THE RELATIONSHIP BETWEEN SEXUAL VIOLENCE AND GIRL-CHILD PRIMARY SCHOOL EDUCATION IN DEVELOPING COUNTRIES

Godwin Okafor

De Montfort University, Leicester, UK

Jenifer Piesse

University of Stellenbosch, South Africa

Abstract

All children have the right to quality education that respects their human dignity and their right to be protected from violence and abuse. However, in some developing countries this is not the case. According to the latest data from the United Nations Office on Drugs and Crime (UNODC), sexual violence in developing countries over the past 15 years rose by over 370%. Sexual violence on girls results in physical and psychological harm including long-lasting suffering. In this study, our interest mainly lies in the social impact sexual violence is likely to cause to the victims. This includes, but not limited to, rejection by family and community, exclusion from economic engagement, isolation, and the likelihood of further violence. All things being equal, all of these will affect the demand for schooling and the desire to acquire formal education. Therefore, the contribution of this study is to quantify the impact of sexual violence on girl-child education in a broad range of developing countries. To achieve this, we used country-level data from 72 developing countries between 2003-2017. The pooled OLS and fixed effects techniques were then used in estimating the impact of sexual violence on different measures of girl-child education. The results of the estimations showed a negative relationship between sexual violence and the different measures of the girl-child education. For example, using the fixed effects results, an increase in sexual violence by one standard deviation from the sample mean, will reduce girls' enrolment rate and completion rate by 2.385% and 3.150% points, respectively. The results provide an interesting dimension to what is already known of the girl-child education and can aid policymakers in their interventions in improving educational outcomes for girls. With respect to policy implications from the findings, countries must formulate adequate responses to protect their young citizens from the cruelty of sexual abuse. In addition, effective support mechanisms for victims of sexual violence should be facilitated and sustained in developing countries. This will help in ameliorating some of the negative impact of their violent experiences and help to prepare them to re-enter society and return to education.

JEL Classification: I20, I25, I31, O1, O50

Keywords: Girl-Child Education; Primary Schooling; Developing Countries; Sexual Violence.

Contact author's email address: godwin.okafor@dmu.ac.uk

1. INTRODUCTION

There is clear evidence to suggest that in countries with low levels of economic development, girls are less likely to be enrolled in school compared to boys. Several factors such as economic opportunities, government policies, cultural and religious characteristics, low initial conditions in girl-child education, etc. have been attributed to this disparity (Grigoli and Sbrana, 2013; Novella, 2019). Indeed, while since the turn of the century, progress has been made regarding girl-child education in developing countries, several hurdles such as political instability, conflict and civil wars remain (Amin and Ntembe, 2021). Of particular interest to this study is the impact of sexual violence on girl-child education as there is an ever-increasing awareness that across the world girls are faced with varying forms of sexual abuse (Le Matt et al. 2019). Sexual violence is a constant threat in most developing countries (Marsh, Purdin & Navani 2006). Thus, it is important that both scholars and policymakers have an in-depth understanding that is supported by empirical evidence of the impact of sexual violence on girl-child education. Therefore, the contribution of this study is to quantify the impact of sexual violence on girl-child education in a wide selection of developing countries. The study will aid policymakers in girl-child policy interventions.

2. THE IMPACT OF CRIME AND VIOLENCE ON EDUCATION.

Sexual violence is a type of crime that is regarded as one of typologies of gender-based violence (Marsh, Purdin & Navani 2006), although, determining the degree to which violence affects schooling and educational outcomes is difficult. However, it is possible to envisage that trauma and fear associated with violence can affect access to education including school attendance and academic participation and performance. From a theoretical point of view, educational outcomes are influenced by three main factors: demand, supply and government policy (Connelly and Zheng 2003). The decision by children and their parents regarding access to education is influenced by demand factors. Thus, the threat of sexual violence is one thing that will affect the decision by parents to send their child to school and equally, the child may decide they may not wish to continue with schooling. This is because both parents and children may perceive that safety outweighs any benefit that may be derived from education (Bisika, Ntata & Konyani 2009; Onoyase 2019). Unfortunately, there is a dearth of studies on specifically sexual violence and educational outcomes. However, Leon (2012), Guariso and Verpoorten (2018) and Landis et al. (2019) have investigated the impact of crime and violence on education. These studies are relevant to the focus of this paper given that sexual violence is closely related to other forms of violence.

