



United Nations Educational, Scientific and Cultural Organization

**GENDER-SENSITIVE
EDUCATION STATISTICS
AND INDICATORS**

A practical guide

*Training material for workshops
on education statistics and indicators*

Division of Statistics

PREFACE

'Non-discriminatory education benefits both girls and boys and thus ultimately contributes to more equal relationships between women and men. Equality of access to and attainment of educational qualifications is necessary if more women are to become agents of change. Literacy of women is an important key to improve health, nutrition and education in the family and to empowering women to participate in decision-making in society.' (Fourth World Conference on Women, Beijing 1995. *Platform for Action*, Paragraph 69.)

The strategic objectives of the Fourth World Conference on Women and related goals of the World Conference on Education for All (Jomtien, 1990) have been adopted by most countries and anchored in national policy declarations. Progress towards these goals would need to be closely monitored and evaluated on the basis of timely and reliable statistics and indicators that are gender-sensitive.

In fact another objective of the Beijing Conference was to *'...allocate sufficient resources for and monitor the implementation of educational reforms'*. It is implied by this objective that international and intergovernmental organizations, especially UNESCO, should *'contribute to the evaluation of the progress achieved, using educational indicators generated by national, regional and international bodies'* and *'to provide technical assistance to developing countries to strengthen the capacity to monitor progress in closing the gap between women and men in education, training and research, and in levels of achievements in all fields, particularly basic education and the elimination of illiteracy'*. (Ibid. Paragraph 87).

The present guide is part of the training material intended to promote and facilitate the building of national statistical capacities for systematic monitoring of progress towards these objectives. It was originally prepared for the sub-regional workshops on gender issues in education statistics and indicators held in Accra, Ghana, in October 1996, and in Abidjan, Côte d'Ivoire, in April 1997. Based on the positive experience and feedback gathered during these two workshops, which brought together 30 statisticians from 25 countries, the original draft version has been enriched to form the present version.

It is hoped that this guide could build up awareness among the readers and help them to produce and utilize more and better gender-sensitive education statistics and indicators to effectively monitor gender disparities in education. Ideas, experiences and new methods, techniques and gender-sensitive indicators that would emerge while using this guide would be most welcome, so as to enable the UNESCO team to further upgrade the training material and disseminate it to a broader audience. I wish to acknowledge the contribution of Vittoria Cavicchioni in compiling this guide with the assistance of Roser Cusso and the collaboration of Ranwa Safadi (Education Sector) and Wim Renkema who participated in the Abidjan and Accra workshops. A special thanks goes to the FAWE and UNICEF for their financial support to the organization of the Abidjan workshop.

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GENDER-SENSITIVE EDUCATION STATISTICS AND INDICATORS

A PRACTICAL GUIDE

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I. INTRODUCTION

I.1 Purpose

The main purposes of this guide are:

- (i) to sensitize producers and users of education statistics to the importance and feasibility of producing and using gender-sensitive statistics and indicators in education ;
- (ii) to clarify the concepts, methods and techniques required for the systematic collection, analysis, presentation and dissemination of education statistics and indicators with special emphasis on the gender perspective ;
- (iii) to offer practical ideas and guidance to policy-makers and managers of education in using gender-sensitive education statistics and indicators to more effectively monitor progress and set policies and plans in favour of gender equity.

It is hoped that this guide could generate not only widespread application and use of such indicators, but also new ideas and further developments both at the international and national levels.

I.2 The guide's users

This guide should be useful to all persons concerned with monitoring development in education and in particular progress in reducing gender disparities.

Its primary target audience are producers of education statistics in the ministries of education and national statistical offices; it is expected that policy-makers, administrators and managers of educational programmes may also find this guide offering practical advice for interpretation of statistical information in support to decision-making.

The guide has been purposefully written in a simple language so as to enable those who are not familiar with basic statistical concepts to interpret and use gender-sensitive education statistics and indicators.

I.3 Content of the guide

This guide focuses on some of the best practices for presenting and analysing indicators of gender disparities in literacy and schooling, utilizing regional and country data available at the UNESCO Division of Statistics.

The basic principles for gathering data and elaborating valid indicators are presented in Section II and the main factors which affect gender equality are briefly discussed.

Section III analyzes the meanings and relative advantages of alternative ways of calculating and presenting gender disparities in literacy and schooling. More specific indicators of disparities such as the index of gender segregation by field of study and the gender-equity-sensitive indicators are presented in this section. Other aspects of disparities dealt with in this section are the analysis and representation of inter-country and regional variations (Section III.3) and the correlation of gender disparities in education with other socio-economic factors (Section III.9) .

II. EDUCATION STATISTICS AND INDICATORS

II.1 About policy-relevant education statistics and indicators

Statistics and indicators are quantitative information produced to facilitate understanding of the state of a phenomenon, its progress and its relations with other phenomena. Statistics and indicators are given a broad meaning in this guide, to include both absolute quantities such as the number of illiterates, students, teachers, as well as derived percentages, rates and ratios, including combinations of rates and ratios as in certain composite indices.¹

In the field of education, one is constantly concerned with a number of inter-related aspects ranging from the level of demand for and supply of educational opportunities, to the way in which people gain access to and participate in education, the quality of the teaching and learning process, the internal efficiency of the education system, individual learning outcomes, and the impact of education on personal growth and the well-being of the individual, the community and the country as a whole. Equally important is the concern for equity in education, the study of the causes of disparities, and their effect on social and economic development.

This guide focus on some of the most commonly available education statistics and indicators, and on their use in analyzing gender disparities.

II.2 Focusing on ‘good’ indicators

When one attempts to link such concerns to information needs as well as to the kind of indicators and statistics required, one finds that there can be as many indicators as there are policy concerns and types of users. The experience of national and international agencies has helped to develop principles that are now accepted as essential in developing a system of indicators.

For example the *World Education Report 1991* indicated that good indicators should be:

- ***policy-relevant***, by being capable of providing clear and unambiguous responses to key policy issues and concerns;
- ***user friendly***, i.e., comprehensible, timely and few in number;
- ***derived from a framework***, which allows the interpretation of one figure (say enrolment) in the context of other basic variables (say demography and investment in education) of a particular country;
- ***technically sound***, i.e. valid, reliable and comparable;
- ***feasible to measure at reasonable cost***, in that the basic statistics required for deriving them can be either readily available or comparatively easy to collect within a well-defined time-frame.

¹ Only some basic principles on education statistics and indicators are recalled here. For a more exhaustive presentation of education indicators see the document: *Basic education indicators*, prepared by the Division of Statistics as part of the training materials on education statistics and indicators.

Ideally, the ultimate goal is to produce a small number of indicators that satisfactorily explain a maximum of phenomena to a broad array of users. Indicators of qualitative phenomena are also very useful, although these are usually more difficult to produce, for both conceptual reasons (selection of appropriate measures of qualitative phenomena) and technical considerations (difficulty to obtain suitable data).

II.3 Data channels

Data required for measuring gender disparities in education can be collected from different sources using a variety of existing methods of collection. Essentially, the data sources may be categorized into: (a) individual persons; and (b) educational institutions. The individual persons in this respect refer not only to the students and teaching staff, but can also include the parents, other members of the same family, community leaders, employers, etc. The educational institutions, although most often referring to the schools and universities, may eventually be extended to cover adult education centres and other places of learning/training. As well, the methods of collection may include the regular school surveys and administrative reporting, as well as population censuses and household surveys. Each of these methods has proved to be effective for collecting specific types of education statistics (see Box below).

DATA ON EDUCATION AND LITERACY	
<u>METHODS OF COLLECTION</u>	<u>VARIABLES COLLECTED</u>
Population censuses	Illiteracy Educational attainment School attendance Fields of study
Household (or other) sample surveys	Additional data on illiteracy and educational attainment Household educational expenditures Qualitative data Other specific subjects (reasons for drop-out, parents', teachers', communities' expectations or opinions)
Periodic school surveys	Pupils/students by gender, by age, by grade, by field of study; Repeaters, graduates; Conditions of schools, equipment, facilities, etc.
Administrative files	Educational expenditures Teachers' salaries Teaching and other staff by age, qualification, status, etc. Examination results

Current data gathered from regular school surveys and population censuses are essential for obtaining a general outlook of gender differences in illiteracy and education, access to school, participation, etc. Specific additional data are necessary if one wants to study more in depth the reasons for inequalities in order to identify appropriate measures to reduce disparities. It may be interesting to identify reasons for drop-out, low or no school attendance of girls, low female participation in scientific and technical fields, and to analyze other elements such as children and community's needs, parents' perceptions and expectations, etc. Similarly, information is needed about the aspects of the supply of education, e. g. public policies, resources allocation and school infrastructure. For this kind of information, ad hoc (sample) surveys are best suited, although cost considerations limit their use.

II.4 Factors affecting gender equality in education

Despite recent progress in female enrolment and literacy, owing to positive actions and sensitization campaigns undertaken by governments, disparities still exist and are particularly striking in certain Sub-Saharan African and Southern Asian countries and in some Arab States. Obstacles and resistance to gender equality in education persist, especially in rural or marginalized areas, where traditional attitudes are predominant and the education supply is insufficient to meet the demand.

The various factors which hinder gender equality in education can be grouped into four main categories.

- on the *demand side* socio-economic and cultural factors which affect the behaviour and the choices of parents and students;
- on the *supply side* political and institutional factors and factors linked to the school.

They are summarized in the box on the following page.

The relative importance of these factors may vary from country to country, and among local communities and population groups. For example, in the Sub-Saharan African countries covered initially by UNESCO's programme on gender-sensitive education statistics and indicators, it appeared that factors on the supply side are perceived as predominant as compared with those relating to the demand side.

There is an obvious need to measure the exact degree of gender disparities and to carry out research on their interrelation with the social, economic and cultural characteristics of the countries and communities, as well as with the supply and quality of educational opportunities. Statistical techniques to identify and measure these interactions are discussed in Section III.9, dealing with correlation analysis.

While recognizing that change and reforms require the commitment of all parties concerned (policy makers, educators, parents, boys and girls themselves), the study and diagnosis of the situation, with the relevant figures and analysis to corroborate facts, can provide the support necessary to intervene at the management and decision-making level. This document is not in itself a study of actual gender differences but rather an attempt to propose different methods and techniques of representing gender inequalities in education so as to facilitate such studies and analyses.

Factors affecting gender equality in education

DEMAND

Socio-economic factors

Poverty
Direct costs (fees, uniforms, transportation)
High opportunity costs/lower rate of return
Girls needed for household/agricultural tasks
Residence in remote, low population areas
Limited employment opportunities for graduates
Lower remuneration for women

Cultural factors

Parents' low level of education
Lower priority for girls' education
Girls' education perceived as incompatible
with traditional beliefs and/or religious principles
Early marriages and pregnancies
Role of the girl/woman as a wife and mother
Sceptical attitudes towards the benefits
and outcomes from educating girls

SUPPLY

Political/institutional factors

Budget constraints; Structural adjustment programmes
Insufficient public support for the poor
Political instability; Inconsistent educational policies
Poor quality of education programmes
Ill-adaptation of education systems to local learning needs
Lack of clear strategy for women and girls' education
Lack of public support for women in scientific activities
Limited employment prospects
Poor data collection mechanisms; Inadequate elements
for progress assessment and policy formulation

Factors linked to the school

Limited school/classroom space
High school fees
Low proportion of female teachers
Teachers untrained/not sensitized to gender issues
Stereotypes at school (curricula, textbooks)
School curricula in conflict with traditional culture
Orientation of girls/women to non scientific fields
Lack of accommodations for or exclusion
of pregnant adolescents and young mothers
Sexual harassment; insecurity
Distance from school
Lack of school canteens
Poor quality of hygienic facilities
School calendar incompatible with farming cycles

RESULTS

Limited access to schooling
Low female enrolment
School drop out, particularly at puberty age
Low female participation in scientific/technical fields
High proportion of illiterate women
Scarce or low scale employment opportunities
Reduced contribution to national economic and social development
Limited bargaining power
Absence from the political decision-making processes

III. GENDER ISSUES IN DATA AND INDICATORS ON LITERACY AND EDUCATION

Gender issues can be considered with reference to different kinds of data sets. At the simplest level one can consider the absolute figures and the absolute difference between the numbers of male and female illiterates, pupils, students, teachers, etc. Similar considerations can be applied to derived statistics in the form of indicators such as literacy rates, admission rates, enrolment ratios, school survival and so on. At a more sophisticated level one can use specific gender-disparity indicators as well as multivariate statistical methods for the purposes of a more in-depth analysis.

