West Africa
Spatial Analysis Prototype
Exploratory Analysis

Creating Social Borders
From The WASAP Data Sets

⊕DHS

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Creating Social Borders From the WASAP Data Sets

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September 1998

Introduction

Maps are often used to examine the distribution of demographic, economic, and social phenomena. A map of the United States of America for example, might be shaded to show the distribution of unemployment by administrative or political units (e.g., the 50 states). Maps of this type are examining a bivariate relationship: the association between the phenomena and the map's geographic units. The unemployment map mentioned above would show the distribution of unemployment across the 50 states of the USA.

The geographic units in maps examining relationships are often physical (e.g., continents) or political (e.g., countries) areas. Political borders are used to denote administrative units. Physical borders are used to denote areas of similar environmental conditions, areas that are geographically contiguous, or areas of geographic interest (e.g., a river's watershed).

Social borders form a third kind of geographic unit. Social borders denote areas that share a set of social characteristics (e.g., religion, ethnicity, and language). Maps that use social borders are uncommon. They are difficult to create compared with more traditional maps, particularly maps that use political units[1].

Political units (e.g., countries, states, etc.) are based upon geographic constructs. A political unit *is* an area on a map. Social units do not necessarily have any geographic continuity and their borders are subjective.

But social units can be created and they can useful. Some phenomena have more of a social basis than a political or physical basis. The appropriate geographic units for maps examining such phenomena are social units.

The aim of this paper is to demonstrate and evaluate the construction and application of a set of social borders. The social borders will be based upon ethnicity; they will designate areas of common ethnicity, areas that we will call ethnic enclaves. The ethnicity data that they will be based upon comes from the West Africa Spatial Analysis Prototype (WASAP), a project concerned with the regional interpretation of West African data.

After the ethnic enclaves' borders have been created, the distribution of a set of demographic and health indicators will be displayed across them and national political borders. This comparison is intended to demonstrate that the association between a set of indicators and social borders (in this case ethnic borders) is different than the association between these indicators and national borders. The aim of this comparison is therefore to demonstrate the general utility of social borders in analyzing regional data, not to draw specific conclusions about the association between ethnicity and the set of indicators.

Ethnicity was chosen as the basis for the social borders for two reasons. First, ethnic enclaves are likely to be few in number, large, and geographically contiguous – a small number of geographically contiguous enclaves is a prerequisite for a coherent map. Second, there are theoretical reasons for expecting an association between ethnicity and the set of indicators.

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[1]Not all political borders are easily established. The borders of some political units (e.g., China, India, Pakistan) are disputed. Some political units (e.g., Saudi Arabia, Yemen) even have borders that are undefined.

The set of demographic and health indicators to be examined can be classified into two categories: fertility and infant feeding. Two maps will be produced for each indicator, one showing its value by country and one showing its value by ethnic enclave.

Data Source

WASAP data sets

WASAP brings together data sets from a number of sources. All of the data sets in WASAP are geocoded (i.e., their location can be accurately represented on a map). They can be linked to one another using location as the linking variable.

Among the WASAP data sets are 15 demographic and health surveys (DHS) covering 12 West African Countries. A DHS is a nationally representative survey of households and their women of reproductive age (i.e., between the ages of 15 and 49). Table 1 presents information on the most recent DHS included in WASAP for each of the 12 countries. A cluster is a sampling unit that usually contains 10-30 women of reproductive age.

Table 1   Cluster characteristics for each DHS used in the WASAP project.

| Country	Survey Date	Clusters	Women
Benin	1996	200	5,491
Burkina Faso	1992-1993	230	6,354
Cameroon	1991	149	3,871
Central African Republic	1994-1995	231	5,884
Côte d'Ivoire	1994	246	8,099
Ghana	1993	400	4,562
Liberia	1986	156	5,239
Mali	1995-1996	300	9,704
Niger	1992	235	6,503
Nigeria	1990	298	8,781
Senegal	1992-1993	258	6,310
Togo	1988	153	3,360
Total	1986-1996	2,856	74,158

The DHS data files in WASAP were combined into seven West Africa data files. The unit of analysis in these West Africa data file is the DHS cluster. They contain all of the clusters from all of the country surveys in Table 1, but they include only a subset of the variables from each survey. Each of the West Africa data files covers a different subject area (e.g., family planning, fertility, nutrition, etc.). Figure 1 shows the locations of the DHS clusters in West Africa.

Two different methods were used to geocode the DHS clusters in the West Africa data files. The clusters in Benin and Mali were geocoded during the surveys using Global Positioning System (GPS) units. GPS units calculate their location based on the location of satellites. The estimated locations given by these units are highly accurate[2]. The DHS clusters in the other 10 countries

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[2] This assumes that the units are used correctly. There are several sources of user error. Units must be initialized before they can be used. If a unit is not initialized correctly, subsequent location estimate will be

were geocoded using detailed maps and databases of populated places. The locations of these clusters are likely to be less accurate than the locations of the clusters in Benin and Mali.

Figure 1 – DHS clusters in West Africa
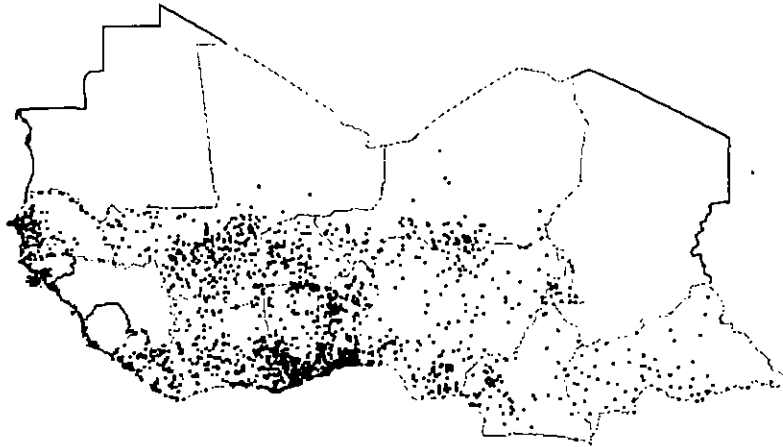
When all of the DHS clusters had been geocoded, the accuracy of their estimated locations was tested. The accuracy test was based upon first level administrative areas (e.g., the first level administrative areas in the USA are states). The DHS data files contain sampling information about every cluster, including the first administrative areas that they are within. If a cluster's estimated location placed it outside of its first administrative area, its estimated location was corrected until it placed the cluster within its first administrative area.

Weaknesses of the West Africa data files

Some of the variables in the West Africa data files are only present for a sub-set of the countries. These missing data points are due to differences in questionnaire content. Questionnaire differences are most serious for older surveys such as Togo and Liberia. The total amount of missing data due to questionnaire differences is low overall, in part because the variables in the West African data files were selected based on their availability across DHS data sets,

The variation in the dates of the surveys presents another problem. The gap between the earliest survey (1986; Liberia) and the latest survey (1996; Benin) is ten years. On the other hand, two-thirds of the surveys were performed in a 5 year period between 1992 and 1996. This weaknesses is serious only for variables that have experienced systematic change over time.

A related problem is seasonal variation. The DHS data files that make up the West African data files were not all gathered in the same seasonal periods. The values of some variables (e.g., nutritional status) may therefore display some variation that is due to the timing of the survey. The variables included in this paper are unlikely to be affected by this problem.

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poor. Units give preliminary readings before they produce a final reading; untrained users might record a preliminary reading instead of the final reading.

Finally, the clusters' estimated locations may not be the same as their true location. The clusters are within the correct first administrative area, but they may not be in the correct location within that administrative area. Errors of this type do not cause problems for national borders; if a cluster is within the correct first administrative area, it is within the correct country. However, if a new set of borders (i.e., ethnic enclaves) is created using cluster locations, any errors in these locations will affect the accuracy of the borders.

Excluding capital cities

Clusters in capital cities are excluded from the analysis in this paper. Capital cities contain a broad range of ethnic groups, and these ethnic groups are in close contact with each other. This may limit, or breakdown entirely, the influence of ethnic tradition on behavior. The removal of clusters in capital cities reduces the total number of DHS clusters from 2,856 to 2,312. Table 2 shows information for all the DHS clusters and for the DHS clusters that are located outside of capital cities.

Table 2 Cluster characteristics with and without clusters in capital cities

Country	With Capital Cities		Without Capital Cities	
	Clusters	Women	Clusters	Women
Benin	200	5,491	173	4,828
Burkina Faso	230	6,354	171	5,577
Cameroon	149	3,871	106	3,086
Central African Republic	231	5,884	186	4,617
Côte d'Ivoire	246	8,099	194	6,303
Ghana	400	4,562	358	4,117
Liberia	156	5,239	130	3,955
Mali	300	9,704	260	8,349
Niger	235	6,503	185	6,068
Nigeria	298	8,781	246	8,156
Senegal	258	6,310	186	4,804
Togo	153	3,360	117	2,649
Total	2,856	74,158	2,312	62,510

Ethnic Enclaves

Anthropological basis

The ethnic enclaves used in this paper are based upon the ethnic clusters and provinces described by George Peter Murdock (1967; 1968). Murdock classified 862 societies into 412 ethnographic clusters. (He notes that additional societies and ethnographic clusters will be found around the world, but doubts that any additional ethnographic clusters will be found in Africa.)

These 412 ethnographic clusters then were grouped into 200 ethnographic provinces using the following principal criteria:

- A close linguistic relationship, suggesting common linguistic heritage.

- A close cultural resemblance, suggesting intensive cultural contact and borrowing.

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- Geographic proximity (i.e., two or more ethnographic clusters' principal members live within 200 miles of each other). This criteria is based on the assumption that .ethnographic clusters that live in such close proximity must engage in high levels of cultural contact and borrowing.

For each ethnographic cluster, Murdock provides a list of the societies that belong to this cluster. For each ethnographic province, he provides a list of the ethnographic clusters that it contains. These ethnographic clusters and provinces are two distinct levels of ethnic aggregation. This paper will henceforth use ethnographic provinces because they represent a higher level of aggregation (and so are more likely to lead to large, geographically contiguous ethnic enclaves).

Creating ethnic enclaves

All of the DHS data sets in WASAP contain self-reported data on women's ethnicity or language[3], except for Cameroon. These data were used to create ethnic enclaves. Because Cameroon had no data on ethnicity or language, it was excluded from consideration in this paper.

One of the West Africa data sets (filename: dhs_bkc.dbf) contains information on the background characteristics of the women in each DHS cluster. This data set contains the three variables that were used in creating the ethnic enclaves in this paper: the major ethnographic province (WETHNPRV) in the DHS cluster, the total number of women aged 15-49 in the DHS cluster (WNBWOM), and the number of women who belong to the major ethnographic province in the DHS cluster (WETHNNB). The major ethnographic province in a DHS cluster is the ethnographic province to which the most women in that cluster belong.

This data set does not contain information on the ethnicity of women who do not belong to the major ethnographic province in the DHS cluster. All we know is the total number of women in the cluster who belong to ethnographic provinces other than the major ethnographic province (WNBWOM – WETHNNB).

The first step in creating ethnic enclaves was to display the DHS clusters on a map of West Africa. This mapping was done using ArcView[4], a Geographic Information System (GIS) software package. When the DHS clusters had been displayed, they were assigned a color based on their major ethnographic province. Areas on the map where clusters of the same color were grouped were the building blocks for ethnic enclaves.

The next step was to create a set of ethnic borders around these building blocks. There are two ways of creating a new border set:

1. Drawing a new set of borders using the drawing and editing tools included in ArcView. The drawback of this approach is that it is difficult and time consuming to draw accurate external borders (i.e., borders that abut the ocean or countries not included in WASAP).

2. Modifying an existing set of borders using ArcView's tools for splitting and merging existing polygons. If an existing border set contains some or all of the necessary external borders, this approach saves a lot of time and effort and produces more accurate external borders.

[3] Data on language were used as a proxy for ethnicity in the absence of data on ethnicity.
[4] ArcView is a registered trademark of Environmental Systems Research Institute, Inc.

The ethnic borders for this paper were created by modifying a set of borders for DHS reporting areas[5]. Internal borders (i.e., the borders between ethnic enclaves) were created by merging or splitting existing polygons. These internal borders were positioned to create ethnic enclaves in which the majority of DHS clusters had the same major ethnographic province.

The goal was to create ethnic enclaves with reasonable, contiguous borders while maximizing the number of clusters with the same major ethnographic province. A few examples (Figures 2 and 3) will illustrate the decision making process.

Figure 2 is centered on the borders of the enclave for the Tiv-Adamawa ethnographic province. Clusters for which Tiv-Adamawa is the major ethnographic province are in light gray. Clusters in which any other ethnographic province is dominant are in black.

Figure 2 – Creating the Tiv-Adamawa ethnic enclave
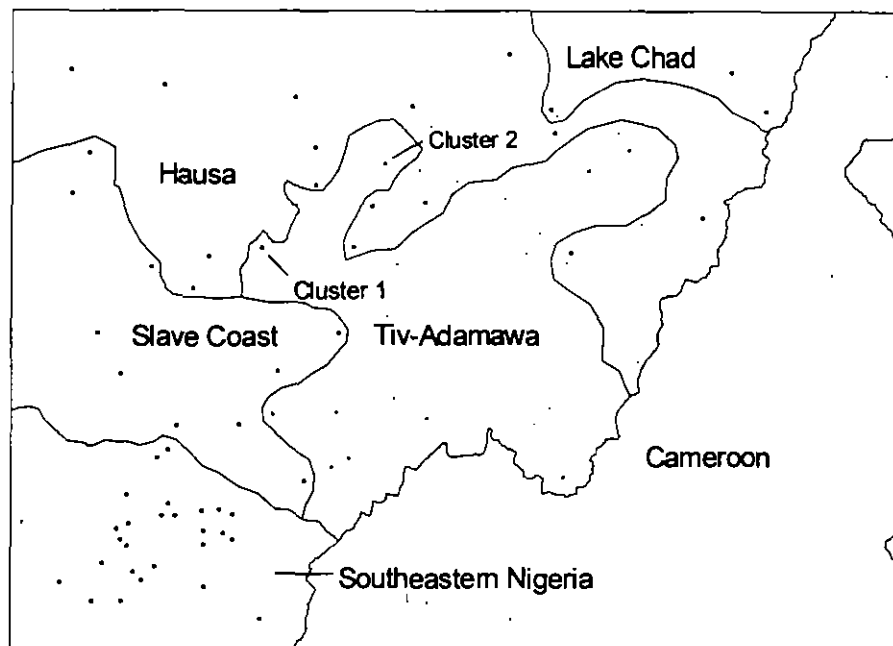
At first glance, cluster 1 appears not to belong in the Tiv-Adamawa ethnic enclave. However, it is in fact two clusters that share the same location. The major ethnographic province in cluster 1a (the displayed cluster) is Jos Plateau[6]. 34 women in cluster 1a belong to this ethnographic province. The major ethnographic province in cluster 1b (the cluster beneath 1a) is Tiv-Adamawa. 45 women in cluster 1b belong to this ethnographic province. Since the clusters cannot be separated, the borders of the Tiv-Adamawa ethnic enclave include both of them.

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[5] DHS reporting areas are used in the logistics of the survey; they often correspond to national administrative units.

[6] This was the major ethnographic province in 3 clusters. 1 of these clusters shared a location with another cluster, and the total number of women in the 3 clusters who belonged to the Jos Plateau ethnographic province was low. As a result no ethnic enclave was created for this ethnographic province. It is the only ethnographic province that dominates a cluster but does not have an enclave. The Teda ethnographic province had only 3 clusters as well, but its clusters were grouped and far from other clusters.

Cluster 2 is just one cluster. Its dominant ethnographic province is Tiv-Adamawa, but it is surrounded by clusters that have a different major ethnographic province. The borders of the Hausa ethnic enclave could have included this cluster. It was included in the Tiv-Adamawa ethnic enclave because it was possible to include it without greatly distorting the enclave's borders.

Figure 3 shows the ethnic enclaves in Senegal (and a small part of Mali). The different cluster shapes represent different dominant ethnographic provinces. Triangles represent Senegambian clusters, circles represent Fulani clusters, and squares represent Mande clusters.

Cluster 1 is two clusters that share the same location. One of the clusters is Mande and the other is Senegambian. Despite a Mande numbers advantage (9 Mande women compared with 5 Senegambian women), this cluster was included in the Senegambian enclave because it is surrounded by Senegambian clusters.