3. SAMPLE AND DATA

3.1 Sample Countries

This study uses secondary data for a sample of 72 developing countries. The data were collected from the United Nations Office on Drugs and Crime (UNODC), the World Bank Development Indicators (WDI) and the World Bank Governance Indicators (WGI) for the period, 2003-2017. The sample size was predominantly a function of data availability.

3.2 Variable Description

a. Dependent Variables

Three education measures comprise the dependent variables: girls' primary school enrolment rate(gross)ⁱ, girls' primary school completion rate (gross)ⁱⁱ and percentage of girls in primary schoolⁱⁱⁱ. These measures reliably capture basic educational levels and outcomes and have been widely adopted in the existing literature.

b. Main Independent and Control Variables

Sexual violence was used as the main independent variable. This is defined as an unwanted sexual act, attempt to perform a sexual act, or contact or communication with unwanted sexual attention without consent or with consent due to force, intimidation, coercion, threat, abuse of power, etc. (UNODC 2020). For comparability across countries and to allow for appropriate scaling, the number of sexual violence events recorded in each country in each year, was normalised per 100,000 of population. In addition, and following the literature on the determinants of education, there are demand, supply and government policy factors that can influence education. Some of these factors were used as control variables.

3.3 Brief Data Points to be Noted

There are some anomalies in the statistics with respect to the three variables used to capture the education variables that should be noted. For girls' enrolment rate, the mean is approximately 104%. It is important to note that gross enrolment and completion rates can be more than 100% because the measure is not weighted against the total population of girls but rather to the population of the age group that officially corresponds to that level of primary education (World Bank 2013). The completion rate is approximately 91% at the mean but the minimum value of approximately 24% is very low. The percentage of girls in primary school is less at about 48% on average. The incidence of sexual violence is the main independent variable and at the mean, it is 32 per 100,000 of population.

4. MODELS AND ESTIMATION

The baseline regression was estimated using Pooled OLS. This analysis was then extended using the Fixed Effects estimation as this approach controls for heterogeneity across individual countries and the unobserved characteristics that are time-invariant (Baltagi 1995).

$$Y_{it} = \alpha_i + \beta X_{it} + X_{ct}\Gamma + \mu_i + v_{it} \quad (1)$$

where Y represents the different measures of educational outcomes, in country i at time t . X represents the main independent variable and X_{ct} is a matrix of control variables. α and β are

the coefficients to be estimated. μ_i and v_{it} represent the disturbance term – country-specific effects and random errors that are distributed normally.

For further robustness, we employed a technique to address any endogeneity in the model. One possible argument is that where girls are unable to participate in schooling due to serious socio-economic challenges or poor initial conditions their lack of education may lead them to criminal activity. This largely specious argument may suggest that lack of education within a society due to poor enrolment and completion rates has increased levels of crime. The diagnostics of the GMM were inconsistent possibly due to gaps in the data and thus these results are not reported. For two stage least squares estimation, identifying valid instruments is very difficult. However, lagged explanatory variables were used to estimate the models. Some studies have supported this approach in addressing potential reverse causality (see, Afonso and Jalles 2013; Bellemare et al. 2017).

5. EMPIRICAL RESULTS AND DISCUSSIONS

5.1 Baseline Results

The regression results of the baseline analysis are in table 1. Sexual violence was negatively related to all measures of education, but this was not significant for the percentage of girls in primary school. For enrolment rates, an increase in sexual violence by one standard deviation (45) from the mean reduces the girls' enrolment rate into primary school by 2.115% points (45×0.047). The same computation for girls' completion rate shows a reduction in completion rate by 2.565% points. These results are consistent with the existing studies reviewed in section 2.

First, sexual violence carries emotional, physical, and psychological implications for the victims and as such, will likely affect the demand for education. Secondly, their victims face a social stigma, isolation, and subsequently a lack of desire for education. Third, there is a negative relationship between poor health conditions (e.g., sexually transmitted disease, trauma, and unwanted pregnancies) and education (Alderman et al. 1999). Evidence has shown that victims of sexual violence face some of these health challenges (Marsh, Purdin & Navani 2006), which most likely will affect their demand and desire for education. Fourth, the fear and insecurity that is associated with sexual violence and attacks may deter parents from sending their girls to school (Shemyakina 2011).

