**.

The system of observation to study spatial mobility relied on a combination of statistical and anthropological approaches. This system, the chief characteristics of which are summarized in Table 1, includes two parts. First, a **demo-statistical survey** was carried out among more than 1000 private households at their place of residence. A structured questionnaire was used to collect information on daily commuting between place of residence and place of work or study, residential system and temporary mobility, as well as the migratory trajectory since the time of birth. In a second round conducted one year later (in Bogota), information on moves and changes that had taken place in the households since the first round and the arrival of new households was collected. In the second phase, **semi-directed interviews** were held among a sub-sample of households selected by reasoned choice from the sample of the statistical survey. Such anthropological surveys give us a deeper insight into mobility patterns and permit a careful observation of the solidarity networks that come into play while deciding residential strategies. In addition, in Delhi, specific surveys - using once again a combination of statistical and anthropological methods - were carried out among the houseless in the old city centre, where their impact has been very significant.

Table 1 - General characteristics of the two surveys

	BOGOTA	DELHI
Survey title	Spatial mobility in the metropolitan area of Bogota	Spatial mobility in the metropolitan area of Delhi
Institutions concerned	ORSTOM and CEDE	ORSTOM and IEG
Objective	<ul style="list-style-type: none"> To analyze the mobility patterns of the population in the metropolitan area in relation to their absorption into the labour market and access to housing To analyze the effects of this behaviour on the forms of urban development and restructuring in the metropolitan area 	
Spatial mobility survey system	<ul style="list-style-type: none"> Two-round statistical survey Anthropological survey among a sub-sample 	<ul style="list-style-type: none"> One-round statistical survey Statistical survey among houseless Anthropological survey among the sub-sample of the 2 statistical surveys
Mobility approach implemented in the survey system	<ul style="list-style-type: none"> Consideration of all forms of mobility Introduction of a longitudinal approach Analysis of behaviour at the individual and family levels 	
UNIVERSE OF STUDY		
Universe of study	District of Bogota + 17 outlying townships	Delhi National Capital Territory + 6 ring towns
Survey zones	7 zones of the District of Bogota and 4 townships on the metropolitan outskirts	4 zones in Delhi + 2 zones on the metropolitan outskirts
SAMPLE		
Sample scheme	3-stage area stratified sample (blocks, dwelling units, households) on the basis of satellite image or map	3-stage stratified sample (polling stations, dwelling units, households) on the basis of the electoral lists
Sample size	1031 households or 4448 individuals	1413 households or 6819 individuals
QUESTIONNAIRE		
Surveyed population	All household members living in private dwelling units (usual residents + persons having lived in the dwelling unit surveyed for at least 30 days, not necessarily in a continuous manner, during the year preceding the survey)	
Contents of the questionnaire	<ul style="list-style-type: none"> Dwelling unit and household characteristics Demo and socio-economic characteristics of every household member 	
	<ul style="list-style-type: none"> Life history of one household member 	-
DATA COLLECTION		
Date of data collection	15 September - 15 October 1993	14 February- 29 April 1995
Duration of interview	Average 50 minutes out of which 25 minutes for life history	Average 45 minutes
Rate of non response	Between 2% (low income areas) and 10% (affluent neighbourhoods)	Between 1% (slums) and 10% (middle ranking civil servants' residences)

* The specific statistical survey among the houseless does not figure in the remaining part of the table which refers only to the statistical surveys in Delhi and Bogota among ordinary households.

2. DEFINITION OF UNIVERSE: DELIMITATION OF THE METROPOLITAN AREA AND SELECTION OF THE ZONES TO BE STUDIED

Given the nature of urban dynamics and the purpose of our research, it was essential to carry out our surveys in a spatial framework that corresponded to the **entire metropolitan area**, beyond the administrative limits of the capital. In Bogota, where metropolitan realities are not

always recognized by the administration, we selected three criteria to define the metropolitan area: geographic (distance to Bogota), demographic dynamics (growth rate, density, proportion of migrants) and functional integration (proportion of working population in Bogota). These criteria were applied to the townships of the Cundinamarca region within which Bogota is located. A group of 17 townships were selected which form, together with the District of Bogota, the metropolitan area. In Delhi, the concept of metropolitan area first appeared as early as 1962 in the First Master Plan: initially, 6 ring towns were identified, all situated within a radius of about 35 km around the capital. The demographic and economic development of these towns, which experience intense commuting, appears to be interdependent with that of Delhi. For the purposes of our study, we retained this delimitation of the metropolitan area, which includes the Delhi Urban Agglomeration and 6 ring towns with their respective rural hinterland.

In view of the scope of the research programme and the budgetary constraints, we decided that instead of using a sample dispersed over the entire metropolitan area, we would **reduce our universe of study by selecting survey zones** (11 in Bogota, 6 in Delhi) within the metropolitan area. Indeed, the objectives of our surveys, for which we needed to measure and carefully observe intra-city flows between neighbourhoods, made it imperative that our sample be truly representative of the local level (neighbourhood). We had also wished to highlight mobility patterns which could reflect the overall functioning of the metropolitan area. Reducing the universe of study provides -at the level of each zone- not only a statistically accurate observation of mobility patterns but also a good understanding of the situation of each neighbourhood. Apart from the budgetary and statistical imperatives, we were obliged to select this option in order to analyze to what extent neighbourhood characteristics (housing supply, economic activities) shape or generate residential strategies at the individual and household level, and inversely to what extent residential strategies have a bearing on the neighbourhood dynamics and the internal structuring of the metropolis.

In Bogota, the selection criteria were designed to take into account the diversity of locations in the metropolitan area, the socioeconomic composition of the population, current population dynamics and form of housing production². In Delhi, preference was given to zones that had developed recently with a high population growth rate. Other criteria then aimed to take into account the diversity of neighbourhoods in terms of geographic location (5 zones on the outskirts and 1 in the pericentre), residential density, economic functions, socioeconomic composition of the population, type of settlement and form of housing production. In both the capitals, we selected a mix of neighbourhoods inhabited by the poor, middle class and upper income groups. Traditionally urban research on the South tends to focus on housing for the

² While selecting the 4 outlying townships, we also took into consideration the town's employment structure and the inhabitants' characteristics of daily mobility.

poor, and upper income groups are often overlooked although they have a key role to play in shaping large cities as also the restructuring they are undergoing.