Figure 3 – Creating ethnic enclave borders in Senegal
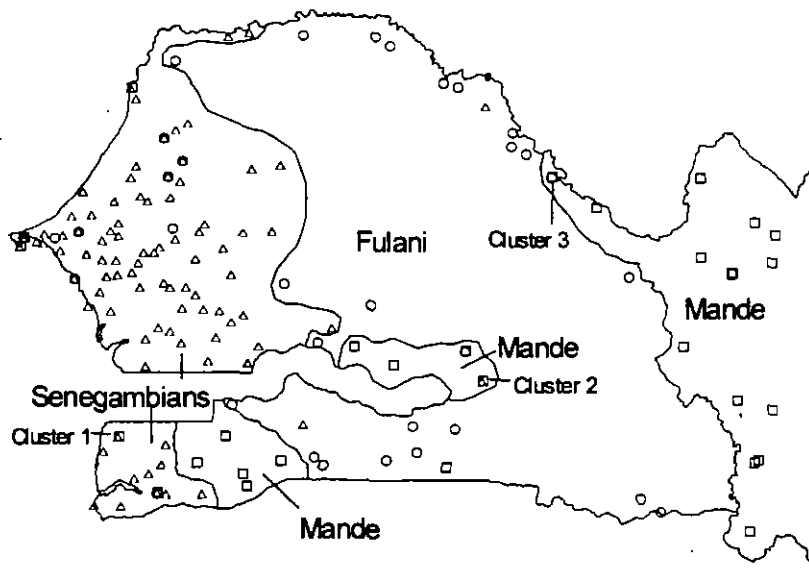
Cluster 2 is two clusters that share the same location. Once again, one cluster is Mande and the other is Senegambian. The Mande are once again numerically superior (34 Mande women to 7 Senegambian women) and this time the cluster seemed to fit most naturally in the Mande enclave.

Cluster 3 is also two clusters at the same location. One cluster is Mande and the other is Fulani. The Mande hold a numerical advantage (52 to 40) and the cluster seemed more appropriate in the Mande ethnic enclave.

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The ethnic enclaves

Figure 4 displays the final ethnic enclaves (the dotted lines are national borders). Some of the ethnic enclaves are not contiguous; they are made up of more than one polygon. Multiple polygons that make up a single ethnic enclave are defined and treated in ArcView as single units. For example, the Habe-Senufo ethnic enclave comprises two polygons. When an indicator is calculated for this enclave it will be based upon all DHS clusters within both polygons. If the value of the indicator is displayed by shading the map, both polygons will be the same shade.

Table 3 shows the characteristics of the ethnic enclaves. The dominant province columns show the number of DHS clusters and women within an enclave whose major ethnographic province is the same as the ethnographic province of the enclave. The total column shows the total number of clusters and women in the ethnic enclaves. The percent dominant column is the dominant province column divided by the total column.
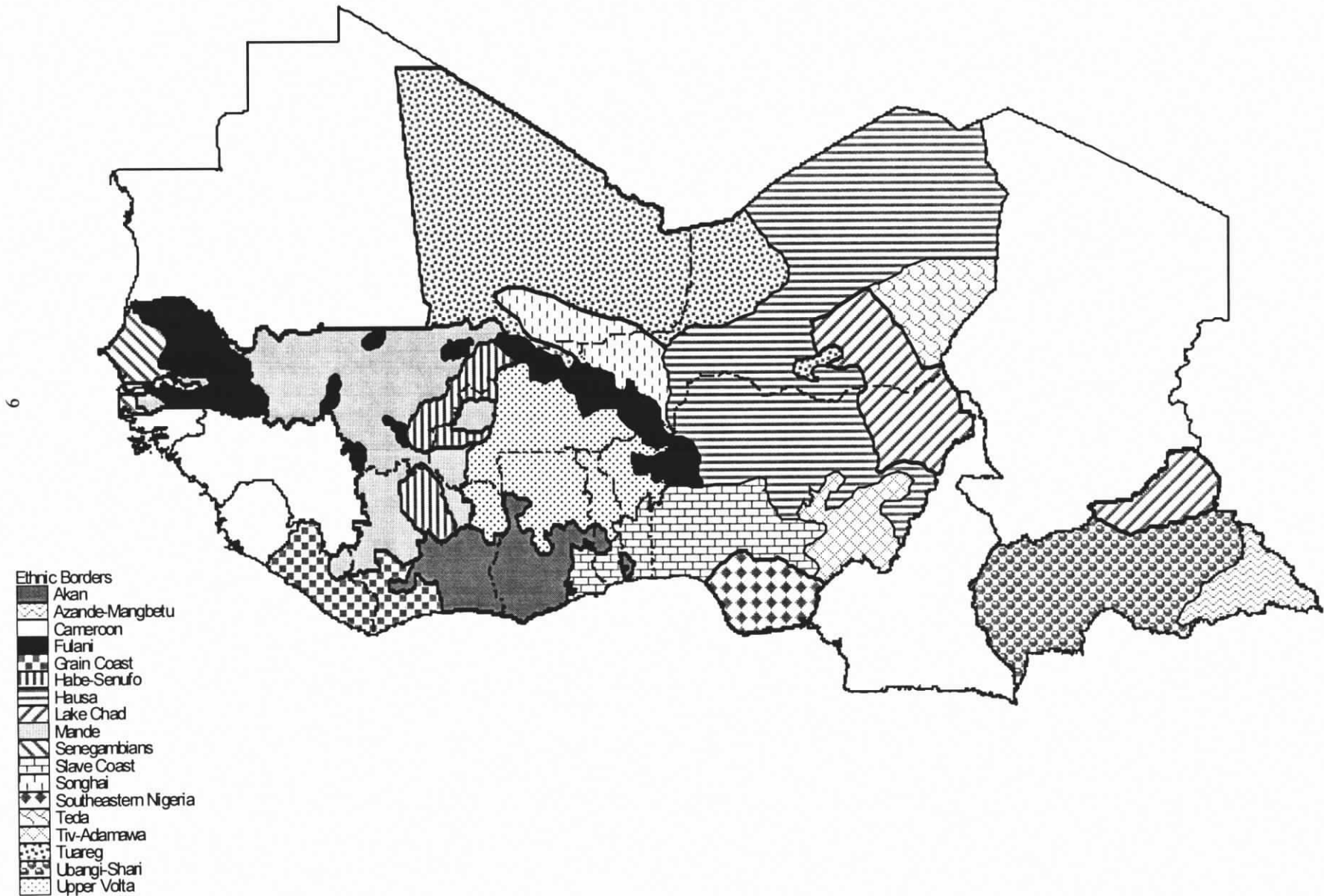
The values in the dominant province column are minimum values for women. The data only contain information on the number of women who belong to the major ethnographic province in each DHS cluster. A cluster that does not share the ethnographic province of its enclave may have women in it who do, but these women are not included in the counts for dominant province column.

Table 3 Characteristics of the ethnic enclaves

Ethnic Enclave	Clusters			Women		
	Dominant province	Total	Percent dominant	Dominant province	Total	Percent dominant
Akan	339 .	367	92	4,216	6,280	67
Azande-Mangbetu	10	10	100	92	109	84
Fulani	67	72	93	1,505	2,073	73
Grain Coast	133	148	90	3,265	4,483	73
Habe-Senufo	96	120	80	2,376	3,512	68
Hausa	193	208	93	5,410	6,784	80
Lake Chad	25	30	83	495	697	71
Mande	218	240	91	5,605	8,477	66
Senegambians	126	138	91	2,609	3,429	76
Slave Coast	256	265	97	5,477	6,352	86
Songhai	54	56	96	1,294	1,646	79
Southeastern Nigeria	75	75	100	2,495	2,667	94
Teda	3	3	100	16	42	38
Tiv-Adamawa	17	19	89	437	567	77
Tuareg	21	21	100	248	346	72
Ubangi-Shari	161	171	94	3,584 .	4,416	81
Upper Volta	258	263	98	6,236	7,544	83
Total	2,052	2,206		45,359	59,424	

The strength of the enclaves is that their ethnographic provinces are shared by a high proportion of their clusters and women. The higher the concentration of the dominant ethnographic group in an ethnic enclave, the more variables represent the actions of that ethnographic group.

Figure 4 – West African ethnic enclaves

Ethnic Borders
- Akan
- Azande-Mangbetu
- Cameroon
- Fulani
- Grain Coast
- Habe-Senufo
- Hausa
- Lake Chad
- Mande
- Senegambians
- Slave Coast
- Songhai
- Southeastern Nigeria
- Teda
- Tiv-Adamawa
- Tuareg
- Ubangi-Shari
- Upper Volta

The Teda enclave is an exception to the strength mentioned above. It has a very low percentage of women who share the dominant ethnographic province. The Teda form such a low percentage of women in their enclave that indicators for this enclave will not reflect of the behavior of the Teda. Results will be presented for this enclave but they will not be analyzed.

The Azande-Mangbetu, Teda, Tiv-Adamawa, and Tuareg enclaves have small sample sizes (very small in the case of the Teda enclave). The results for these enclaves should be interpreted with caution.

A general weakness of the enclaves is that they were drawn based on the available data with no use of *a priori* information. They reflect the reality of these data well, but they may not reflect geographic reality; the DHS samples were not selected to give representative estimates of ethnographic provinces. If the borders of our estimated ethnic enclaves are distorted, clusters may be in the wrong ethnic enclave.

Another weakness of the enclaves is that they were created using an early version of the West Africa background characteristics (dhs_bkc.dbf) data file. In this file, the major ethnographic province in a DHS cluster was the largest ethnic group **before** the data had been aggregated to the ethnographic province level. This raises the possibility of undercounting the number of women who belong to the major ethnographic province at the DHS cluster level (the previous undercounting problem was at the enclave level). Women from different ethnic groups may belong to the same ethnographic province.

It also raises the possibility of incorrect major ethnographic provinces at the DHS cluster level; the largest ethnic group in a cluster before aggregating to the ethnographic province level may not be part of the largest ethnographic province in the cluster when the aggregation has been done. This possibility is only a problem in cluster's whose major ethnographic province was shared by less than 50 percent of women., a small proportion of the clusters

Since this data problem has now been resolved and the purpose of this paper is illustrative rather than substantive, it is not a serious problem. But bear it in mind before drawing conclusions based on the results presented in the next two sections.

Fertility

How does fertility vary across countries and ethnographic provinces? Every country has its own reproductive health programs. National borders affect the reach of family planning distribution networks, the methods available at distribution points (method mix), and the intensity with which family planning is promoted. Fertility is also affected by economic and political conditions, and conditions that vary from country to country.

While the effect of national borders is bureaucratic, the effect of ethnographic borders is cultural. Traditions affect attitudes regarding many proximate determinants of fertility: age at first marriage, age at first sex, birth intervals, ideal family size, and others. Ethnicity, particularly as it relates to language, may also affect the spread of information and adoption of products and techniques. This can affect the use of family planning in general and specific methods in particular.

This section contains five sets of maps that examine the variation of fertility and its determinants across national and ethnographic borders. The subjects of the maps are the percentage of women

who are currently married, the median age at first birth, women's ideal number of children, the current use of a modern method of contraception, and the total fertility rate.

The indicators in all of the figures in this section and the infant feeding section that follows were calculated using the DHS aggregation script – a script for ArcView that is included in the WASAP GIS. The aggregation script produces an indicator by summing and weighting the denominator and numerator of an indicator.

Each set of maps in this section and the infant feeding section has the same scale so that comparisons can be made across maps (e.g. 5a and 5b have the same scale). All of the scales have five categories of equal range. The dotted line on figures with the a subscript (e.g., Figure 5a) are national borders. They are included to show the positions of ethnic enclaves relative to countries.

Precise numbers presented in the text are taken from the relevant table in Appendix A. These tables also provide information about the number of cases and clusters that the estimates are based on, and when possible, the indicator's standard error. They are numbered to match the figures, so Table A5 contains information about Figures 5a and 5b.

Currently married women

Figures 5a and 5b show the percentage of women who are currently married (or in union) by ethnic and national borders respectively. The percentage of currently married in the Teda ethnic enclave is not presented because it is based on fewer than 50 unweighted cases.

The percentage of women who are currently married on Figure 5a decreases as you move from the north to the south and west. It is below 75 percent in the ethnic enclaves along the Atlantic coast, with the exception of the Slave Coast enclave. The Fulani, Habe-Senufo, Hausa, Mande, Tuareg, and Upper Volta ethnic enclaves form a large area where the percentage of women who are currently married is above 82 percent.

There is significant variation among ethnic enclaves that fall within the same national borders. There are five different ethnic enclaves in Nigeria and only two (Hausa and Lake Chad) fall in the same marriage prevalence category (on the map's scale). The Central African Republic contains three ethnic enclaves, and the prevalence of marriage in each enclave is in a different category.

Figure 5b shows a similar pattern to Figure 5a. Burkina Faso, Mali, and Niger form an area in which more than 82 percent of women are currently married. The prevalence of marriage decreases as you move to the south and west. The Central African Republic, Côte d'Ivoire, Ghana, and Liberia have the lowest percentages of women who are currently married – less than 75 percent of the women in these countries are currently married.

Figures 5a and 5b have similar patterns but significant differences. The area with a marriage prevalence above 82 percent extends further south and west on Figure 5a. Three ethnic enclaves (Akan, Azande-Mangbetu, and Southeastern Nigeria) on Figure 5a have marriage prevalence rates below 69 percent while only one country (Côte d'Ivoire) on Figure 5b has a marriage prevalence rate below this threshold.

The percentage of currently married women is lower in the Songhai ethnic enclave than in all three of the countries it stretches across. It's marriage prevalence rate is also in a lower category than all three of the ethnic enclaves it borders.

Figure 5a – Percentage of women who are currently married, by ethnic borders

	62.7-69.0
	69.0-75.3
	75.3-81.6
	81.6-87.9
	87.9-94.2
	No data
	Fewer than 50 unweighted cases
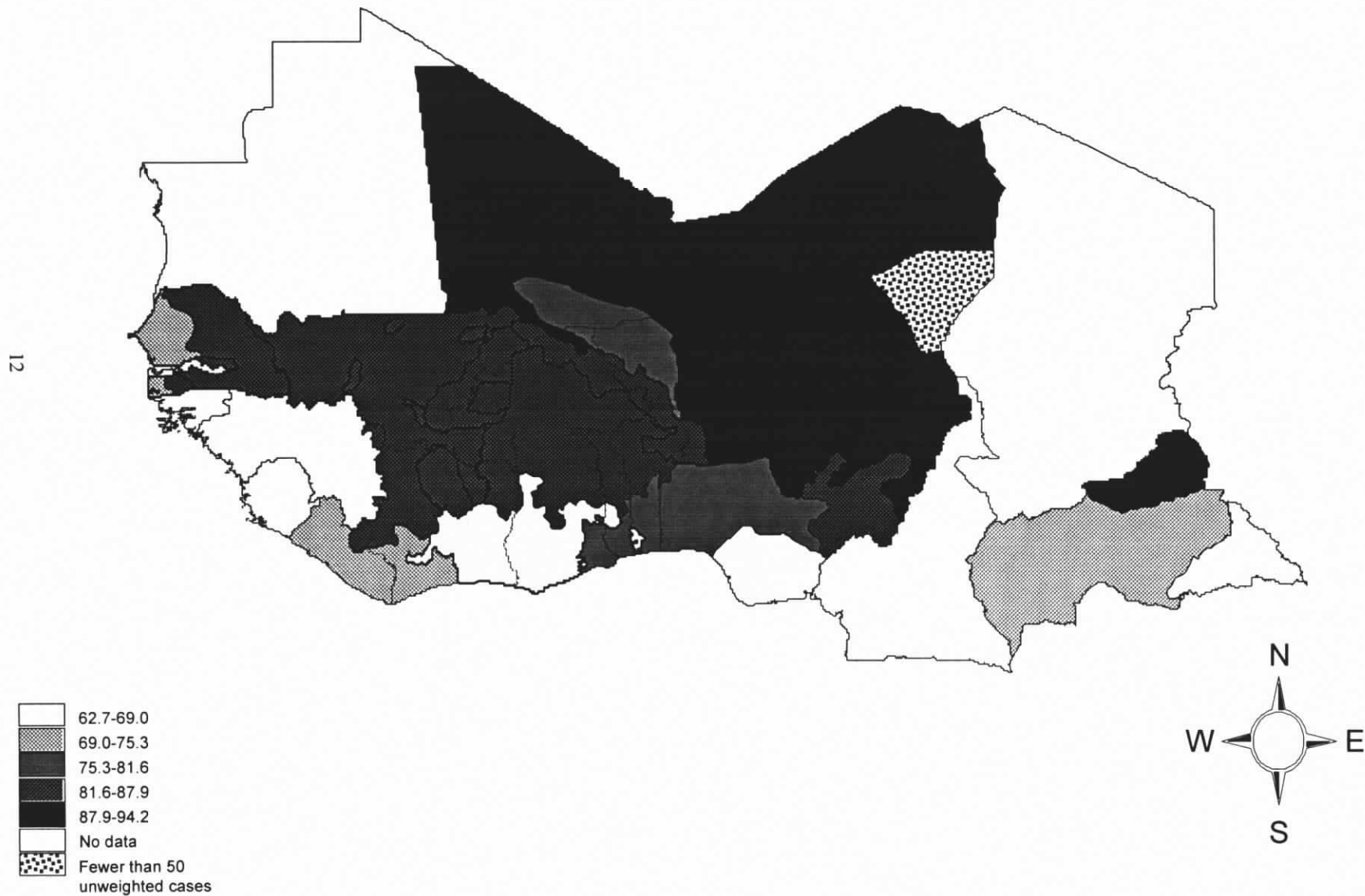
Figure 5b – Percentage of women who are currently married, by national borders