III.1 Illiteracy data

Table 1 presents the estimated total number of adult illiterates, broken down by sex, for the world as a whole, developed and developing countries and five developing regions¹. Different ways of representing gender inequalities are possible. The absolute gap (column 4) defined as the difference between the absolute number of male and female illiterates could be interpreted, in terms of the amount of efforts needed to reduce illiteracy, as the number of women who should be made literate in order to achieve at least equality between the sexes.

The percentage of female illiterates in the total number of illiterates (column 5) is one of the simplest and most commonly used indicators of gender disparity. Based on the fact that the male and female populations are virtually equal in most regions, the ideal situation would be when the percentage of females approaches 50%, whereas lower or higher values indicate disparity in favour of women or men respectively.

The gender ratio (column 6), similar to the gender ratio used in demography, represents the ratio between the number of male and female illiterates. Theoretically this ratio can vary from 0 (in case of 0 male illiterates) and infinite (in case of 0 female illiterates). In the case of perfect equity the ratio equals 1. It can also be expressed as a percentage, giving the number of illiterate men per 100 illiterate women. One can also compute the inverse i. e. the ratio of female to male illiterates, which, when expressed in percentage, shows the number of illiterate women per every 100 illiterate men. According to the phenomenon studied and the aspects one wants to emphasize one can use the male/female or the female/male ratio.

Table 1. Estimated adult illiterate population aged 15 and over, by sex and by region, 1995

	<i>Estimated number of adult illiterates</i>			<i>Absolute gap (F-M)</i> <i>(Millions)</i>	<i>Gender ratio (F-M)/F</i>		
	<i>Both sexes</i>	<i>Male</i> <i>(Millions)</i>	<i>Female</i>		<i>% female</i>	<i>M/F</i>	<i>%</i>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
WORLD TOTAL	884.7	320.0	564.7	244.7	63.8	0.57	43.3
Developing countries <i>of which:</i>	871.8	315.0	556.7	241.7	63.9	0.57	43.4
Sub-Saharan Africa	140.5	53.4	87.1	33.7	62.0	0.61	38.7
Arab States	65.5	24.3	41.2	16.9	62.9	0.59	41.0
Latin America/Caribbean	42.9	19.4	23.4	4.0	54.7	0.83	17.1
Eastern Asia/Oceania	209.9	60.4	149.5	89.1	71.2	0.40	59.6
Southern Asia	415.5	159.4	256.1	96.7	61.6	0.62	37.8
Developed countries	12.9	5.0	7.9	2.9	61.6	0.62	36.7

Source: Compendium of statistics on illiteracy, SRS n° 35, 1995.

¹ The term 'regional' in the context of this document refers to the major regions of the world. However the same approach can be used when analyzing administrative or geographical subdivisions (regions, provinces or districts) within a country.

Other possibilities of measuring disparities can be envisaged, such as the relative gap given by the formula $(F-M)/F \times 100$, which indicates the proportion of illiterate women that should be made literate to achieve parity with men. This indicator is shown in column 7.

Using the data presented in Table 1 as an example, a comparative analysis of gender disparities is possible with these different indicators.

Interpretation of Table 1:

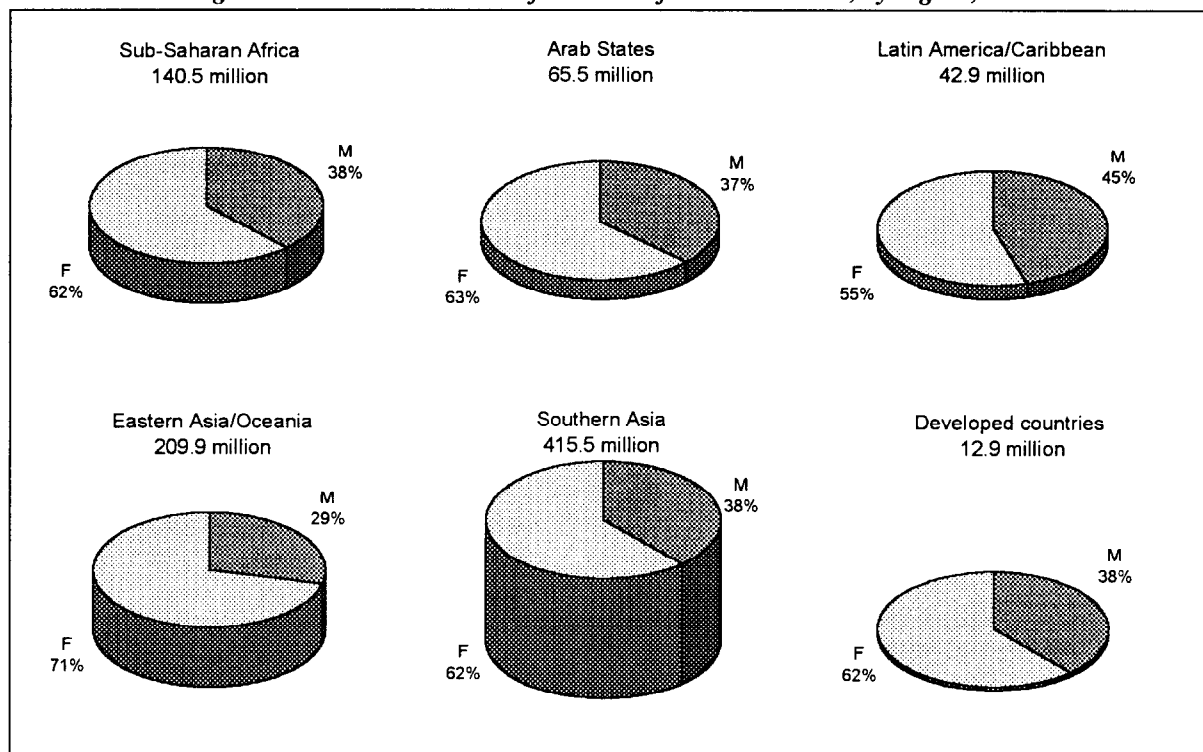
- ☛ *in all developing regions the number of female illiterates is higher than that of male illiterates;*
- ☛ *if we rank developing regions in terms of the absolute gaps, Southern Asia shows the highest gap, whereas if we order them according to either the percentage female, the gender ratio or the percentage $(F-M)/F$, Eastern Asia/Oceania presents the highest disparities.*

Graphic presentation

Various examples of graphic presentation of gender disparities can be proposed. As for all graphic presentation, the principle to follow is to illustrate the salient facts in a clear and comprehensible manner while avoiding crowding too many details into the same graphic.

For example Figure 1 below shows the relative shares of male and female illiterates by region. To reflect the absolute size of the illiterate population, the 3-dimensional pie charts represent the total volume of male and female illiterates, which in certain regions of the world can be quite striking.

Figure 1. Estimated number of male and female illiterates, by region, 1995



Source: Table 1.

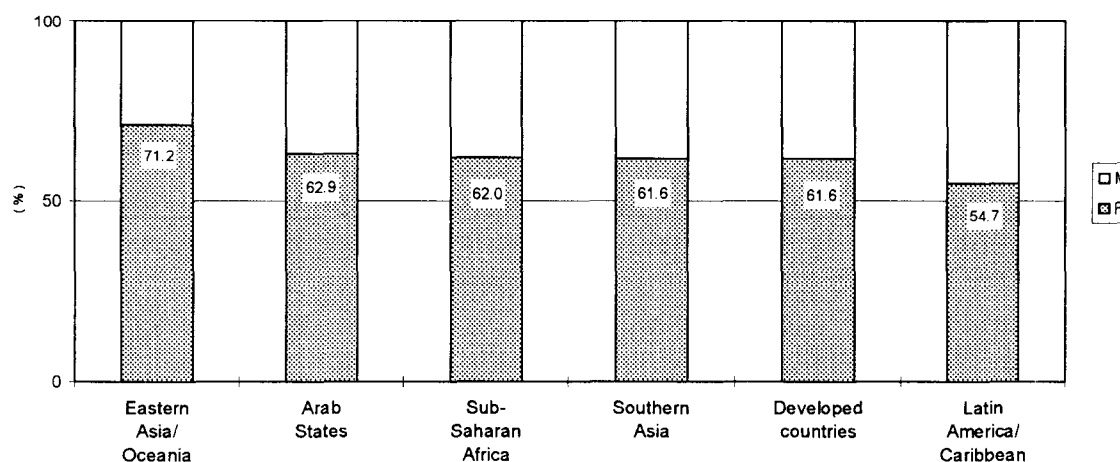
Interpretation of Figure 1:

- the volumes of the pies show that the absolute number of both male and female illiterates is highest in Southern Asia and lowest in the developed countries;
- in the developed countries the proportion of women among illiterates (62%) is as high as in Sub-Saharan Africa and in Southern Asia; it is higher than in Latin America/Caribbean, the region which comes closest to gender parity;
- when the proportion of females is multiplied by the corresponding total number of illiterates, it appears that the number of female illiterates does not exceed 8 million in the developed countries, as compared to 87 million in Sub-Saharan Africa, 256 million in Southern Asia and 23 million in Latin America/Caribbean ;
- although the number of illiterates in Eastern Asia/Oceania is only half that of Southern Asia, the former region, with 71% of women among illiterates, shows the highest gender disparity.

If one wants to emphasize the differences between male and female illiterates, disregarding the total number, one may choose to present charts where the total is standardized (=100). This can be done with simple bar charts (histograms) or pie charts.

An example of bar chart showing the percentage of women in the total number of illiterates is given in Figure 2. For ease of comparison the bars are arranged in the descending order according to the percentages of female illiterates. For clarity and ease of interpretation, it is good practice to indicate the values on each bar. The horizontal line at 50% represents the line of equality between the number of male and female illiterates.

Figure 2. Estimated percentage of women in the total number of illiterates, by region, 1995
(in descending order of percentage of female illiterates)
Male + Female = 100 %



Source: Table 1.

Interpretation of Figure 2:

- all the bars' upper edges are above the level of 50%, indicating that the number of female illiterates exceeds the number of males in all regions of the world, including the developed countries.

One should also not forget that, due to the structure of the population, where women outnumber men, especially among older generations, equality does not necessarily coincide with

50%. For this reason it is appropriate, when measuring disparity, to provide also a comparison of illiteracy rates by gender, as shown below.

Illiteracy rates

It is always necessary, when analyzing education and literacy not to rely solely on absolute figures but also on relative values, such as the rates and ratios calculated in relation to the corresponding population, as those shown in Table 2 below. In order to facilitate the analysis of both the overall illiteracy rates and the disparities, the absolute gender gap is also shown (column 4); this is given by the difference between the female and the male illiteracy rate and is expressed in percentage points.

Table 2. Estimated adult illiteracy rates and gender gap, by sex and by region, 1995

	Illiteracy rates (%)			Absolute gap (F-M, in percentage points) (4)
	Both sexes (1)	Male (2)	Female (3)	
WORLD TOTAL	22.6	16.4	28.8	12.4
Developing countries of which:	29.6	21.1	38.3	17.2
Sub-Saharan Africa	43.2	33.4	52.7	19.3
Arab States	43.4	31.6	55.8	24.2
Latin America/Caribbean	13.4	12.3	14.5	2.2
Eastern Asia/Oceania	16.4	9.4	23.7	14.3
Southern Asia	49.8	37.1	63.4	26.3
Developed countries	1.3	1.1	1.6	0.5

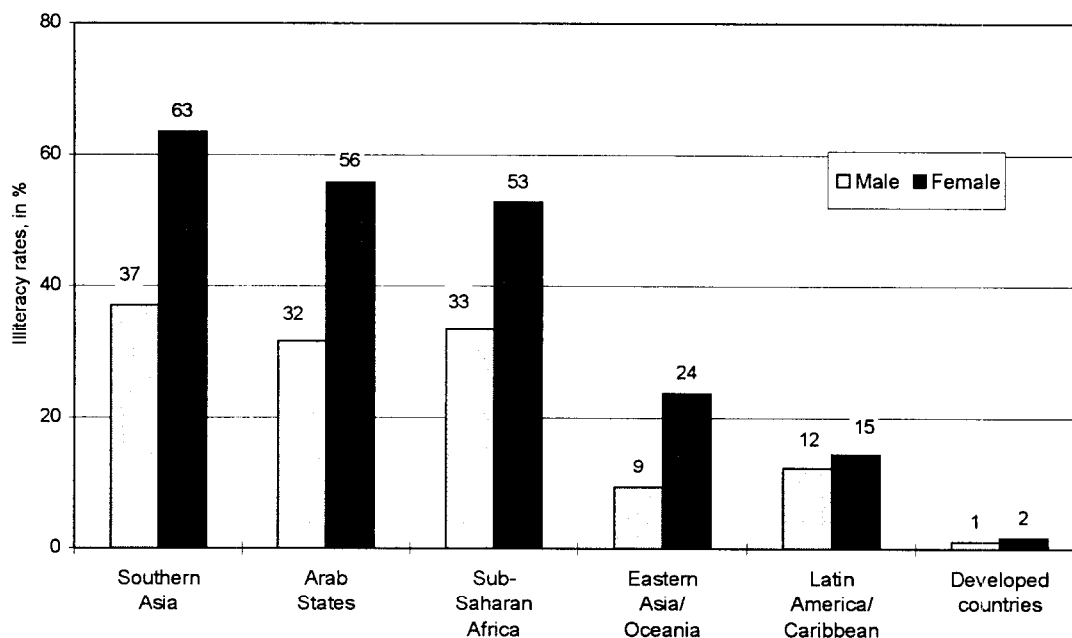
Source: Compendium of statistics on illiteracy, SRS n° 35, 1995.