Table 1: Pooled OLS (baseline) results of sexual violence and enrolment rate, completion rate, and percentage of girls in primary school

	Panel OLS Model 1 Girls' Primary School	Panel OLS Model 2 Girls' Primary School	Panel OLS Model 3 Percentage of Girls in Primary School
Dependent Variables:	Enrolment Rate	Completion Rate	
<i>Main Independent Variable</i>			
Sexual violence (per 100,000 of population)	-0.047** (0.019)	-0.057** (0.025)	-0.002 (0.001)
<i>Demand Factors Variables:</i>			
Income (growth rate)	0.107* (0.064)	0.171* (0.092)	0.003 (0.006)
Birth Rate	0.940*** (0.318)	0.641 (0.511)	0.017 (0.017)
% of repeaters (girls)		-1.083*** (0.274)	-0.056*** (0.011)
<i>Supply Factors Variables</i>			
Number of primary school teachers (log)	8.796*** (3.266)	8.727 (5.648)	1.275*** (0.202)
% of female teachers in primary school	0.592*** (0.108)	0.778*** (0.193)	0.030*** (0.007)
Population density	-0.024 (0.064)	0.117 (0.086)	-0.002*** (0.001)
<i>Government Factors Variables:</i>			
External debt (% of GNI)	-0.077*** (0.024)	-0.001 (0.001)	-0.0001** (0.0000)
Official development assistance (per capita)	0.017** (0.007)	0.004 (0.012)	-0.0004 (0.0004)
Governance	2.822*** (1.024)	3.864** (1.522)	0.099 (0.067)
Constant	-34.546 (32.995)	-66.795 (58.078)	33.175*** (2.012)
F Stat	49.790	55.510	101.310
Prob. > F	0.000	0.000	0.000
No. of Obs.	303	264	292
Year Effects	No	No	No
R Square	0.921	0.935	0.961

Note: number of observations is less than 1080 (72 × 15) due to gaps in the data for all the countries

5.2. Robustness Analysis to Alternative Techniques and Variable

a. Fixed Effects Analysis

These results are in table 2 and remain consistent with those of the baseline regression although with slight differences in the size of the coefficients. They again confirm the negative consequences of sexual violence on girls' education. With respect to the control variables, the growth rate of income was positive and significant with respect to all education measures. Education is a normal consumption good and all things being equal, should be positively influenced by income (Glick and Sahn 2010). The birth rate was also positive with respect to education variables. This relationship can be supported by the concept of "specialisation" whereby in larger households, some children work, and others are permitted to attend school (Patrinos and Psacharopoulos, 1997). The percentage of repeaters was negatively related to completion rates and the percentage of girls in primary school. The dissatisfaction associated with repeating a class reduces the inclination to continuously engage in education (Glick and Sahn 2010).

The number of teachers and percentage of female teachers are positively related to the different education variables. The availability of teachers helps to improve and sustain engagements between teachers and pupils (Guimbert, Miwa & Nguyen 2008). The population density was insignificant and shows no evidence to suggest that population density allows for economies of scale for education infrastructures that may likely enhance schooling (Mugisha 2006). External debt is negatively related to enrolment and completion rates as debt servicing obligations often divert scarce resources away from productive activities such as education (Fosu 2010). However, good governance has a positive impact on education, which is expected and confirms existing findings by Oseni et al. (2020). Official development assistance was not significantly different from zero, implying the misuse or misappropriation of aid found by Williamson (2010).

Table 2: Fixed effects results of sexual violence and enrolment rate, completion rate, and percentage of girls in primary school

