

Young Entrants Stay in School Longer: Example from Mozambique.

Annababette Wils and Manuel da Costa Gaspar¹

Abstract

Late school entry prevails in many African countries, yet this widespread phenomenon has received little attention. This paper investigates late school entry in Mozambique, one of the larger countries in sub-Saharan Africa, for which data were available that allowed a detailed investigation. The paper shows that in Mozambique, pupils who enter school late have substantially higher drop-out rates than young entrants. The paper also shows that many pupils in first grade are probably older than reported by the schools. The results were obtained by reconstructing the 1997 school enrollment by age and the school survival by grade, given historical entry rates, promotion, repetition and drop-out rates. The reconstruction method is an adapted form of that proposed by Legare in 1972. The data necessary for the calculations include school attendance statistics from the Ministry of Education, and from the 1997 Population Census.

¹ Corresponding author: Annababette Wils, Vassar College, Department of Geology and Geography, 12604 Poughkeepsie, NY, wils@vassar.edu. Manuel Da Costa Gaspar xxx.

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1. Introduction

The investigation, which led to this paper, arose out of two conundrums concerning school enrollment and dropout data in Mozambique. According to recent statistics from Mozambican schools, compiled by the Ministry of Education, only 87 percent of the pupils proceeded from one grade to the next in elementary school, or, 13 percent dropped out at each level. On the other hand, information from the 1997 Population Census showed of the children who attended school sometime between ages 5-13 – generally in the elementary grades – only 13 percent had left school. How can the high drop out rates given by the schools be reconciled with the low drop out rates found in the Census? A detailed analysis of the school entry and departure patterns, using school enrollment data from the Ministry of Education, and statistics on school attendance from the 1997 Population Census shows that a likely explanation is heterogeneity by age with respect to school departure. Those who enter school at a young age experience lower drop out rates than older entrants.

As a second conundrum, information from schools showed a much higher entry rate at young ages than the Census. An analysis shows that it is likely that pupils or teachers under-report the age of first and second grade pupils – perhaps for reasons of school access or politics.

For the analysis of school drop out, school entry, grade promotion, repetition, and departure were reconstructed over the period 1983-1997 with age-constant drop-out and age-differentiated drop-out. The reconstruction with substantially lower drop out rates for young entrants and higher drop out for older school entrants reconciled the high drop-out per grade with low drop-out by age in the pre-teen years. It also reproduced 1997 age-specific enrollment curve and the number of pupils. According to the approximations, students who entered school in 1997 at age 5-7 can expect to finish 6.9 grades of school, compared to 4.7 for those who enter age 8-10; 3.3 for entrants age 11-14; and only 1.7 for those who enter beyond age 15.

Delayed school entry has received little attention in the literature, but the results show this is unjustified, given its deleterious effect on school outcome. While we did not duplicate the

² Annababette Wils, Department of Geology and Geography, Vassar College, Poughkeepsie, 12604, USA, email wils@iiasa.ac.at or wils@vassar.edu (corresponding author). Manuel da Costa Gaspar, Instituto Nacional de Estatística, Av. Ahmed Sekou Toure 21, Maputo, Mozambique, email gaspar@ine.gov.mz.

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calculation for other countries, we believe it is not unlikely that a similar situation prevails in other countries, which are similar to Mozambique, in that late school entry is common.

That early entry might lead to longer school enrollment is plausible. Parents who send their children to school as soon as it is possible might be more motivated about education in general, and be able to afford the time and financial investments to see their children through a long enrollment period. Also, older children, in particular teenagers, are more likely than younger children to have conflicting responsibilities within the household or at work. Third, some of the causes of late entry might also cause early departure. For example, Caldwell (1967) suggested that children who have a long walk to school might not be able to attend until they are older. At the same time, the long distance would also be a reason for pupils to drop out. In Mozambique in 1997, 18 percent of the population was more than 5 kilometers away from a primary school. Almost all, 89 percent, were more than 5 kilometers away from a secondary school (MPF, 1997). Another reason a child might enter school late is because parents can only afford to send their children to school sequentially, meaning a child might first have to wait his or her turn, and then must give way to the next in line.

2. Late school entry in Africa

Late school entry is pervasive in Africa (Lloyd and Blanc, 1996; UNESCO, 2001). Figure 1 shows age-specific enrollment in 18 African countries, 1996. If all children enter at the official school intake age, there is a short, sharp rise in enrollment at that age. There are only four countries where this is the case: Egypt, Tunisia, Algeria, and Mauritius, none of which is in continental sub-Saharan Africa. In the other countries in the figure, enrollment rises gradually with age, starting from age 5 and continuing up to age 8, or as high as age 12 in Tanzania and Lesotho. A rising enrollment rate by age means that people are still entering school. But even where the enrollment rate is flat from one age to the next, there is often a flux of pupils, with some departing and some entering school.

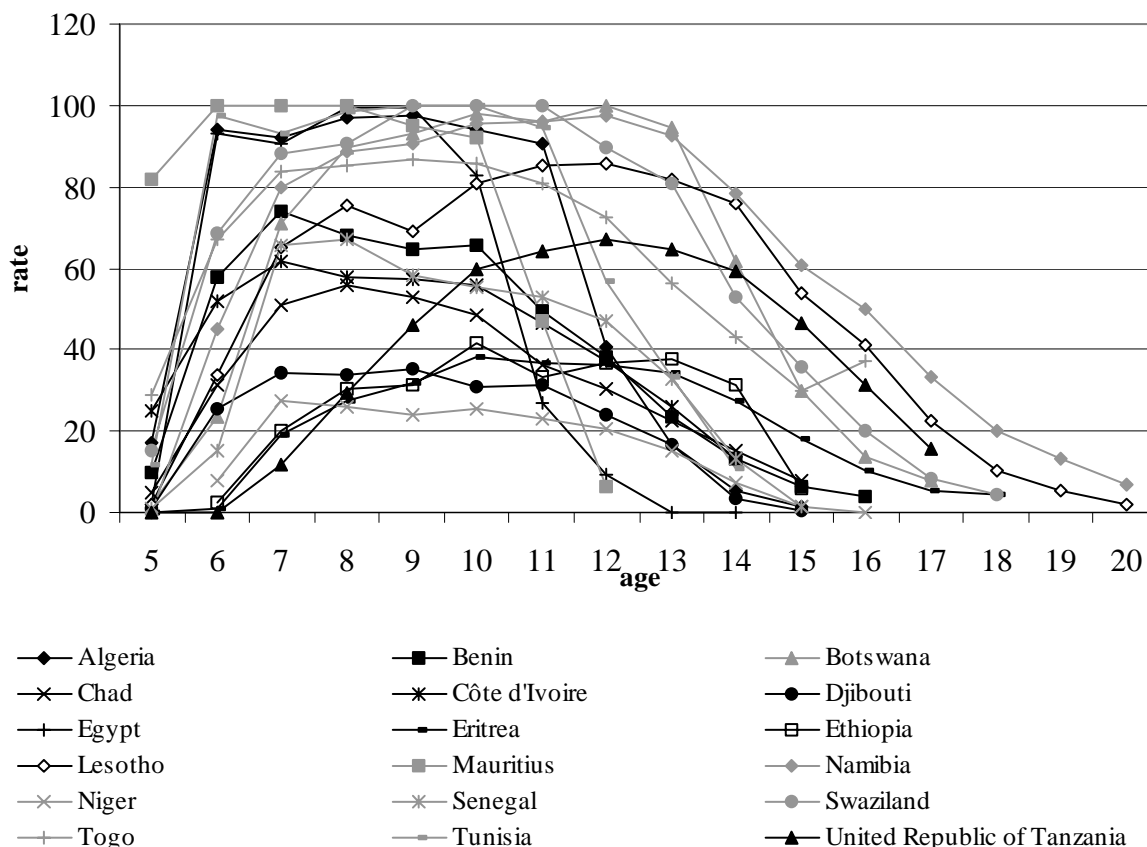


Figure 1. Primary enrollment rates 1996 for African countries where data was available from the UNESCO. Source: www.unesco.org

Another indicator of late entry is the ratio of the *apparent intake rate*³ and the *net intake rate*⁴. The apparent intake rate equals the total number of new enrollments in grade 1 divided by the population of the official school entrance age. For the net intake rate, the numerator is equal to the new school entrants of the official school-entrance age. If the apparent intake rate is higher than the net intake rate, this implies late school entry (barring the unlikely case that many children enter school before the official school-entrance age). Table 1 shows the 1996 apparent intake rate, net intake rate, and the ratio for seven African countries where the data was available from UNESCO. The highest ratios are found in Lesotho (3.4), Eritrea (2.9), and Swaziland (2.1). A comparison with Figure 1 confirms that these are indeed countries where enrollment increases by age until age 9 or higher.

³ Apparent intake rate = total number of new entrants in first grade of primary education, regardless of age, expressed as a percentage of the population at the official primary school-entrance age.