Interpretation of Table 2:

- for both sexes combined the lowest illiteracy rates among developing regions are found in Latin America/Caribbean, followed by Eastern Asia/Oceania, and the highest rates are found in Southern Asia;
- Sub-Saharan Africa, with an overall illiteracy rate of 43.2%, is at practically the same level as the Arab States (43.4%);
- the gaps between female and male illiteracy rates are always positive, indicating that disparities exist in all regions and that they are always in favour of men;
- such disparities are highest in Southern Asia (26.3 percentage points), followed by the Arab States and Sub-Saharan Africa;
- the absolute gaps are lowest in the group of the developed countries (0.5 percentage points) and in Latin America/Caribbean (2.2 percentage points).

The graphic presentation given in Figure 3 can assist in the analysis, as it enables the illiteracy rates and the differences between male and female rates to be visualized.

Figure 3. Estimated illiteracy rates, by sex and by region, 1995
(in descending order of female illiteracy rate)



Source: Table 2.

Interpretation of Figure 3:

- the highest female illiteracy rates are found in Southern Asia, followed by the Arab States and Sub-Saharan Africa;
- the gaps always show a disadvantage for women and are significant in all developing regions, with the exceptions of Latin America/Caribbean where they are quite moderate;
- the lowest values of both illiteracy rates and gender gaps are found in the group of the developed countries.

It should be stressed that disparities have been examined here in terms of absolute gaps, which are influenced by the values of the rates themselves. We will see in the next section, when dealing with enrolment ratios, how relative measures of disparities, i.e. ratios between rates, instead of differences, may give different pictures.

These two measures of disparities - differences and ratios - are discussed extensively in the following section, which deals with the analysis and presentation of gender disparities as regards schooling, enrolment ratios in particular.

III.2 Gender disparities in school participation

The gross enrolment ratios (GER)

If we choose a simple indicator of school participation, the gross enrolment ratio (GER), we can study:

- i) the current female enrolment ratio as compared with the male enrolment ratio;
- ii) the implied, absolute, gender gap (introduced in the preceding section with respect to illiteracy rates); it is here the difference between the male and the female enrolment ratios;
- iii) the gender ratio, here defined as the ratio between the female and the male enrolment ratios, and designated as the *gender parity index* (GPI),

In the most frequent cases where male enrolment ratios are higher than the female enrolment ratios, the GPI varies between 0 (maximum gender disparity) and 1 (gender parity). However, in many developed countries and some other countries in Latin America and the Caribbean and in Southern Africa female ratios exceed male ratios. In these cases the gender parity index (F/M) exceeds 1. In both cases - disparity in favour of men or disparity in favour of women -, the principle remains that the closer the index to the unity, the lower the gender disparity.

Absolute gender gaps versus relative gender disparities

The absolute gender gap M - F and the gender parity index F/M depict disparities in different ways. Both may be interesting depending on the context of the analysis.

Table 3 conveys a broad picture of female and male enrolment ratios in primary and secondary education and the implied gender gap and gender parity index by region.

Disparities in favour of women are indicated by a negative value of the gender gap and by a value exceeding 1 of the gender parity index.

Table 3. Male and female gross enrolment ratios (GER) and gender disparities, by region, 1992

	Gross enrolment ratios, 1992							
	Primary education				Secondary education			
	Male (%)	Female (%)	Absolute gap (M-F, in percentage points)	Gender parity index F/M	Male (%)	Female (%)	Absolute gap (M-F, in percentage points)	Gender parity index F/M
WORLD TOTAL	103.8	93.2	10.6	0.90	58.3	49.6	8.7	0.85
Developing countries of which:	104.4	92.2	12.2	0.88	50.4	39.0	11.4	0.77
Sub-Saharan Africa	79.6	66.7	12.9	0.84	25.9	20.3	5.6	0.78
Arab States	97.9	80.2	17.7	0.82	60.1	47.1	13	0.78
Latin America/Caribbean	110.2	106.1	4.1	0.96	51.2	55.9	-4.7	1.09
Eastern Asia/Oceania	117.1	111.6	5.5	0.95	54.0	45.9	8.1	0.85
Southern Asia	101.4	80.2	21.2	0.79	52.2	33.1	19.1	0.63
Developed countries	100.0	99.5	0.5	1.00	94.3	97.3	-3	1.03

Source: World Education Report 1995.

Interpretation of Table 3:

- among the developing countries, gender gaps in schooling are most pronounced in Southern Asia, followed by the Arab States and Sub-Saharan Africa;
- Sub-Saharan Africa is characterized by the combination of low enrolment ratios and significant gender gaps. The Arab States have higher enrolment ratios than Sub-Saharan Africa, but higher gender gaps;
- the absolute gender gap indicates that in Sub-Saharan Africa the female enrolment ratio in secondary education should increase by 5.6 percentage points to attain gender equality. The gender parity index indicates that in the same region the female enrolment ratio for secondary education is only three quarters (0.78) of the male enrolment ratio;
- in secondary education Latin America and the Caribbean and the developed countries show disparities in favour of women.

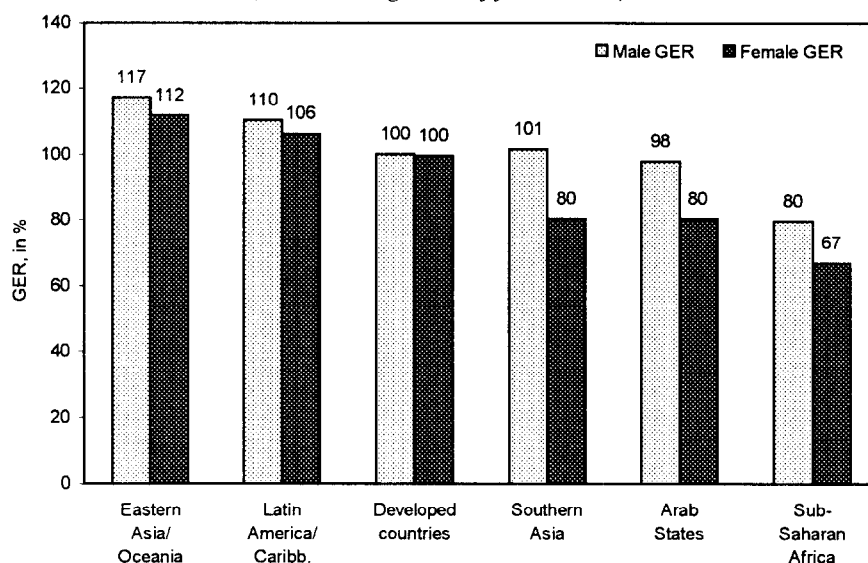
It can be observed that the ranking of developing regions depends on the criteria (gender gap or GPI) chosen to order them. As an example, for secondary education if one ranks regions in order of disparity, as measured by the gender gap, and apart from Latin America/Caribbean, where the disparity is in favour of women, the lowest disparity is found in Sub-Saharan Africa (5.6 percentage points); on the other hand if one orders regions in terms of GPI, the lowest disparity is found in Eastern Asia/Oceania (GPI= .85)

Graphic presentation

Data shown in Table 3 can be presented in different graphical forms (Figures 4 to 7).

Bar charts are suitable graphic representations for the analysis of absolute gender gaps. Figure 4, for instance, shows male and female gross enrolment ratios in a simple bar chart which makes it relatively easy to appreciate the difference between the two ratios.

Figure 4. Primary education: male and female GER, by region, 1992
(in descending order of female GER)

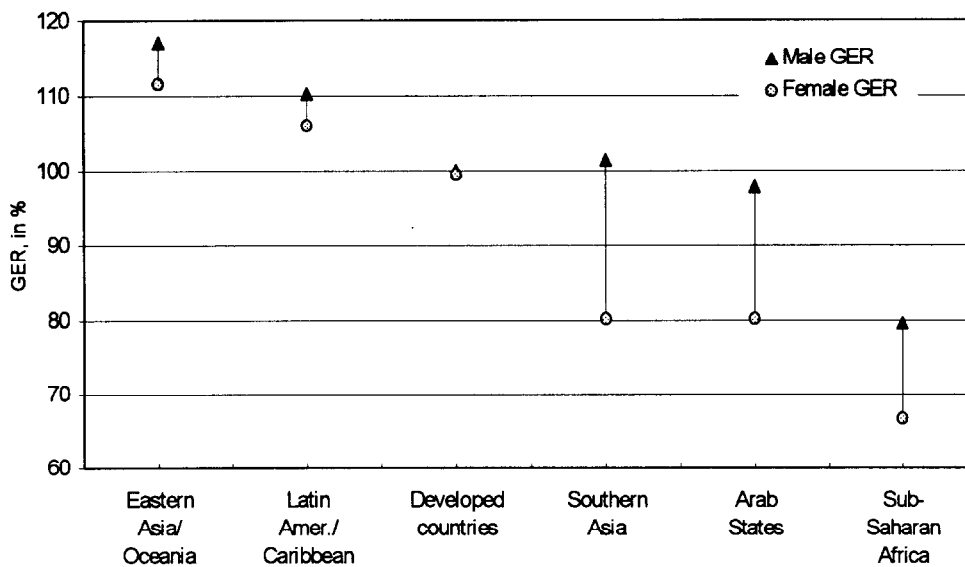


Source: Table 3.

Another example of simple chart is that given in Figure 5. This type of graphical presentation is effective in highlighting gender gaps or changes over time. Note that it is not necessary always to start the presentation from the origin of the axes. In this example, since there are no ratios below

60%, and since we want to emphasize the gender differences rather than the absolute values of the ratios, we have made the X axis intercept the Y axis at 60. There is no general rule for such options in the design of the charts, except perhaps that the graphs should be as informative as possible and not in any way potentially misleading.

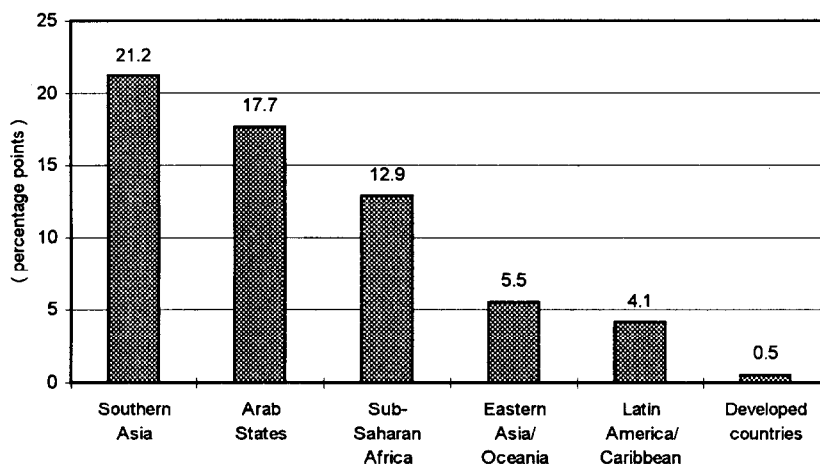
Figure 5. Primary education: male and female GER, by region, 1992
(in descending order of female GER)



Source: Table 3.

If one wants to emphasize the values of the gaps, a bar chart like Figure 6 can be used. However, in this case it is not possible to evaluate the gaps in conjunction with the level of the gross enrolment ratios.

Figure 6. Primary education: gaps between male and female GER (in percentage points), by region, 1992
(in descending order of gaps)



Source: Table 3.