Dependent Variables:	Fixed Effects Model 1 Girls' Primary School	Fixed Effects Model 2 Girls' Primary School Completion Rate	Fixed Effects Model 3 Percentage of Girls in Primary School
	Enrolment Rate		
<i>Main Independent Variable</i>			
Sexual violence (per 100,000 of population)	-0.053** (0.022)	-0.070** (0.031)	-0.002 (0.002)
<i>Demand Factors Variables:</i>			
Income (growth rate)	0.190** (0.084)	0.217* (0.125)	0.012* (0.007)
Birth Rate	1.283*** (0.287)	0.836* (0.434)	0.025 (0.020)
% of repeaters (girls)		-0.796*** (0.278)	-0.056*** (0.015)
<i>Supply Factors Variables</i>			
Number of primary school teachers (log)	8.867*** (2.766)	5.139 (4.536)	1.273*** (0.227)
% of female teachers in primary school	0.416*** (0.111)	0.466*** (0.178)	0.029*** (0.009)
Population density	-0.057 (0.053)	0.073 (0.083)	-0.002 (0.001)
<i>Government Factors Variables:</i>			
External debt (% of GNI)	-0.077*** (0.020)	-0.064* (0.037)	0.002 (0.002)
Official development assistance (per capita)	0.013 (0.009)	0.000 (0.012)	-0.001 (0.001)
Governance	2.949*** (0.998)	4.471*** (1.470)	0.062 (0.077)
Constant	-44.329 (34.104)	-24.815 (55.546)	32.122*** (2.753)
F Stat	6.600	5.400	4.640
Prob. > F	0.000	0.000	0.000
No. of Obs.	303	264	292
Year Effects	Yes	Yes	Yes
R Square Within	0.397	0.399	0.336

b. Analysis of the Lagged Regressors

To control for any potential endogeneity, we estimated with the lagged regressors in line with the arguments in section 4. The results are shown in table 3. These again confirm that sexual violence is negatively related to education outcomes with marginal differences in the size of the coefficients.

Table 3: Estimates of the lagged regressors on the impact of sexual violence on enrolment rate, completion rate, and percentage of girls in primary school

	Panel OLS Model 1 Girls' Primary School Enrolment Rate	Panel OLS Model 2 Girls' Primary School Completion Rate	Panel OLS Model 3 Percentage of Girls in Primary School	Fixed Effects Model 4 Girls' Primary School Enrolment Rate	Fixed Effects Model 5 Girls' Primary School Completion Rate	Fixed Effects Model 6 Percentage of Girls in Primary School
Dependent Variables:						
<i>Main Independent Variable</i>						
Sexual violence (per 100,000 of population)	-0.049*** (0.019)	-0.045* (0.026)	-0.003** (0.001)	-0.055** (0.023)	-0.066** (0.032)	-0.003 (0.002)
CONTROL VARIABLES	YES	YES	YES	YES	YES	YES
Constant	-20.697 (29.345)	-57.269 (60.990)	33.740*** (2.116)	-48.407 (36.786)	-57.787 (56.367)	32.398*** (2.844)
F Stat	49.760	55.880	101.350	6.690	3.560	4.340
Prob. > F	0.000	0.000	0.000	0.000	0.000	0.000
No. of Obs.	280	239	269	280	239	292
Year Effects	No	No	No	Yes	Yes	Yes
R Square	0.924	0.941	0.966	0.411	0.322	0.333

Note: For brevity, control variables are not reported.

c. Analysis of an Alternative Measure to Sexual Violence

For further robustness, we replaced sexual violence with serious assault as the dependent variable. The results are in table 4 while table 5 reports the results of the model including lagged regressors. The results are again consistent with previous estimation. The consequences of physical assault include mental health issues, shame, social exclusion, etc. and can lead to disruption across a wide range of productive activities (Fuller 2015).

Table 4: Results of the impact of serious assault (alternative measure) on enrolment rate, completion rate, and percentage of girls in primary school

	Panel OLS Model 1 Girls' Primary School Enrolment Rate	Panel OLS Model 2 Girls' Primary School Completion Rate	Panel OLS Model 3 Percentage of Girls in Primary School	Fixed Effects Model 4 Girls' Primary School Enrolment Rate	Fixed Effects Model 5 Girls' Primary School Completion Rate	Fixed Effects Model 6 Percentage of Girls in Primary School
Dependent Variables:						
<i>Main Independent Variable</i>						
Serious assault (per 100,000 of population)	-0.011** (0.005)	-0.014** (0.006)	-0.001* (0.000)	-0.011** (0.005)	-0.019*** (0.006)	-0.001* (0.000)
CONTROL VARIABLES	YES	YES	YES	YES	YES	YES
Constant	-74.538** (30.702)	-78.363* (43.547)	36.795*** (2.544)	-113.690*** (39.179)	-72.001 (53.211)	36.527*** (3.160)
F Stat	43.290	71.610	88.310	7.410	7.440	4.640
Prob. > F	0.000	0.000	0.000	0.000	0.000	0.000
No. of Obs.	335	285	313	335	285	313
Year Effects	No	No	No	Yes	Yes	Yes
R Square/Within	0.899	0.941	0.949	0.393	0.450	0.314