62.7-69.0
69.0-75.3
75.3-81.6
81.6-87.9
87.9-94.2
No data
Fewer than 50 unweighted cases

N
W E
S
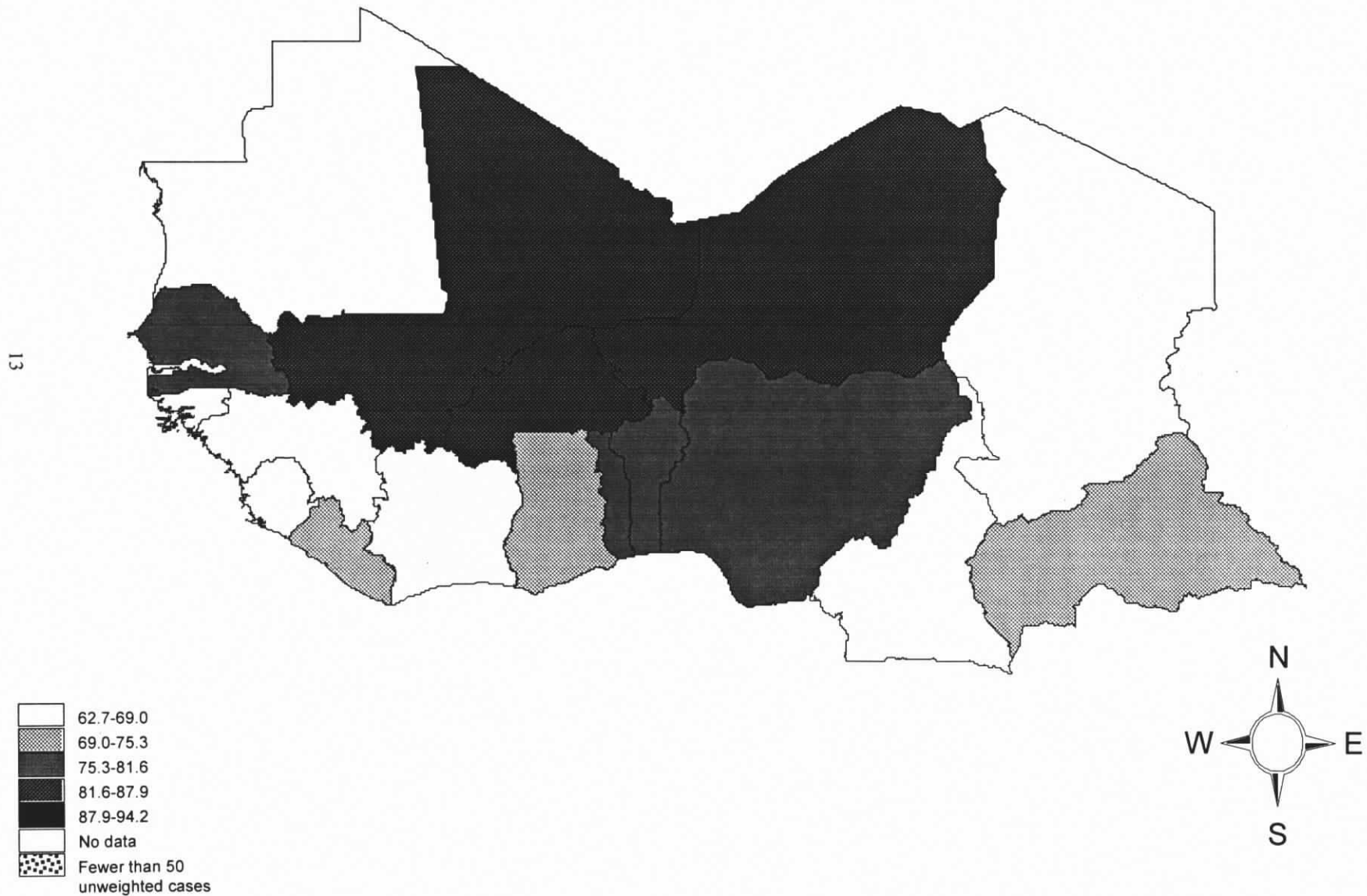
The Southeastern Nigeria and Tiv-Adamawa ethnic enclaves also stand out. They are in different marriage prevalence categories than the country they are within (Nigeria), and despite bordering one another, their marriage prevalence rates differ by 21 percentage points.

Age at first birth

Figures 6a and 6b show the median age at first birth for all women aged 25-49 by ethnic and national borders respectively. Five ethnic enclaves in the north and north-east of Figure 6a (Fulani, Hausa, Songhai, Tiv-Adamawa, and Tuareg) have median ages at first birth equal to or below 18.5 years. Three ethnic enclaves in the center and south of the map (Akan, Slave Coast, and Upper Volta) have the highest median ages at first birth – their median ages are equal to or above 19.2 years.

The untidy distribution in Figure 6a has some interesting features. Two of the ethnic enclaves with the highest median ages at first birth (Upper Volta, Slave Coast) abut two of the ethnic enclaves with the lowest median ages at first birth (Fulani, Hausa). Burkina Faso, Côte d'Ivoire, and Nigeria contain parts of ethnic enclaves that represent four of the five age at first birth categories.

Figure 6b's distribution is no tidier than its partner's. Niger, Mali, and Côte d'Ivoire form a contiguous area with low median ages at first birth, but it's an L-shaped area that ranges from the north-east to the south-west. Liberia, Ghana, Benin, and the Central African Republic are the areas with the highest median ages at first birth, and none of them is contiguous with any of the others. The countries with the highest and lowest median ages at first birth (Ghana and Niger respectively) abut countries with median ages at first birth towards the other end of the distribution (Côte d'Ivoire and Benin respectively).

Figures 6a and 6b show some interesting differences. Liberia's median age at first birth falls in the 19.1-19.5 category, but the median age at first birth for its dominant ethnic enclave, Grain Coast, falls in the 18.3-18.7 category. The clusters in the Grain Coast enclave must have low median ages at first birth in Côte d'Ivoire and high median ages at first birth in Liberia.

The Mande ethnic enclave, whose territory is concentrated mainly in Mali and Côte d'Ivoire, has a lower median age at first birth than either country. The Slave Coast ethnic enclave has a higher median age at first birth than all but one of the countries (Ghana) whose territory it contains. Finally, the Azande-Mangbetu and Tiv-Adamawa ethnic enclaves both have lower values than the countries that contain them (note that both also have small numbers of unweighted women).

Ideal number of children

Figures 7a and 7b show the ideal number of children desired by women aged 15-49 by ethnic and national borders respectively. The gap between the lowest ideal number of children and the highest ideal number of children is striking. The gap between the ethnic enclaves with highest and lowest ideal number of children is 4 children; the gap between the countries with the highest and lowest ideal number of children is 3.8 children.

The ideal number of children decreases on Figure 7a as you move south-west. The ethnic enclaves were the ideal number of children is highest – Hausa, Songhai, and Tuareg – are clustered in the north and north-east. The ideal number of children is 6.2 or below for the five ethnic enclaves along the Atlantic coast (Akan, Grain Coast, Slave Coast, Senegambians, and Southeastern Nigeria).

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Figure 6a – Median age at first birth for all women aged 25-49, by ethnic borders

Legend:
- 17.9-18.3
- 18.3-18.7
- 18.7-19.1
- 19.1-19.5
- 19.5-20.0
- No data
- Fewer than 50 unweighted cases
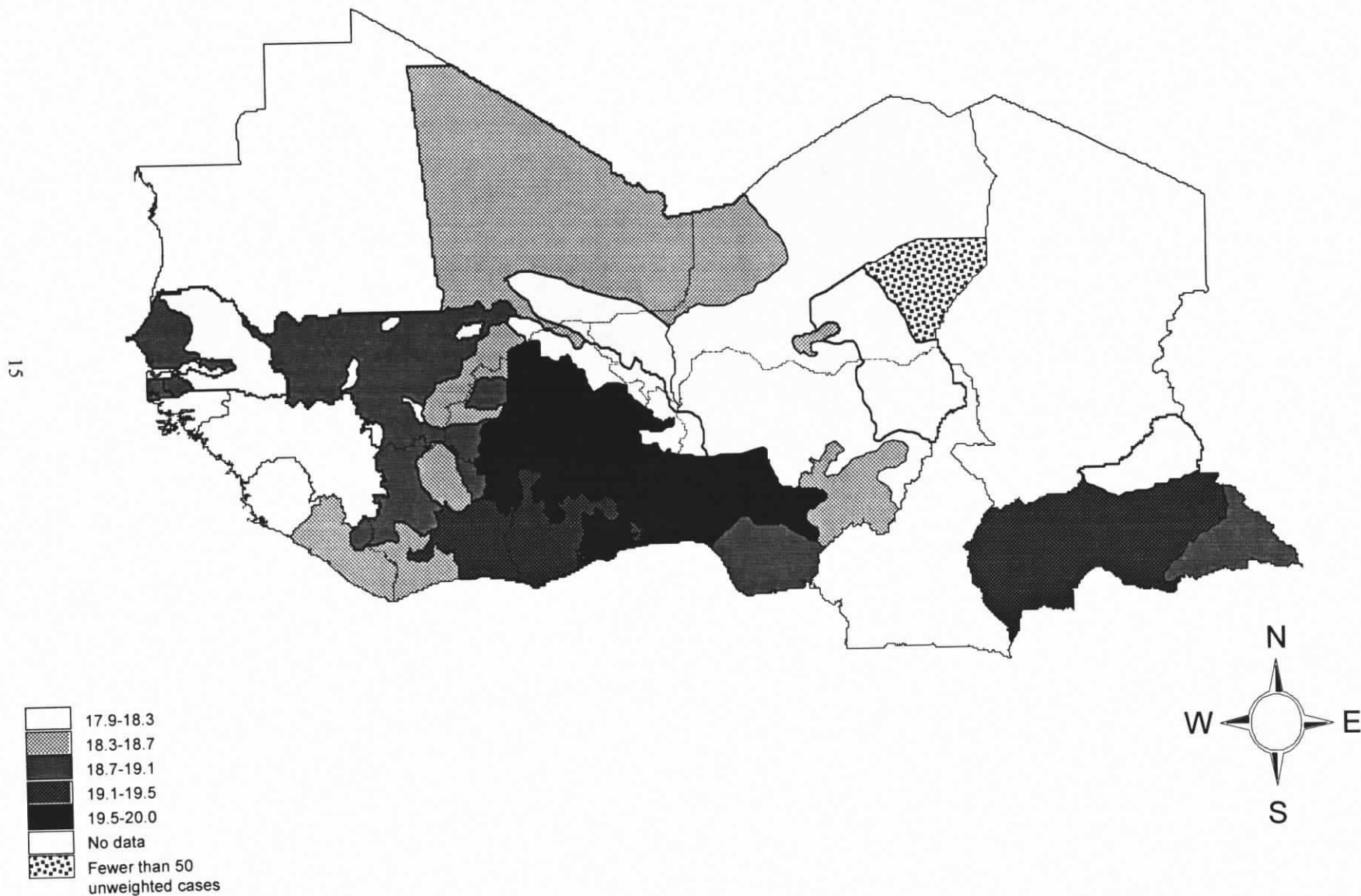
Figure 6b – Median age at first birth for all women aged 25-49, by national borders

Legend:
- 17.9-18.3
- 18.3-18.7
- 18.7-19.1
- 19.1-19.5
- 19.5-20.0
- No data
- Fewer than 50 unweighted cases
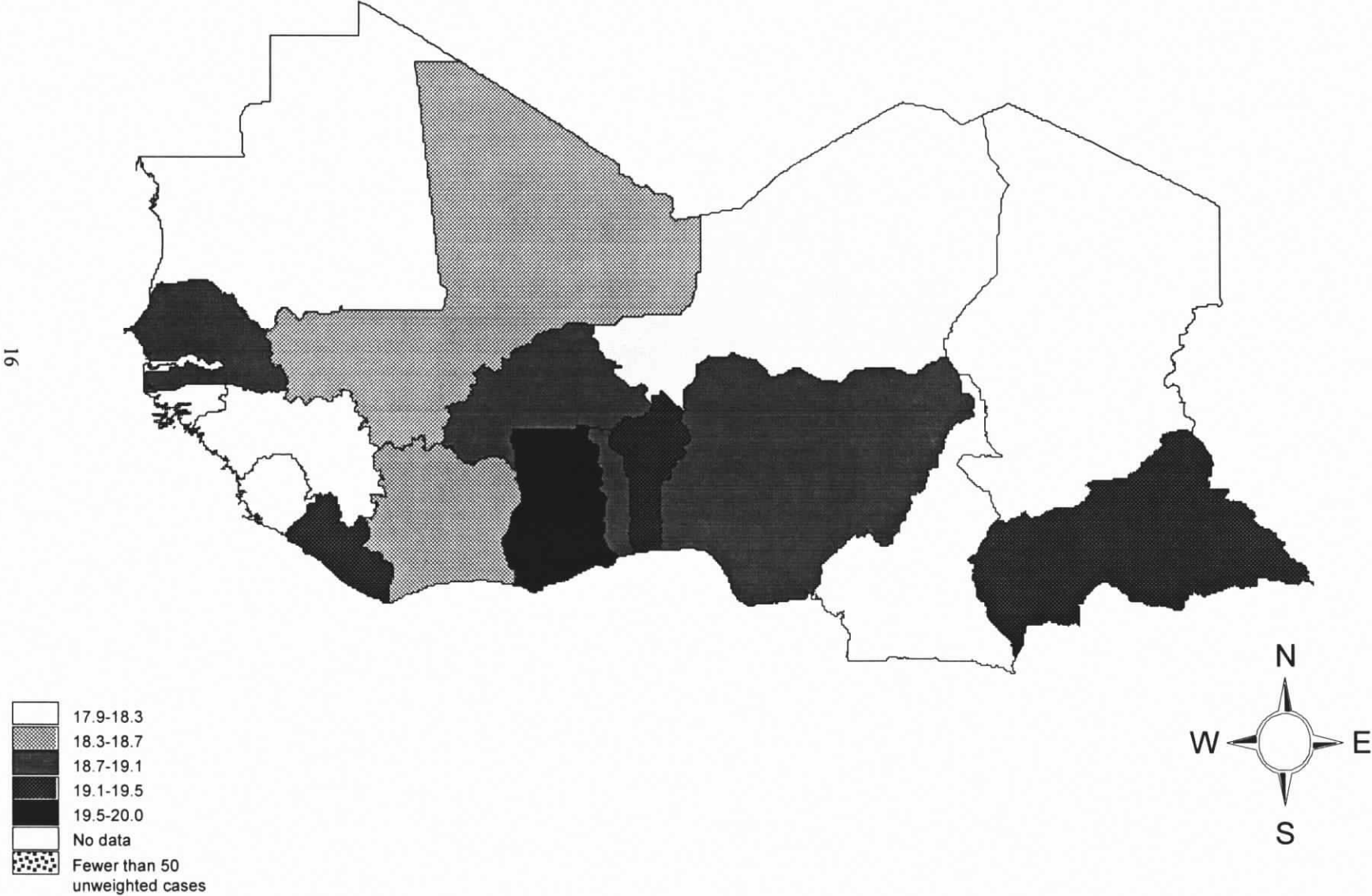
Figure 7a – Ideal number of children desired by women aged 15-49, by ethnic borders