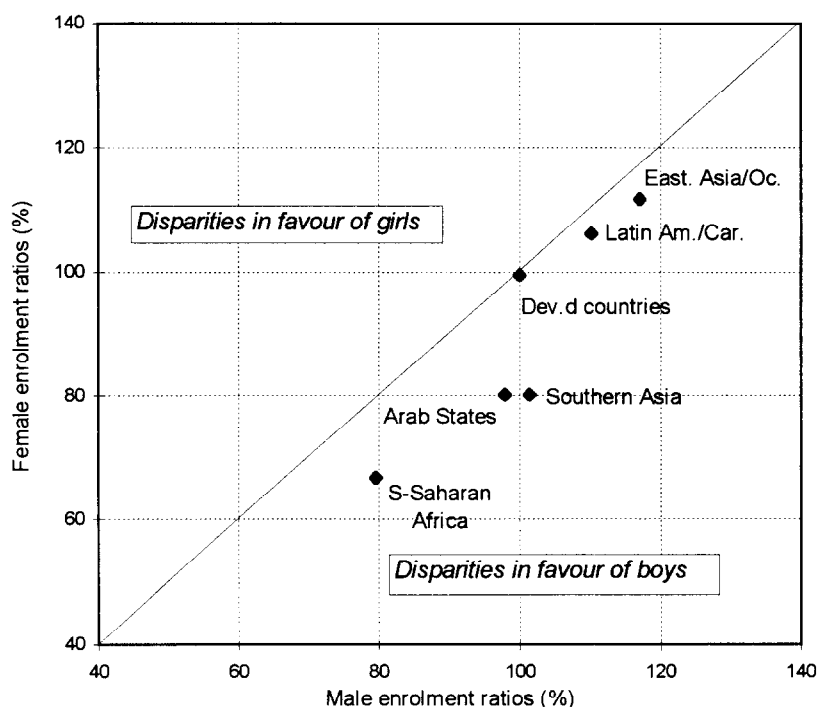
A suitable way to analyze at the same time the level of enrolment, the gender gap and the relative disparity, is to represent them graphically by using an XY scatter diagram, an example of which is given in Figure 7.

It can be seen that, when gross enrolment ratios for boys are higher than those for girls, the corresponding points/regions are situated below the 45° line (diagonal) which represents in fact the line of gender equality. In other words, all points/regions situated below the diagonal reflect disparities in favour of boys.

It can also be seen that the two measures of disparities discussed above are represented in Figure 7:

- the *gap* between the male and female enrolment ratios, (indicated in the third column of Table 3) is represented by the vertical distance of each point from the diagonal.
- the *ratio* of the female to the male enrolment ratio (GPI) (indicated in the fourth column of Table 3), is represented by the tangent¹ of the angle between the horizontal axis and the line which could be drawn from a given point to the origin of the diagram.

Figure 7. Primary education: male and female GER, by region, 1992



Source: Table 3.

Interpretation of Figure 7:

- all regions fall below the diagonal. In other words, total equality between male and female enrolment ratios has not been reached yet in any of the regions of the world except for developed countries where the gap is insignificant.
- Sub-Saharan Africa has the lowest enrolment ratios and quite high gender disparity. Southern Asia and the Arab States have somewhat higher enrolment ratios, but fairly high gender gaps and disparity.

This diagram is also useful to show trends over time, as can be seen from Figure 10, in Section III.4.

¹ In trigonometry the tangent of an angle is defined as "the ratio between the side opposite to the angle and that adjacent to the angle" i.e. exactly the gender parity index as defined by F/M.

III.3 Inter-country variations of enrolment and gender disparities

In addition to a global approach by world regions, it may be interesting to study female enrolment ratios and gender disparities at a more disaggregated level. Table 4 lists male and female enrolment ratios, gender gaps and the gender parity index for the first and second levels combined, in 1994, for the Arab States.

Table 4. Arab States: male and female GER, gender gaps and parity index for primary and secondary education combined, 1994

Gross enrolment ratio in primary and secondary education						
Country	Enrolment ratios (%)		Country	Absolute gap (M-F, in percentage points) (in decreasing order of gaps)	Country	Gender parity index F/M (in increasing order of GPI)
	M	F (in increasing order of F)				
Djibouti	30	22	Yemen	61	Yemen	0,39
Sudan	43	34	Morocco	18	Djibouti	0,73
Mauritania	50	38	Iraq	16	Morocco	0,74
Yemen	100	39	Egypt	14	Mauritania	0,76
Morocco	68	50	Mauritania	12	Sudan	0,79
Iraq	77	61	Syria	10	Iraq	0,79
Saudi Arabia	69	62	Algeria	10	Egypt	0,85
Kuwait	66	66	Sudan	9	Syria	0,88
Syria	82	72	Djibouti	8	Algeria	0,89
Oman	77	72	Saudi Arabia	7	Saudi Arabia	0,90
Algeria	89	79	Tunisia	7	Tunisia	0,92
Egypt	93	79	Oman	5	Oman	0,94
Tunisia	89	82	Qatar	2	Qatar	0,98
Qatar	88	86	Kuwait	0	Kuwait	1,00
Lebanon	92	95	Un. Arab Emir.	-2	Un. Arab Emir.	1,02
Un. Arab Emir.	102	104	Lebanon	-3	Bahrain	1,03
Bahrain	104	107	Bahrain	-3	Lebanon	1,03

Source: Statistical Yearbook 1996.

In columns (1) and (2) data are shown in increasing order of female enrolment ratios. It is easy to identify the countries where female participation in education is highest and where it is lowest.

If we want to emphasize the gender disparity aspect, the two indicators, gender gap and gender parity index should be considered. In column 3 we have ranked the countries in decreasing order of the absolute gap while in column 4 countries are ranked in ascending order of the GPI.

Interpretation of Table 4:

- *in the Arab States the highest female enrolment ratios are found in Lebanon, the United Arab Emirates and Bahrain and the lowest in Djibouti, Sudan, and Mauritania;*
- *the largest gaps are found in Yemen, Morocco, Iraq and Egypt which, judging from this indicator, are the countries that have to make the biggest effort to reach parity;*
- *if we consider the gender parity index Yemen, Djibouti, Morocco and Mauritania show the largest relative disparities between male and female enrolment ratios.*

Thus, depending on the measure or the indicator of disparity selected, different rankings are obtained.

When presenting indicators for a certain number of countries (or provinces or regions) it may be useful to give a synthetic idea of the situation by providing the mean values (weighted or unweighted, depending on the type of analysis). However since the mean may conceal important variations, it is also advisable, for a finer analysis, to provide the reader with the basic measures of variation, such as the highest and the lowest values, the range, the standard deviation (SD) and the coefficient of variation (CV).

The standard deviation (SD) (unweighted) may be defined as:

$$SD = \sqrt{\frac{\sum_i (x_i - \bar{x})^2}{n}}$$

Where x_i is the value of the variable in the i th unit (country) and \bar{x} is the mean.

It can be recalled that the coefficient of variation (CV) is more appropriate for comparisons since it is scale free. In fact the CV is defined as the ratio of the SD to the mean:

$$CV = SD/Mean$$

An example of a summary description of inter-country dispersion is given in Table 5 for the Arab States.

Table 5. Arab States: cross-country dispersion in male and female GER, gender gap and GPI, in primary and secondary education combined, 1994

	Gross enrolment ratios (%)		Gap (in percentage points)	Gender parity index
	primary + secondary			
	M	F	M-F	F/M
Mean	78	68	10	0,86
Highest value	104	107	61	1,03
Lowest value	30	22	-3	0,39
Range	74	85	64	0,64
SD	21	25	15	0,16
CV	0,27	0,37	1,45	0,18
Number of countries	17	17	17	17

Source: Table 4. The above statistics are unweighted.

Interpretation of Table 5:

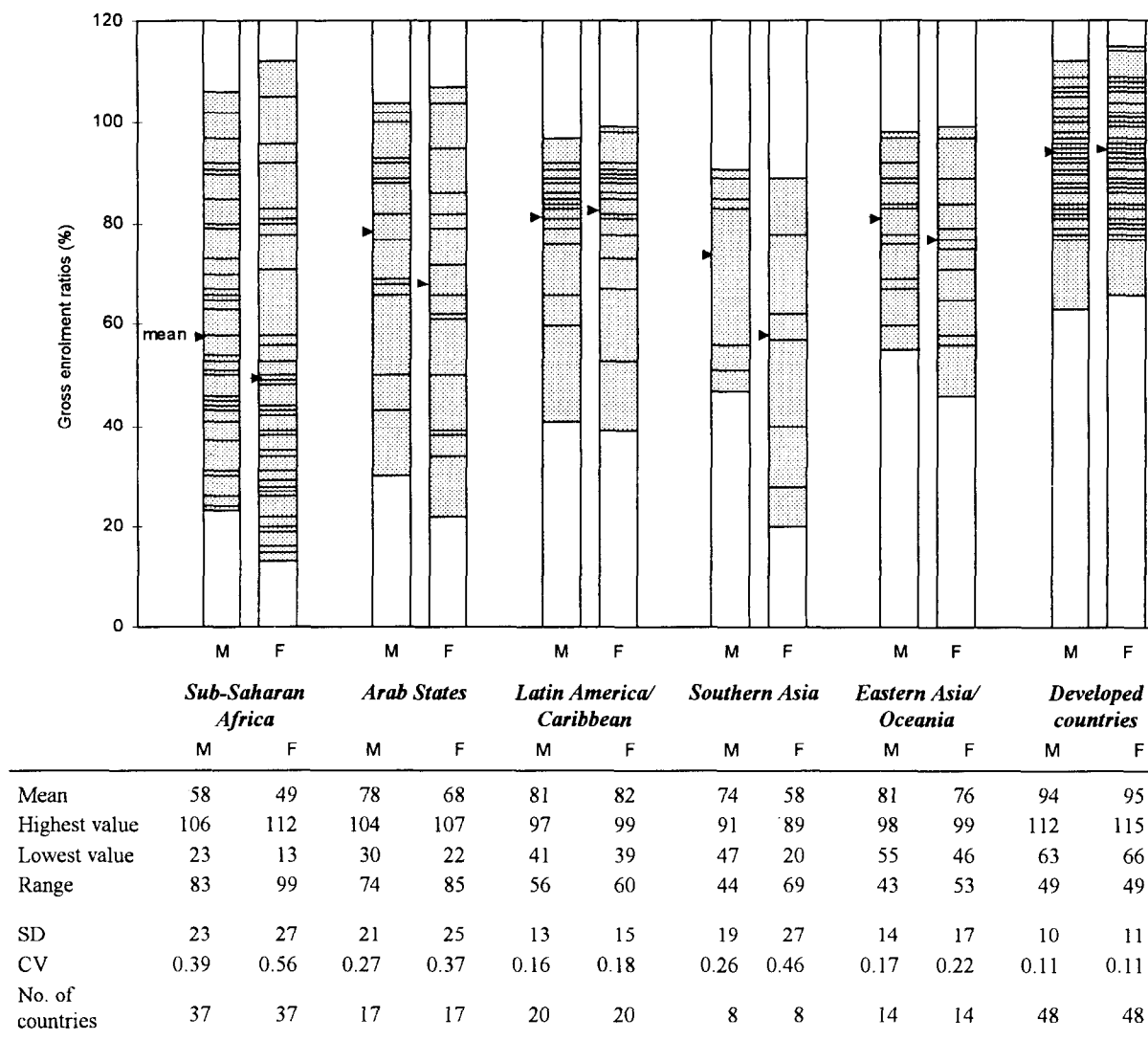
- combined gross enrolment ratios for primary and secondary education are, on average, lower for females (68) than for males (78);
- both the standard deviation (SD) and the coefficient of variation (CV), indicate that cross-country variation of female enrolment ratios is larger than that of male enrolment ratios.

Graphic presentation

The analysis of dispersion is particularly useful to compare different regions since it provides, in addition to the regional means, the other main statistics mentioned above. An example of graphic presentation of cross-country dispersion for the six world regions is given in Figure 8. The corresponding statistics are given at the bottom of the figure.

Figure 8. Cross-country dispersion in male and female GER in primary and secondary education combined, 1994

(each horizontal line corresponds to the GER of one or several countries in the corresponding region)



Source: Statistical Yearbook 1996.

Interpretation of Figure 8:

- in developing regions the mean is higher for male than for female GER, with the exception of Latin America/Caribbean;
- dispersion, as measured by both the standard deviation (SD) and the coefficient of variation (CV), is always higher for female than for male GER;
- in the developed countries the mean as well as the measures of dispersion are virtually the same for male and female GER.