⁴ Net intake rate = total number of new entrants in first grade of primary education of the official primary school entrance age, expressed as a percentage of the population at the official primary school-entrance age

Country	Apparent intake rate	Net intake rate	Ratio apparent:net intake rates
Algeria	100.8	77.3	1.30
Eritrea	42.3	14.5	2.92
Lesotho	102.6	30.2	3.40
Mauritius	110.1	82.2	1.34
Niger	31.6	19.3	1.64
Swaziland	115.2	54.6	2.11
Tunisia	101.7	87.8	1.16

Table 1. Apparent intake rate, net intake rate, and the ratio apparent:net intake for seven African countries in 1996 for which the data were available from UNESCO. Source: www.unesco.org.

If late entry leads to higher drop out rates, then there should be a negative relationship between late entry and overall school performance. One expression of this relationship could be that the more late school entry prevails, the larger the ratio of enrollment at age $a:a+x$ is compared to the *survival ratio to grade x* ⁵. If there is no late entry and survival to say, grade 4 is 50 percent, then the ratio of school enrollment at age 10:age 6 (assuming the common official school entry age six) is .5. If there is late entry, and survival to grade 4 is 50 percent, then the ratio of enrollment age 10:age 6 would be higher than .5, because, although half of the children who started school at age 6 have dropped out by age 10, other children who entered school later replaced them. Repetition will tend to inflate the ratio of enrollment at age $a:a+x$, and there are also confounding effects of changes in school entry and –retention over time.

Figure 2 plots school survival to grade 4 against enrollment age age 10:6 (except for those countries where the official school entry is at age 7. Then the ratio is for age 11:7) for countries in Africa, 1970-95. There are 291 pairs for 39 countries available from UNESCO. The diagram, is divided into four areas with the possible combinations of low or high survival and low or high late entry. Area I contains survival ratios below .8 and enrollment ratios age 10:6, which are more than twice as high as the survival ratio – indicating late entry. There are 24 countries, which were in this area in the period 1970-95. Mozambique, which is in this area, is highlighted with distinctive markers and labels. In the beginning of the 1980s, Mozambique was a real outlier with extremely low survival ratios and very common late entry. The two more recent points, for 1994 and 1995 indicate the country is now within the realm of more common experience. Area II has high survival ratios above .8 and also high late entry. There are 18 countries in this area, including Botswana and Burkina Faso for which a long time series was available. This shows that late entry can be combined with good to complete retention. One implication for further study would be to indentify the

⁵ Survival ratio to grade x = Percentage of a cohort of pupils enrolled in the first grade of a given level or cycle of education in a given school-year who are expected to reach grade x . Calculation method provided in www.unesco.org under statistics.

circumstances in these countries, which allow late entrants to stay in school. Area III with 11 countries has low survival ratio and low late entry. Area IV shows high survival and low late entry in 14 countries. In 13 of these 14 countries school is also nearly universal, only in Djibouti enrollment by age never reaches even 40 percent. Because there are shifts in school experience over time, some countries are in more than one area, depending on the year. It is most common for countries to be in both area I and II, in other words, with consistent late entry but variable grade survival.

The figure is a cloud, which shows that in Africa, countries run the gamut with regards to possible experiences for late school entry and grade survival. In some countries most children reach grade 4, but many enter school late (Botswana); in Mauritius and the North-African countries children enter school at age 6 and most of them reach grade 4. However, in many sub-Saharan countries, there is combined low survival and late entry.

From the figure, we conclude that while the combination of late entry and poor school performance is not universal, it is common. The combination could be the result of a weak school system overall, and/or school survival heterogeneity, where late entrants have lower survival rates. The analysis for Mozambique indicates the latter, at least for that country.

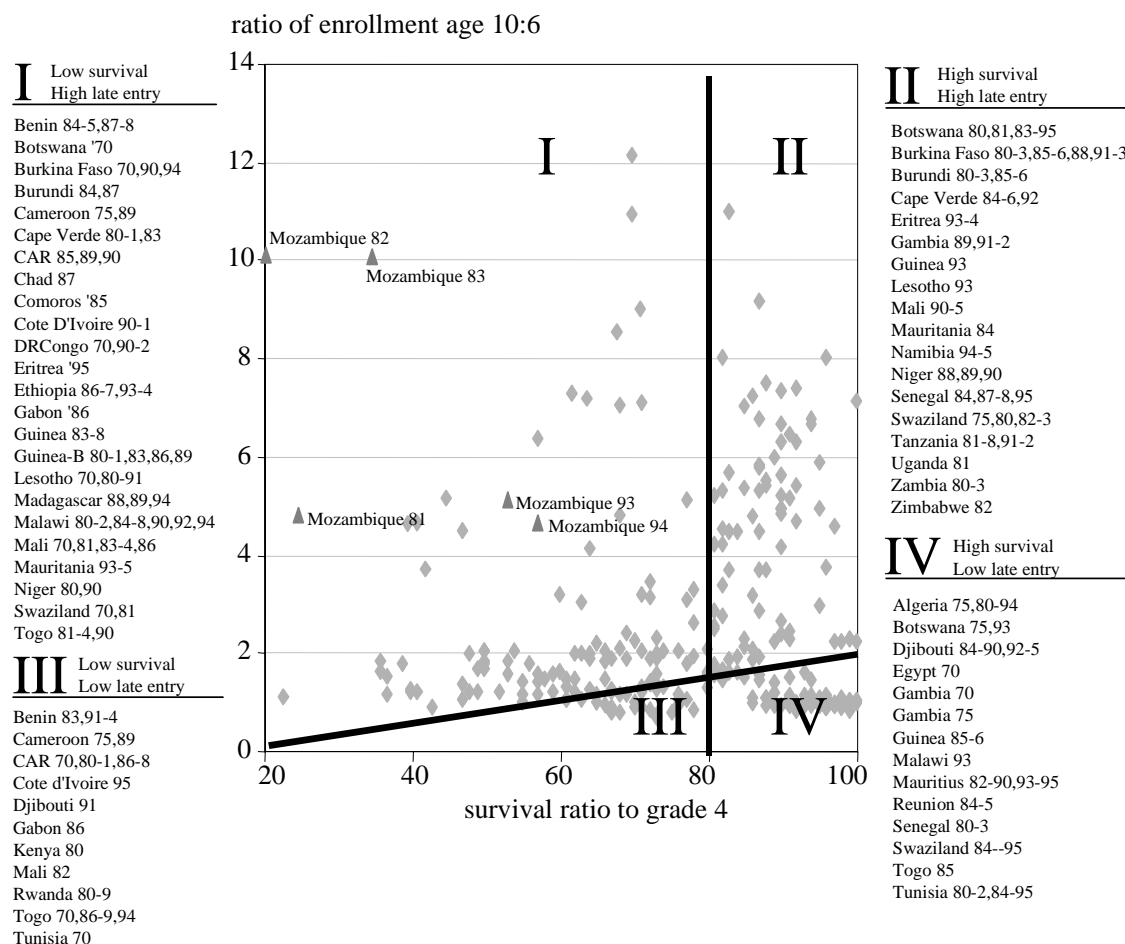


Figure 2. Scattergram of the ratio of school enrollment age 10:age 6 (or age 11:age 7 if official school entrance is age 7) and survival to grade 4.

3. School attendance data from Mozambique

We turn now, to the case study, Mozambique, which allows a much more detailed investigation of late school entry and school survival. Mozambique held one of the presently most recent published African Censuses, in 1997, so an up to date analysis is possible. It is also interesting in its own right as a large country emerging from a long period of war, with a rapidly expanding school system. In 1992, when the recent peace agreement was signed, there were 1.3 million pupils in primary school; by 2000, there were 2.5 million. Relatively speaking, school entry has increased even more. In 1992, 267 thousand entered first grade; in 1995, 349 thousand; and by 2000, 582 thousand. The country has been building an average of 500 new schools annually since 1992, and there are now approximately 7300 primary schools. Still, country's education profile is similar to that of many other poor countries in Africa. Net and gross primary enrollment rates were .43 and .74 respectively in 1997, although by 2000, gross enrollment had increased to an estimated .91⁶. As in many sub-Saharan countries, school entry is delayed (Lloyd and Blanc,1996), although at present, it is probably close to complete. There are high-drop out rates for each grade.

3.1. Data sources

The analysis uses two data sources: the 1997 population census conducted by the National Institute of Statistics, and school enrollment, and repeaters by grade and sex collected from schools by the Ministry of Education.

In almost all countries, Ministries of Education or related institutions, provide annual statistics on school enrollment, namely children in each grade and repeaters. From these data, indicators, such as the gross and net enrolment rates, intake rates, school survival and school life expectancy (see appendix for definitions) are calculated. See for example, www.unesco.org for an extensive global collection.

In addition, census data, collected at larger intervals, contain valuable information about school attendance. What can a population census provide that is new? For one, a census collects information on school participation from a different source – namely the household rather than the school – and so, is a “reality check”. A census also provides the correct (or more correct) base population for the calculation of rates. Third, a census provides information that is otherwise unavailable, namely on people who are *not* in school. A census might ask, of those who are not presently in school, what is the highest grade completed, or, on a more basic level, whether the person in question never attended school or did, but left. The latter piece of information, if provided by age, allows an estimation of age-specific drop-out rates, which are not normally available from the published annually collected data.