Legend:

- 4.5-5.4
- 5.4-6.3
- 6.3-7.2
- 7.2-8.1
- 8.1-9.0
- No data
- Fewer than 50 unweighted cases

17
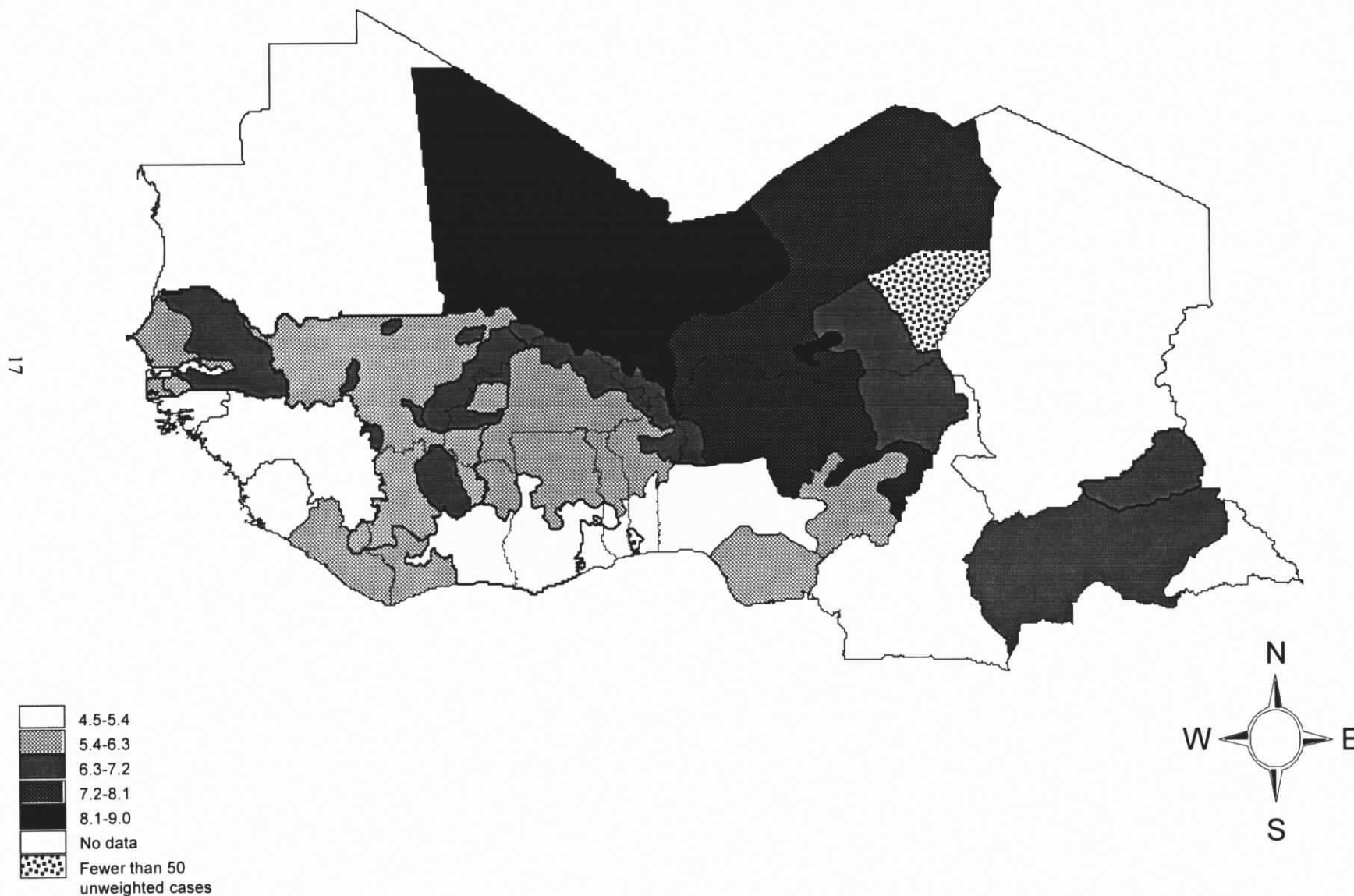
Figure 7b – Ideal number of children desired by women aged 15-49, by national borders

Legend:

- 4.5-5.4
- 5.4-6.3
- 6.3-7.2
- 7.2-8.1
- 8.1-9.0
- No data
- Fewer than 50 unweighted cases

Figure 7b shows a different pattern. The country with the highest ideal number of children does fall in the north (Niger), but Mali's (the other northern country) ideal number of children is between 6.3 and 7.2, the middle range. The ideal number of children in Senegal and Liberia, two countries on the Atlantic Coast, is also in this middle range, despite the low values of the coastal ethnic enclaves. Benin, Burkina Faso, Côte d'Ivoire, Ghana, Nigeria, and Togo, a contiguous group of countries with ideal numbers of children equal to or below 6, directly abut Niger, where the ideal number of children is 8.4.

Figure 7 shows some of the differences that Figures 5 and 6 displayed. The Azande-Mangbetu ethnic enclave, for example, is once again in a different category than the Central African Republic, the country in which it lies. Figure 7 also has some differences of its own, such as the large area with an ideal number of children between 4.5 and 5.4 formed by the Akan and Slave Coast ethnic enclaves on Figure 7a. This area is not duplicated on Figure 7b, where only Ghana has an ideal number of children between 4.5 and 5.4.

Current use of modern family planning methods

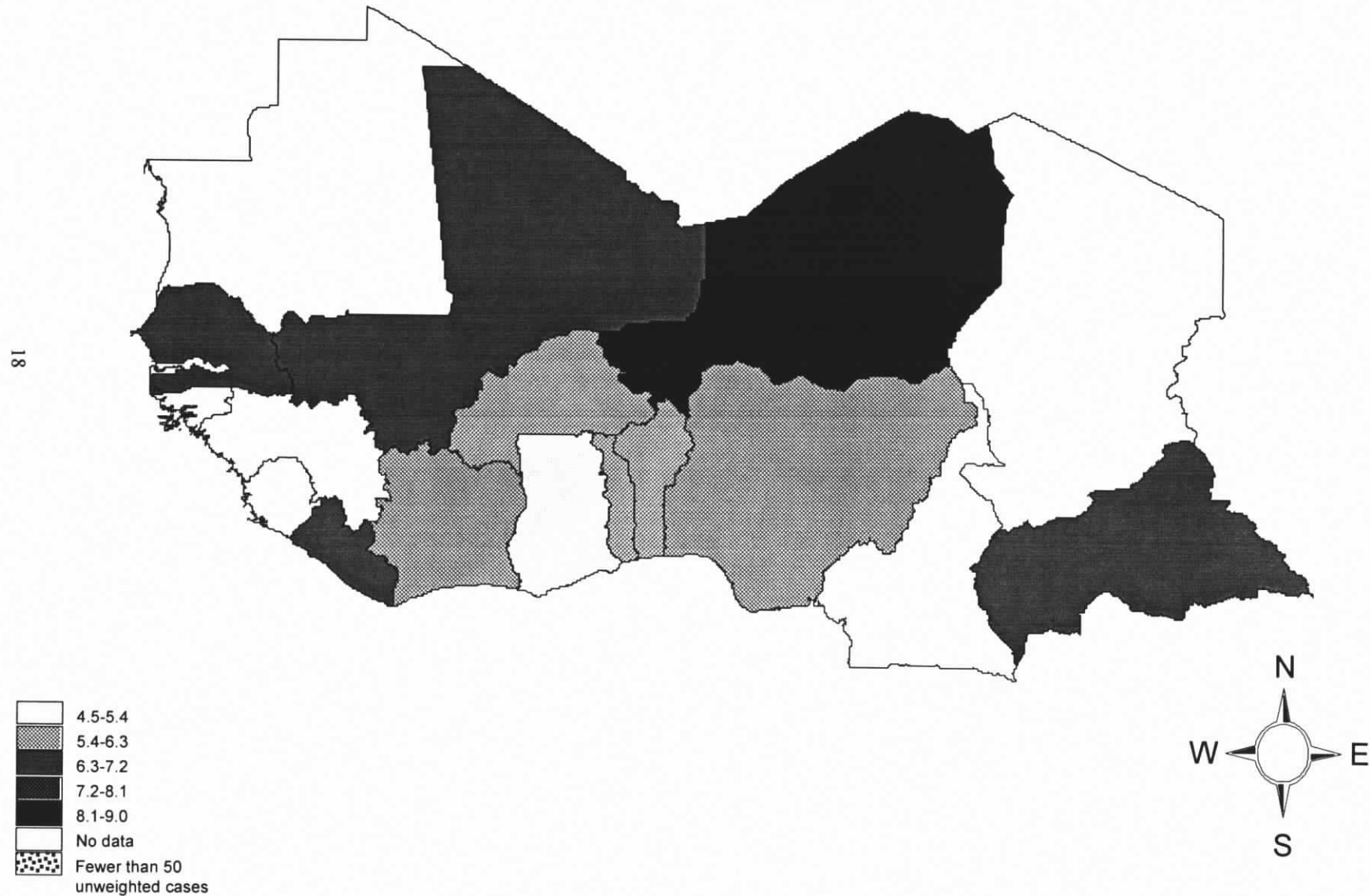Figures 8a and 8b show the percentage of currently married women aged 15-49 who currently use any modern method of family planning[7] by ethnic and national borders respectively. Modern family planning is used by less than 10% of currently married women in all of the ethnic enclaves and countries. It is used by more than 5% of currently married women only in Ghana and the Akan ethnic enclave.

In Figure 8a, the contraceptive prevalence for all but four (Akan, Slave Coast, Southeastern Nigeria, and Tiv-Adamawa) ethnic enclaves is in the two lowest categories (0.2-2.1, 2.1-4.0). Family planing use is lowest in a band of enclaves in the north and east (Fulani, Hausa, Lake Chad, Songhai, Tuareg, and Ubangi-Shari).

Figure 8b is also dominated by areas where modern family planning is used by a small percentage of currently married women. Only Ghana and Liberia do not fall in the two lowest contraceptive prevalence categories. The Central African Republic and Niger have the lowest use of modern family planning.

Figures 8a and 8b have similar distributions, but there are a few differences. The area with contraceptive prevalence rates above 4 percent formed by four ethnic enclaves (Akan, Slave Coast, Southeastern Nigeria, and Tiv-Adamawa) in the south of Figure 8a is larger than the equivalent area (Ghana) on Figure 8b. The area of low family planning use (0.2-2.1 percent) also extends further west and south on Figure 8a than on Figure 8b.

The Azande-Mangbetu, Southeastern Nigeria, and Tiv-Adamawa ethnic enclaves all have different contraceptive prevalence rates than the countries that contain them. The Fulani ethnic enclave appears in parts of 6 countries – Benin, Burkina Faso, Mali, Niger, Nigeria, and Senegal – and it has lower family planning use than all of them except Niger.

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[7] Condoms, diaphragms, female sterilization, foaming tablets, injections, IUD, jelly, male sterilization, Norplant, and the pill.

Figure 8a – Percentage of currently married women aged 15-49 who currently use any modern method of family planning, by ethnic borders

Legend:

- 0.2-2.1
- 2.1-4.0
- 4.0-5.9
- 5.9-7.8
- 7.8-9.7
- No data
- Fewer than 50 unweighted cases

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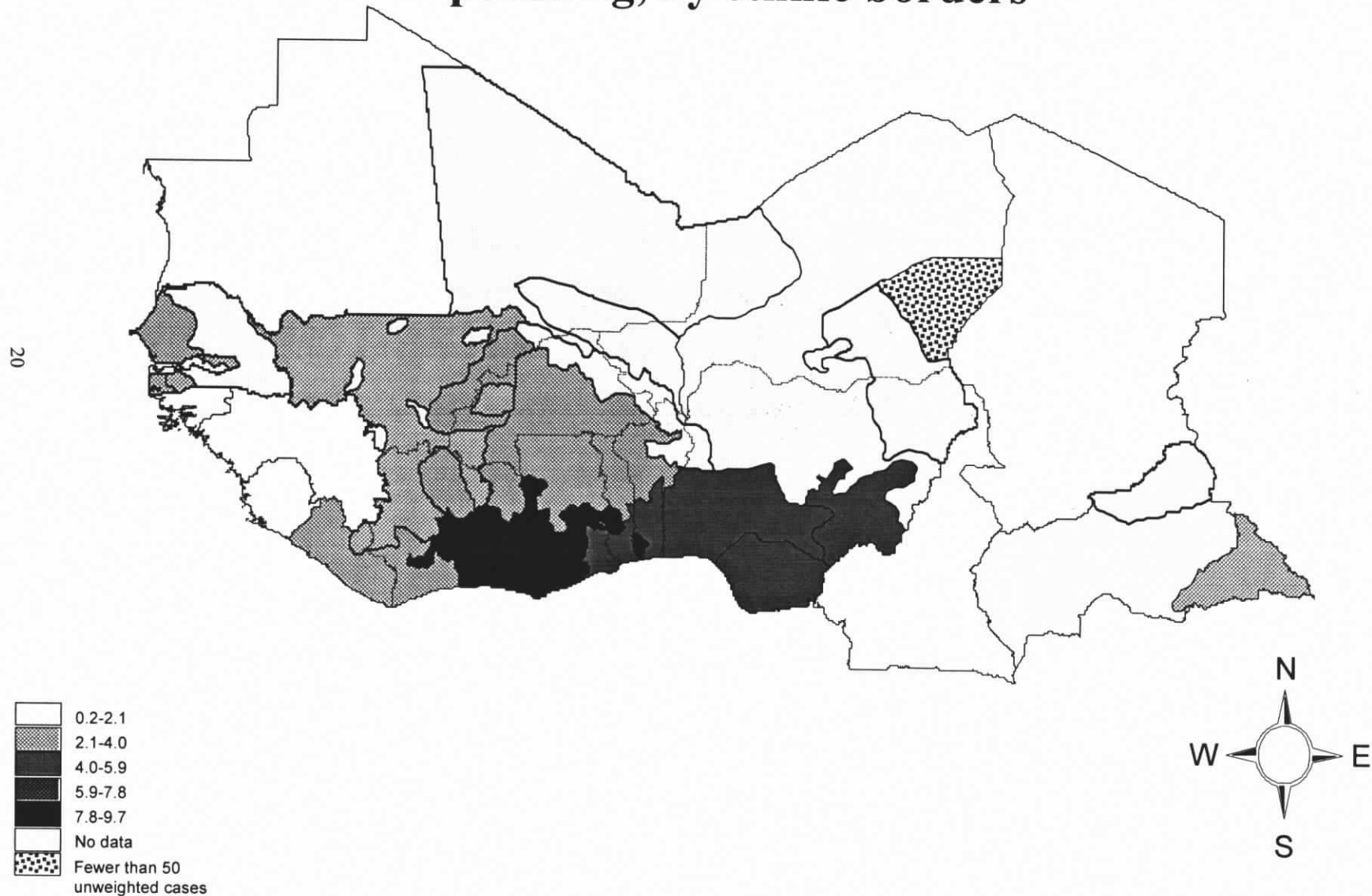# Figure 8b – Percentage of currently married women aged 15-49 who currently use any modern method of family planning, by national borders