III.4 Changes over time in gross enrolment ratios and gender disparities

Having assessed gender disparities at a given moment one can proceed to an analysis of changes over time. Table 6 gives a broad picture of enrolment ratios and gender gaps in primary and secondary education, by region, for 1985 and 1992.

Table 6. Male and female GER in primary and secondary education, and gender gaps, by region, 1985 and 1992

	Gross enrolment ratios											
	Primary education						Secondary education					
	1985			1992			1985			1992		
	M	F	Gap	M	F	Gap	M	F	Gap	M	F	Gap
(%)	(%)	(perc. points)	(%)	(%)	(perc. points)	(%)	(%)	(perc. points)	(%)	(%)	(perc. points)	
WORLD TOTAL	105.5	91.4	14.1	103.8	93.2	10.6	53.6	43.6	10.0	58.3	49.6	8.7
Developing countries	107.1	90.4	16.7	104.4	92.2	12.2	43.9	31.2	12.7	50.4	39.0	11.4
<i>of which:</i>												
Sub-Saharan Africa	83.9	68.1	15.8	79.6	66.7	12.9	25.7	17.9	7.8	25.9	20.3	5.6
Arab States	99.1	76.0	23.1	97.9	80.2	17.7	53.9	37.2	16.7	60.1	47.1	13.0
Latin America/Caribbean	108.6	104.3	4.3	110.2	106.1	4.1	48.8	51.8	-3.0	51.2	55.9	-4.7
Eastern Asia/Oceania	122.9	109.6	13.3	117.1	111.6	5.5	45.5	35.1	10.4	54.0	45.9	8.1
Southern Asia	97.6	70.6	27.0	101.4	80.2	21.2	43.4	23.7	19.7	52.2	33.1	19.1
Developed countries	97.3	97.0	0.3	100.0	99.5	0.5	95.9	97.0	-1.1	94.3	97.3	-3.0

Source: WER 1995.

From Table 6 we can easily calculate the variations in the female enrolment ratios and gender gaps between 1985 and 1992. These are shown in Table 7.

Table 7. Male and female GER in primary and secondary education and gender gaps by region: changes between 1985 and 1992 (in percentage points)

	Differences between 1992 and 1985 values:						
	Changes in GER, primary			Changes in GER, secondary			
	M	F	Gap	M	F	Gap	
	(1)	(2)	(3)	(4)	(5)	(6)	
	(percentage points)			(percentage points)			
WORLD TOTAL	-1.7	1.8	-3.5	4.7	6.0	-1.3	
Developing countries	-2.7	1.8	-4.5	6.5	7.8	-1.3	
<i>of which:</i>							
Sub-Saharan Africa	-4.3	-1.4	-2.9	0.2	2.4	-2.2	
Arab States	-1.2	4.2	-5.4	6.2	9.9	-3.7	
Latin America/Caribbean	1.6	1.8	-0.2	2.4	4.1	-1.7	
Eastern Asia/Oceania	-5.8	2.0	-7.8	8.5	10.8	-2.3	
Southern Asia	3.8	9.6	-5.8	8.8	9.4	-0.6	
Developed countries	2.7	2.5	0.2	-1.6	0.3	-1.9	

Source: Table 6.

Interpretation of Table 7:

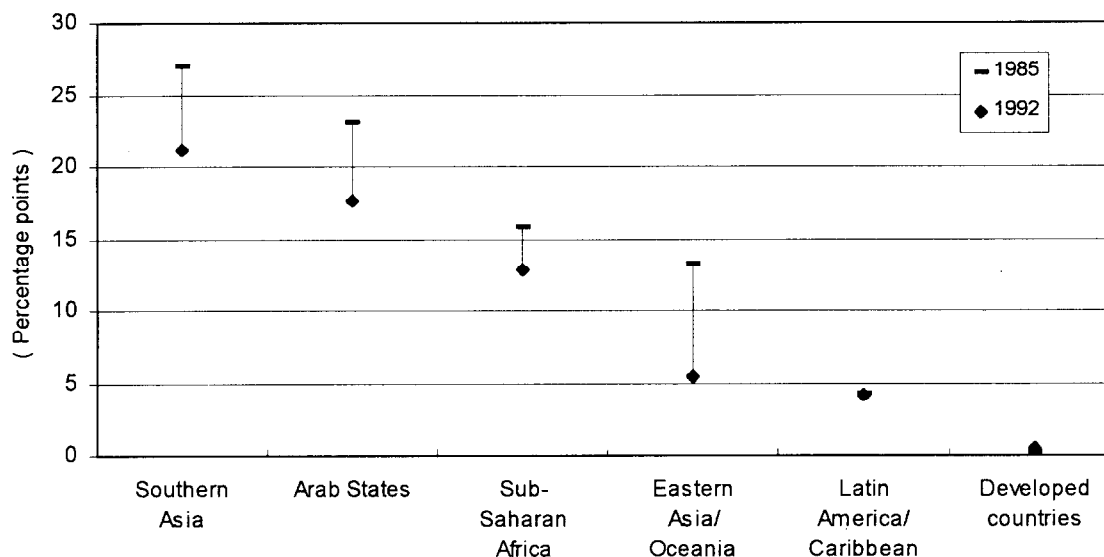
- For the world as a whole, the improvement in the female enrolment ratios (columns 2 and 5) is larger than that in the male enrolment ratios (columns 1 and 4) at both levels of schooling and there is a consequent decline in the gender gaps at both levels (columns 3 and 6).
- For the developing regions:
 - gender gaps decrease in all regions (the values in column 3 and 6 are always negative);
 - the increase in the female enrolment ratio for both primary and secondary schooling is substantially larger than for the male enrolment ratio (which is actually decreasing of 2.7 percentage points for primary education);
 - a decrease in primary school enrolment ratios is observed for both males and females in Sub-Saharan Africa ; in the Arab States and Eastern Asia/Oceania the decrease is observed for male ratios only;
 - the increases in the female enrolment ratios are larger for secondary than for primary education, with the exception of Southern Asia.

Obviously a similar analysis could be made based on the Gender parity index (GPI) rather than on the gap.

Graphic presentation

There are several possibilities for presenting the gender gaps and their variation over time. An example is given in Figure 9.

Figure 9. Primary education: gender gaps in male and female GER, by region, 1985 and 1992
(in decreasing order of gaps in 1992)



Source: Table 6.

Interpretation of Figure 9:

- The decrease of the gaps between 1985 and 1992 is observed for all regions (with the exception of the developed countries, where the gap was negligible in 1985).

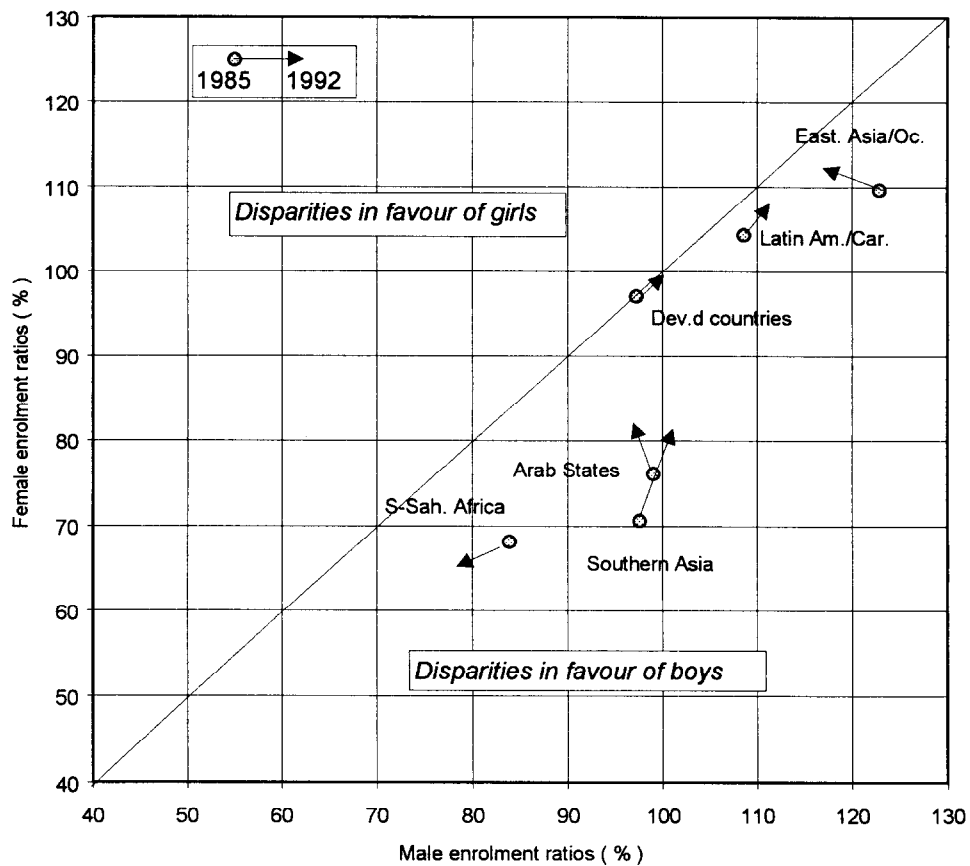
Disparities can also be represented through a scatter diagram.

As shown in connection with Figure 7 in Section III.2, there are two measures of disparities that can be depicted in a scatter diagram: the gender gap and the ratio of female to male GER, i.e. the gender parity index (GPI). Changes over time of these measures can also be represented as shown in Figure 10.

This shows scatter plots of enrolment ratios, with the small circle at the origin of each line corresponding to the year 1985 and the small arrow corresponding to the year 1992. The diagonal joining the lower left and the upper right corners of the diagram represents all points where the male and female enrolment ratios are equal. When male GER are higher than female GER, as is the case in practically all regions, the corresponding points are situated below that diagonal.

The length of the line joining the small circle and the arrow can be regarded as a measure of the magnitude of change in that region's enrolment ratios between the two dates. The direction of the line is an indicator of whether the change in enrolment ratios was in favour of boys (the line points away from the diagonal) or in favour of girls (the line points towards the diagonal).

Figure 10. Primary education: GER by region, 1985 and 1992



Source: Table 6.

Interpretation of Figure 10:

- *In all the regions the male GER is higher than the female GER in both years, except for developed countries, where male and female ratios are very close.*
- *the biggest increase in GER was in the case of the Southern Asia and the smallest in the developed countries; in the case of Sub-Saharan Africa there was a decline in GER during the period under review*
- *in four of the developing regions (Sub-Saharan Africa, Arab States, Southern Asia and Eastern Asia/Oceania) the change was in favour of girls, indicating a much larger increase in female ratios than in male ratios, as shown by the position of the arrows which are closer to the diagonal.*

III.5 School participation and school survival

In most developing countries girls and women are worse off than boys and men as regards access to and participation in schooling, as shown by an analysis of gender disparities in intake (entrance) rates into primary education and enrolment ratios. It is of interest also to examine the behaviour of girls as compared to boys *once they are in school*, i.e. whether they tend to remain in school more or less than boys, and indeed whether they perform better or worse than boys. However the subject of gender differences in school performance is rather complex and is not treated here.

As a first step one may compare gender disparities as regards access to schooling with disparities as regards school survival. Access to schooling is measured by the apparent intake (entrance) rate while school survival is given by the estimated percentage of a cohort of pupils who have entered grade 1 in a given year and eventually reach grade 5. Table 8 shows gender disparities with regard to intake rates and survival rates in Sub-Saharan African countries.

It should be mentioned that the two types of measures are not strictly comparable, since, while the apparent intake rate can exceed 100% due to early and late entrants into school, the survival rates to grade 5 cannot exceed 100%¹. Thus no country-to-country comparisons between the absolute gaps are made. It is however legitimate to make country-to-country comparisons according to the GPI.

It is quite revealing to compute the number of countries where disparities are in favour of girls for the two indicators (this is indicated by a negative value in the absolute gap and by a value exceeding 1 in the GPI).

¹ *The apparent intake rate (entrance rate) is the number of new entrants into first grade, first level, regardless of age, expressed as a percentage of the population of official admission age to the first level of education.*

The percentage of a cohort reaching grade 5 (survival to grade 5) is the percentage of children starting primary school, who eventually attain grade 5. The estimate is based on the Reconstructed Cohort method which uses data on enrolment and repeaters for two consecutive years.