3.2. The Census Data

The basic Census data for our analysis is information on the number of people who 1) were presently attending school, 2) had left school, and 3) had never attended school, by single year age groups from 5-34. The *proportions* of each age group in these three categories are shown in the bars of Figure 3. The figure shows that in 1997, at age 5 almost nobody had ever

⁶ Data made available by the Ministry of Education, Maputo.

attended school, and only a small portion was presently in school. The proportion that never attended school is generally lower for each consecutive age group up until age 13, as more and more people enter school. At age 13, only 37 percent never attended school. The *gradual* decline in the proportion who never attended school signals that children begin school at various age, ranging from age 5 at least up to age 13. Beyond age 13, we see that the proportion that never attended school rises. At age 19 and higher, about 50 percent never attended school. The high proportions of people who never attended school at age 19 and above reflect the low levels of school enrollment during civil war, when these people were of normal school age. Also, generally, the proportion that has left school gradually takes up more of each bar, as with each consecutive age group a larger portion has quit school. There are a few fluctuations within the general pattern. In section 5.3, school intake and school drop out rates by age are calculated with this data.

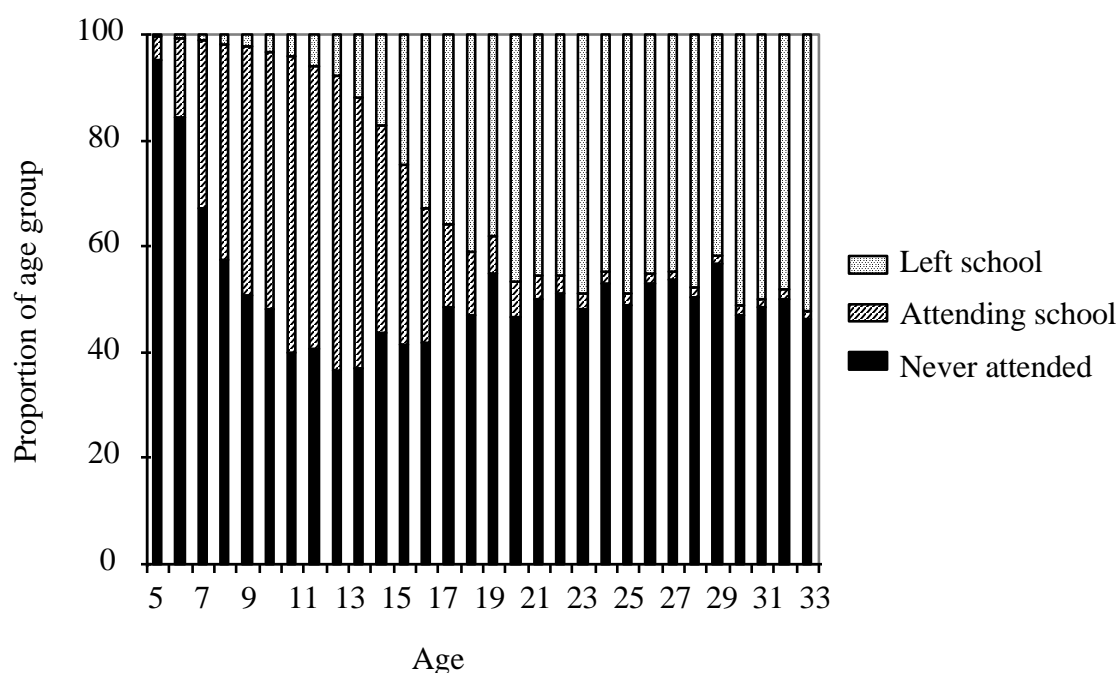


Figure 3. Proportion of people who 1) never attended school, 2) are presently in school, and 3) left school, by one year age groups age 5-34, Mozambique as a whole in 1997. Source: Second General Population Census 1997, INE, 1999.

3.3. The School Data

The relevant information from the Ministry of Education is collected annually from all schools. The schools provide information about the number of pupils by grade, age and year, the number of repeaters, and the number of teachers and classrooms. We collected the total pupils and repeaters, per grade and sex, for 1992-95 and 1998-2000 (the latter three years also by province), and the number the total number of pupils by age and grades 1-5 in 1997 and 1998. From these data, we can calculate promotion rates, repetition rates, and the drop-out rates in the earlier of the two years. The promotion rates equal:

$$\frac{\text{First time in grade}_{year 2, grade x+1}}{\text{Enrolled}_{year 1, grade x}} \quad 1).$$

The repetition rates equal:

$$\frac{\text{Repeaters}_{year 2, grade x}}{\text{Enrolled}_{year 1, grade x}} \quad 2).$$

The drop-out rates are:

$$\frac{\text{Enrolled}_{year 1, grade x} - \text{Repeaters}_{year 2, grade x} - \text{First time in grade}_{year 2, grade x+1}}{\text{Enrolled}_{year 1, grade x}} \quad 3).$$

A numerical example is given in Table 2. In 1999, the promotion rate from first grade to second was $420689/708120 = .59$; repetition in first grade was $190558/708120 = .27$; and drop-out was .14 for males and females taken together.

Table 2. Example for the calculation of promotion, repetition and drop-out rates using 1999 and 2000 data for first and second grade.

Year	Classification	Grade 1	Grade 2
1999	Enrolled	708,120	514996
	Repeaters	190558	127066
	First time	517,562	387930
2000	Enrolled	770777	551764
	Repeaters	190558	131075
	First time	580419	420689
	Drop-out	96,873	

3.4. Compatibility of Data

The two data sources agree on the number of pupils in elementary school. According to the information collected by schools, there were 1.919 million students enrolled in primary school in March 1997 (first and second level) compared to 1.900 million counted by the Census in August, 1997. However, there are differences in the age structure of the pupils.

shows pupils age 6-10 according to the two data sources. Clearly, the schools show a younger pupil age structure than the census data. At age 7 for example, according to the school data, the age-specific enrollment rate is 47 percent compared to 31 found during the Census. On the other hand, the school data show age specific enrollment declining beyond age 10, the Census data does not.

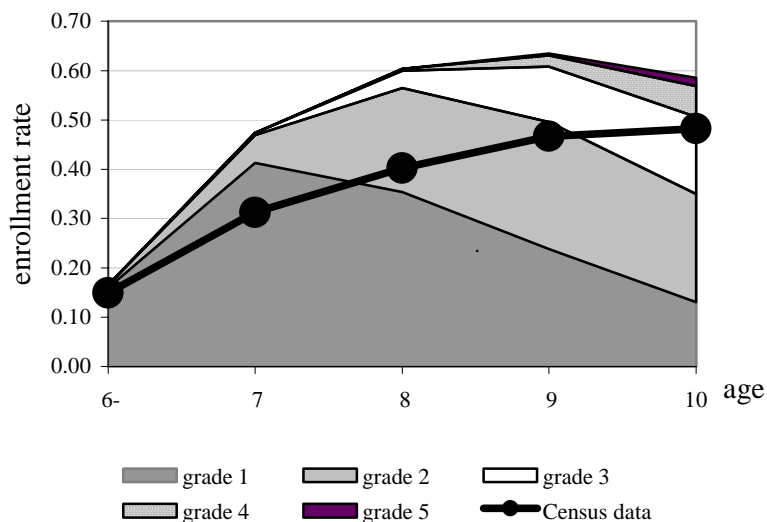


Figure 4. Elementary school pupils by age 6-10 according to information collected from schools and by the 1997 Population Census. Data from schools shown disaggregated by grade. Source: Population census CD-Rom, and school data kindly provided by the Ministry of Education.

One possible explanation for the difference is that children who enter school under-report their age in order to be accepted (or school officials say their first and second grade pupils are younger than they really age), while during the census count, age reporting was more correct.

Another discrepancy, discussed in sections 5 and 6 is in the school retention. The drop out rates in each grade of primary school, according to calculations made with the school data, ranged from 9-35 percent in the period 1995-1999. On the other hand, according to the Census data, only 10 percent of those who entered school left by the time they were 13 years old, meaning there was high retention at the young ages, which fill much of the primary school classes.

4. School intake

In a school system such as that of Mozambique, children and adults enter school at a wide range of ages, and drop-out occurs at every age-group. Both the school information and the Census can be used to estimate of the age pattern of school entry.

To obtain a rough estimate of the age-specific school entry pattern from the Census, we look at the differences in the proportions, who never attended school from one age to the next. We also need to adjust for the fact that enrollment was increasing rapidly by about 9 percent in 1997 (about 4 percentage points are simply a result of increasing age-group size). Then, the estimated proportion starting school at age a is:

$$s_a = n_a - n_{a-1}(1-.05), \tag{eq. 4}$$

where n is the proportion who never attended school age a and s is the school starters.

From the schools, we have pupils in first grade by age, but need to subtract the repeaters, in order to obtain the entrants. Overall repetition is .27 in first grade, but might differ by age. The number of pupils who started first grade in any given year, by age, is:

$$s_a = E_{1,a} * (1 - r_{1,a}) / P_a, \tag{Eq. 5}$$

where $E_{1,a}$ is the number of pupils enrolled in grade 1, age a ; $r_{1,a}$ is the repetition rate grade 1, age a ; and P_a is the population age a .