	0.2-2.1
	2.1-4.0
	4.0-5.9
	5.9-7.8
	7.8-9.7
	No data
	Fewer than 50 unweighted cases
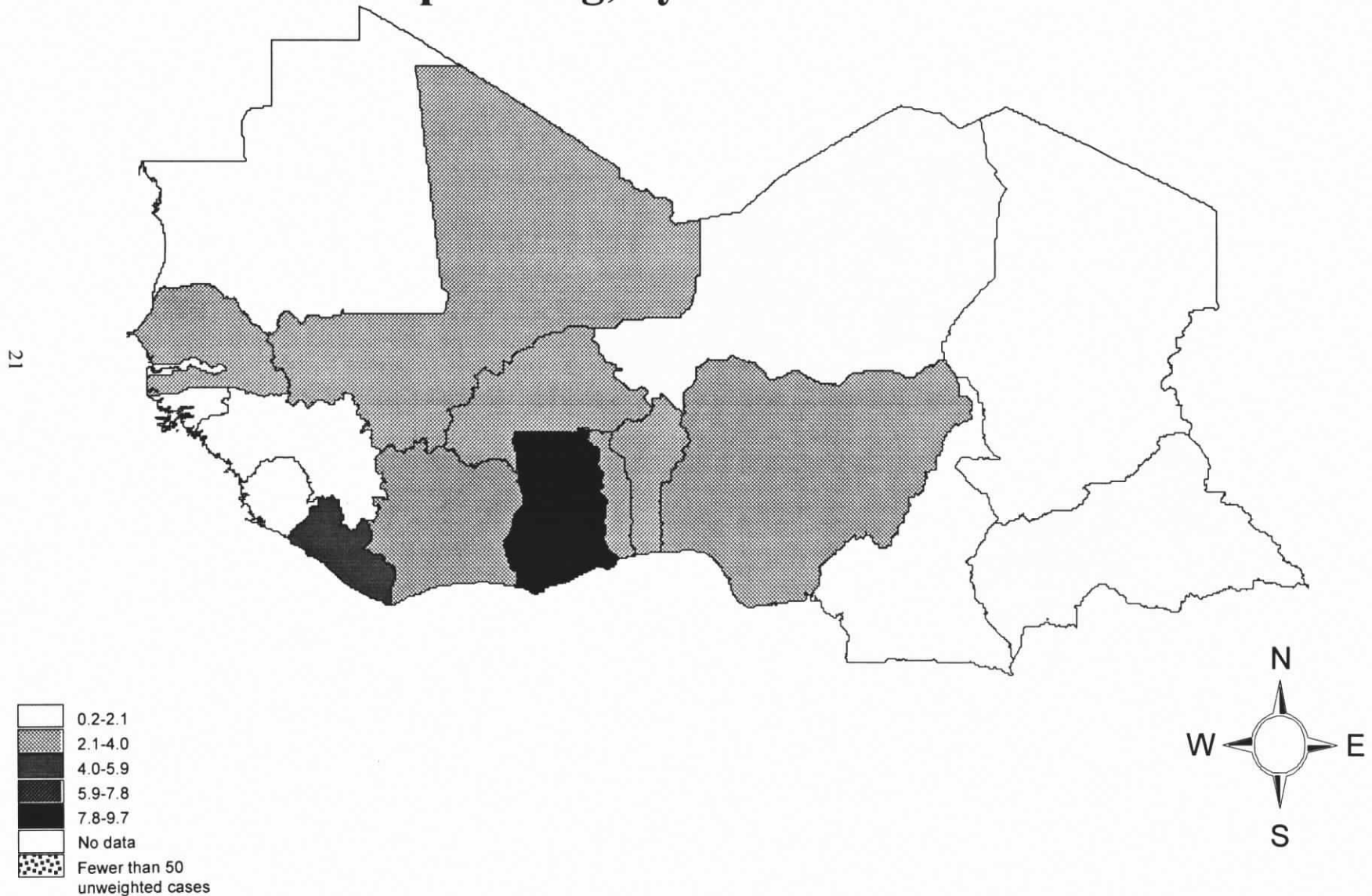
Total fertility rate

Figures 9a and 9b show the total fertility rate by ethnic and national borders respectively. Total fertility rates are not presented for the Azande-Mangbetu, Teda, Tiv-Adamawa, and Tuareg ethnic enclaves because they were based on denominators of less than 500 unweighted cases.

The total fertility rate decreases as you move south and west on Figure 9a. It is highest in the Mande and Songhai enclaves; it is lowest in the Akan, Southeastern Nigeria, and Ubangi-Shari ethnic enclaves.

Fertility is high in the north of Figure 9b, and with the exception of Togo and Liberia, decreases as you move west, south, and east. Three countries, the Central African Republic, Côte d'Ivoire, and Ghana have total fertility rates of 5.8 or lower.

Figures 9a and 9b have different distributions. Some of this difference is due to the four ethnic enclaves with missing total fertility rates, but there are differences in sections of the figures unaffected by missing total fertility rates. The Southeastern Nigeria ethnic enclave, for example, has a lower total fertility rate than Nigeria, the country which it is within. Togo has a higher fertility rate than the ethnic enclaves that constitute it. The Grain Coast ethnic enclave, which contains most of Liberia, has a total fertility rate of 6.14 while Liberia has a total fertility rate of 6.92.

Some of the results on Figures 9a and 9b are surprising considering the results on Figures 5 to 8. Among countries, the Central African Republic has the lowest total fertility rates despite the second lowest contraceptive prevalence rate and the third highest desired number of children. Liberia has a high total fertility rate, but a relatively late age at first birth and relatively low marriage prevalence.

Among ethnic enclaves, the Mande enclave has the second lowest total fertility rate despite a relatively low ideal number of children and average age at first birth. Not all of the results are surprising; the Hausa ethnic enclave has a high total fertility rate and the determinants you would expect – a low contraceptive prevalence and age at first birth, and a high ideal number of children and marriage prevalence.

Figure 9a – Total fertility rate, by ethnic borders

5.2-5.6
5.6-6.0
6.0-6.4
6.4-6.8
6.8-7.2
No data
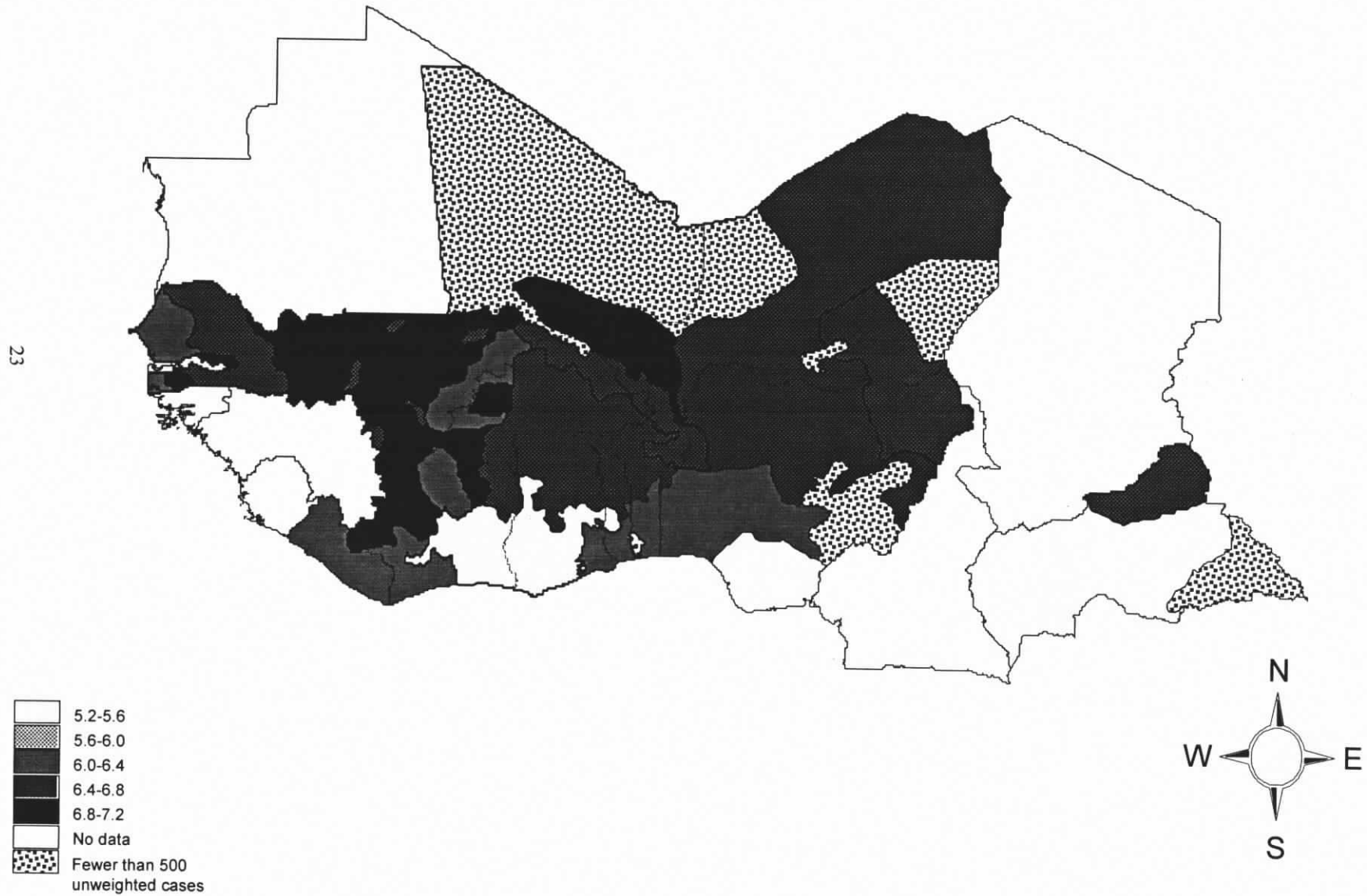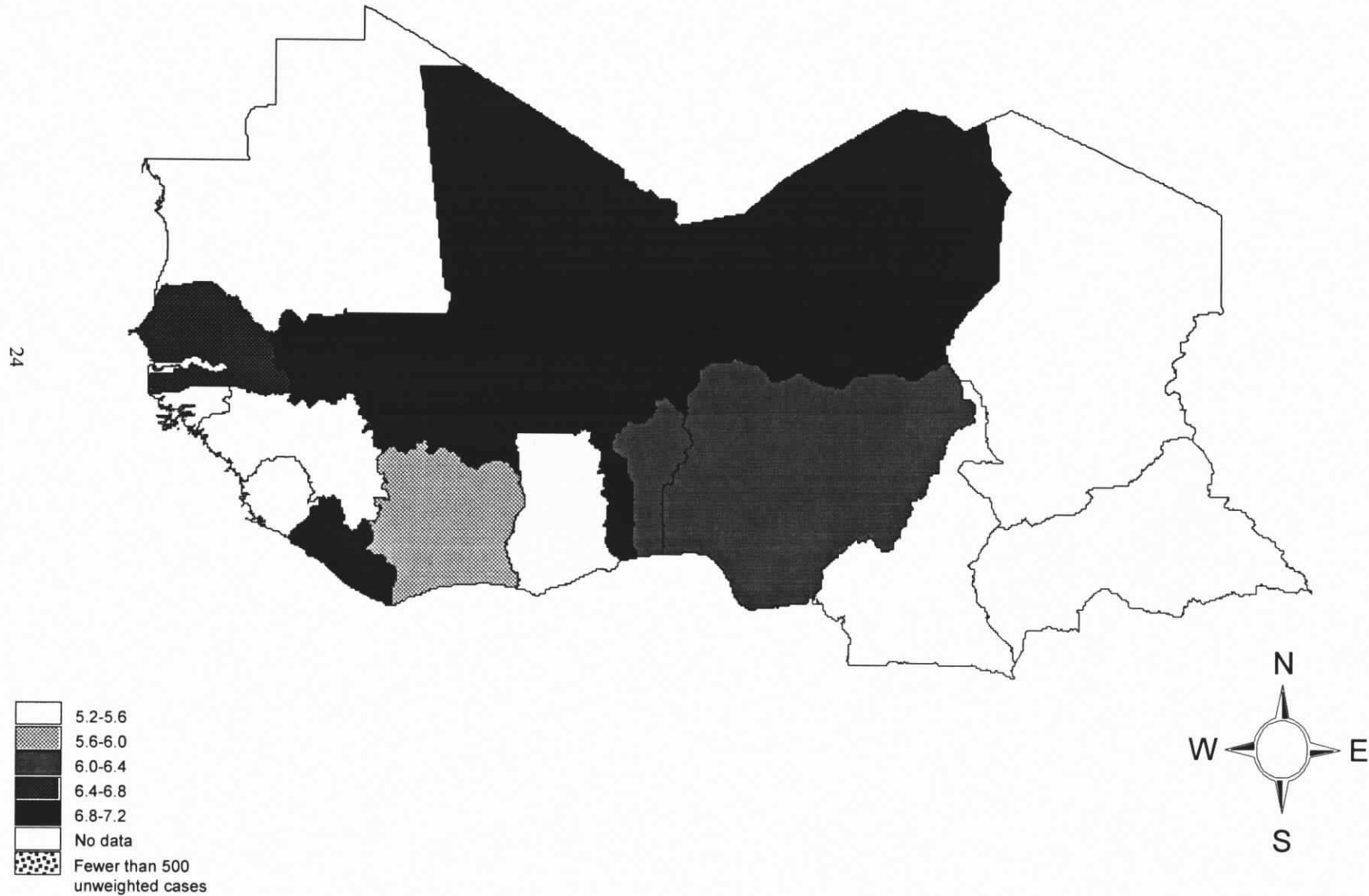Fewer than 500
unweighted cases

Figure 9b – Total fertility rate, by national borders

Legend:
- 5.2-5.6
- 5.6-6.0
- 6.0-6.4
- 6.4-6.8
- 6.8-7.2
- No data
- Fewer than 500 unweighted cases

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Infant Feeding

How, what, and when infants are fed affects their health and nutritional status. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have issued a set of recommendations about optimal infant feeding practices (WHO/UNICEF 1990; WHO 1994). These recommendations include

- Initiation of breastfeeding within about one hour of birth.

- Exclusive breastfeeding (breast milk only) until the infant is about 6 months old.

- The introduction of foods to supplement breast milk when the infant is about 6 months old.

Nobody expects 100 percent compliance with the recommendations above. There is certain to be some variation across national and ethnic borders. Governments assess the importance and validity of each recommendation and develop policy programs based on this assessment and their own recommended practices. It is unlikely that any two governments will make the same assessment and develop the same programs.

The effect of ethnicity on feeding practices is based upon traditions and customs (which supercede the recommendations above). These traditional practices may be resistant to the recommendations of governments and non-governmental organizations alike.

This section presents 3 sets of maps concerned with the variation of infant feeding practices across national and ethnographic borders. The subjects of these maps are: the percentage of children breastfed in their first hour of life, the percentage of children who were ever breastfed, and the percentage of children aged 4-6 months who were given foods to supplement breast milk.

The percentage of children breastfed in the first hour of life corresponds to one of the WHO/UNICEF recommendations. The percentage of children who were ever breastfed corresponds to the implicit recommendation that all children be breastfed.

The percentage of children aged 4-6 months who received supplemental foods corresponds to the second and third recommendations above. The ideal indicator would include only children aged 6 months (or perhaps children aged 6-7 months). Unfortunately, the WASAP data files do not contains information about children of this age; the choice was between children aged 4-6 months and children aged 7-11 months. Children aged 4-6 months were selected because they provide information about both the second and third WHO/UNICEF recommendations.

Breastfeeding in the first hour of life

Figures 10a and 10b show the percentage of last-born children who were breastfed in the first hour after birth by ethnic and national borders respectively. No data are available on this indicator for two countries, Liberia and Togo. When interpreting data for ethnic enclaves that include territory in these two countries bear in mind that there are no clusters in these countries. The estimate for the Grain Coast, for example, is based exclusively on clusters in Côte d'Ivoire. Percentages are not displayed for two ethnic enclaves – Azande-Mangbetu and Teda – because they were based upon less than 50 unweighted cases.