Table 8. Sub-Saharan Africa: school access and survival to grade 5, 1992

Country	Apparent intake rate 1992				Percentage of 1991 cohort reaching grade 5			
	Male (%)	Female (%)	Absolute gap (in % points)	Gender parity index F/M	Male (%)	Female (%)	Absolute gap (in % points)	Gender parity index F/M
Benin	101	52	49	0.51	54	56	-1.6	1.03
Botswana	125	123	2	0.98	82	86	-4.9	1.06
Burkina Faso	48	29	19	0.60	65	78	-12.9	1.20
Burundi	67	56	11	0.84	74	75	-0.3	1.00
Cameroon	91	80	11	0.88	63	69	-5.8	1.09
Central African Republic	85	58	27	0.68	66	63	2.9	0.96
Chad	80	47	33	0.59	57	33	24.4	0.57
Cote d'Ivoire	71	54	17	0.76	75	70	4.6	0.94
Eritrea	53	42	11	0.79	85	80	5.2	0.94
Ethiopia	50	34	16	0.68	22	21	1.5	0.93
Gambia	90	64	26	0.71	85	89	-4.0	1.05
Ghana	85	77	8	0.91	81	79	2.0	0.98
Guinea	70	36	34	0.51	82	75	6.7	0.92
Kenya	115	111	4	0.97	74	78	-4.4	1.06
Lesotho	99	103	-4	1.04	54	66	-12.2	1.23
Madagascar	80	79	1	0.99	26	30	-4.1	1.16
Malawi	106	99	7	0.93	48	44	4.0	0.92
Mali	37	27	10	0.73	76	77	-0.5	1.01
Mauritius	97	95	2	0.98	100	99	0.4	1.00
Mozambique	69	55	14	0.80	39	31	8.5	0.78
Namibia	143	143	0	1.00	62	67	-5.5	1.09
Nigeria	112	90	22	0.80	83	84	-1.0	1.01
Rwanda	103	101	2	0.98	58	60	-2.1	1.04
Senegal	61	49	12	0.80	92	83	8.7	0.91
South Africa	133	128	5	0.96	68	74	-5.9	1.09
Sudan	70	54	16	0.77	90	95	-5.0	1.06
Swaziland	133	127	6	0.95	74	80	-5.3	1.07
Togo	99	77	22	0.78	76	57	18.6	0.75
United Rep. of Tanzania	80	76	4	0.95	81	86	-4.3	1.05
Zaire	78	61	17	0.78	73	54	18.8	0.74
Zimbabwe	135	132	3	0.98	72	81	-8.5	1.12
<i>Mean</i>	89	76	13	0.83	69	68	0.6	0.99
<i>Highest value</i>	143	143	49	1.04	100	99	24.4	1.23
<i>Lowest value</i>	37	27	-4	0.51	22	21	-12.9	0.57
<i>SD</i>	27	33	12	0.15	18	20	8.6	0.14
<i>CV</i>	0.31	0.43	0.90	0.18	0.26	0.29	14.74	0.14
<i>Number of countries</i>	31	31	31	31	31	31	31	31

Source: WER 1995.

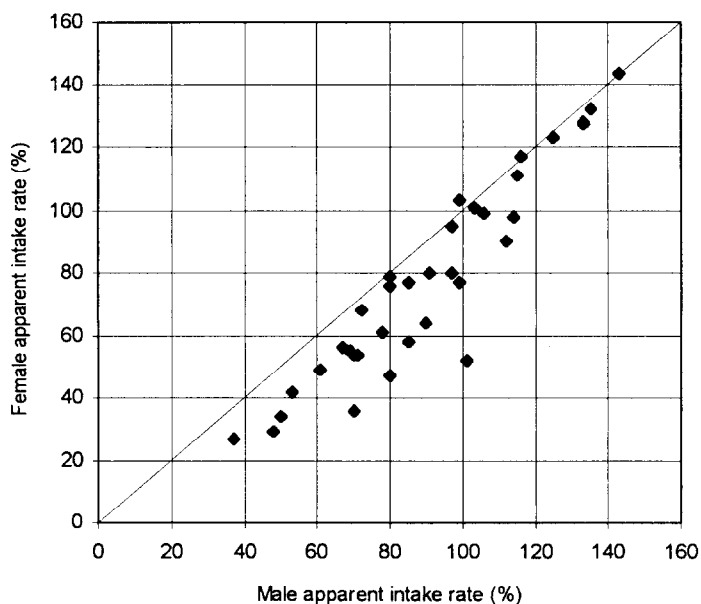
Interpretation of Table 8:

- *as concerns intake rates, the disparities are always in favour of boys, with only two exceptions, namely Lesotho and Namibia;*
- *with regard to survival to grade 5, the disparities are in favour of boys in 13 cases only, out of 31, indicating that girls have a higher probability of reaching grade 5.*

This shows that, from a global standpoint, once girls are admitted into school they do not drop out more than boys do.

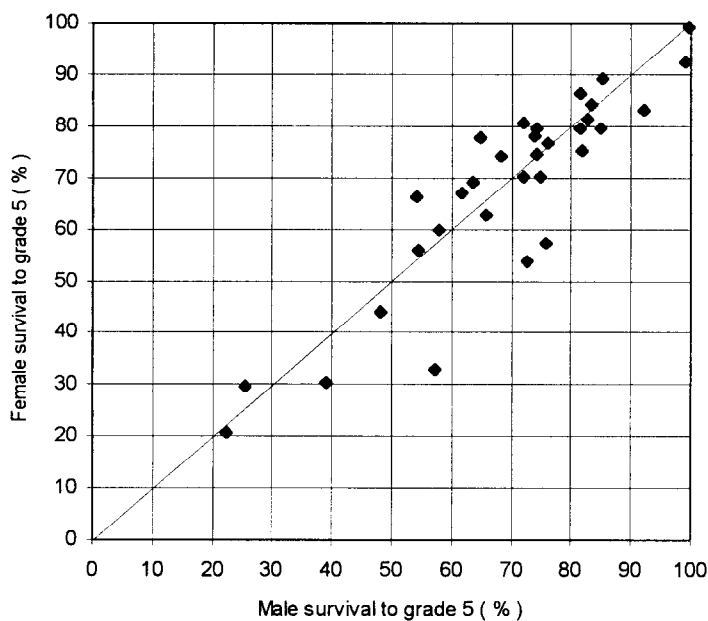
The above observations can also be illustrated graphically as shown in the following figures on male and female access to schooling (Figure 11) and survival to grade 5 (Figure 12).

Figure 11. Sub-Saharan Africa: male and female apparent intake rates, 1992



Source: WER 1995.

Figure 12. Sub-Saharan Africa: percentage of 1991 cohort reaching grade 5



Source: WER 1995.

Interpretation of Figures 11 and 12:

- *in terms of access to schooling (apparent intake rate), girls are almost always worse off than boys (in Figure 11 virtually all countries are below the line of equality);*
- *as concerns school survival (cohort reaching grade 5), girls do better than boys in more than half the countries (in Figure 12 more than half the points are above the line of equality).*

Another way of analysing differences in the school life of boys and girls is to compare male and female school life expectancy (SLE) and school survival expectancy (SSE). The SLE is the total number of years of schooling which a child of a certain age can expect to receive in the future ¹. The SSE is the number of years of schooling which a child of a certain age *who is already at school* can expect to receive in the future.

Table 9. Male and female school life expectancy (SLE) and school survival expectancy (SSE) and gender gaps, 1992

	School life expectancy		Absolute gap	School survival expectancy		Absolute gap
	(in years of schooling)		(in years of schooling)	(in years of schooling)		(in years of schooling)
	Male	Female	M-F	Male	Female	M-F
Botswana	10.4	10.9	-0.5	10.5	10.9	-0.4
Burkina Faso	3.4	2.1	1.3	9.0	8.5	0.5
Burundi	5.1	4.0	1.1	9.3	8.5	0.8
Gambia	6.1	4.0	2.1	9.2	8.2	1.0
Guinea	3.8	1.6	2.2	10.4	8.6	1.8
Lesotho	7.8	9.5	-1.7	11.3	10.6	0.7
Malawi	6.3	5.0	1.3	8.8	8.4	0.4
Mali	2.3	1.2	1.1	9.2	8.3	0.9
Mozambique	4.0	2.9	1.1	7.6	7.4	0.2
Namibia	12.0	13.0	-1.0	13.5	13.3	0.2
Niger	2.8	1.4	1.4	8.4	7.9	0.5
Rwanda	5.9	5.5	0.4	7.2	6.8	0.4
Senegal	5.6	3.6	2.0	9.8	8.8	1.0
South Africa	11.7	12.2	-0.5	12.8	12.7	0.1
Togo	10.6	5.9	4.7	11.3	9.5	1.8
Zaire	6.7	4.4	2.3	11.5	9.2	2.3
<i>Mean</i>	6.5	5.5	1.0	9.9	9.3	0.6

Source: World Education Report 1995.

Interpretation of Table 9:

- gender gaps are often smaller in school survival expectancy (SSE) than in school life expectancy (SLE);
- in other words a larger proportion of boys than girls has access to school in the first place but once girls get into school their chances of 'survival' are only slightly less favourable than those of boys.

¹ The definitions of the two indicators given in the *World Education Report 1995* are as follows:

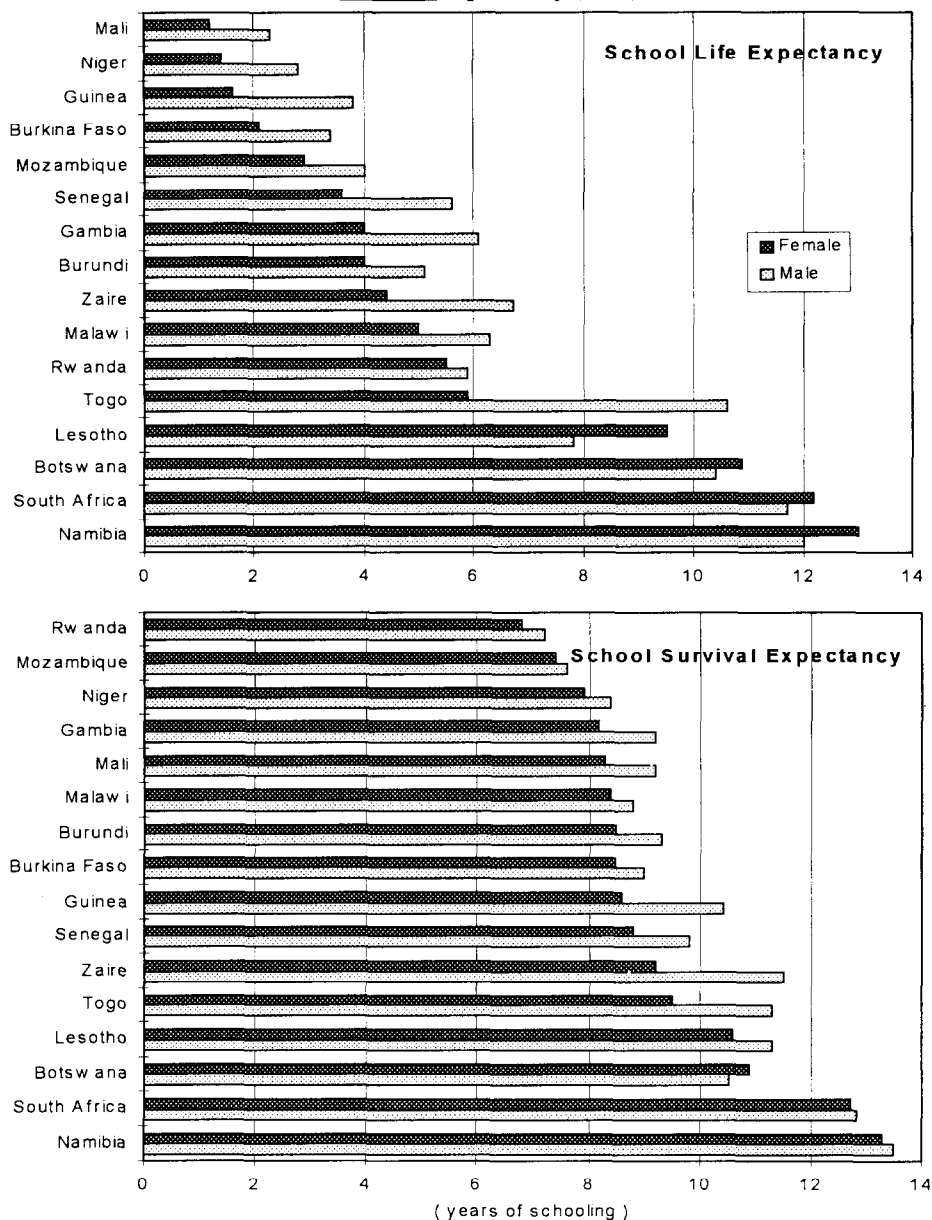
School life expectancy (SLE): For a child of certain age, the SLE is defined as the total number of years of schooling which the child can expect to receive in the future, assuming that the probabilities of his or her being enrolled at school at any particular future age is equal to the current enrolment ratio for that age. It is the sum of the age-specific enrolment ratios for primary, secondary and higher education.