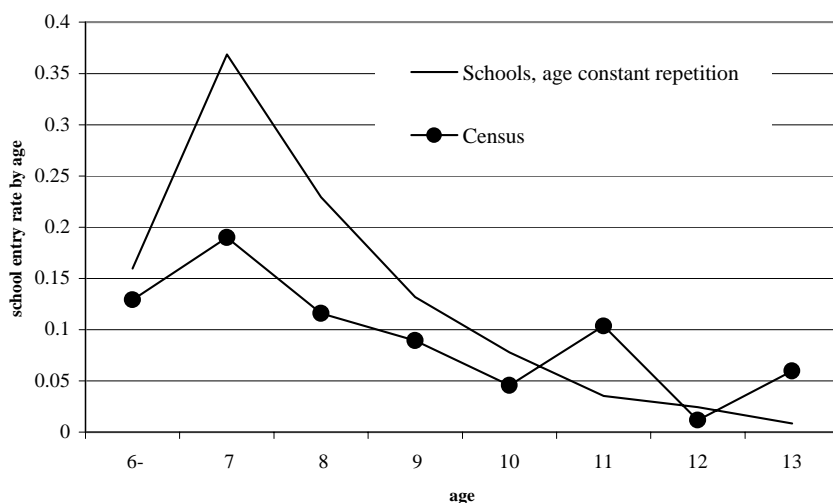


Figure 5. Estimated school entry in 1997 by age, according to calculations with school data and with Census data. Age constant repetition in grade 1 = .27 regardless of age.

Figure 5 shows the estimates for school entry rates by age from the above calculations. Both sources agree that the highest rates of school entry are at age 7, but not on the level. According to the Census data, about 19 percent of the 7 year olds entered school in 1997, compared to an estimated 36 percent according to the school data. Furthermore, according to the Census, there was still substantial school entry in the early teen years, whereas the school data show entry tapering off towards zero. The difference explains almost all of the overall enrollment rate discrepancy shown in

. Hypothesis 1 arose from this comparison:

H1: Pupil age reported in grade 1 and possibly 2 is often lower than the actual age.

The analysis of school drop out in section 5.2 confirms this hypothesis.

5. School retention and drop out

5.1. Drop out by grade: school data

Legare (1972) developed the method to calculate a synthetic cohort survival by grade, which is the basis for all of our survival and drop out calculations, and also of the method the UNESCO uses. The survival to grade x is a quasi-lifetable, which gives the *expected number of grades completed*⁷ under present promotion, repetition, and drop out rates. The original method does not differentiate by age, but rather, treats all entrants as one group. The spreadsheet with which one does the calculations is shown Table A of the Appendix.

With this method, one can calculate the school survival curves – the proportion of original entrants who reach grade x . The survival curves for 1994 and 1999 are shown in **Error! Reference source not found.** Both of the curves are very similar. There is somewhat higher survival at grade 6 and beyond – the school levels higher than basic primary -- in 1999. This means that in spite of the rapid expansion, the school system has been able to maintain the same level of efficiency⁸: an extraordinary achievement. The retention from grade 1 to 2 in 1999 was 81 percent. Only 71 percent of those who start school reach grade 3; 48 percent finish the lower primary level grade 5; and a mere 6 percent would complete the whole 12 grade school cycle with the 1999 retention and repetition pattern. In terms of drop out rates, this means that in first grade, a total of 19 percent of the first graders left school in 1999; 13 percent of the second graders; 18 percent of the third; and 17 percent of the fourth graders. The dotted lines in the figure show the corresponding 1994 and 1999 drop out rates in each class. In the lower grades, the overall drop out level ranges from 13-20 percent. There are clear spikes at grade 5, 7 and 10, the transition grades from one school level to the next.

⁷ Grade expectancy to grade x = The number of grades a pupil who enters school can expect to complete if the present promotion, repetition, and drop-out rates prevail throughout the pupil's enrollment. Calculated as the sum of survival ratios to grade x . Primary grade expectancy includes only primary school enrollment. Overall grade expectancy includes primary and secondary enrollment up to grade 12.

⁸ During a previous period of rapid expansion, in the early years after independence, there was a significant loss of efficiency as school intake levels expanded according to the data provided on the UNESCO website.

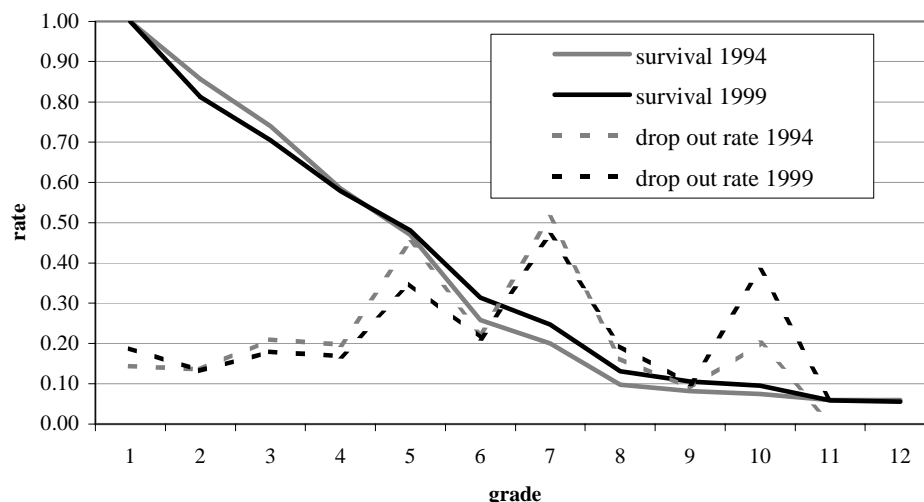


Figure 6. Grade specific school survival and drop out, starting with a cohort of 100 at grade 1, using 1994,1995 and 1999,2000 enrollment data from the Ministry of Education.

5.2. Drop out by age and grade: school data

The available school information also allowed an estimate of the drop out rates by age for grades 1-5 1997 and 1998. To make this calculation, the Legare method was modified to include each age and grade group as a separate mini-cohort. Otherwise, the calculations are as above. The calculations require repetition rates or the number of repeaters. Three estimations were made: constant repetition rates, repetition rising with age, and repetition falling with age (shown in the appendix).

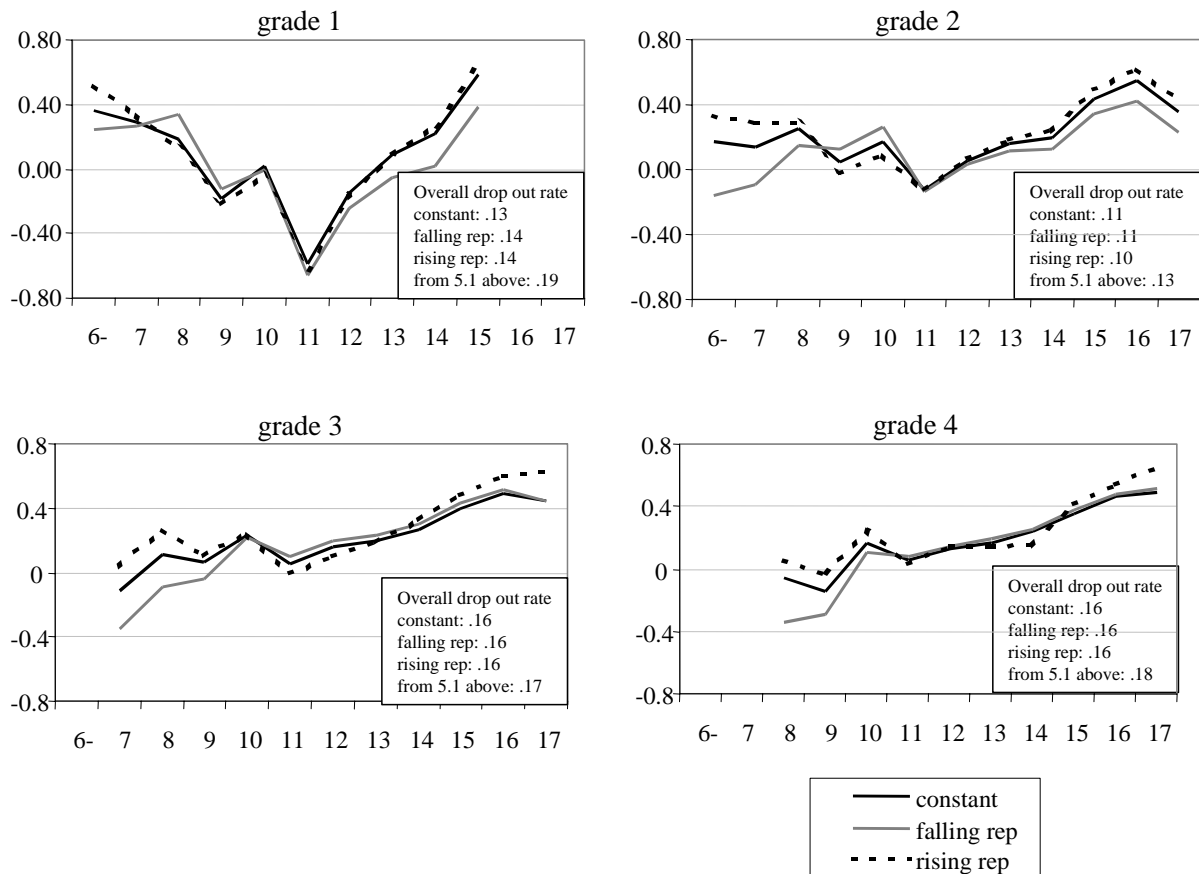


Figure 7 shows the age and grade specific drop out rates for 1997 arranged by grade. The overall drop out rates for each grade – counting all the ages in each grade together -- are also shown in the panels along with the rates calculated in 5.1 above.