Table 5: Estimates of the lagged regressors on the impact of serious assault (alternative measure) on enrolment rate, completion rate, and percentage of girls in primary school

	Panel OLS Model 1 Girls' Primary School Enrolment Rate	Panel OLS Model 2 Girls' Primary School Completion Rate	Panel OLS Model 3 Percentage of Girls in Primary School	Fixed Effects Model 4 Girls' Primary School Enrolment Rate	Fixed Effects Model 5 Girls' Primary School Completion Rate	Fixed Effects Model 6 Percentage of Girls in Primary School
Dependent Variables:						
<i>Main Independent Variable</i>						
Serious assault (per 100,000 of population)	-0.008** (0.003)	-0.019*** (0.007)	-0.001*** (0.000)	-0.007 (0.005)	-0.023*** (0.006)	-0.001*** (0.000)
CONTROL VARIABLES	YES	YES	YES	YES	YES	YES
Constant	-41.267 (35.963)	-40.956 (49.939)	0.126 (0.096)	-83.251** (40.736)	-48.620 (55.059)	37.143*** (3.423)
F Stat	47.150	72.650	80.800	6.810	6.420	4.540
Prob. > F	0.000	0.000	0.000	0.000	0.000	0.000
No. of Obs.	310	262	291	310	262	291
Year Effects	No	No	No	Yes	Yes	Yes
R Square/Within	0.911	0.946	0.949	0.383	0.429	0.319

6. CONCLUSION

In this study, we investigated the impact of sexual violence on girls' enrolment rates, girls' completion rates and the percentage of girls in primary school in a sample of developing countries. The analyses showed evidence of a negative relationship between sexual violence and the different measures of education for girls. This negative relationship was robust to different estimation techniques and was consistent when sexual violence was replaced with another measure of violent crime – serious assault. Based on these results, the following policy implications are clear. First, sexual violence has a negative and lasting impact on victims and as such, developing countries must formulate adequate responses to protect their young citizens from such cruelty. Second, effective support mechanisms for victims of sexual violence should be facilitated and sustained in developing countries. This will help in ameliorating some of the negative impact of their violent experiences and help to prepare them to re-enter society and return to education.

REFERENCES

- Afonso, A., and Jalles, J. T., 2013, 'Growth and Productivity: The role of Government Debt', *International Review of Economics and Finance*, 25, 384-407
- Alderman, H., Behrman, J. R., Lavy, V., and Menon, R., 1999, 'Child Nutrition, Child Health, and School Enrollment: A Longitudinal Analysis', © *The World Bank, Washington, DC*
- Amin, A. A., and Ntembe, A., 2021, 'Public Spending on Education and Learning Outcomes in Senegal', *The Journal of Developing Areas*, 55(4), 297-314
- Baltagi, B., 1995, 'Econometric Analysis of Panel Data', *Chichester, UK*
- Bellemare, M. F., Masaki, T., and Pepinsky, T. B., 2017, 'Lagged Explanatory Variables and the Estimation of Causal Effect', *The Journal of Politics*, 79(3), 949-963
- Bisika, T., Ntata, P., and Konyani, S., 2009, 'Gender-violence and Education in Malawi: A study of Violence Against Girls as an Obstruction to Universal Primary School Education', *Journal of Gender Studies*, 18(3), 287-294
- Connelly, R., and Zheng, Z., 2003, 'Determinants of School Enrolment and Completion of 10 to 18 Year Olds in China', *Economics of Education Review*, 22(4), 379-388