3. SELECTION OF SAMPLE

In each of the zones that formed the universe of our survey we used a three-stage stratified sampling scheme. In Bogota, every survey zone was divided beforehand into 2 or 3 strata in relation to the morphological characteristics of the neighbourhood and, in the case of the District of Bogota, in relation to the socioeconomic stratification of the Administrative Department of Planning of the District (DAPD)³. In Delhi, the stratification in 2 to 6 strata of survey zones was based on the types of settlement and modes of housing production found in the zone, after field observation.

The sample scheme described in Table 1 and applied to every stratum is slightly different in Bogota and Delhi. In Bogota, the first stage comprised a systematic selection of blocks with the help of a grid superimposed on a SPOT satellite image or a map⁴. In the second stage, the five dwelling units to be surveyed in each block were chosen by a method of systematic equi-probability sampling from a list of dwelling units drawn up for every block of the sample. In the third stage, the observation units were the households of the selected dwellings: the questionnaire was filled in for each household in every dwelling unit of the sample.

In Delhi, since the maps which had been initially identified to be used as a sampling frame were not available, we were obliged to change the sampling method. In 5 out of the 6 survey zones, the sampling frame used corresponded to the electoral lists updated till end 1994-beginning 1995. In the first stage, polling stations were selected and in the second stage, dwelling units, identified from the addresses given in these lists. In the third stage, all the households and individuals of the dwelling units selected were surveyed, irrespective of whether or not their names figured on the electoral lists. In the sixth survey zone, a new township on the outskirts, a two-stage stratified sampling plan was applied (dwelling units, households) on the basis of a list of dwelling units drawn up on the field.

4. QUESTIONNAIRE DESIGN

The questionnaire was designed by the team working in Bogota beginning 1993 and tested in the course of two pilot surveys carried out in neighbourhoods of Bogota with varying socioeconomic profiles. The first survey was conducted by students among 70 households, the

³ The DAPD classification of each block in Bogota is based on the quality of building materials used and access to public services, whose rates vary in accordance with this stratification.

⁴ The sample design corresponds to the satellite image sampling method developed by an ORSTOM team. For a complete description of this method, see: Dureau et al, 1989.

second by experienced interviewers among 20 households. The lessons drawn from the Bogota experiment were used to design the Delhi questionnaire on almost similar lines. The questionnaire was tested only once in a pilot survey among 58 households; this exercise formed part of the training session held for the interviewers and supervisors.

4.1. General structure of the questionnaire

The first few sections dealt with the **characteristics of the building and dwelling unit**. After which, the interviewer drew up a **list of household members**, applying criteria distinct from those normally used in censuses and household surveys. Indeed, if we wish to understand temporary migration and complex systems of residence (multi-residential), our field of observation must include not just the usual residents of the dwelling but also persons for whom the dwelling forms a component of their residential system. For the purposes of our survey, it was decided therefore that, apart from the usual residents (persons who live most of the year in the household, whether or not they were present at the time of the survey), we would include as members of the household persons who lived most of the year in another dwelling, but who had resided in the dwelling unit surveyed for at least thirty days - not necessarily in a continuous manner - during the year preceding the visit of the interviewer (whether or not these persons were present at the time of the interviewer's visit).

The next set of questions related to the **demographic and socio-economic characteristics of the household members**: sex, age, marital status, level of education, characteristics of main and secondary occupation, and in the case of Delhi, caste, religion, mother tongue, other languages spoken and income. In addition to this basic data, in both the surveys information was sought on daily moves: dwelling unit - place of study, dwelling unit - place of work, i.e. commuting. Commuting was described in terms of space (exact location of the place of destination), mode of transportation used, time taken and cost in case of public transportation. In this section as in the rest of the questionnaire, the description of place was transcribed verbatim with accuracy.

The object of the following section (**Migratory steps**) was to gather information on the residential trajectory from the time of birth till the date of the survey. Four key steps were recorded: birth (place), departure from the place of birth (year), arrival in Bogota or Delhi (year and place of last previous residence), arrival in the present dwelling (year and place of last previous residence).

In Bogota, information was gathered subsequently on the number of years spent in four types of places: Bogota, the townships of Cundinamarca region, the remaining part of Colombia and outside Colombia. For respondents with a complex residential trajectory, the interviewer recorded with the help of a table the residential trajectory in a detailed and chronological manner

before filling up the final column, i.e. the total number of years spent in each type of place. In Delhi, this section included supplementary questions pertaining to the type of activity in the last place of residence before coming to Delhi, reasons for migration to Delhi and last change of dwelling in Delhi. However, the number of years spent in 4 types of places could be not recorded, as this appeared to be a difficult task in a population where about a quarter of the people were illiterate in 1991 and for whom age and dates remain hazy notions. But the chronological table was made compulsory, which enabled us to calculate two other variables: the number of migratory steps before arriving in Delhi and the number of dwellings occupied in Delhi.

Table 2 - Information on spatial mobility collected in the two surveys

	BOGOTA	DELHI
Spatial definition of residential mobility	Within the metropolitan area: any change of dwelling, irrespective of distance. Outside: any change of township or village	
TYPES OF MOBILITY CONSIDERED FOR EACH HOUSEHOLD MEMBER		
Commuting	Journey from dwelling to place of work Journey from dwelling to place of study	
Temporary and/or circular mobility	System of residence: places where the individual has resided for at least 30 days - not necessarily in a continuous manner - during the preceding year, and frequency of residence in these places	
Permanent migration	Summary of migratory trajectory since birth till the residence at the time of the survey Questions: --> Information on 4 key steps: place of birth, departure from place of birth, arrival in the metropolitan area, arrival in the present dwelling	
	Optional chronological table ---> Number of years spent in 4 types of places	Compulsory chronological table ---> Number of migratory steps before arrival in Delhi, and Number of dwellings occupied in Delhi
INFORMATION COLLECTED IN THE LIFE HISTORY SECTION		
	Migratory steps (1 year minimum) since birth, in relation to family and occupational history	-

This section thus provided the necessary information to calculate the migratory flow to and within the metropolitan area, identify the types of trajectories and link this information with the individual demographic and socio-economic characteristics. Now, even though it is not exhaustive, we do have basic information on the migratory trajectory of all the household members, making it possible to introduce the family unit in the analysis of residential practices. The first part of the questionnaire provides a cross-sectional observation of the household members' characteristics and a summary of their migratory trajectory. Then come the most innovative sections of the questionnaire on spatial mobility. A detailed presentation of the same is given below.