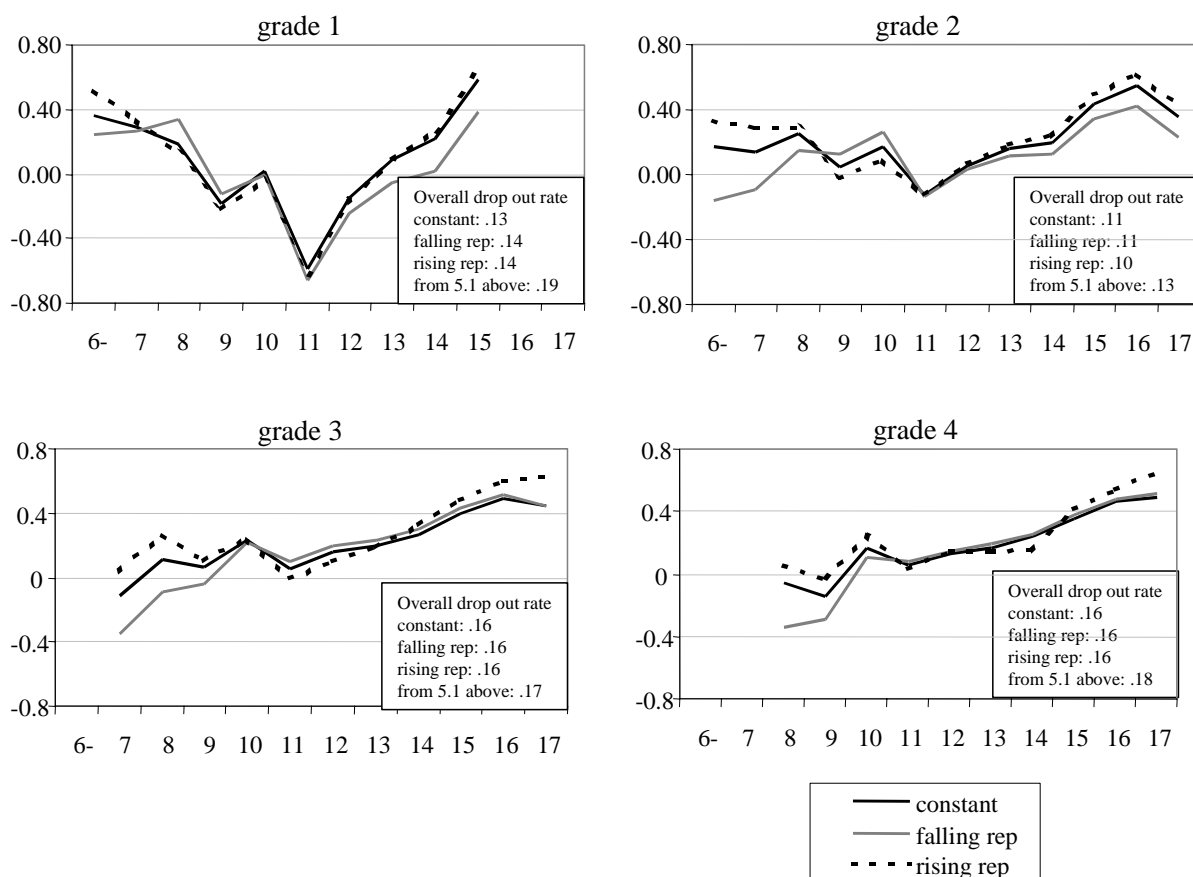


Figure 7. Estimated drop-out rates using school data and three variations for repetition rate: constant repetition regardless of age (solid black line); lower repetition at higher ages (solid gray line); and higher repetition at higher ages (dotted line).

For grade 1, estimated drop-out rates at ages 9-13 are negative, and similarly for grade 2 age 11, grade 3 age 7 and grade 4 age 8. Negative drop-out rates mean that the mini-cohort grew: there were *more* pupils enrolled in 1998 age $x+1$ (including repeaters and those who were promoted), than there were age x in 1997. If ages of many pupils at lower grades were reported too low, particularly first grade, this is the pattern of numbers we would expect. Say a pupil who was actually 9 years old told teachers she was 7 when she entered first grade (or teachers reported her age as 7). Assume she was promoted, and that when she got to second grade in the next year, her real age, which would be 10, was reported. In the statistics, there would suddenly be an extra pupil age 10 in the second grade, while a 7 year old first grader would appear to have dropped out. With enough similar cases, one would observe negative drop-out rates for children who were 9 in grade 1, and exaggerated drop-out rates for 7 year old first graders. This finding supports hypothesis 1 above.

A second finding from the figures is that in grades 3 and 4 drop-out rates rise with age, regardless of the repetition pattern chosen. The differences are large: for example in third grade (with rising repetition rates) only .05 of the seven year olds dropped out of school, compared to 60 percent of the 16 year olds. Moreover, the constant and falling repetition rates produce implausible negative drop out rates at ages 7-9. Only rising repetition – from .1 at younger ages, to .3 for older pupils in both grades – have overall positive drop out rates. This seems to indicate that within grades 3 and 4, like drop out rates, repetition rises with age (it might if, for example, higher order repetition leads to discouragement and drop out).

For grades 1 and 2 rising drop out rates are less obvious. At least one can say that drop out rises from age 11 onwards, but that the pattern at younger ages is unclear, due to the age under-reporting.

5.3. Drop out by age: Census data

Figure 3 above, with the census data shows the proportion who left school and those who are enrolled. Together, these form the group of people who have had access to schooling. Eyeballing the figures, we can see that, of this group, the proportion who left school increases with age, as it should. Figure 8 shows the proportion who have left school from age 5-21 for urban and rural males and females. The proportion, which has left school (of those who entered) by age x , l_x equals

$$l_x = 1 - e_x / \sum s_x \tag{Eq. 6}$$

where e_x is the proportion of the age cohort enrolled in school at age x , and $\sum s_x$ is the total proportion of people who entered school at age x or before.

The figure shows that for all four groups, the proportion who have left school is under 10 percent up to age 11-13, depending on the group. It is clear that retention at young ages is high. During the teen-age years, the proportion who have left school rises, most for rural females, and least for urban males. By age 21, only 4 percent of the rural women who ever attended school are still in school; compared to 23 percent of the urban men. By age 28, 95 percent or more of each of the four groups has left school. More than 40 percent of the adults age 20-34 who are attending school are enrolled in primary. This means that older teenagers and adults enter, or return to school.

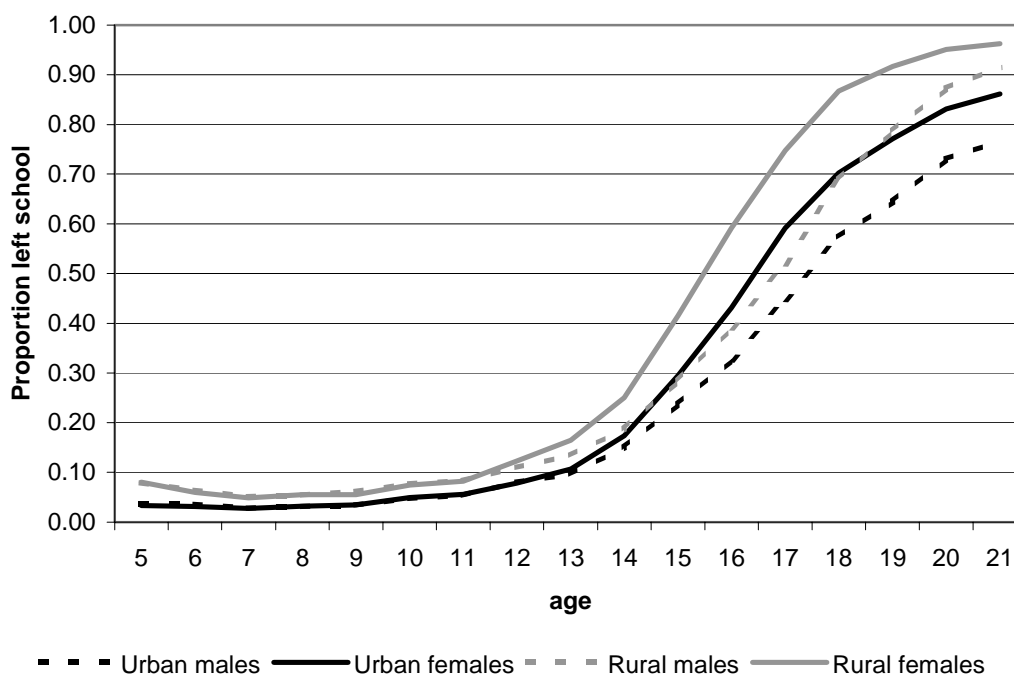


Figure 8. Proportion of children who have left school, of those who attended, age 5-21, 1997. Source: calculations with data from Second General Population Census 1997, INE, 1999.