School survival expectancy (SSE): The SSE for a child of a certain age (the reference age) is defined as the number of years of schooling which a child of that age, who is already at school, can expect to receive in the future. It is the ratio between the sum of the age-specific enrolment ratios for primary, secondary and higher education and the enrolment ratio at the reference age. For more details about the mode of calculation, see Statistical notes in the same *Report*.

Graphic presentation

The above findings are presented graphically in Figure 13. The upper part presents countries in ascending order of School life expectancy (SLE) while the lower part gives the same presentation for School survival expectancy (SSE), in terms of years of schooling.

Figure 13. Sub-Saharan Africa: Male and female school life expectancy (SLE) and school survival expectancy (SSE), 1992



Source: Table 9.

Interpretation of Figure 13:

- gender gaps in School life expectancy are in general higher than those in School survival expectancy.
- notable exceptions are some Southern African countries (Lesotho, Botswana, South Africa and Namibia) where gender gaps in schooling are often in favour of girls.

III.6 Index of gender segregation by fields of study

While in the majority of developing countries overall gender parity in education is far from being achieved, progress is being made quite fast in some developed countries, and in some countries of Latin America and the Caribbean region. However even in countries where overall parity is achieved, large disparities appear in the distribution of male and female students among the different fields of study in technical and vocational and in higher education..

It may be useful, when studying female participation in the different fields of study in vocational and technical education or in higher education, to possess a tool to measure how men and women tend to concentrate in specifically 'masculine' or 'feminine' fields respectively.

The index of gender segregation by fields of study described below can constitute such a tool. It is defined as the percentage of all persons enrolled at a given level of education who would need to change their field of study if the ratio of females to males were to be the same in all fields, assuming that there is no change in the total enrolment.

In effect, the index equalises the gender composition of enrolments in all fields of study on the basis of the gender composition of the total enrolment in all fields of study taken together. For example:

	<i>Male</i>	<i>Female</i>	<i>Total</i>
Field A	220	60	280
Field B	20	100	120
<u>All fields</u>	<u>240</u>	<u>160</u>	<u>400</u>

The gender composition of the total enrolment in all fields taken together (400) is 60 per cent male (240) and 40 per cent female (160).

If the gender composition of the total enrolment in field A (280) and in field B (120) were also to be 60 per cent male and 40 per cent female, then the enrolment in each of these fields would be:

	<i>Male</i>	<i>Female</i>	<i>Total</i>
Field A	168	112	280
Field B	72	48	120
<u>All fields</u>	<u>240</u>	<u>160</u>	<u>400</u>

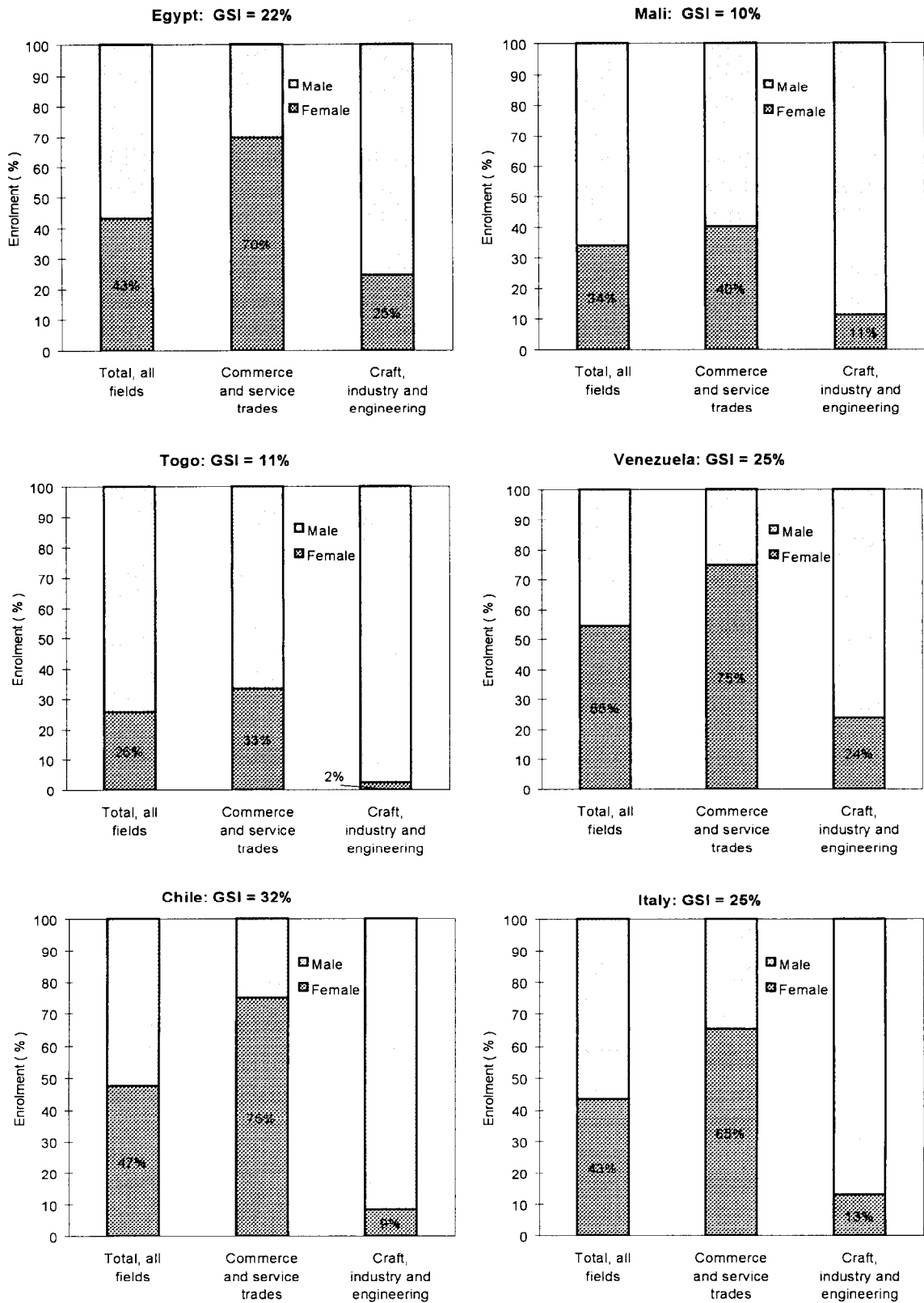
In order to obtain this new composition, 52 males in field A would need to 'move' into field B and 52 females in field B would need to 'move' into field A.

104 persons would need to change fields out of the grand total of 400 persons enrolled. In this case the gender segregation index (GSI) is equal to:

$$\text{GSI} = \frac{104 \text{ (number of persons who have to change fields)}}{400 \text{ (total enrolment)}} = 26 \text{ per cent}$$

It should be stressed that the calculation of the number of persons who would need to change field is based on the percentages of males and females in the total enrolment for all fields taken together.

Figure 14. Secondary vocational education. Enrolment by broad field of study and by gender, in selected countries, around 1992



Source: Data are from the document *Secondary technical and vocational education: Female participation in the various fields of study, 1980 and 1992. STE-17. UNESCO. Paris 1995.*

It follows that the index is not a measure of the overall gender disparity in access to, or participation in, a particular level of education but rather a measure of the concentration of men and women in specific fields, *for a given overall gender distribution*.

The graphic presentation given in Figure 14 for selected countries may help to clarify the meaning of the index. It can be observed from the diagram that the countries with the lowest index of gender segregation by field of study, Togo and Mali in the example, can have a rather low proportion of women in the overall (all fields) enrolment. On the other hand high gender segregation by field of study may be associated with a comparatively high female participation in the overall enrolment, as shown in the case of Venezuela and Chile.

III.7 Utilization of thematic maps

Geographical representation by thematic maps is particularly suited to show proportions or intensities of certain phenomena in a given area and can prove particularly appropriate for illustrating changes over time. These days various geographical interpretation systems (GIS) on microcomputers are becoming accessible to ordinary users and common software applications can be used for simple maps. Therefore larger use should be made of them in the presentation of education statistics and indicators.

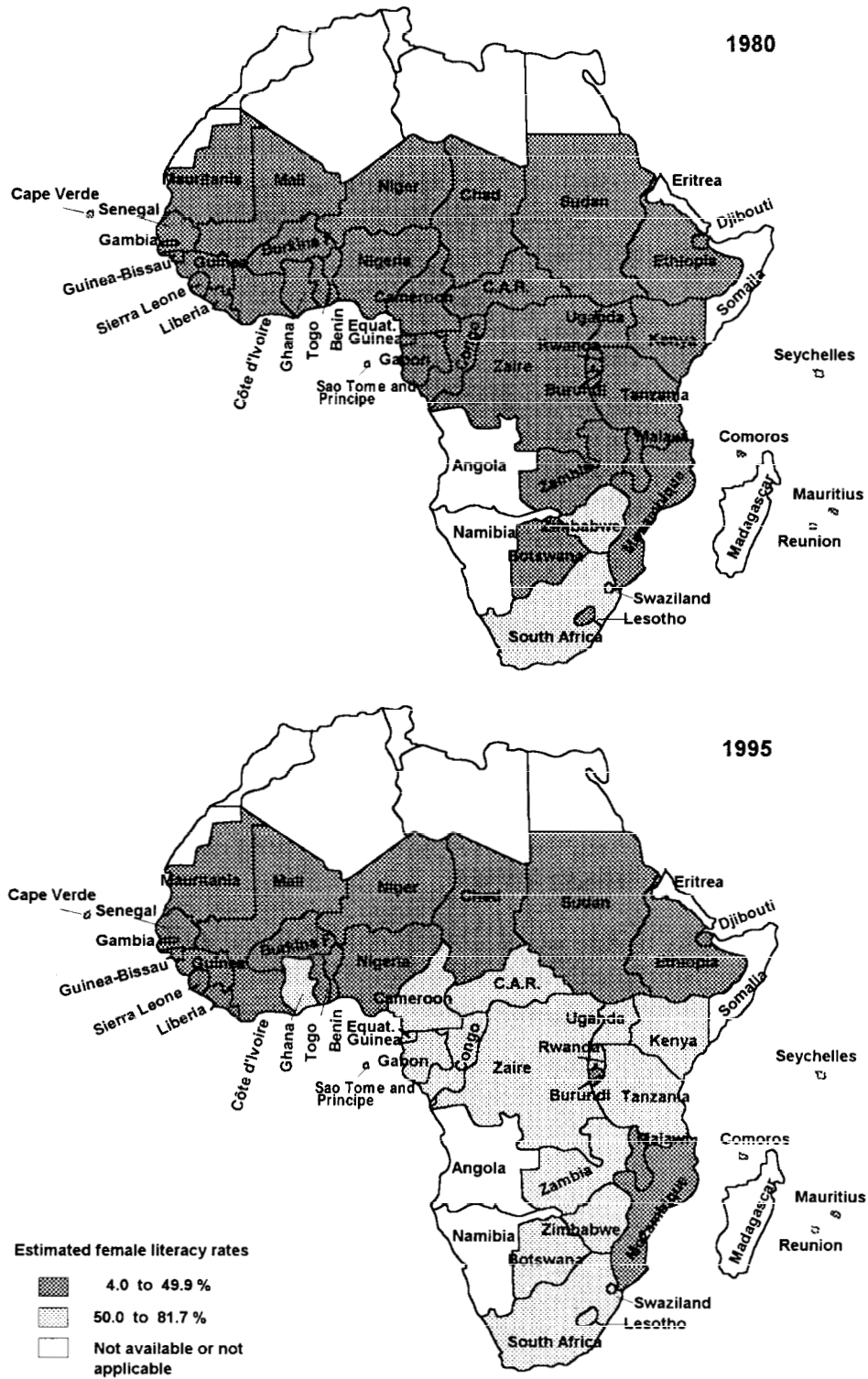
As an example, Figure 15 provides a representation of changes in female literacy in Africa between 1980 and 1995.

Interpretation of Figure 15:

- *although large areas remain, where half the female population is still illiterate, progress achieved during the last 15 years in the eradication of female illiteracy is not negligible;*
- *many countries of Eastern and Central Africa have moved from the category 'less than 50%' to 'more than 50%' female literacy.*

To have a comparative picture with respect to male illiteracy, similar maps could be drawn for total or male illiteracy rates as well as for gender gaps. Naturally further analysis is needed to assess the situation in more detail and to detect variations from the general pattern.