Figure 1 - Extract of the Delhi questionnaire: 'System of residence' Section

INDIVIDUAL N° | | | |

C-V- SYSTEM OF RESIDENCE (For all the household members)

C50. Where have you lived for the last 12 months ?

|_1_|_| Spent most of the time in this dwelling → Total duration of absence (accumulated) { - less than 1 week |_1_|_| } *Go to the next person*
 { - from 1 week to less than 1 month |_2_|_| }
 { - 1 month and more |_3_|_| }
 Total N° of months absent |_ | | |

|_2_|_| Spent most of the time outside this dwelling → Number of days present in this dwelling |_ | | | → CONTINUE

C51. During the time you were absent, did you stay for at least 30 days in one place - not necessarily in a continuous manner ?

Yes |_1_|_| *Go to C52* No, travelled to different places |_2_|_| *Go to the next person*

Could you give us some information about the dwelling where you lived most of the time when you were absent from the present dwelling ?

	Other dwelling N° 1	Other dwelling N° 2
C52. How many days of the last 12 months did you spend in that dwelling ?	_	_
C53. When and how frequently did you stay in that dwelling ? (see calendar)	_	_
C54. Where is that dwelling located ? (1) Outside India: Country (2) In India outside Delhi U.A. : State, District, Teshil (3) In Delhi Urban Agglomeration: District, Locality	Country: _ State: _ District: _ Teshil: _ Locality: _	Country: _ State: _ District: _ Teshil: _ Locality: _
C55. Is it in a rural (1) or urban (2) place ?	Rural/Urban _	Rural/Urban _
C56. In that place, in which kind of dwelling did you stay ? (1) A private dwelling where a relative lives (2) A private dwelling where no relative lives (3) A hotel, guest house, dharamshala (4) A work site (factory, construction site...) (5) A boarding school (6) A military quarter (7) A hospital (8) Any other (specify)	_	_
C57. For which reasons did you stay in that dwelling ? (tick more than one if applicable) (1) Work (2) Studies (3) Rest, holidays (4) Visit family, relatives (5) Delivery (6) Health (7) Religious purpose (8) Previous or usual place of residence (9) Other reasons (specify)	1 _ 6 _ 2 _ 7 _ 3 _ 8 _ 4 _ 9 _ 5 _	1 _ 6 _ 2 _ 7 _ 3 _ 8 _ 4 _ 9 _ 5 _
C58. Did you work in that place ?	Yes _ <i>Continue</i> No _ <i>Go to C64</i>	Yes _ <i>Continue</i> No _ <i>Go to C64</i>
C59. Was your occupation different from the one you have when you stay in the present dwelling ?	Yes _ <i>Continue</i> No _ <i>Go to C64</i>	Yes _ <i>Continue</i> No _ <i>Go to C64</i>
C60. What kind of work did you do in that place ?	_	_
C61. In that job, were you working as an: (1) employer (2) own-account worker (3) employee in the public sector (4) employee in the private sector (5) unpaid helper	_	_
C62. Was that work: (1) permanent/regular (2) temporary (3) seasonal (4) casual	_	_
C63. What was the main activity of the establishment /enterprise for which you worked in that place? (1) Agriculture, livestock, hunting, forestry and fishing (2) Mining and quarrying (3) Manufacturing (4) Electricity, gas and water (5) Construction (6) Wholesale and retail trade, restaurants and hotels (7) Transport, storage and communication (8) Financing, insurance, real estate and business services (9) Community, social and personal services	_	_
C64. Did you stay in any other place for at least 30 days in the last 12 months - not necessarily in a continuous manner- apart from the dwelling where you are now and the one you just described ?	Yes _ <i>Repeat C52 to C63 (other dwelling N° 2)</i> No _ <i>Go to the next person</i>	<i>Go to the next person</i>

Write in the following calendar the duration of stay in each dwelling unit, using the following abbreviations :

DS: dwelling unit surveyed

D1: other dwelling unit N° 1

D2: other dwelling unit N° 2

Feb. 94	March 94	April 94	May 94	June 94	July 94	Aug.94	Sept.94	Oct. 94	Nov. 94	Dec. 94	Jan. 95	Feb. 95	March 95	April 95

4.2. System of residence of all household members

This section is identical in both surveys except for some variables, the modalities of which were adapted to local conditions. The aim was to gather information on temporary moves of all household members and locate bi and tri-residential practices⁵. Apart from the dwelling surveyed, two places of stay (Figure 1) were identified for each individual. For the other places of stay, questions were asked about the type of dwelling, purpose of stay and type of activity in that place. As in the case of the list of the household members surveyed, the minimum period of stay in a dwelling unit for it to be considered as "another dwelling" - a component of the system of residence - was 30 days, not necessarily in a continuous manner, during the year preceding the survey. This data enables us to grasp the system of residence of an individual, i.e. the spatio-temporal configuration defined by the various places of stay and the frequency of residence in each one of them.

4.3. Life history of one member of the household

Whereas the previous sections covered all the members of the household, the "Life history" Section, included only in the Bogota survey⁶, was restricted to only one of the household members present, aged 18 or above and selected by a quota system (sex, age, relationship with household head, place of birth). We were of the view that the biographical section should not be limited to the head of the household for two reasons. First, the usual practice of observing only the head of the household resulted in biases in historical analysis. Second, in the absence of information for each family member, an in-depth analysis of mobility patterns at the level of their family groups was not possible. However, recording the life history of each household member would mean inordinately long interviews. We therefore chose to steer the middle course: while a summary of the migratory trajectory of all household members was recorded, the life history section was restricted to one household member along with data on the relatives of the member selected.

The "Life history" Section consists of **two tables**, with each line of the table corresponding to a particular year. The first table deals with the residential, educational and occupational history of the respondent (Figure 2), the second with family events and co-residence with the relatives of the respondent (Figure 3). As both the tables used a common calendar it was possible to classify the information datewise or agewise, depending on what the respondent reported. Whatever be the life event, the minimum duration considered was a year⁷.