It is clear that most school departure occurs in the teenage years and very little in the pre-teen years. The school retention implied by the Census and by the school data appear to contradict each other. How can it be that more than 90 percent of those who have ever entered school are still in school by age 11 –13 (most of those in lower grades), when the enrollment data indicate that 13-20 percent are lost with each grade progression in the lower grades?

The explanation must lie in the heterogeneous drop-out rates found in section 5.2 above. The older the pupil in each grade, the more likely he or she will drop out. If this is true, then it might be possible to have high retention rates at young ages, even though the *overall* drop-out rates in each grade are comparatively high. Since the younger pupils in each grade are those who enter school early, and possibly, those with lower repetition rates, hypothesis 2 is:

H2: Young school entrants have lower drop out rates than older entrants.

6. Cohort reconstruction with age-differentiated entry and drop out

To test the hypothesis, we reconstruct school attendance in Mozambique in such a way that the results show drop out by grade, by age, as well as overall school enrollment by age in 1997. A number of adaptations were made to the Legare method. First, to account for age-differentiated school entry, we treat each age-entry cohort a separate group (as in section 5.2). Second, drop out and promotion are differentiated by age-of-entry. Third, historical rates of school promotion, repetition, and departure are used for the reconstruction.

6.1. Historical entry, repetition and departure

Because of Mozambique's restless history in the past 20 years, school attendance has fluctuated considerably. In the first years after independence in 1975, before conflicts between the Government and the opposition movement grew into a full-fledged civil war, apparent intake rates rose quickly. Unfortunately, as the war intensified, and the opposition targeted schools in particular, intake dropped by 50 percent, to 63 in 1992. In the eight years since the signing of the Peace Accord (1992) apparent intake has risen again and was 113 in 2000.

School survival by grade fluctuated as well. The early period of independence was characterized by high intake, but also very high drop out. In 1982, for example, only 21 percent of those who entered school reached fourth grade, the lowest in Africa at that time (according to available data). Throughout the war, there was actually a gradual tendency for school survival to increase. In 1993, survival to fourth grade was 47 percent; by 1994 it was 58 percent and it has remained constant since then. Repetition by grade has been largely unchanged since 1981, fluctuating between 23-30 percent (depending on the grade), with an ever so slight tendency to decline.

Putting variable school intake over time into the reconstruction is relatively easy, we simply shift cohorts up and down according to the relative apparent intake rate for that cohort (and the most recent cohort is the base). Survival and repetition variation is very difficult, and would require simulation rather than a spreadsheet reconstruction. Luckily, school survival and repetition did not shift recently as much as intake. A majority of pupils who were in school in 1997 had entered since 1993.

Another problem is the entry rates by age. While the analysis of section 5 above suggests that the age pattern of school entry indicated by the school data exaggerates the entry rates of young pupils at the expense of older ages, it does not indicate by how much. As a solution, the entry age pattern found with the census data is used (see Figure 5).

6.2. Reconstuction assumptions

There are, of course, a number of simplifying assumptions in the reconstruction. First, school survival and repetition are assumed constant over the historical period included in the reconstruction. For the years 1994-1997 this assumption is close to reality; in earlier years, survival was lower than in the reconstruction. This means that the reconstruction will tend to inflate enrollment at higher ages and higher grades somewhat.

Second, within each age-of-entry group, promotion, repetition, and drop out are constant regardless of how many times the student has repeated the grade. This is the same assumption as Legare and UNESCO use in their calculations of survival. In reality, multiple repetition probably acts as a discouragement, so drop out rises with the number of repetitions in a grade. One effect would be higher repetition rates for older pupils within each grade (as suggested by the results of section 5.2). As the numbers for second and third order repetition are small in the calculations this effect does not make a big difference to the outcome. Promotion might also vary between those who are in a grade for the first time and repeaters, although it is hard to say in which direction. On the one hand, repetition gives slower students more time to acquire the necessary knowledge, on the other, the weaker students are those who repeat.

Further, it is assumed school entry occurs in ages 5-25 and school enrollment up to age 34 is reconstructed. The pattern of school entry by age is constant, but the level is variable depending on the year of entry. Although the school data does not show any school entry beyond age 15, the high incidence of primary school enrollment at ages 20-34 suggests that there is some.

6.3. Reconstruction method

To include school entry at multiple ages, the spreadsheet for the synthetic cohort (Table A of the appendix) has to be rearranged to accommodate three rather than two dimensions, namely, age-of-entry, years-since-entry, and grade. We rearranged age-of-entry and age as a column, and years-since-entry in rows, with grade as a secondary category in rows, as shown in Table B of the Appendix. The first column shows the estimated school entry rates for 1997. The second column has those repeating grade 1, equal to the number of first graders in the previous age group in 1997 times the repetition rate. The third column has those in grade 2 for the first time, equal to the first graders in the previous age group times the promotion rate. And so forth for all ages, grades, and orders of repetition. The calculations were made for grades 1-12 and for 16 years, which lobs off a small proportion of the enrollment at the highest grades – because, with the high repetition rates, it takes many students more than 16 years to complete the full school cycle. However, the numbers are very small: by year 16 only 1 percent of the original school entrants is still enrolled.

The synthetic cohort of Legare is prospective: higher order years (those who are in their second, third, etcetera, year of school) are years beyond the base year. In the historical reproduction, it is the other way around: those who are in their second, third, etcetera, year,

are pupils who entered *before* the base year. For example, with 1997 as the base year, those in year 2, rather than being an estimate of school enrollment in 1998, would be pupils who entered in 1996 and are in their second year of school. Those in year 3 would be pupils who entered in 1995 and so forth. The reconstruction includes historical variation of school intake by multiplying the pupils in year x of the synthetic cohort with the ratio of school intake(1997- $X+1$):intake(1997). This change shifts school enrollment by age down (since pre-1997 intake was mostly lower than 1997) as compared to the synthetic cohort. It does not affect survival by grade and the proportion who have dropped out by age.

This reconstruction is used to test the effects of age-uniform and age-differentiated school experiences. In the uniform rate calculation, promotion, repetition and drop out rates -- equal to the overall, grade specific rates of 1997 -- were the same within each grade, regardless of age-of-entry.

For age-differentiated school performance, separate sets of promotion, repetition, and drop out are prepared for each age-of-entry group. Two sets of variations were tested. In the one that is used, repetition is constant regardless of age-of-entry, drop out is differentiated, and promotion rates are the residual of 1-repetition rate-drop out rate. In another set, the promotion rates are held constant, and repetition is the residual of 1-promotion rate-drop out rate. The thought is that although students of all ages would have similar performance within a grade, repetition would act as a greater discouragement for older pupils. This second set of experiments does not reproduce the historical values of survival and enrollment nearly as well as the first.

To find the differentiated drop out rates, the population was manually divided into age-of-entry groups and the drop out rates are manually tweaked to achieve a "good" fit of the reconstruction to the data. In other words, there was neither a computerized iteration procedure nor a formal measurement of the "good" fit. This led to four age-of-entry groups: those who enter school age 5-7; age 8-10; 11-14, and age 15-25. In reality, there is no doubt a continuum of school experience by age of entry, rather than discrete groups. Also, the actual drop out rates probably differ from those estimated. It should be noted however, that any changes to drop out tend to ripple through the whole, enrolled population, so there is not room for terribly large errors.

The reconstruction results are fitted to three empirical observations: 1) survivors by grade in 1997 -- from school data; 2) the proportion who left school by age x -- from the census data; and 3) overall age-specific school enrollment -- from the census data. In the spreadsheet, survival by grade x is equal to the sum of all those enrolled in grade x divided by the sum of enrollment in grade 1. Age specific enrollment is equal to the sum of all enrollment at each age, regardless of age-of-entry, grade, and year. Finally, the proportion who have dropped out by age x is equal to one minus enrollment at age x divided by the sum of school entry by age x (as the calculation in *eq. 6*).

	Grade											
	1	2	3	4	5	6	7	8	9	10	11	12
All ages together												
Promotion rates	0.59	0.62	0.56	0.61	0.41	0.51	0.26	0.50	0.58	0.25	0.89	0.78
Repetition rates	0.31	0.28	0.29	0.24	0.24	0.33	0.35	0.33	0.31	0.40	0.09	0.22
Dropout rates	0.10	0.10	0.15	0.15	0.35	0.16	0.39	0.17	0.11	0.34	0.03	0.00
Entrants age 5-7												
Promotion rates	0.68	0.69	0.70	0.70	0.55	0.51	0.41	0.50	0.58	0.36	0.89	0.78
Repetition rates	0.31	0.28	0.29	0.24	0.24	0.33	0.35	0.33	0.31	0.40	0.09	0.22
Dropout rates	0.01	0.03	0.01	0.06	0.21	0.16	0.24	0.17	0.11	0.24	0.03	0.00
Entrants age 8-10												
Promotion rates	0.66	0.63	0.69	0.61	0.24	0.42	0.06	0.54	0.60	0.32	0.89	0.78
Repetition rates	0.31	0.28	0.29	0.24	0.24	0.33	0.35	0.33	0.31	0.40	0.09	0.22
Dropout rates	0.03	0.09	0.02	0.15	0.53	0.25	0.59	0.13	0.09	0.28	0.02	0.00
Entrants age 11-14												
Promotion rates	0.63	0.53	0.49	0.38	0.03	0.01	0.06	0.50	0.58	0.36	0.89	0.78
Repetition rates	0.31	0.28	0.29	0.24	0.24	0.33	0.35	0.33	0.31	0.40	0.09	0.22
Dropout rates	0.06	0.20	0.23	0.38	0.74	0.66	0.59	0.17	0.11	0.24	0.03	0.00
Entrants age 15-25												
Promotion rates	0.40	0.13	0.11	0.15	0.03	0.18	0.06	0.50	0.58	0.25	0.89	0.78
Repetition rates	0.31	0.28	0.29	0.24	0.24	0.33	0.35	0.33	0.31	0.40	0.09	0.22
Dropout rates	0.30	0.59	0.60	0.61	0.74	0.49	0.59	0.17	0.11	0.34	0.03	0.00

Table 3. Overall 1997 promotion, repetition, and drop out rates, and four groups differentiated by age-of-entry. Source: own estimations.