Figure 10a – Percentage of last-born children born in the last 3 years who were breastfed in the first hour after birth, by ethnic borders

26

9.0-16.8
16.8-24.6
24.6-32.4
32.4-40.2
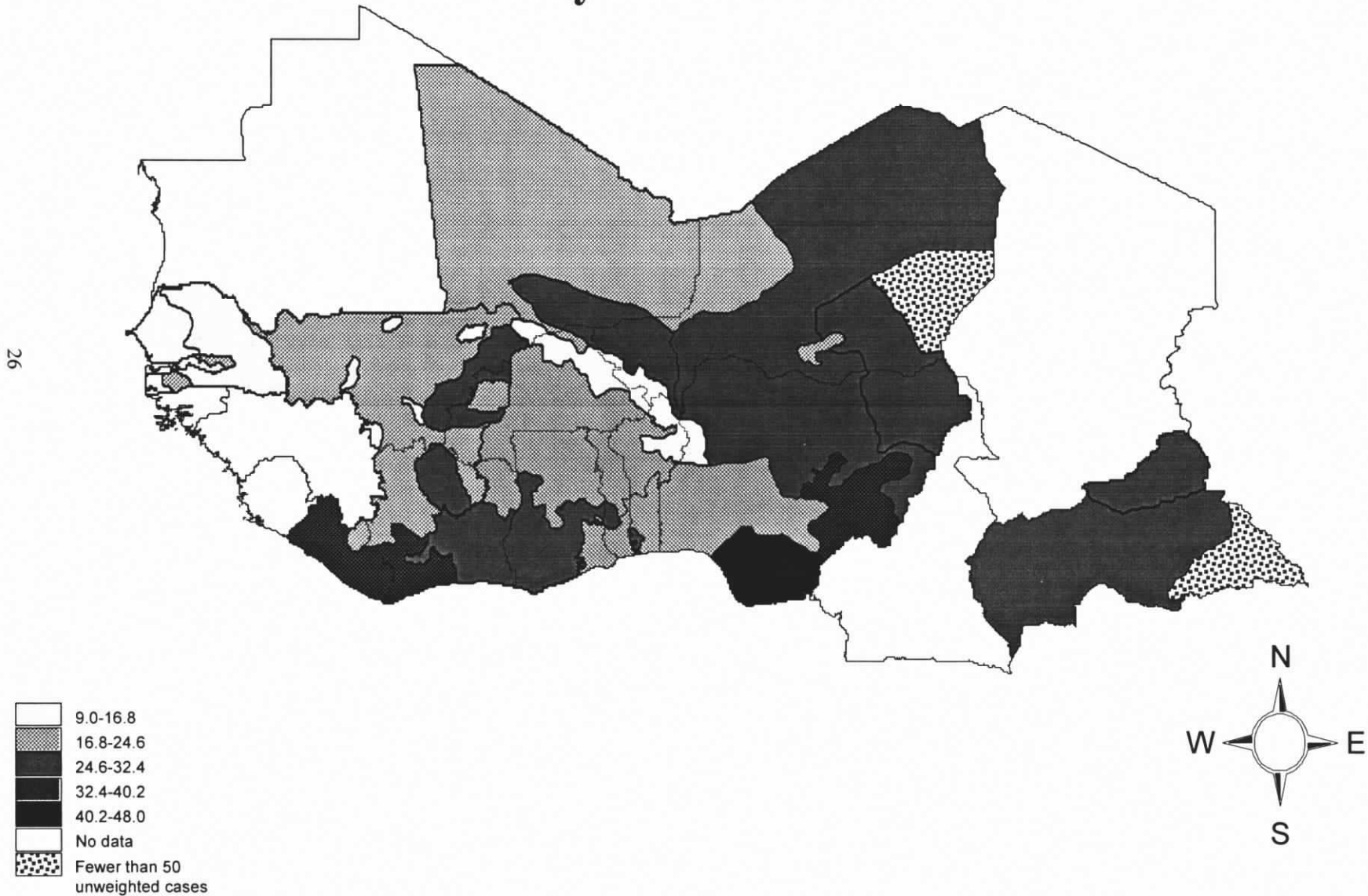40.2-48.0
No data
Fewer than 50 unweighted cases

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Figure 10b – Percentage of last-born children born in the last 3 years who were breastfed in the first hour after birth, by national borders

	9.0-16.8
	16.8-24.6
	24.6-32.4
	32.4-40.2
	40.2-48.0
	No data
	Fewer than 50 unweighted cases

N
W E
S
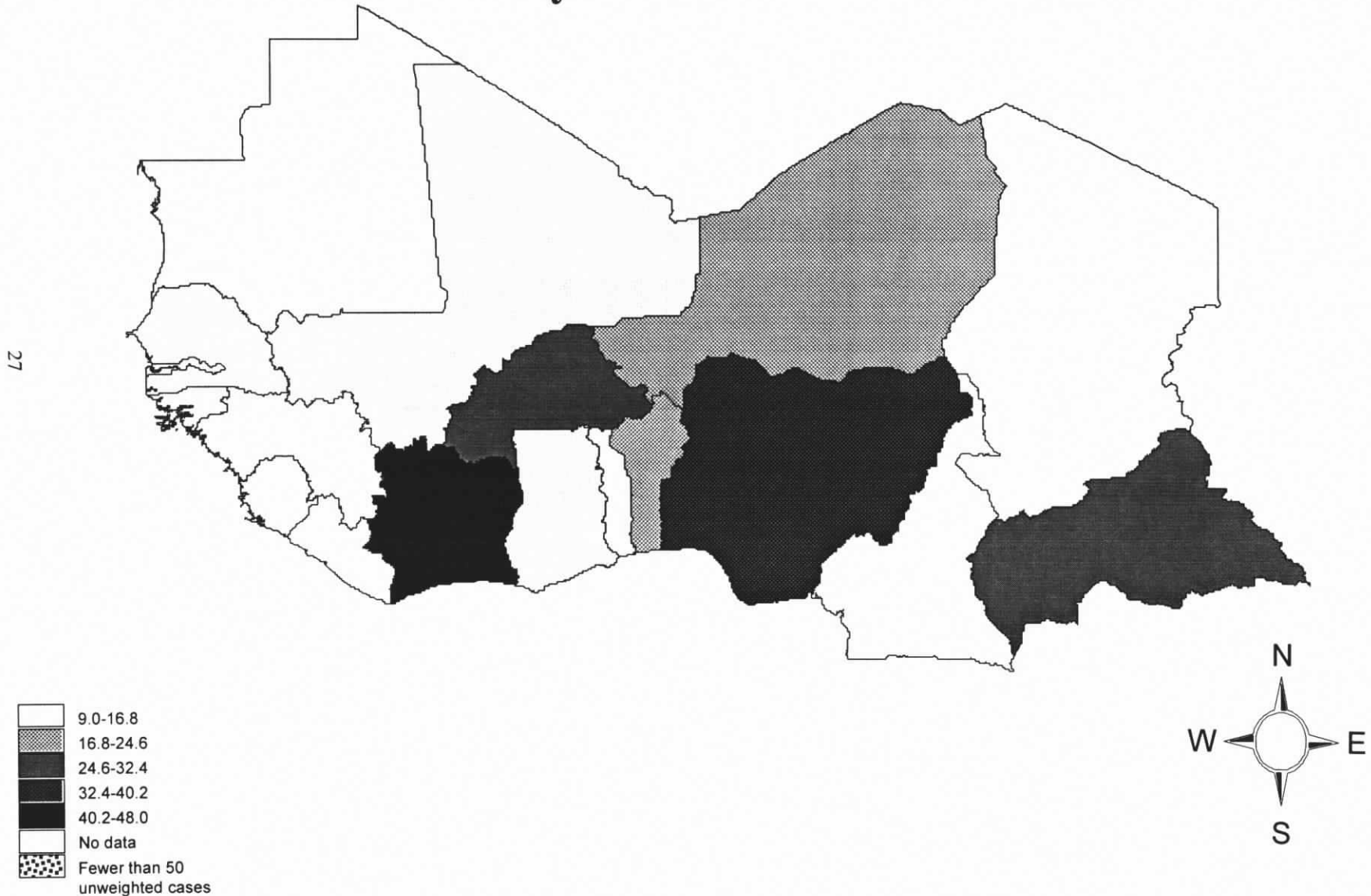
The outstanding feature of Figures 10a and 10b is the low percentage of children who were breastfed in the first hour of life. Breastfeeding in the first hour of life has advantages for infants and their mothers: it provides infants with the benefits of colostrum (Righard and Alade, 1990), stimulates the production of breast milk, and can reduce postpartum blood lose by causing the uterus to retract. The low levels of first hour breastfeeding shown on Figures 10a and 10b have negative effects on the health and nutrition of infants and their mothers.

Ethnic enclaves in the west and north-west have the lowest percentages of children who were breastfed in the first hour of life. This area of low percentages extends into parts of the center and south of Figure 10a. In only three enclaves – Grain Coast, Southeastern Nigeria, and Tiv-Adamawa – were more than 32 percent of children breastfed in the first hour of life.

Less than 25 percent of children were breastfed in the first hour of life in a solid block of countries in the west and north (Mali, Niger, Senegal) of Figure 10b. The countries in which the highest percentage of children were breastfed in the first hour of life are Côte d'Ivoire and Nigeria (43 and 34 percent respectively). Interestingly, Côte d'Ivoire borders Mali and Ghana, countries at the other end of the distribution.

The patterns of Figures 10a and 10b have some significant differences. The area in which a low percentage of children began breastfeeding in the first hour is larger in Figure 10b and it extends further south. Côte d'Ivoire has a higher percentage of children breastfed in the first hour than any of the ethnic enclaves that constitute it, while Ghana has a lower percentage than any of the ethnic enclaves that constitute it.

Children who were ever breastfed

Figures 11a and 11b show the percentage of children born in the last 3 years who were ever breastfed by ethnic and national borders respectively. Percentages are not displayed for two ethnic enclaves – Azande-Mangbetu and Teda – because they were based upon less than 50 unweighted cases.

The scale on both figures shows high percentages of children were breastfed in all ethnic enclaves and countries. Breastfeeding provides many benefits for infants, and a high percentage of infants in the West Africa data set reaped these benefits.

There is little variation on Figure 11a. In all the ethnic enclaves except the Mande ethnic enclave, between 96.9 and 98.5 percent of children were ever breastfed. Figure 11b does not show much more variation than Figure 11a. Mali has the lowest percentage of children who ever breastfed (95 percent). The percentage of children who ever breastfed is between 96.1 and 98.5 for the remaining countries.

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Figure 11a – Percentage of children born in the last 3 years who were ever breastfed, by ethnic borders

94.5-95.3
95.3-96.1
96.1-96.9
96.9-97.7
97.7-98.5
No data
Fewer than 50 unweighted cases
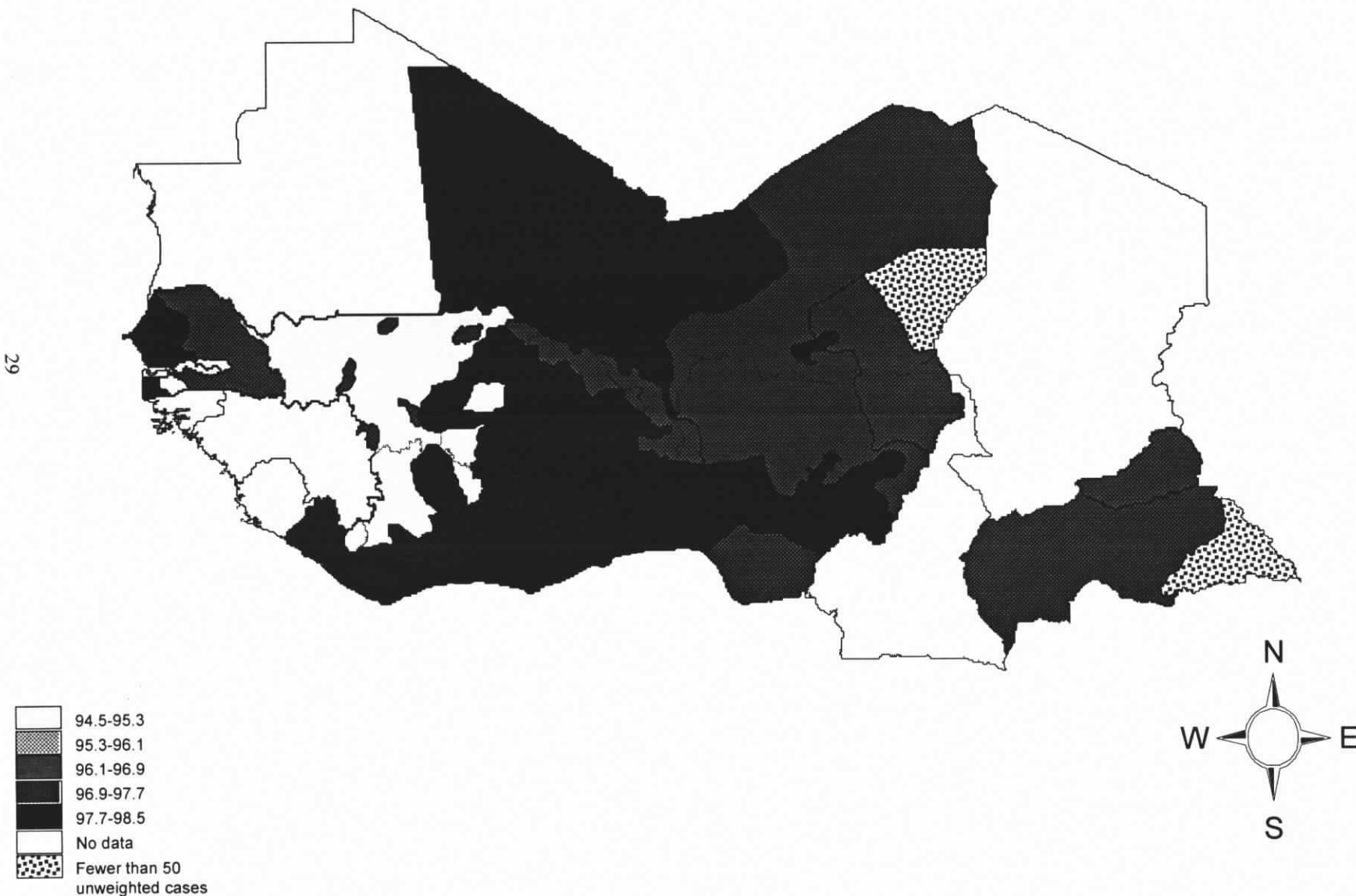
Figure 11b – Percentage of children born in the last 3 years who were ever breastfed, by national borders

☐	94.5-95.3
▦	95.3-96.1
▨	96.1-96.9
■	96.9-97.7
■	97.7-98.5
☐	No data
▒	Fewer than 50 unweighted cases
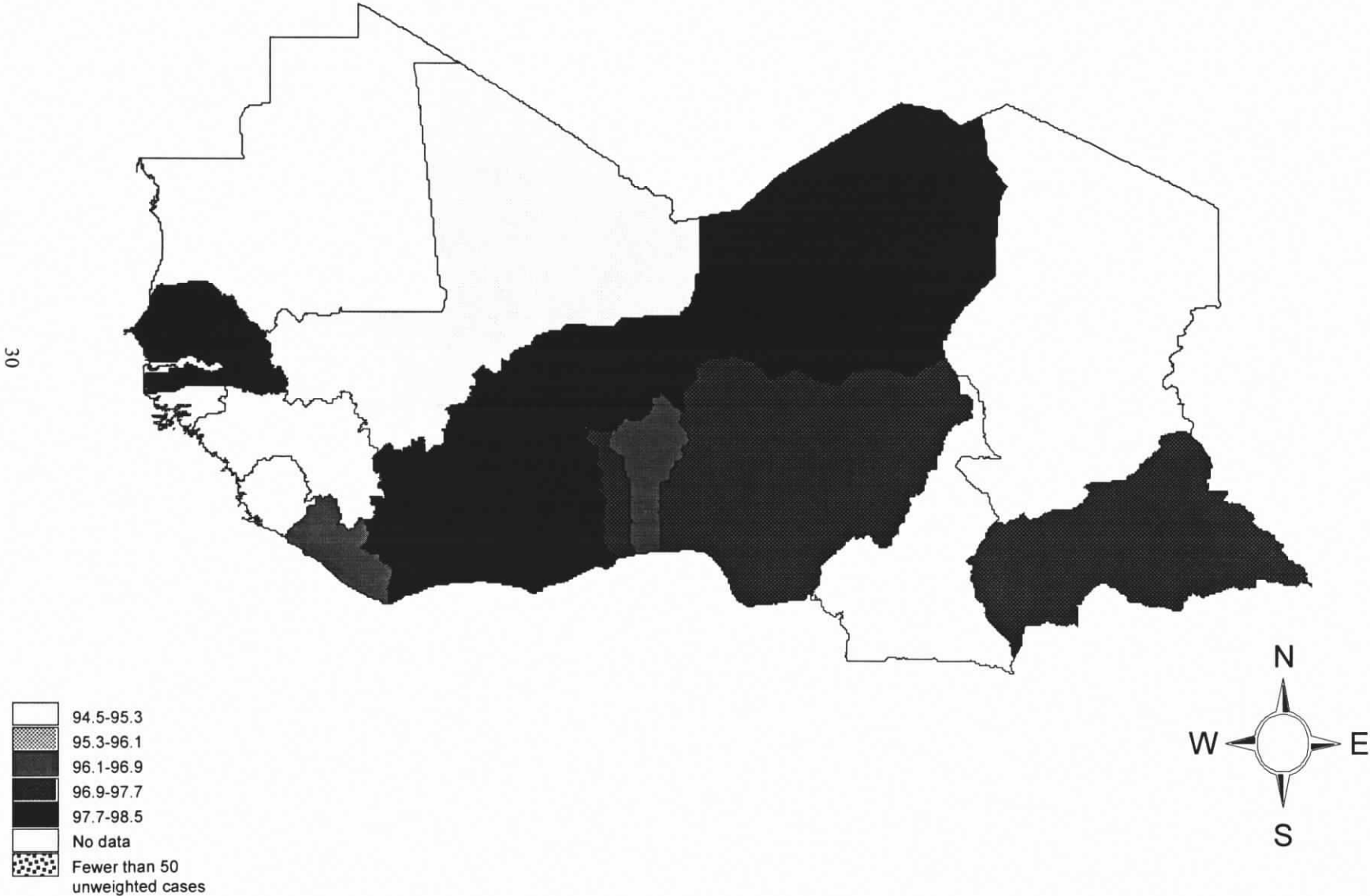
Supplementary feeding

Figures 12a and 12b show the percentage of living last-born children aged 4-6 months and currently breastfeeding who received supplementary feeding in the last 24 hours by ethnic and national borders respectively. Percentages are not displayed for four ethnic enclaves – Azande-Mangbetu, Lake Chad, Teda, and Tuareg – because they were based on less than 50 unweighted cases.