⁵ The lessons drawn from the first experiment carried out by F. Dureau in Quito in 1987 were used in designing this section. For an analysis of residential spaces in Quito, see: Barbary, Dureau, 1993.

⁶ The principal difference between the Delhi questionnaire and the Bogota questionnaire is the exclusion of the "Life history" Section in the former, due mainly to the composition of the teams working in the two cities. This exclusion was compensated for partially in Delhi by making more exhaustive the "Migratory steps" Section (see *infra*) and the anthropological survey containing migratory and occupational histories recorded during in-depth interviews.

⁷ Except in the case of the migratory step corresponding to the place of birth, which figures systematically, even if the individual has lived there for less than a year.

HISTORIA DE VIDA

1. En que año nació Ud?	1		2. LUGAR DE RESIDENCIA							3. Relac. paren.	4. Tipo de ocupación de la vivienda	5. Educa ción	6. OCUPACION					
	Fecha	Edad	Etapa	País	Departamento	Municipio	Cab	Barrio	Dirección				Ocupación	Tiempo	Pos. ocup.	Aetf. empr.		
19.. 00																		
19.. 01																		
19.. 02																		
19.. 03																		
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19.. 39																		
19.. 40																		

2. Podría decirme todos los sitios donde haya vivido por lo menos 1 año en forma continua, y la fecha o edad de traslado a este sitio?
(Fuera de Cundinamarca: cambio de municipio. En Cundinamarca: cambio de vivienda) Cabezas: (1) Si (2) No

3. Cuál era su parentesco con el jefe del hogar?
(1) Ud era el jefe del hogar (2) Esposa (o) (3) Hijo (a) (4) Yerno o nuera (5) Nieto (a) (6) Padre o madre (7) Tío (8) Suegro (9) Abuelo (a) (10) Otro parente (11) Otro no parente (12) Vivienda colectiva

4. La vivienda era:
(1) De propiedad de algún miembro del hogar (2) En arriendo (3) En usufructo (4) Otra

5. Asistió alguna vez a la escuela o al colegio?
No, pase a 6
Si: Podría decirme todos los periodos de por lo menos 1 año durante los cuales asistió a la escuela o al colegio. (1) Precolectiva, (2) Primaria, (3) Secundaria, la (4) Universitaria, u (5) Otro tipo de enseñanza?

6. Para cada uno de los trabajos que realizó durante por lo menos 1 año consecutivo, podría decirme:
- A que edad o fecha inició y dejó ese trabajo?
- ¿Cuál era su ocupación?
- ¿Tiempo parcial o tiempo completo?
- ¿Cuál era su posición ocupacional?
(1) Trabajador independiente por cuenta propia (2) Autónomo o empleador (3) Empleado del gobierno (4) Empleado de empresa particular (5) Obrero - jornalero (6) Empleado doméstico (7) Trabajador familiar sin remuneración (8) No informado

7. Familia y correspondencia
Para su padre, su madre, su conyuge (cada uno de sus conyuges, si se casó más de una vez), y cada uno de sus hijos nacidos vivos:
a - En que año nació?
Padres y conyuges: marque el año de nacimiento en la parte superior de la columna
Hijos: Marque N_ en la columna Vid
b - Vive todavía o se murió?
En que año se murió?
Marque M_ en la columna Vid
c - En qué año se unió?
Para cada unión:
Marque U_ en la columna Nup
Si esa unión ha terminado, en que año se terminó la unión?
Marque T_ en la columna Nup
d - Podría decirme todos los periodos de por lo menos 1 año durante los cuales vivió con Ud, en la misma vivienda?
Marque V_ en la columna Cor

Figure 2 - Extract from the Bogota questionnaire:
1st part of the "Life history" Section

• *Residential, educational and occupational history*

For the purposes of **migratory history**, those places were considered where the individual had lived continuously for at least one year. If an individual had occupied two dwellings simultaneously, the dwelling in which he or she had spent most of the year was considered. For every change of dwelling, X was marked in the "Step" column, against the corresponding year, and the place was described in the columns "Country" to "Locality". Within Bogota and the Cundinamarca region, any change of dwelling was considered a migratory move, and recorded as such in the residential history; outside Bogota and the Cundinamarca region, only a change of township or village was termed a migratory move. Apart from the migratory trajectory, the individual's **relationship** with the head of the household in which he or she lived, and the **status of occupancy** of the dwelling were recorded. Such additional information proved significant in analyzing both access to housing and establishing the link between spatial mobility and the life cycle of the individual. In the column "**Education**" all the periods during which the individual studied are described. The "**Occupation**" column records the occupations of the respondent for at least one continuous year as well as his or her periods of unemployment.

• *Family and Co-residence*

Each column corresponds to one of the family members of the respondent: the individual's parents (2 columns), spouse (3) and children (10). Each column is subdivided into 3 parts (Figure 3):

- 1°) Upper part: year of birth of parents and spouse(s), and sex of children;
- 2°) Middle part: 3 sub columns made up of squares, filled in accordance with the biographical dates and age of the respondent:
 - "**Life**", for the vital statistics of the family member (birth and death [wherever applicable]),
 - "**Nuptiality**", for marriage data (beginning and end [wherever applicable] of the union),
 - "**Co-residence**", for periods of co-residence with the individual (beginning and end);
- 3°) Lower part to record **place of residence and current activity of the family member**, only if the latter is still alive and not living in the dwelling surveyed.

A separate section of the Delhi survey, with respect to the **characteristics of family members not living in the dwelling unit surveyed**, is similar to some sections of "Family and Co-residence" module of the Bogota survey. The family members covered in this section were: parents of the head of the household, his/her spouse, parents of the spouse, and head's children, in case these individuals had not already been included in the list of household members. For each of these individuals, the following was recorded: year and place of birth, year of death for parents and deceased spouses, current place of residence (or at the time of death), main occupation.