The results are shown in Figure 9 three panels for 1) historical 1997 values (solid line), 2) historical reconstruction with uniform drop out rates (solid line with squares), and 3) reconstruction with drop out differentiated by age-of-entry (solid line with circles).

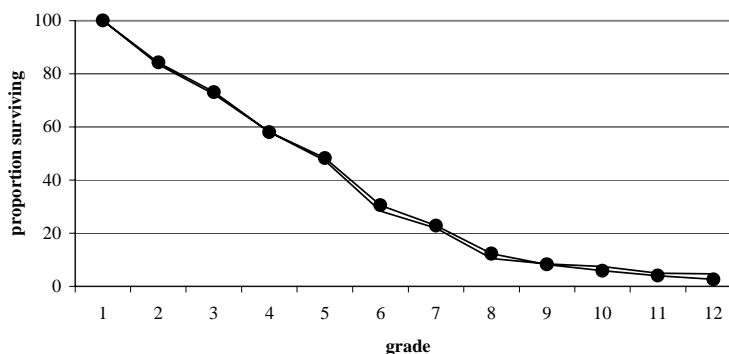
In panel A for survival by grade, all three lines overlap. The uniform reconstruction rates are identical to the 1997 historical values are produced with uniform drop out rates (so they are identical for the reconstruction with historical and uniform rates) and the differentiated reconstruction was able to reproduce survival almost exactly.

In panel B, the proportion who has left school, the uniform rate reconstruction leads to an immediate and fairly constant rise in the proportions who have left school, quite contrary to the 1997 values. The differentiated reconstruction does much better. It has the same sigmoidal shape as the historical values, although it rises at slightly younger ages – we were not able to remove this discrepancy with the four age-of-entry groups. Perhaps it would be possible with single year age-of-entry categories. In fact, shifting from two, to three, to four age-of-entry groups did, with each step, lead to a closer reproduction of the historical values. To go beyond the four groups was impractical, however, because there were strong

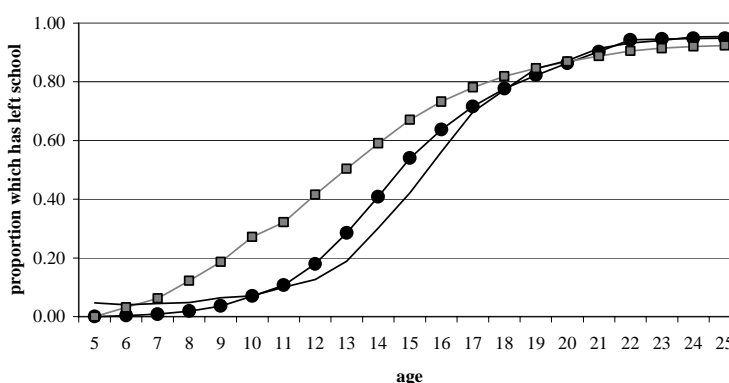
diminishing returns to effort, and the manual fitting procedure became more complicated with each additional group. More importantly, it did not look like further dis-aggregation would not lead to important new insights.

Panel C shows age-specific enrollment. The uniform rate reconstruction results in enrollment levels that are too low from age 7-18, and too high at older ages. Moreover, the absolute number of students (found by multiplying each age-specific enrollment rate by the population of that age) is far too low with constant drop out. The differentiated rate reconstruction with fits much better to the census data and the number of pupils is correct. The actual number of primary and secondary school students, according to the 1997 census, was 2.009 million. The uniform rate reconstruction leads to only 1.644 million, while the differentiated reconstruction produces 2.016 million students.

Panel A. Survival rates



Panel B. Proportion left school by age x of those who entered school.



Panel C. Age specific enrollment rate.

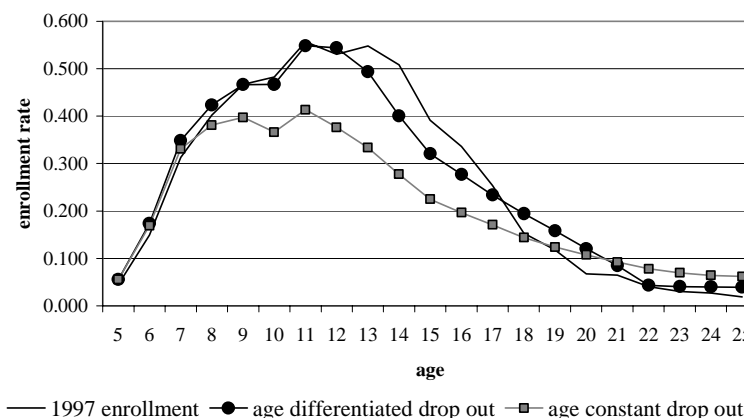


Figure 9. 1997 survival by grade (panel A), and proportion who have left school by age x (panel B), school enrollment by age (panel B) for 1997, historical values (solid line), historical reconstruction with uniform drop out rates (solid line with squares), and reconstruction with drop out rates differentiated by age-of-entry (solid line with circles).

Table 4 shows survival rates to grade x, and total grade expectancy, for the overall historical rates of promotion, repetition, and drop out, and for the four age-of-entry groups if the differentiated rate reconstruction. The young entrants, age 5-7 have very low drop out percentages in grades 1-4, in fact, with the numbers we found, 86 percent of those who

enrolling reach grade 5, the last grade of the lower primary cycle. The school entrants age 8-10 also do relatively well in primary school: 65 percent finish the first cycle. On the contrary, for the group age-of-entry 11-14, only 23 percent reach grade 5, and of the oldest entrants, only .3 percent (not shown in table due to rounding). The expected grades completed are commensurate; 6.9 grades for the youngest entrants; 4.7 for the second group; 3.3 for the third; and 1.7 for the fourth. Interestingly, the 6.9 grades are about equal to the expected grades completed in Cidade de Maputo where 85 percent of the entrants who enter before age 13, are age 5-7.

Age of Entry	Grade expectancy	Survival to grade											
		1	2	3	4	5	6	7	8	9	10	11	12
All ages	4.4	100	86	74	58	47	26	20	9	7	6	4	4
Age 5-7	6.9	100	99	95	94	86	63	48	32	25	22	16	16
Age 8-10	4.7	100	96	84	81	65	21	14	3	3	3	2	2
Age 11-14	3.3	100	91	66	45	23	1	0	0	0	0	0	0
Age 15-25	1.7	100	57	10	2	0	0	0	0	0	0	0	0

Table 4. Survival by grade, and grade expectancy in 1997 with overall historical rates, and estimated for young entrants (age 5-7), entrants age 8-10, age 11-14, and 15-25.

7. Conclusions

School entry and school retention are important measures of a school system's success. In both aspects, the school system of Mozambique has long been lacking, in part due to the havoc wrought by a 16 year civil war, and before that, a racially discriminating colonial system. Recently, there have been great improvements. Whereas apparent school intake in 1992, the year of the recent peace agreement, was only 60 (67 for boys, 53 for girls), by 2000, they were 105 for females and 121 for males. The average, for both sexes, was 113⁹. School retention has remained constant over the post-war period. In 1994, those who entered school could expect to remain 5.9 years according to the 1994 promotion, repetition and drop-out rates; in 1999, the number was hardly changed, 6.1 years.

One of the characteristics of the school system of Mozambique, as in many other sub-Saharan countries, is delayed school entry. Probably, during this period of rapid school expansion, there is more delayed entry than might be the case in a stable school system, as older pupils start school in regions, which were previously un-serviced. Delayed school entry has not received much attention in the literature despite its prevalence. This is unfortunate, because the results of this paper show that late school entry can have a serious effects on school achievement.

⁹ Data made available by the Ministry of Education, Maputo.

The analysis is based on school intake, school retention by grade and by age, and expected years of schooling using two important data sources: the 1997 population Census and annual data collected from schools. The combination of the two sources shows an apparent discrepancy with regards to entering and leaving school. The school data imply far higher entry at ages 6-9 than the Census and lower entry for the older children. Second, whereas the Census results indicate that school drop-out in the pre-teen years is very low; the annual enrollment data from schools show that drop-out in each grade is high, including those grades that are largely populated by pre-teen pupils.