According to the WHO/UNICEF recommendations, children should be exclusively breastfed until about six months of age, when supplementary feeding should begin. The percentage of children who received supplementary feeding in the last 24 hours ranges from 78.7 to 96.7 on Figure 12. Most children are therefore not being exclusively breastfed until six months of age, but they are receiving supplementary feeding when they are six months old.

The highest percentage of children receiving supplementary feeding on Figure 12a is found in ethnic enclaves in the extreme west (Senegambians) and the south-east (Azande-Mangbetu, Southeastern Nigeria, and Tiv-Adamawa). A group of ethnic enclaves in the center and south (Akan, Habe-Senufo, Songhai, and Upper Volta) forms another area in which a high percentage of children received supplemental feeding. This area is flanked by the two ethnic enclaves, Grain Coast and Slave Coast, in which the lowest percentage of children received supplemental feeding.

On Figure 12b, the Central African Republic and Niger have the highest percentage of children receiving supplementary feedings. In Liberia, 79 percent of children received supplemental feeding, easily the lowest percentage among the countries.

The are several interesting differences between Figures 12a and 12b. The Southeastern Nigeria and Tiv-Adamawa ethnic enclaves both have higher percentages of children receiving supplementary feedings than Nigeria, the country that they are within. The Hausa and Slave Coast ethnic enclaves have a lower percentage of children receiving supplementary feedings than the countries they are within. Liberia, on the other hand, has a lower percentage of children receiving supplementary feedings than the two ethnic enclaves that constitute it.

31

Figure 12a – Percentage of last-born children aged 4-6 months and currently breastfeeding who received supplementary feeding in the last 24 hours, by ethnic borders

32

Legend:
- 78.7-82.3
- 82.3-85.9
- 85.9-89.5
- 89.5-93.1
- 93.1-96.7
- No data
- Fewer than 50 unweighted cases
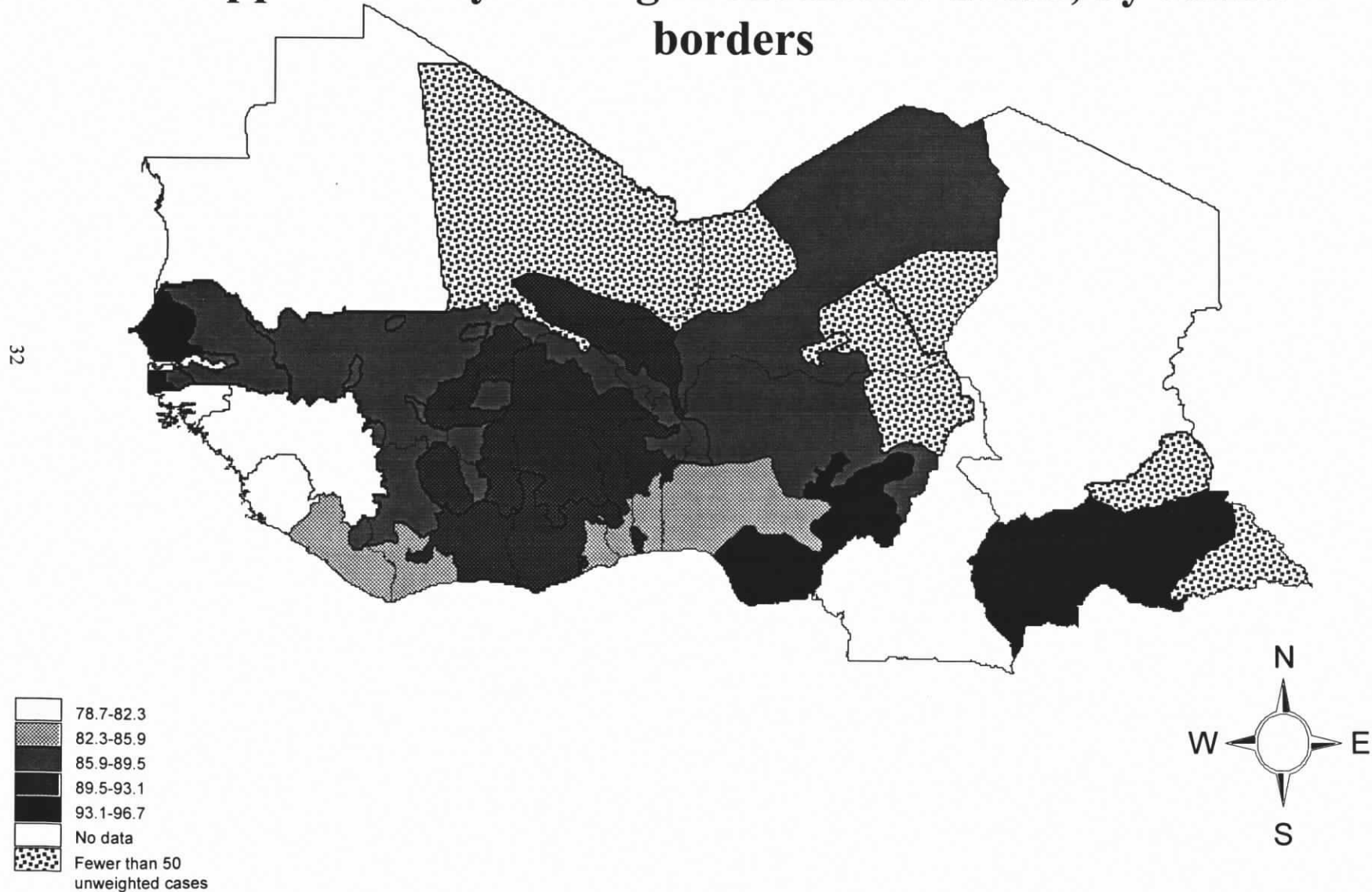
Figure 12b – Percentage of last-born children aged 4-6 months and currently breastfeeding who received supplementary feeding in the last 24 hours, by national borders

	78.7-82.3
	82.3-85.9
	85.9-89.5
	89.5-93.1
	93.1-96.7
	No data
	Fewer than 50 unweighted cases
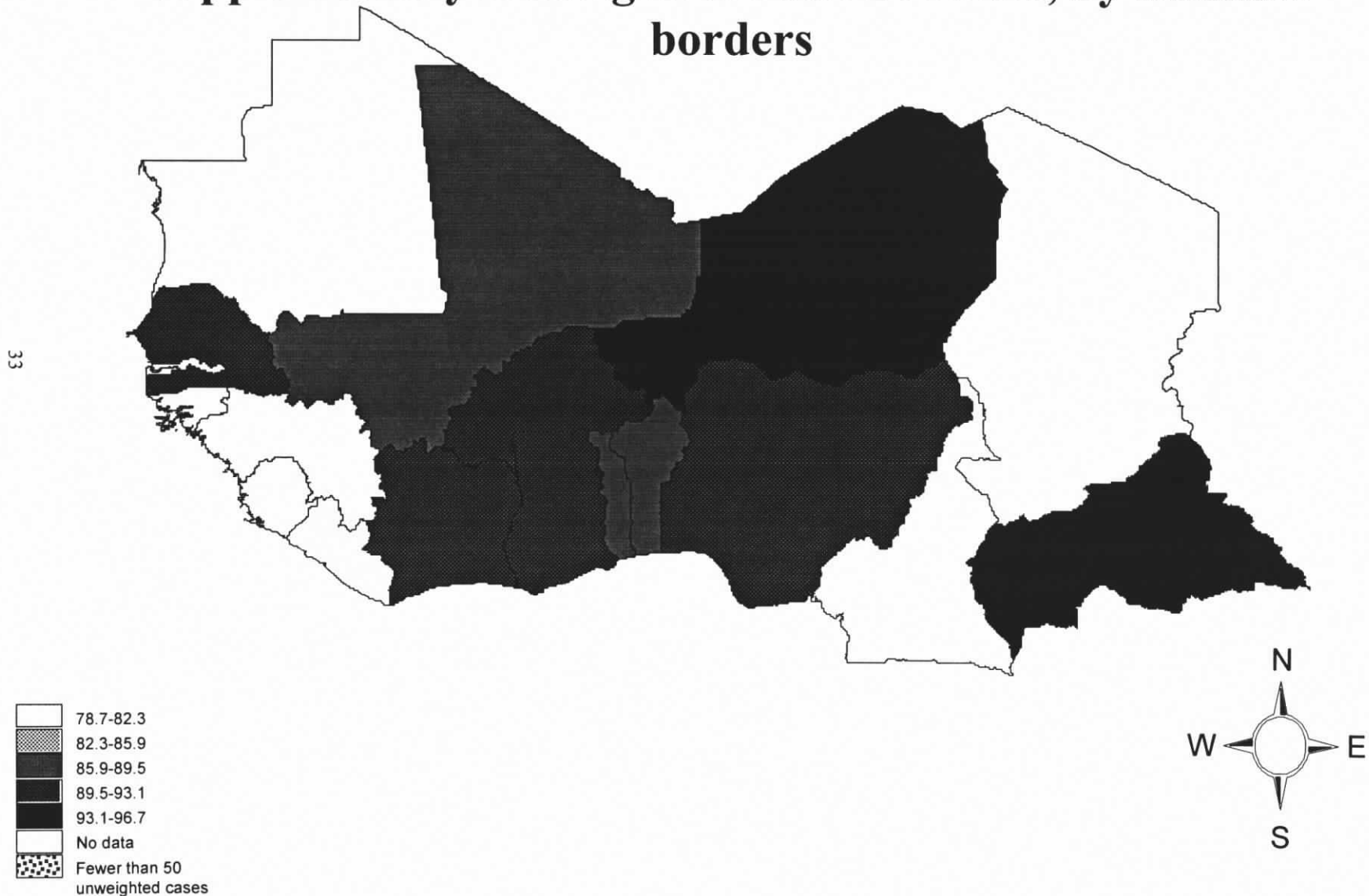
Conclusions

The process of creating and applying a set of ethnic borders showed some of the strengths and weaknesses of social border sets. An inherent problem with social borders sets is that they are not intuitively familiar. It is easy to name the countries on a political map of West Africa; it is difficult to name the ethnic enclaves on a social map of West Africa. This can make the information on a map with social borders difficult to grasp.

Another problem is that some of the ethnic enclaves in this paper cross national borders. The indicators for these ethnic enclaves may mask significant national variation within ethnic enclaves. One solution to this problem is to present a national map broken into ethnic regions. Figure 13 shows this approach applied to Côte d'Ivoire.

Figure 13 – Ideal number of children desired by women aged 15-49, by ethnographic province
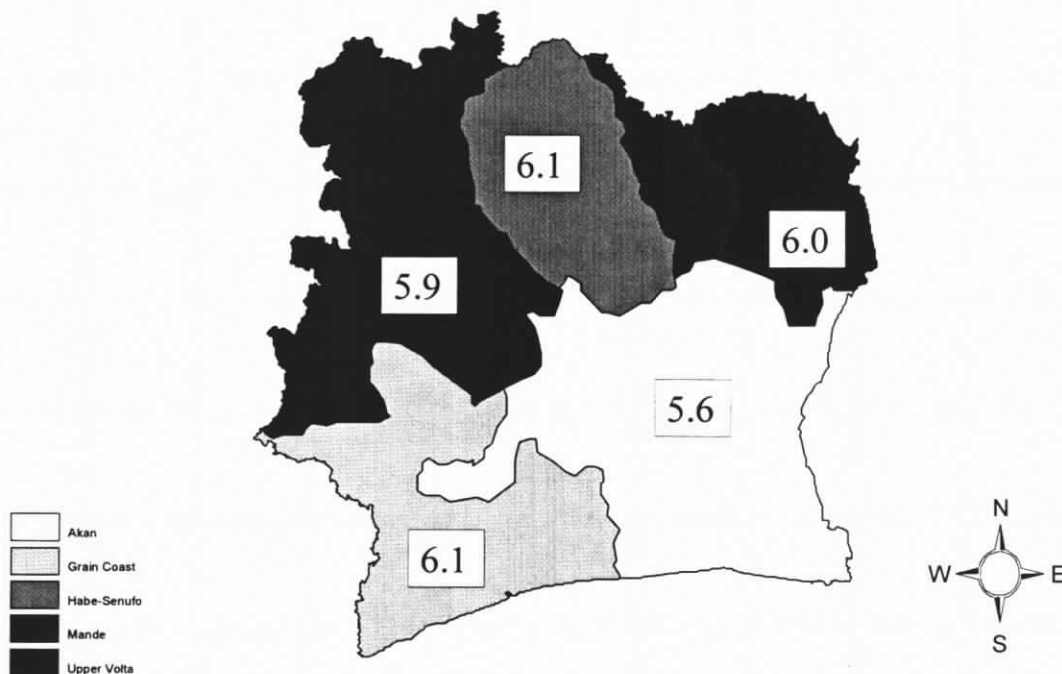
Figure 13's pattern can be considered without worrying about the confounding effect of nationality. Another solution to the problem of national variation would be to present ethnic enclaves broken into national regions. This solution, which shows the impact of nationality across an ethnic enclave, would be most useful for examining the validity of using ethnic enclaves that cross national borders.

Enclaves that crossed national borders also faced the problem of heterogeneous survey dates. The Grain Coast ethnic enclave, for example, combined data gathered in 1986 with data gathered in 1994. Studies that use supra-national borders to examine behavior that changes quickly over time should use data from surveys that were conducted within a few years of each other.

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Despite the problems mentioned above, social borders can be useful at the supra-national, national, and sub-national levels. When creating social borders, follow these guidelines:

- Select a social characteristic with a geographic basis and small number of similarly-sized categories. This will led to large, geographically contiguous enclaves.

- If data sets are combined, make sure that they were gathered at roughly the same time and contain roughly the same information.

- Create borders from an existing border set whenever possible. It is difficult and time consuming to draw accurate external borders.

- Focus on creating social enclaves on a recognizable political map (e.g., create ethnic enclaves on a map of Côte d'Ivoire). Maps of this type are easily grasped and remove one potential confounding factor (e.g., nationality).

- If several countries are included on one map, present the figures for social enclaves broken down by nationality. For example, the Akan enclave on a map of Ghana and Côte d'Ivoire would have two values; one for clusters in Ghana and one for clusters in Côte d'Ivoire.

Finally, remember that maps show associations between variables – not causation. They are best used for presenting significant results, exploring data sets, and showing the geographical distribution of variables.