7. FAMILIA Y CORRESIDENCIA

Padre			Madre			Conyuge 1			Conyuge 2			Conyuge 3			Hijo 1:		Hijo 2:		Hijo 3:		Hijo 4:		Hijo 5:		Hijo 6:		Hijo 7:		Hijo 8:		Hijo 9:		Hijo 10:			
Nac.			Nac.			Nac.			Nac.			Nac.			1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2				
Vid Nup Cor			Vid Nup Cor			Vid Nup Cor			Vid Nup Cor			Vid Nup Cor			Hombre	Mujer	Hombre	Mujer	Hombre	Mujer	Hombre	Mujer	Hombre	Mujer	Hombre	Mujer	Hombre	Mujer	Hombre	Mujer	Hombre	Mujer				
Residencia actual			Residencia actual			Residencia actual			Residencia actual			Residencia actual			Residencia actual		Residencia actual		Residencia actual		Residencia actual		Residencia actual		Residencia actual		Residencia actual		Residencia actual		Residencia actual		Residencia actual			
Pais Depart.			Pais Depart.			Pais Depart.			Pais Depart.			Pais Depart.			Pais Depart.		Pais Depart.		Pais Depart.		Pais Depart.		Pais Depart.		Pais Depart.		Pais Depart.		Pais Depart.		Pais Depart.		Pais Depart.			
Municipio Cab.			Municipio Cab.			Municipio Cab.			Municipio Cab.			Municipio Cab.			Municipio Cab.		Municipio Cab.		Municipio Cab.		Municipio Cab.		Municipio Cab.		Municipio Cab.		Municipio Cab.		Municipio Cab.		Municipio Cab.		Municipio Cab.			
Alcaldia Barrio			Alcaldia Barrio			Alcaldia Barrio			Alcaldia Barrio			Alcaldia Barrio			Alcaldia Barrio		Alcaldia Barrio		Alcaldia Barrio		Alcaldia Barrio		Alcaldia Barrio		Alcaldia Barrio		Alcaldia Barrio		Alcaldia Barrio		Alcaldia Barrio		Alcaldia Barrio			
Ocupación actual			Ocupación actual			Ocupación actual			Ocupación actual			Ocupación actual			Ocupación actual		Ocupación actual		Ocupación actual		Ocupación actual		Ocupación actual		Ocupación actual		Ocupación actual		Ocupación actual		Ocupación actual		Ocupación actual			
Trab.(sí/no)			Trab.(sí/no)			Trab.(sí/no)			Trab.(sí/no)			Trab.(sí/no)			Trab.(sí/no)		Trab.(sí/no)		Trab.(sí/no)		Trab.(sí/no)		Trab.(sí/no)		Trab.(sí/no)		Trab.(sí/no)		Trab.(sí/no)		Trab.(sí/no)		Trab.(sí/no)			
Ocupación			Ocupación			Ocupación			Ocupación			Ocupación			Ocupación		Ocupación		Ocupación		Ocupación		Ocupación		Ocupación		Ocupación		Ocupación		Ocupación		Ocupación			
Pos.oc. Act.EMP			Pos.oc. Act.EMP			Pos.oc. Act.EMP			Pos.oc. Act.EMP			Pos.oc. Act.EMP			Pos.oc. Act.EMP		Pos.oc. Act.EMP		Pos.oc. Act.EMP		Pos.oc. Act.EMP		Pos.oc. Act.EMP		Pos.oc. Act.EMP		Pos.oc. Act.EMP		Pos.oc. Act.EMP		Pos.oc. Act.EMP		Pos.oc. Act.EMP			

Si no vive en el hogar encuestado, donde vive ?
 - Cúal es su ocupación profesional ?
 - Cúal es su posición ocupacional ?
 - Cúal es la actividad de la empresa ?

Si trabaja:
 - Cúal es su ocupación profesional ?
 - Cúal es su posición ocupacional ?
 - Cúal es la actividad de la empresa ?

Si no trabaja:
 - Cúal es su ocupación profesional ?
 - Cúal es su posición ocupacional ?
 - Cúal es la actividad de la empresa ?

Si no vive en el hogar encuestado, donde vive ?
 (1) Otro país : país
 (2) Colombia fuera de Bogotá : Departamento, Municipio, Cabecera municipal
 (3) Bogotá : Barrio, Dirección

Cúal es su ocupación ?
 (1) Trabajador independiente, por cuenta propia
 (2) Patrono o empleador
 (3) Empleado del gobierno
 (4) Empleado de empresa particular
 (5) Obrero - jornalero
 (6) Empleador doméstico
 (7) Trabajador familiar sin remuneración
 (8) No informa

Cúal es la actividad de la empresa ?
 (0) Agric., ganadería (1) Minería (2) Industria
 (3) Insect. gas. agua (4) Construcción (5) Comercio
 (6) Transporte (7) Edu. financ. (8) Servicios (9) No informa

Figure 3 - Extract from the Bogota questionnaire:
 2nd part of the "Life history" Section

The graphical presentation of the Life history section in the Bogota survey is such that it is easy to establish, thanks to a common calendar, the relationship between the various types of data (migration, change of job, family events and co-residence) and avoid repetition of data collected. Together with the migratory history of the respondent, the "co-residence and family" section provides the necessary material to analyze mobility both at the individual and collective level. Individuals can be placed, at any point of their life, not just within the **household** but also within their **family group**, which may be geographically dispersed. Collecting data on the residence and current activities of family members is a method that has already been tested out successfully in earlier surveys in Latin America (in particular the Monterrey survey in Mexico). Such an approach makes for a good observation of family systems of residence and provides new insights into the function of some types of individual residences - urban stays, for example - in the context of the family's social and economic reproduction. It also enables us to understand conditions determining family strategies to occupy geographic and economic space.

5. DATA COLLECTION

In Bogota as well as Delhi field work began after a week's training: the data was collected by 10 interviewers divided into two teams; each team was headed by a supervisor and all the interviewers were of university level. We monitored the data collection operation with our respective partners directly on the field and carried out a daily check of the questionnaires filled in by the interviewers. During the **training period**, in which every question was explained at length, and the first few days of data collection, the interviewers were asked to pay special attention to the following:

- **description of places**: we stressed the need for the interviewers to be particularly careful in describing places, as localization was a key element in our survey on spatial mobility. We were apprehensive about a certain amount of carelessness on this point, most interviewers being habituated to questionnaires in which there is very little description of place, almost non-existent at the intra-urban level.
- **concept of metropolitan area**, i.e. going beyond the administrative limits of the capital to include the outlying townships;
- **description of activity**: a clear description of the individual's activity and that of the enterprise; once again, we stressed the need for an accurate recording of information so that it could be coded correctly subsequently.