- Fosu, A. K., 2010, 'The External Debt-servicing Constraint and Public-expenditure Composition in Sub-Saharan Africa', *African Development Review*, 22(3), 378-393
- Fuller, G., 2015, 'The Serious Impact and Consequences of Physical Assault', *Trends and Issues in Crime and Criminal Justice*, 496, 1-8
- Glick, P., and Sahn, D. E., 2010, 'Early Academic Performance, Grade Repetition, and School Attainment in Senegal: A Panel Data Analysis', *World Bank Economic Review*, 24(1), 93-120
- Grigoli, F., and Sbrana, G., 2013, 'Determinants and Dynamics of Schooling and Child Labour in Bolivia', *Bulletin of Economic Research*, 65, 17-37
- Guariso, A., and Verpoorten, M., 2018, 'Armed Conflict and Schooling in Rwanda: Digging Deeper', *Peace Economics, Peace Science and Public Policy*, 25(1), 1-40
- Guimbert, S., Miwa, K., and Nguyen, D. T., 2008, 'Back to School in Afghanistan: Determinants of School Enrolment', *International Journal of Educational Development*, 28(4), 419-434
- Landis, D., Yu, G., Tanner, S., Karungu, C., Mallinga, P. A., Falb, K., and Stark, L., 2019, 'The School Participation Effect: Investigating Violence and Formal Education Among Girls in the Democratic Republic of the Congo', *Compare: A Journal of Comparative and International Education*, 49(5), 817-836
- Le Mat, M. L., Kosar-Altinyelken, H., Bos, H. M., and Volman, M. L., 2019y, 'Discussing Culture and Gender-based Violence in Comprehensive Sexuality Education in Ethiopia', *International Journal of Educational Development*, 65, 207-215
- Leon, G., 2012, 'Civil Conflict and Human Capital Accumulation the Long-term Effects of Political Violence in Perú', *Journal of Human Resources*, 47(4), 991-1022
- Marsh, M., Purdin, S., and Navani, S., 2006, 'Addressing Sexual Violence in Humanitarian Emergencies', *Global Public Health*, 1(2), 133-146
- Mugisha, F., 2006, 'School Enrollment Among Urban Non-slum, Slum and Rural Children in Kenya: Is the Urban Advantage Eroding?' *International Journal of Educational Development*, 26(5), 471-482
- Novella, R., 2019, 'Parental Education, Gender Preferences and Child Nutritional Status in Peru', *Oxford Development Studies*, 47(1), 29-47
- Onoyase, A., 2019, 'School-Related Gender Based Violence (SRGBV) and Its Consequences on Secondary School Students: Implications for Counselling', *Journal of Education and Training Studies*, 8(2), 29-37
- Oseni, I. O., Akinbode, S. O., Babalola, D. A., and Adegboyega, S. B., 2020, 'Government Spending and School Enrolment in Sub-Saharan Africa: A System GMM Approach', *Journal of Economics & Management*, 40, 91-108
- Patrinos, H. A., and Psacharopoulos, G., 1997, 'Family Size, Schooling and Child Labor in Peru – An Empirical Analysis', *Journal of Population Economics*, 10(4), 387-405
- Shemyakina, O., 2011, 'The Effect of Armed Conflict on Accumulation of Schooling: Results from Tajikistan', *Journal of Development Economics*, 95(2), 186-200
- UNODC, 2020, 'United Nations Office on Drugs and Crime', © United Nations, Vienna, Austria
- WDI, 2020, 'World Development Indicators', © The World bank, Washington, DC
- WGI, 2020, 'World Governance Indicators', © The World bank, Washington, DC
- Williamson, C. R., 2010, 'Exploring the Failure of Foreign Aid: The Role of Incentives and Information', *The Review of Austrian Economics*, 23(1), 17-33
- World Bank, 2013, 'Gross Enrollment Ratio in Primary Education, 2013', Available at <https://ourworldindata.org/grapher/gross-enrollment-ratio-in-primary-education> © The World Bank, Washington, DC

ⁱ $GER_e^t = \frac{E_e^t}{P_{e,a}^t}$, where:

GER_e^t = girls' gross enrolment ratio/rate into primary education (e), in school year (t).

E_e^t = total number of girls enrolled into primary education (e), in school year, (t).

$P_{e,a}^t$ = population of the age group (a), that officially corresponds to that level of primary education (e), in school year, (t).

ⁱⁱ $GCR_e^t = \frac{C_e^t}{PC_{e,a}^t}$, where:

GCR_e^t = girls' gross completion ratio/rate in primary education (e), in school year (t).

C_e^t = total number of girls entering the last grade of primary education (e), in school year, (t).

ⁱⁱⁱ $PG_e^t = \frac{G_e^t}{TP_e^t}$, where:

PG_e^t = percentage of girls in primary education (e), in school year (t).

G_e^t = total number of girls in primary education (e), in school year, (t).

TP_e^t = total number of pupils in primary education (e), in school year, (t).