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Appendix A

Table A5   Percentage of currently married women

Unit	% of currently married women	Numerator	Denominator	Unweighted Denominator	Standard Error	Number of Clusters
ETHNIC ENCLAVES						
Akan	66.6	4185	6280	6622	0.89	367
Azande-Mangbetu	62.7	69	109	134	4.16	10
Fulani	85.4	1769	2073	1944	1.42	72
Grain Coast	70.8	3172	4483	5024	1.51	148
Habe-Senufo	83.6	2937	3512	3454	1.37	120
Hausa	93.6	6353	6784	6341	0.78	208
Lake Chad	94.1	657	697	718	2.31	30
Mande	84.5	7162	8477	8008	0.92	240
Senegambians	73.6	2522	3429	3429	1.45	138
Slave Coast	76.2	4842	6352	5922	3.58	265
Songhai	80.6	1327	1646	1887	1.45	56
Southeastern Nigeria	63.0	1680	2667	2183	1.70	75
Teda	79.3	33	42	47	9.89	3
Tiv-Adamawa	84.5	479	567	530	3.47	19
Tuareg	90.5	313	346	554	3.07	21
Ubangi-Shari	72.6	3204	4416	4424	1.08	171
Upper Volta	84.0	6335	7544	6873	0.87	263
COUNTRIES						
Benin	79.6	3843	4828	4944	0.98	173
Burkina	85.8	4787	5577	4755	0.84	171
Cameroon	75.0	2315	3086	2700	1.47	106
Central African Rep.	72.5	3345	4617	4677	1.05	186
Cote d'Ivoire	68.4	4311	6303	6835	1.25	194
Ghana	71.9	2961	4117	4117	1.00	358
Liberia	71.1	2812	3955	4306	1.64	130
Mali	87.7	7323	8349	8439	0.80	260
Niger	87.2	5290	6068	5156	0.69	185
Nigeria	79.6	6488	8156	7412	1.47	246
Senegal	76.5	3674	4804	4804	1.16	186
Togo	77.8	2062	2649	2649	1.38	117

Table A6   Median age at first birth for all women aged 25-49

Unit	Median age at 1st birth	Numerator	Denominator	Unweighted Denominator	Standard Error	Number of Clusters
ETHNIC ENCLAVES						
Akan	19.2	69061	3597	3753	NA	367
Azande-Mangbetu	19.1	1029	54	66	NA	10
Fulani	18.3	22370	1225	1150	NA	72
Grain Coast	18.7	48460	2597	2885	NA	148
Habe-Senufo	18.7	40460	2159	2055	NA	120
Hausa	18.3	75776	4134	3835	NA	208
Lake Chad	18.0	6977	387	392	NA	30
Mande	18.8	96944	5166	4857	NA	240
Senegambians	19.0	36678	1933	1933	NA	138
Slave Coast	20.0	76828	3838	3550	NA	265
Songhai	18.2	16106	887	1011	NA	56
Southeastern Nigeria	19.3	29154	1514	1225	NA	75
Teda	0.0	465	23	24	NA	3
Tiv-Adamawa	18.5	6078	328	313	NA	19
Tuareg	18.5	3754	203	315	NA	21
Ubangi-Shari	19.2	47132	2457	2456	NA	171
Upper Volta	19.6	89769	4593	4169	NA	263
COUNTRIES						
Benin	19.3	57050	2951	3036	NA	173
Burkina	19.1	62400	3276	2735	NA	171
Cameroon	18.3	29910	1632	1408	NA	106
Central African Rep.	19.2	49204	2565	2592	NA	⁻186
Cote d'Ivoire	18.6	65305	3505	3708	NA	194
Ghana	19.8	50081	2528	2528	NA	358
Liberia	19.3	44296	2293	2488	NA	130
Mali	18.7	99341	5318	5284	NA	260
Niger	17.9	63494	3556	2983	NA	185
Nigeria	19.1	92198	4828	4360	NA	246
Senegal	18.8	51204	2726	2726	NA	186
Togo	18.9	29300	1549	1549	NA	117

NA – Not Available

Table A7   Ideal number of children desired by women aged 15-49

Unit	Ideal number of children	Numerator	Denominator	Unweighted Denominator	Standard Error	Number of Clusters
ETHNIC ENCLAVES						
Akan	4.8	28538	5999	6317	0.06	367
Azande-Mangbetu	5.3	471	88	108	0.21	10
Fulani	7.1	11742	1646	1538	0.17	72
Grain Coast	6.2	22114	3591	4044	0.10	148
Habe-Senufo	6.7	21730	3228	3175	0.16	120
Hausa	7.6	29203	3867	3504	0.15	208
Lake Chad	7.1	2572	363	331	0.42	30
Mande	6.3	45120	7177	6815	0.08	240
Senegambians	6.1	17645	2885	2885	0.11	138
Slave Coast	5.2	25862	4968	4929	0.20	265
Songhai	8.4	12982	1552	1799	0.26	56
Southeastern Nigeria	5.7	8430	1469	1205	0.11	75
Teda	7.2	236	33	38	1.69	3
Tiv-Adamawa	6.1	2100	345	319	0.21	19
Tuareg	8.8	2359	268	494	0.62	21
Ubangi-Shari	6.7	23620	3534	3581	0.09	171
Upper Volta	6.2	39529	6375	5929	0.09	263
COUNTRIES						
Benin	5.8	26330	4558	4657	0.11	173
Burkina	6.0	24529	4078	3558	0.10	171
Cameroon	7.1	19731	2769	2427	0.22	106
Central African Rep.	6.7	24531	3687	3773	0.08	186
Cote d'Ivoire	5.8	35732	6155	6676	0.08	194
Ghana	4.6	17303	3807	3807	0.08	358
Liberia	6.3	18331	2898	3215	0.13	130
Mali	6.9	51064	7440	7538	0.10	260
Niger	8.4	43805	5215	4403	0.10	185
Nigeria	6.0	18159	3032	2865	0.10	246
Senegal	6.3	24610	3887	3887	0.10	186
Togo	5.6	14715	2632	2632	0.13	117

Table A8   Percentage of currently married women aged 15-49 who currently use any modern method of family planning

Unit	Usage of modern family planning (%)	Numerator	Denominator	Unweighted Denominator	Standard Error	Number of Clusters
ETHNIC ENCLAVES						
Akan	7.9	334	4211	4399	0.55	367
Azande-Mangbetu	3.6	2	69	84	2.60	10
Fulani	1.2	21	1774	1672	0.35	72
Grain Coast	3.5	108	3143	3546	0.42	148
Habe-Senufo	3.1	93	2998	2858	0.53	120
Hausa	1.1	66	6175	5682	0.24	208
Lake Chad	0.3	2	637	644	0.24	30
Mande	3.0	219	7212	6793	0.33	240
Senegambians	3.5	89	2522	2522	0.60	138
Slave Coast	4.4	211	4809	4383	1.34	265
Songhai	1.7	23	1319	1396	0.58	56
Southeastern Nigeria	4.5	76	1680	1356	0.83	75
Teda	7.3	2	33	37	1.71	3
Tiv-Adamawa	4.3	21	479	431	1.34	19
Tuareg	1.1	3	309	427	0.64	21
Ubangi-Shari	1.9	60	3204	3176	0.28	171
Upper Volta	3.3	208	6323	5701	0.42	263
COUNTRIES						
Benin	3.1	121	3843	3971	0.35	173
Burkina	2.4	116	4787	3988	0.33	171
Cameroon	3.3	75	2315	1978	0.52	106
Central African Rep.	2.0	66	3345	3354	0.29	186
Cote d'Ivoire	3.1	135	4311	4572	0.29	194
Ghana	9.5	281	2961	2961	0.62	358
Liberia	4.1	116	2812	3076	0.71	130
Mali	3.0	221	7323	7226	0.36	260
Niger	1.5	78	5290	4392	0.23	185
Nigeria	2.7	177	6488	5831	0.37	246
Senegal	2.9	106	3674	3674	0.44	186
Togo	2.3	47	2062	2062	0.40	117

Table A9   Total fertility rate

Unit	Total Fertility Rate	Numerator	Denominator	Unweighted Denominator	Standard Error	Number of Clusters
ETHNIC ENCLAVES						
Akan	5.48	3212	17615	18561	NA	367
Azande-Mangbetu	0.00	4110	309	378	NA	10
Fulani	6.69	1280	5798	5445	NA	72
Grain Coast	6.14	2623	12565	14043	NA	148
Habe-Senufo	6.26	2014	9891	9681	NA	120
Hausa	6.66	4314	19019	17778	NA	208
Lake Chad	6.46	409	1954	2008	NA	30
Mande	6.85	5410	23976	22607	NA	240
Senegambians	6.32	1927	9557	9557	NA	138
Slave Coast	6.17	3414	17943	16704	NA	265
Songhai	7.15	1092	4481	5170	NA	56
Southeastern Nigeria	5.29	1293	7452	6107	NA	75
Teda	0.00	9213	119	132	NA	3
Tiv-Adamawa	8.14	415	1593	1482	NA	19
Tuareg	0.00	67148	942	1529	NA	21
Ubangi-Shari	5.25	2174	12377	12396	NA	171
Upper Volta	6.73	4595	21326	19441	NA	263
COUNTRIES						
Benin	6.28	2753	13700	14057	NA	173
Burkina	6.82	3470	15683	13327	NA	171
Cameroon	6.05	1723	8554	7484	NA	106
Central African Rep.	5.21	2257	12944	13109	NA	186
Cote d'Ivoire	5.80	3377	17465	18885	NA	194
Ghana	5.37	2080	11752	11752	NA	358
Liberia	6.92	2527	11148	12088	NA	130
Mali	7.03	5470	23653	23872	NA	260
Niger	7.12	4105	16807	14283	NA	185
Nigeria	6.20	4673	22928	20810	NA	246
Senegal	6.45	2794	13398	13398	NA	186
Togo	7.05	1662	7439	7439	NA	117

NA – Not Available

Table A10   Percentage of last-born children who were breastfed in the first hour after birth

Unit	% breastfed in first hour	Numerator	Denominator	Unweighted Denominator	Standard Error	Number of Clusters
ETHNIC ENCLAVES						
Akan	28.3	780	2759	2883	1.63	355
Azande-Mangbetu	26.3	8	31	38	6.85	10
Fulani	12.6	140	1116	1051	1.61	72
Grain Coast	39.9	244	611	595	4.52	35
Habe-Senufo	27.9	510	1831	1739	2.51	120
Hausa	29.5	1115	3779	3525	1.91	208
Lake Chad	28.7	96	335	338	3.49	30
Mande	17.8	760	4259	4084	1.81	223
Senegambians	10.0	165	1643	1643	1.13	138
Slave Coast	18.5	433	2345	2109	3.14	213
Songhai	30.5	272	891	957	3.19	56
Southeastern Nigeria	47.7	509	1067	848	4.32	75
Teda	67.2	17	25	27	23.10	3
Tiv-Adamawa	36.0	124	344	301	6.01	19
Tuareg	18.4	38	204	324	8.18	21
Ubangi-Shari	31.7	594	1873	1855	1.33	171
Upper Volta	22.6	805	3560	3142	1.44	210
COUNTRIES						
Benin	24.0	580	2417	2510	1.70	173
Burkina	28.4	879	3099	2541	1.72	171
Cameroon	11.6	180	1556	1279	1.34	106
Central African Rep.	32.0	623	1946	1947	1.32	186
Cote d'Ivoire	43.0	1286	2987	3159	1.89	194
Ghana	15.1	280	1858	1858	0.98	358
Liberia	0.0	0	0	0	0.00	0
Mali	9.1	423	4637	4660	0.83	260
Niger	17.9	609	3402	2867	1.55	185
Nigeria	33.9	1336	3947	3539	2.12	246
Senegal	10.9	259	2378	2378	0.95	186
Togo	0.0	0	0	0	0.00	0

Table A11　　　Percentage of children born in the last 3 years who were ever breastfed

Unit	% ever breastfed	Numerator	Denominator	Unweighted Denominator	Standard Error	Number of Clusters
ETHNIC ENCLAVES						
Akan	98.0	3209	3276	3418	0.27	367
Azande-Mangbetu	97.6	33	34	42	2.39	10
Fulani	97.0	1229	1267	1194	0.57	72
Grain Coast	97.8	2326	2377	2682	0.38	148
Habe-Senufo	98.0	2034	2075	1967	0.38	120
Hausa	97.4	4378	4494	4209	0.35	208
Lake Chad	97.5	379	389	393	1.26	30
Mande	94.9	5068	5342	5029	0.45	240
Senegambians	98.3	1862	1895	1895	0.30	138
Slave Coast	97.8	3327	3403	3148	0.73	265
Songhai	98.4	1045	1062	1147	0.43	56
Southeastern Nigeria	97.5	1249	1281	1011	0.46	75
Teda	100.0	34	34	36	0.00	3
Tiv-Adamawa	97.8	402	411	364	0.66	19
Tuareg	98.0	237	242	392	0.69	21
Ubangi-Shari	97.3	2103	2161	2147	0.40	171
Upper Volta	97.8	4604	4708	4248	0.31	263
COUNTRIES						
Benin	96.9	2649	2733	2841	0.40	173
Burkina	98.3	3390	3448	2827	0.28	171
Cameroon	97.1	1794	1847	1528	0.39	106
Central African Rep.	97.4	2184	2242	2250	0.39	186
Cote d'Ivoire	98.0	3303	3371	3563	0.25	194
Ghana	98.0	2028	2070	2070	0.34	358
Liberia	96.6	1998	2069	2286	0.46	130
Mali	94.6	5108	5402	5455	0.46	260
Niger	97.8	3989	4080	3450	0.31	185
Nigeria	97.6	4520	4633	4176	0.30	246
Senegal	97.9	2685	2744	2744	0.29	186
Togo	97.3	1615	1660	1660	0.37	117

Table A12   Percentage of last-born children aged 4-6 months and currently breastfeeding who received supplementary feeding in the last 24 hours

Unit	% received supplem- entary feeding	Numerator	Denominator	Unweighted Denominator	Standard Error	Number of Clusters
ETHNIC ENCLAVES						
Akan	91.2	284	311	323	1.82	367
Azande-Mangbetu	0.0	4	4	5	0.00	10
Fulani	88.7	119	135	123	2.50	72
Grain Coast	84.6	255	301	341	2.67	148
Habe-Senufo	92.7	227	244	234	1.68	120
Hausa	89.1	379	426	405	2.14	208
Lake Chad	0.0	24	24	23	0.00	30
Mande	87.4	460	526	485	1.78	240
Senegambians	94.4	168	178	178	1.91	138
Slave Coast	85.9	294	342	322	5.46	265
Songhai	92.8	97	105	113	3.12	56
Southeastern Nigeria	94.5	113	120	87	2.60	75
Teda	0.0	2	2	3	0.00	3
Tiv-Adamawa	96.6	51	53	50	2.46	19
Tuareg	93.2	23	24	40	7.74	21
Ubangi-Shari	95.6	186	195	195	1.57	171
Upper Volta	91.1	430	472	422	1.46	263
COUNTRIES						
Benin	89.5	242	271	279	1.97	173
Burkina	92.1	330	359	292	1.63	171
Cameroon	88.8	138	155	127	2.77	106
Central African Rep.	95.7	194	202	204	1.51	186
Cote d'Ivoire	91.2	296	324	338	1.68	194
Ghana	91.1	184	202	202	1.93	358
Liberia	78.7	218	277	308	2.84	130
Mali	88.9	502	565	562	1.45	260
Niger	93.6	353	378	319	1.44	185
Nigeria	90.2	412	456	415	1.96	246
Senegal	92.8	243	262	262	1.63	186
Togo	88.7	149	168	168	2.69	117

Table A??   Percentage of children aged 7-11 months who are currently breastfeeding

Unit	% currently breast-feeding	Numerator	Denominator	Unweighted Denominator	Standard Error	Number of Clusters
ETHNIC ENCLAVES						
Akan	90.6	445	491	511	1.73	367
Azande-Mangbetu	0.0	6	7	8	0.00	10
Fulani	94.5	180	191	181	1.56	72
Grain Coast	85.2	371	435	491	2.02	148
Habe-Senufo	91.1	259	284	265	1.79	120
Hausa	86.0	557	647	597	2.19	208
Lake Chad	90.9	42	47	47	6.50	30
Mande	90.1	693	769	717	1.10	240
Senegambians	93.2	260	279	279	1.42	138
Slave Coast	97.3	460	473	443	1.00	265
Songhai	91.7	114	124	129	2.55	56
Southeastern Nigeria	87.2	168	193	153	3.65	75
Teda	0.0	6	6	6	0.00	3
Tiv-Adamawa	89.3	35	39	34	4.21	19
Tuareg	78.7	27	35	48	7.70	21
Ubangi-Shari	91.3	278	304	301	1.88	171
Upper Volta	90.6	620	684	617	1.45	263
COUNTRIES						
Benin	93.5	382	409	427	1.26	173
Burkina	90.1	423	469	381	1.64	171
Cameroon	92.6	259	280	232	1.79	106
Central African Rep.	91.1	288	316	316	1.83	186
Cote d'Ivoire	91.7	428	467	488	1.27	194
Ghana	91.4	276	302	302	1.92	358
Liberia	78.7	329	418	455	2.35	130
Mali	90.5	713	788	773	1.08	260
Niger	90.3	488	541	463	1.42	185
Nigeria	89.1	600	673	599	1.62	246
Senegal	93.5	362	387	387	1.20	186
Togo	92.4	218	236	236	1.70	117