Many hours were spent in training interviewers to apply the **residence criterion** in the right way, as our definition of residence, unlike the usual definition, included individuals who were not usual residents of the dwelling unit surveyed. The point that was stressed repeatedly was that the criterion of a minimum period of 30 days did not refer exclusively to a continuous stay

but also to a series of stays the sum total of which reached or exceeded 30 days (the same is true for the 30 days criterion applied in the "System of residence" Section). Similarly, the interviewers needed to be instructed carefully in the **correct usage of the calendar in the "System of residence" Section**, as this was a tool completely new to them.

In Bogota, during the training period, the "**Life history**" Section was explained in great detail and the interviewers were given several exercises to do. Except the interviewers who had previous experience in recording life history information in a table of this type⁸, all the other interviewers experienced some difficulty initially. Special emphasis was laid on the consistency of information gathered in the various trajectories. For a meaningful analysis, there had to be an accurate observation of the relative chronology of the various events (the important thing was to respect the chronology rather than trying to get exact dates, impossible to obtain in certain cases). The interviewers also had to understand how to use the data collection technique (a table using a common calendar to establish the relationship among the various aspects of the individual's life history) to improve the quality of the information gathered: i.e to take immediate advantage of responses of "multiple interest" (for instance, "*I inherited my parents' house and shifted to such and such neighbourhood in 1988 with my husband and our first son who had just been born*"). The technique employed was to begin recording events the respondent remembered easily and then glean information that did not come so readily to mind.

Generally speaking however, it was not these innovative sections that posed the most problems and the difficulties encountered were soon overcome.

The **rate of refusal** was on the whole low; in both the surveys, it went up as the socio-economic level improved (Table 2)⁹. Indeed it was the affluent sections which proved to be the most reticent. In Bogota, tight security systems made it difficult to access their buildings. In addition, the very rich were wary about answering certain questions: the threat of kidnapping made it difficult to get information such as school address of children or the address of the dwelling units in which the individual had stayed recently. In Delhi, male interviewers faced a clearly higher rate of refusal than female interviewers. On week days, it was mainly women¹⁰ who responded and they were sometimes hesitant in talking to a male interviewer. An additional problem was that of house owners who, while allowing their own household to be surveyed, would not let the interviewers talk to their tenants staying in the same house.

⁸ Demographic transition survey, carried out in 1987 by CEDE, under the supervision of C.E. Florez.

⁹ By applying a strict rule of substitution, it was possible to avoid any bias in the replacement of households.

¹⁰ The female work force participation rate remains very low: 7% in Delhi National Capital Territory, according to the 1991 census.

A total of 1031 complete interviews were carried out in Bogota and 1413 in Delhi. The **interview time** needed to complete the questionnaire varied significantly, depending on the household size, the complexity of trajectories, and the interviewers. Generally speaking however, the average duration of the interview in Bogota was 50 minutes, of which half the time was spent on the life history section. In Delhi, as the average household size was bigger and the rate of illiteracy much higher, the interviews lasted 45 minutes on an average, despite the fact that the life history section was not included.

6. EDITING, CODING AND ENTRY OF QUESTIONNAIRE DATA

Given their familiarity with the questionnaire, we decided to entrust the task of editing and coding to those who had taken part in the data collection. Since most of the questions had been precoded, the major part of the time was spent on editing. The only questions that required coding related to: age, place, occupation, sector of activity, frequency of stay in other dwelling units, and in the case of Delhi, caste, language as well as, in the "**Migratory steps**" Section, variables with respect to the number of migratory steps before coming to Delhi and the number of dwelling units occupied in Delhi. Data recorded in the calendar of the "**System of residence**" Section was coded by creating a synthetic variable whose modalities described the main frequency of stay patterns in a dwelling unit: continuous stay, weekly periodicity of 1-2 days per week, weekly periodicity of 3 days or more per week, monthly periodicity of one week per month, ...etc. The number of days spent in the dwelling unit surveyed was cross-checked with the information in the calendar and corrected, wherever required.

In the "**Life history**" Section of the Bogota questionnaire, the place and occupation codes were recorded and:

- all dates with respect to events recorded in the biographies were entered in the "Date" column;
- each of the crosses which represented a migration was encircled in the "Step" column of biography 2 (Place of residence) ;
- box codes of the first year of a step were encircled in biography 3 (Relationship with the household head) and biography 4 (Status of occupancy in the dwelling unit);
- box codes of the first and last year of a step were encircled in biographies 5 (Education) and 6 (Occupation);
- codes of events were encircled in the columns of biography 7 (Family and co-residence);
- in all columns, where a given step was under way at the time of the survey, 97 was written at the bottom of the column.

The **data structuring** aimed at fulfilling two requirements. First, to enable data entry directly from the questionnaires, in order to reduce the work of coding or transformation of information and minimize the risk of error. Second, to create files with an adequate structure for data processing and analysis. Thus information was organized in the following way: there were 12 files of fixed size for Bogota (1 for households, 2 for individuals and 9 for life events with respect to the various sections of the Life history)¹¹. For Delhi, there were 3 files of fixed size: 1 for households, 1 for household members (at the individual level), 1 for family members not living in the household surveyed (at the individual level). This data management system allowed us to satisfy the dual objective of the survey: analysis at the individual and collective levels (household, family) and statistical analysis of life event data.

In Bogota, the data was **entered** in a micro-computer, using a CLIPPER programme, specially written for the survey¹². A number of value and flow checks were included and some variables were assigned values automatically. The files were corrected in two phases. First, EXCEL was used to correct errors, detected through simple frequencies and checks in real time, in the internal consistency of each file. In the second phase, the data correction was done with the help of a FORTRAN programme specially written to detect the errors in this survey. The programme included about 500 checks and produced a list of errors detected in each questionnaire. Four types of checks were carried out: data check of sections I, II and III for all the household members; in the case of those interviewed in the "Life history" Section, internal consistency checks of life event data and consistency checks between the data in the first three sections and life event data; finally, internal consistency checks of data for relatives not members of the household surveyed.