Figure 15. Sub-Saharan Africa: Estimated female literacy rates, 1980 and 1995



Source: Compendium of statistics on illiteracy, SRS n° 35, 1995.

1118 Towards gender-equity-sensitive indicators

Absolute achievement versus gender parity

In making inter-country comparisons we want to take into account at the same time overall (both sexes) achievement and gender inequalities (gender gaps and parity indices). If the overall value is the same, more inequality will evidently indicate a worse social situation. But the question is more complex when the overall or mean levels of achievement are different. In particular, in measuring progress should the criterion be a reduced gender disparity or a higher absolute achievement? In Haiti, for instance, the literacy rate is 43% with 46% for males and 40% for females. Should this social outcome be judged worse than that of Chad, which has an overall literacy rate of 45% with 59% for males and 31% for females? Haiti has a lower literacy rate than Chad, but it also has less gender inequality.

In order to answer this type of question synthetic indicators have been proposed integrating the gender-equity dimension in the measure of absolute achievement. UNDP has recently developed a *gender-equity-sensitive indicator (GESI)*, which utilises the harmonic mean between the male and female indicators¹. The harmonic mean has the property of taking into account both the value of the overall ratio as well as, to a certain extent, the disparity between males and females.

In the above-mentioned examples of literacy rates in Haiti and Chad, the calculation of the GESI would be:

For Chad:

$$\frac{1}{GESI_{Ch}} = \frac{JU_{Ch}}{0.59} + \frac{0.5}{0.31} = 0.847 + 1.613 = 2.459$$

where 0.5 is the approximate share of males and females on total population. Therefore:

$$GESI_{Ch} = \frac{1}{2.459} = 0.41$$

For Haiti:

$$\frac{1}{GESI_{H}} = \frac{0.5}{0.40} + \frac{0.5}{0.40} = 1.087 + 1.250 = 2.337$$

Therefore:

$$GESI_{H} = \frac{1}{2.337} = 0.43$$

Thus if we calculate the gender-equity-sensitive indicator instead of the arithmetic mean, in the above example Haiti would rank higher than Chad despite the fact that the overall (both sexes) literacy rate is higher for the latter.

It is possible to modify the calculation of the index to make it more sensitive to gender disparities. The interested reader may refer to the Appendix of the *Human Development Report 1995*. We just want to recall here that the general idea is to correct the overall (both sexes) value of a given indicator by a gender equality index, using appropriate formulae.

¹ For more information on gender-equity-sensitive indicators see *UNDP. Human Development Report 1995, Technical Notes*.

III.9 Correlation between education and other socio-economic factors

Various socio-economic variables such as income and fertility may be supposed to account to a certain extent for the observed variation among countries (or provinces or regions) in the literacy rates and enrolment of girls in first and second level education.

The techniques of regression and correlation enable relationships between pairs of variables to be identified and quantified. These techniques can be more frequently used in the study of gender disparities, especially as most micro-computer spreadsheet software nowadays incorporate such analytical facilities.

*It may be recalled that, given two distributions x and y , if we divide the covariance of x and y by the standard deviation of the x and the standard deviation of the y distribution, and finally average the results, we obtain the **coefficient of linear correlation**, r :*

$$r = \frac{\Sigma(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\Sigma(x_i - \bar{x})^2 \Sigma(y_i - \bar{y})^2}}$$

This expression has the extremely important property that r is a pure number with no associated units and

$$-1 \leq r \leq +1$$

*Where $r = +1$ indicates perfect positive linear correlation;
 $r = -1$ indicates perfect negative linear correlation and
 $r = 0$ indicates zero linear correlation.*

It should be recalled that positive or high correlation between two variables, x and y , does not of itself demonstrate that x causes y or that y causes x (or indeed that they are both caused by a third factor).

Table 10 presents the coefficients of correlation among:

- a) total fertility rate (TFR)
- b) real GNP per capita (GNP)
- c) male and female adult illiteracy rate (ILLIT.M and ILLIT.F)
- d) male and female gross enrolment ratios at primary and secondary education (GER1.M and GER1.F; GER2.M and GER2.F)
- e) percentage of female teachers in primary education (%FT)
- f) gender parity index for GER of primary and secondary education (GPI1 and GPI2)

Correlation has been calculated for 56 developing countries for which data are available.

Table 10. Coefficients of correlation between fertility, income, adult illiteracy, GER, percentage of female teachers and gender parity index, 1992

	Total fertility rate TFR	GNP per capita GNP	Adult illiteracy rate ILLIT		Gross enrolment ratio				% of female teachers primary %FT	Gender parity index	
			M	F	primary GER1		secondary GER2			primary GPI1	secondary GPI2
					M	F	M	F			
TFR	1										
GNP	-0.61	1									
ILLIT.M	0.67	-0.57	1								
ILLIT.F	0.73	-0.59	0.94	1							
GER1.M	-0.58	0.33	-0.63	-0.55	1						
GER1.F	-0.71	0.48	-0.81	-0.79	0.89	1					
GER2.M	-0.75	0.67	-0.59	-0.57	0.64	0.66	1				
GER2.F	-0.83	0.74	-0.70	-0.75	0.58	0.74	0.92	1			
%FT	-0.60	0.48	-0.65	-0.78	0.39	0.68	0.44	0.71	1		
GPI1	-0.61	0.49	-0.79	-0.81	0.48	0.81	0.43	0.65	0.79	1	
GPI2	-0.60	0.49	-0.63	-0.75	0.32	0.65	0.34	0.65	0.88	0.85	1

Note : Illiteracy rates are estimates for 1995. All other data refer to 1992.

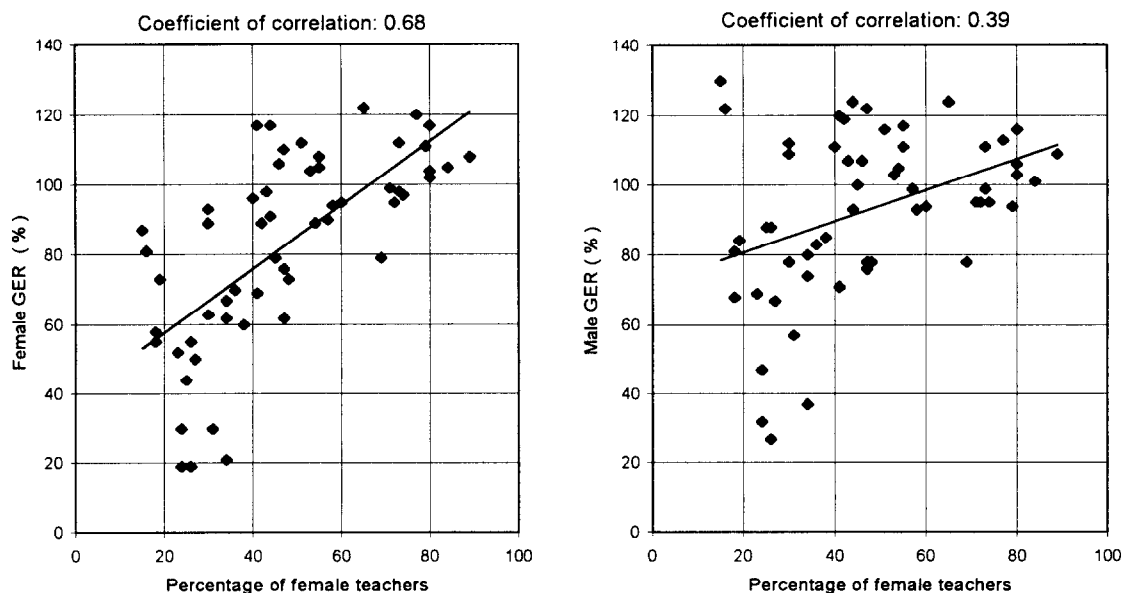
Interpretation of Table 10:

- *male and female enrolment ratios correlate highly at both levels of education (0.89 and 0.92). Therefore, although female enrolment ratios are typically lower, these are highly correlated with the corresponding male enrolment ratios. In other words, the basic factors tend to make both rates move in a similar manner. As regards illiteracy the correlation between the male and the female rate is also very high (0.94);*
- *total fertility rates are highly correlated with female illiteracy and education. More particularly, it can be observed that correlation between the total fertility rate and female illiteracy ($r = 0.73$) is slightly higher than the correlation between fertility and male illiteracy ($r = 0.67$). The (negative) correlation between the total fertility rate and GER is also higher for female than for male GER and for secondary than for primary education;*
- *the correlation of GNP with the GER is more marked for females than for males and for secondary than for primary education;*
- *there is also a negative correlation ($r = -0.78$) between the percentage of female teachers and the female illiteracy rate, i. e. countries with high female illiteracy are likely to also have a low percentage of female teachers. A negative correlation with male illiteracy rates also exists, but lower than with female rates ($r = -0.65$);*
- *high correlation is found between the percentage of female teachers and the gender parity index for gross enrolment ratios in primary ($r = 0.79$) and secondary education ($r = 0.88$);*
- *there is high negative correlation between illiteracy rates and the gender parity index, particularly for primary education.*

Graphic presentation

A scatter diagram may help to judge at a glance to what extent two variables are correlated.

Figure 16. Correlation between the percentage of female teachers and the male and female gross enrolment ratios (GER) in primary education, 1992



Source: Table 10.

Interpretation of Figure 16:

- there is a positive correlation between male and female GER and the percentage of female teachers in primary education for the same 56 developing countries as in Table 10;
- the female enrolment ratio is more highly correlated with the percentage of female teachers than the male ratio;
- while the above conclusions are suggested by the two scatter diagrams, the coefficients of correlation (0.68 and 0.39) give a precise measure of the degree of association between each couple of variables.

III.10 Example of country statistical profiles

It is interesting to show the main indicators by gender as well as the indicators of gender disparities for each country so as to show a picture which is comparable at the international level. The Forum for African Women Educationalists (FAWE) has proposed a very useful National Score Card as a tool to compile basic statistics on the participation of girls in education in Sub-Saharan Africa. In order to provide the baseline information to complete the detailed National Score Card, UNESCO and the African Academy of Sciences have published in 1995 *Female participation in education in Sub-Saharan Africa. Statistical profiles*, presenting available statistics for countries in Sub-Saharan Africa.

The model of statistical profile proposed below is similar to that adopted in the above document, with more emphasis given to the indicators of gender disparities, such as gender gap and gender parity index.

STATISTICAL PROFILE
COUNTRY:

Population (Thousands) 1995: Average annual growth rate (%) 1985-95: Total fertility rate (births per woman) 1995: Infant mortality rate (years) 1995:	GNP per capita (U.S. dollars) 1995: Average annual growth rate (%) 1990-95:
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Illiteracy

Number of adult illiterates (15 years and over)	Both sexes	Males (millions)	Females	%F	Gender gap (millions)	Gender parity index
1985						
1995						
Adult literacy rate (15 years and over)	Both sexes	Male (%)	Female		Gender gap (percentage points)	Gender parity index
1985						
1995						

Primary education

Gross enrolment ratio	Both sexes	Male (%)	Female		Gender gap (percentage points)	Gender parity index
(age group:)	1985					
(age group:)	1995					
Net enrolment ratio	1985					
	1995					

Secondary education

Gross enrolment ratio	Both sexes	Male (%)	Female		Gender gap (percentage points)	Gender parity index
(age group:)	1985					
(age group:)	1995					
Net enrolment ratio	1985					
	1995					

Primary and secondary education combined

Gross enrolment ratio	Both sexes	Male (%)	Female		Gender gap (percentage points)	Gender parity index
(age group:)	1985					
(age group:)	1995					
Net enrolment ratio	1985					
	1995					

Access to schooling and survival to grade 5

Apparent intake rate	Both sexes	Male (%)	Female		Gender gap (percentage points)	Gender parity index
(Entrance age:)	1985					
(Entrance age:)	1995					
Survival to grade 5	1985					
	1995					

Tertiary education

Gross enrolment ratio		Both sexes	Male (%)	Female	Gender gap (percentage points)	Gender parity index
(age group:)	1985					
(age group:)	1995					

School life expectancy

School life expectancy		Both sexes	Male (years)	Female	Gender gap (years)	Gender parity index
	1985					
	1995					

Teaching staff

Number of teachers		Both sexes	Male	Female	% Female
Primary education	1985				
	1995				
Secondary education	1985				
	1995				
Tertiary education	1985				
	1995				

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