A further analysis of the data led to two hypotheses to explain these discrepancies:

H1: Pupil age reported by schools in grade 1 and possibly 2 is often lower than the actual age.

H2: Young school entrants have lower drop out rates than older entrants.

In order to test the hypotheses, we furthered the synthetic cohort method proposed by Legare (1972) and used by the UNESCO for the calculation of school survival by grade. The cohorts were separated not only by grade in year x, but also by age in grade. This simple change was used to test H1. To test H2, an historical reconstruction was made, rather than a period analysis. This included age-differentiated rates of school entry, repetition, promotion and drop out and historical shifts in school entry. With this new method, 1997 school enrollment, survival and drop out rates were reconstructed with age-uniform repetition, drop out and promotion rates (within each grade) and with age-differentiated rates.

The examination of H1, reconstructed drop out rates by age, using data from schools for pupils by age and grades 1-5 in 1997 and 1998. The analysis shows that with the ages reported in grade 1, there are high drop out rates for ages 6-8, and implausible *negative* drop out rates for ages 9-13. This pattern would arise if many pupils in the first grade were reported to be younger than they actually are, and if, by grade 2, the correct age were reported. In grade 2, there would be a large influx of older pupils not reported from grade 1 (causing negative drop out rates), and there would be a significant loss of younger ones.

The historical reconstruction to test H2, shows that by differentiating drop out rates by age-of-entry, the low drop out rates in the pre-teen years observed by the Census can be reproduced, while maintaining the observed survival by grade and school enrollment by age. According to the reconstruction, the school experience of young entrants differs substantially from that of older ones. While those who entered school age 5-7 could expect to complete 6.9 grades, according to the estimation, those who entered age 8-10 only 4.7 grades; entrants age 11-14 would complete 3.3 grades; and the oldest entrants a mere 1.7 grades.

We do not pretend that the drop out rates used in the reconstruction are an exact picture of reality. In particular, the more likely variation of drop out rates is a continuum by age, rather than a discrete difference between four groups. However, these results were achieved with many manual variations and it was found that there is not much room for maneuvering because each change ripples through the entire school population, in particular, changes at early grades. We believe that even this simplified reconstruction makes a strong case in support of the hypothesis that school departure is heterogeneous by age of school entry, and further that the heterogeneity is large.

That early entry might lead to longer school enrollment is plausible. Some of the causes for differential drop out rates could be: higher motivation among parents who send their children as soon as possible; competing responsibilities at home and at work for older pupils; structural circumstances, such as a long distance to school, that make both early entry *and* continued enrollment difficult. While we did could not reproduce the calculation for other countries in Africa, it is not unlikely that a similar heterogeneity exists elsewhere, as the causes proposed above are not unique to Mozambique.

In Mozambique, as school intake settles, there will not be as many older pupils from the catch-up effect of an expanding school system. As this happens, survival by grade should automatically increase. Even with this expected effect, a policy specifically aimed at younger school entrants could still be warranted. Also, policies to help older pupils stay in school could improve overall school survival. In some other countries, such as Botswana, even older pupils appear to remain in school. Perhaps something can be learned from policies there.

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Appendix.

A. Definitions of technical terms

The UNESCO definitions for the indicators used in this paper are the following(source: <http://unesco.org/en/stats/stats0.htm>)

Gross enrollment rate = Total enrolment in a specific level of education, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education in give school-year

Net enrollment rate = Enrolment of the official age-group for a given level of education expressed as a percentage of the corresponding population

B. Spreadsheets for calculation of synthetic cohorts

Table A. Simple representation of the calculations made in the school survival method with no age differentiation.

Promotion rates		p1	p2	...	p12	
Repetition rates		r1	r2	...	r12	
Dropout rates		d1	d2	...	d12	Expected years enrolled by grade
Enrollment	year 1	$E1,1 = 100$				$E1,1$
	year 2	$E1,2 = E1,1 * r1$	$E2,2 = E1,1 * p1$			$E1,2 + E2,2$
	year 3	$E1,3 = E1,2 * r1$	$E2,3 = E1,2 * p1 + E2,2 * r2$...		
	...	...	...	...	$E12,12 = E11,11 * P11$	$E1,12 \dots E12,12$
	...	...	...	...	$E12,13 = E11,12 * p11$ $+ E12,12 * r12$	$E1,13 + \dots + E12,13$

	year n	$E1,n = E1,n-1 * r1$	$E2,n = E1,n-1 * p1 + E2,n-1 * r2$	...	$E12,n = E11,n-1 * p11$ $+ E12,N-1 * R12$	$E1,n + \dots E12,n$
Total expected years enrolled						$sum(E1,1 \dots E12,n)$
Drop out	year 1	$E1,1 * d1$...		
	year 2	$E1,2 * d1$	$E2,2 * d2$...		
	...	...	...	...	$E12,12 * d12$	
	
	
	year n	$E1,n * d1$	$E2,n * d2$	...	$E12,n * d12$	
Survivors		$S1 = E1,1$	$S2 = S1 - sum(E2,2 * d2 \dots E2,n * d2)$	...	$S12 = S11 - sum(E12,12 * d12 \dots E12,n * d12)$	
Expected completed grade						$sum(S1 \dots S12)$

Table B. Synthetic cohort calculations with age differentiated entry (adapted from UNESCO method).

Year	1	2	2	3	3	3	N	n		
Grade	1	1	2	1	2	3	...	11	12	
Age	Entrants	Enrolled								Expected years enrolled by age
Age5	S5	E1,1,5=S5								E1,1,5
Age 6	S6	E1,1,6=S6	E1,2,6=	E2,2,6=						E1,1,6+
			E1,1,5*r1	E1,1,5*p1						.... +E2,2,6
Age 7	S7	E1,1,7=S7	E1,2,7=	E2,2,7=	E1,3,7=	E2,3,7=E1,1,6*p1	E3,3,7=			E1,1,7+
			E1,1,6*r1	E1,1,6*p1	E1,2,6*r1	+E2,2,6*r2	E2,2,6*p1			... +E3,3,7)
	...	...	E1,2,8=	E2,2,8=	E1,3,8=	E2,3,8=E1,2,7*p1	E3,3,8=	...		E1,1,8+
			E1,1,7*r1	E1,1,7*p1	E1,2,7*r1	+E2,2,7*r2	E2,2,7*p1			... + E4,4,8
	...	...	...	...	E1,3,89=	E2,3,9=E1,2,8*p1	E3,3,9=	...		...
					E1,2,8*r1	+E2,2,8*r2	E2,2,8*p1			...

Age25	S25	E1,1,25=	E1,2,25=	E2,2,25=	...	...	...	...		...
		S25	E1,1,24*r1	E1,1,24*p1						...
Age 26			E1,2,26=	E2,2,26=	E1,3,26=	E2,3,26=E1,2,25*p1	E3,3,26=	...		...
			E1,1,25*r1	E1,1,25*p1	E1,2,25*r1	+E2,2,25*r2	E2,2,25*p1			...
Age 27					E1,3,27=	E2,3,27=E1,2,26*p1	E3,3,27=	...		...
					E1,2,26*r1	+E2,2,26*r2	E2,2,26*p1			...
							
Age6+	n							E11,n,5+n=	E12,n,5+n=	...
								E10,n-1,5+n-1*p10	E11,n-1,5+n-1*p10	...
								+E11,n-1,5+n-1*r11	+E12,n-1,5+n-1*r12	...
							
Age25	+n							E11,n,25+n=	E12,n,25+n=	E1,n,25+n +
								E10,n-1,25+n-1*p10	E11,n-1,25+n-1*p11	...+E12,n,25+n
								+E11,n-1,25+n-1*r11	+E12,n-1,25+n-1*r12	
Total expected years enrolled										Sum(E1,1,5 ... E12,n,25+n)

C: Repetition rates used in section 5.2

Constant repetition:

Grade	6-	7	8	9	10	11	12	13	14	15	16	17	18+	Overall
<u>grade 1</u>	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27				0.2700
<u>grade 2</u>	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.2600
<u>grade 3</u>		0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.2600
<u>grade 4</u>			0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.2200
<u>grade 5</u>				0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2000

Falling repetition by age

Grade	6-	7	8	9	10	11	12	13	14	15	16	17	18+	Overall
<u>grade 1</u>	0.40	0.33	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20				0.2679
<u>grade 2</u>	0.60	0.50	0.40	0.25	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.2669
<u>grade 3</u>		0.50	0.50	0.40	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.2578
<u>grade 4</u>			0.50	0.40	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.2218
<u>grade 5</u>				0.40	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.2065

Rising repetition by age

Grade	6-	7	8	9	10	11	12	13	14	15	16	17	18+	Overall
<u>grade 1</u>	0.10	0.20	0.30	0.35	0.40	0.40	0.40	0.40	0.40	0.40				0.2669
<u>grade 2</u>	0.10	0.10	0.20	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.2687
<u>grade 3</u>		0.10	0.10	0.20	0.20	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.2587
<u>grade 4</u>			0.10	0.10	0.10	0.20	0.20	0.25	0.30	0.30	0.30	0.30	0.30	0.2172
<u>grade 5</u>				0.10	0.10	0.10	0.20	0.20	0.20	0.30	0.30	0.30	0.30	0.2031