In Delhi, the work of entering, checking and organizing data into files that could be converted to SPSS was subcontracted to a computer centre. The computer specialists were given detailed manuals of instructions for each stage of data processing. The data entry programme (using CLIPPER) included validity checks on the possible values of all the variables of the questionnaire. The data was entered twice and both the records were cross-checked (using DBase and FoxPro programmes). There was also a series of consistency checks among the variables of the same section and among the variables of different sections of the questionnaire (using again DBase and FoxPro programmes). On the basis of the error print out, members of the data collection team made the necessary corrections after cross-checking with the questionnaires.

¹¹ The structure of the life event files is the normal structure used in software for statistical processing of such type of data, i.e. recording in steps which includes the following data: identifier, date of beginning, date of end (only for non continuous trajectories, i.e. biographies 5, 6 and 7), variables describing the status during the step (for example, activity or place of residence). The dates were entered as they were collected, i.e. in years without any further precision.

¹² A. Morales, in-charge of the CEDE computer centre, is the author of this programme.

7. EVALUATION OF SOLUTIONS ADOPTED

The direct monitoring of data collection provided valuable insights in assessing the survey. Furthermore, consistency checks¹³, data correction and in-depth interviews among sub-samples selected from the questionnaires of the statistical survey were also useful in determining the reliability of the data collected.

On the whole, the questionnaire proved to be efficient. Except in a few cases, the sequence and formulation of questions was adequate. After the normal period of adaptation, the interviewers did not encounter any major difficulty in handling the most innovative sections of the questionnaire dealing with the collection of data necessary for the analysis of the various forms of mobility. As the interviewers coped well with the questionnaire, the objectives of the "System of residence" and, in Bogota, "Life history" Sections were met fully. The rate of error (number of errors detected-number of data entered ratio), calculated for each section of the Bogota questionnaire was particularly low for data with respect to the "System of residence" Section (0.3‰) and slightly higher for the "Life history" Section (0.9‰ in the case of individual data and 0.8‰ in the case of data on relatives).

In Bogota, but more so in Delhi, the in-depth interviews brought to light omissions in reporting **members residing temporarily** in the dwelling unit. One way to see that the definition of household members is applied correctly and minimize the risk of omission may be to introduce some questions on the questionnaire itself. This would enable the interviewer to check in a systematic and more stringent fashion the presence of temporary residents during the last 12 months.

The maximum number of errors were found in the "**Migratory Steps**" Section of the Bogota survey: 1.3‰. The difficulties encountered in this section were highlighted at the time of collection, editing, consistency checks and correction of data. This experiment has shown that some questions are of a complex nature: yet, such questions are asked in numerous censuses and surveys without any special precaution, despite the fact that they are often poorly understood and the information so obtained is not reliable. Apart from very simple cases, a chronological reconstruction of the main steps in the form of a table is necessary for an accurate summary of the migratory trajectory. In Delhi, a systematic recording of all the residential steps in the table made it easier to locate the main steps and restore where necessary the consistency of information at the time of editing and coding. This type of chronological

¹³ The questionnaire enables the information gathered to be evaluated correctly, as numerous consistency checks can be carried out. In Bogota, in the case of the "Life history" Section, the data entered in the biographical matrix can be compared with the data of all the preceding sections, enabling a rigorous check of the information collected.

reconstruction is all the more essential where the population is illiterate or has a very low level of education, and whose notions of time remain extremely hazy.

The solution adopted for the "**System of residence**" Section proved to be effective, thanks in particular to the graphical presentation of stays in the various dwelling units in the calendar. The technique allowed for an easy transcription of complex situations, enabling one to meet the objective of this section, namely to understand complex and multipolar systems of residence and highlight temporary moves. During the first few days of the Bogota survey, we were somewhat apprehensive about the way the interviewers would handle the filter of the first question in this section. We therefore checked a sample selected by a systematic draw to test the quality of the data collected and the list of household members who did not reside usually in the dwelling unit surveyed. It was such members who had to be classified as having a multi-polar system of residence. Our check revealed that this section of the questionnaire had been carried out correctly.

On the basis of our experience in Bogota and Delhi, we have a suggestion to offer - one whose relevance was confirmed when put to practice in a recent survey carried out by ORSTOM-CEDE towards the end of 1996 in three small Colombian oil towns with a large floating population. The "**System of residence**" Section was restructured. Activity and occupation were not treated as characteristics of presence in another dwelling unit. Instead, two parallel subsections were provided for, one devoted exclusively to the system of residence, the other to the system of activity. For each system, there was a set of questions (questions pertaining to the dwelling unit and questions pertaining to activity) and a calendar. A juxtaposition of the two calendars makes it easy to collect information while respecting the time frame of each system (which often follows the same logic, though not systematically).

The quota system used in the "**Life History**" Section of the Bogota survey served its purpose by removing any bias in the selection of the respondent for this section. Most of the interviewers said that this section was well received by the respondents¹⁴, even though it was time consuming. The graphic design in the form of two tables proved to be highly satisfactory, regardless of the characteristics and trajectories of the respondents. Thanks to a common calendar, all the events could be co-related and the use of a dual biographical matrix led to an improvement in the quality of information gathered; the same results could not have been achieved with a series of questions. As family events play a vital role in the life of an individual and the dates of these are well known, the collection of family history increases our understanding of other events (migration, change of occupation); by the same token, it

¹⁴ It was easy to get the subjects of the "Life history" Section to respond, as the fact of being selected was perceived as a recognition of their importance within the household. There were no interruptions during this part of the interview.

improves the reliability of migratory and occupational histories. Furthermore, when information is presented in such a compact manner, not only is data collection more efficient but the editing of the questionnaire becomes faster. It takes far less time to check two tables than a set of questions and the degree of reliability is greater. It must be stated however that though the overall appraisal of the "Life history" Section has been positive, the problems associated with **memory** cannot be overlooked. An 'obvious' fact needs to be kept in mind: the universe surveyed in Bogota comprised a young population; many of the zones selected were neighbourhoods that had come up recently and were occupied by young adults. In addition, Bogota was populated through a relatively direct migration with few intermediary steps. The positive evaluation of the questionnaire must be seen in this context: conditions were favourable for collection of biographical data focussed on spatial mobility.

The successful conclusion of the "System of residence" and "Life history" Sections **vindicates the choice of a graphical presentation** for dealing with time and the various components in the life of an individual and his or her family: data gathered on the systems of residence and the two Life history matrixes provide a complete picture of the family unit and the way it evolves over time. Our experience bears out entirely what Massey said (1988) about the relevance of interviews based on *"a series of tables (...). The interviewer holds a naturalistic conversation with the subject and fills in the cells of the table by soliciting required information in a way that the situation seems to demand, using his or her judgement as to the timing and wording of the question or probes"*. Graphic solutions make it possible to avoid the kind of tedious exchange that takes place when a series of closed questions are asked in a fixed order. The respondents tire quickly and often select responses that will help them conclude the interview at the earliest. A graphical presentation has much greater flexibility: questions can be adapted to suit the situation and the discourse of the subject, enabling an easy conversation between interviewer and respondent. The respondent is no longer a passive party; the information, obtained in a faster and more reliable way, can be transcribed on the questionnaire without any need for transformation or reduction as in the case of a series of questions. In the biographical section, respondents participate actively in working out their life history; a positive fall out of this dialogue is that the main components of their life get mapped out on the questionnaire.

8. ANALYSIS OF DATA AND TYPES OF RESULTS OBTAINED

As the analysis of the Delhi survey has started¹⁵, conditions are now ripe for a comparative study of the processes at work in the two metropolises.

¹⁵ See, for example: Dupont, 1997.

The analysis of the Bogota survey began in May 1994 and spread over several phases, each phase corresponding to a particular objective and theme. To satisfy the Department of Planning and have a basic understanding of the mobility patterns in Bogota, **the report of the preliminary results was published as early as June 1994** (Dureau et al, 1994). For each of the survey zones, there were about sixty tables to cover the different themes of the survey: individual and household socio-demographic characteristics, education, occupation, access to housing, migration to Bogota and within the metropolitan area of Bogota, systems of residence, daily mobility to place of work and study. The tables were drawn up using both the data relating to all household members surveyed (first sections of the questionnaire) and some data from the life history section. In this initial phase, a certain number of synthetic variables, essential for the second phase, were developed: type of household, socio-occupational category, system of residence, migratory trajectory, etc. Though at this stage only elementary techniques of descriptive statistics were applied, data from the "Life history" Section was put to effective use. This was possible by means of creating **simple indicators** which characterized a key moment of the individual's trajectory (for instance, first dwelling unit of migrants in the metropolitan area) or summarised behavioural patterns over a period of time (for instance, number of dwelling units occupied in Bogota, and the average duration of stay in each one). These types of indicators, neglected far too often, proved to be extremely informative.

After the completion of the anthropological survey and the second phase of the statistical survey, we began the **combined analysis of the various components of the system of observation**. The information with respect to each of the phases of the statistical survey was organized within a data base. We were thus able to study the demographic dynamics of each of the zones surveyed during the one year interval between the two rounds of observation. The two sources of information, statistical and anthropological, were analysed in an interactive way, one supplementing and probing the other. As the analysis of all the data progressed, papers and articles on specific city zones and/or aspects were presented¹⁶. The main themes dealt with till now are: migratory trajectory of migrants before their arrival in Bogota and access to housing within the metropolitan area (access to the first dwelling unit and its impact on the rest of the trajectory); residential mobility within the metropolitan area (intensity and patterns of mobility); types of trajectory¹⁷; individual mobility / household mobility; life cycle, occupational trajectory and residential itinerary; practices specific to certain neighbourhoods; daily mobility (in relation

¹⁶ See, for example: Dureau, 1996 or Dureau and Florez, 1995.

¹⁷ Researchers from ORSTOM and the National University of Colombia are working on developing methods of statistical analysis of life event data, relying mainly on the life history survey carried out by the ORSTOM-CEDE team in Bogota. Several lines of investigation were considered: qualitative harmonic analysis, joint quantitative table analysis, textual statistics and parametric models. These were first applied in 1995 and 1996 on our survey data: the aim of the analysis was to obtain a typology of intra-urban residential itineraries from birth till the date of the survey. An analysis of the migratory trajectories before arrival in Bogota is currently under way. In this statistical model, the migratory steps are described in terms of geographical localization and size of the locality.

to Bogota's transport system and residential patterns); life spaces, understood in the survey through place of residence of close relatives, place of work and place of study of the various household members; residential mobility and metropolitan dynamics (establishing the relationship between intra-urban residential trajectories and the various stages of development of Bogota and the metropolitan outskirts).

The principal findings of this study will be presented in a book on the patterns of mobility in Bogota and their impact on the dynamics of the metropolitan area. But already the results made available so far have received the attention of researchers and the Department of Planning in Bogota. This is particularly so in the case of: the different ways in which out-lying townships have been integrated in the metropolitan area and the spatial definition of the metropolitan area; important modifications in the population distribution and forms of segregation within the consolidated urban space linked to new strategies of residential localization.

9. SURVEY METHODOLOGY: CONCLUSIONS

The solutions described in this paper have been fully supported by the Bogota survey where they were applied initially and the Delhi experiment. The methodology outlined enables one to translate into practice the various conceptual innovations that have met with the approval of many researchers working on the theme of spatial mobility (Villa, in Dureau et al (ed), 1995). These are: restoring the spatio-temporal continuum of patterns of mobility, combining cross-sectional and longitudinal approaches, placing individuals in their family group, and interpreting mobility patterns in relation to absorption into the labour market and family events.

The limitations of our surveys stem much more from the size of the sample than the survey techniques used or the characteristics of the data collected. We had to settle for a compromise between the research requirements and the means at our disposal. Consequently, the definition of our universe, mode of selection and sample size exclude certain types of data analysis, possible only when information is collected for the entire country. If one city or just some zones of a city are selected, it clearly limits the areas in which the survey data on mobility can be used. On the other hand, such a spatial frame is ideally suited to study the relationship between the behaviour of individuals and the context in which they function. This was the central concern of our research which as has been stated previously aims at interpreting the urban restructuring that is taking place in two large metropolises of the developing world through a careful study of the mobility patterns.

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