

Nathalie Vieira Balmant; Rejane de Souza Reis; Marcell de Oliveira Santos; Beatriz de Camargo.

Introduction

Bone tumors are most common in children and adolescents and young adults (AYA). Osteosarcoma (OS) and Ewing Sarcoma (ES) are the most frequent subtypes that affect children and adolescents.

The aim of this study was to analyze incidence and mortality trends of bone tumors among children and AYA in Brazil.

Materials and Methods

Information about incidence was obtained in 23 Population-based Cancer Registries (PBCR) with different periods of information. For mortality analysis, data were extracted from the Atlas of Cancer Mortality from 1979 to 2013, according to the five regions of Brazil. Specific and adjusted rates per million were analyzed according to gender, morphology and age at diagnosis. The median rate was used as measure central tendency. *Joinpoint* regression analysis was performed to analyze incidence and mortality trends.

Results

Median incidence rates were 5.74 and 11.25 cases per million in 0-14 and 15-29 age groups respectively. (Table 1) OS was the most incident subtype of bone tumor. The peak of OS incidence was earlier in females when comparing to males (Figure 1). Long bones of lower limbs (code C402) were the most frequent involvement topography in both age groups (Table 2).

Increase trends were observed among the 5 of PBCR. Among AYA, decreased trends were seen in 9 of PBCR. (Figure 2)

Median mortality rates were 1.22 and 5.07 deaths per million in children and AYA, respectively. (Table 3)

Increased mortality was observed on the North and Northeast regions in both age groups. Decreased trends of mortality was seen in South among children (0-14 years), while Southeast region decreased among the AYA population. (Figure 2)

Table 1: Incidence rates of bone tumors in children, adolescents and young adults. Absolut values; specific and adjusted rates per million according to age group, Brazilian region and PBCR.

Region	PBCR	0-4 years		5-9 years		10-14 years		0-14 years		15-19 years		20-24 years		25-29 years		15-29 years			
		n	ASIR	n	ASIR	n	ASIR	n	AAIR	CI (95%)	n	ASIR	n	ASIR	n	ASIR	n	AAIR	CI (95%)
North	Belém (2005-2009)	*	1.71	*	6.12	13	19.44	18	8.24	(4.41;12.07)	13	17.70	6	8.48	5	8.26	24	11.79	(7.06;16.52)
	Manaus (2002-2006)	*	1.06	*	2.29	6	7.30	9	3.24	(1.12;5.37)	19	23.16	7	8.77	7	10.50	33	14.63	(9.62;19.63)
	Palmas (2008-2012)	*	0.00	*	0.00	*	19.56	*	5.64	(-2.69;8.28)	*	9.69	*	0.00	*	27.86	*	12.07	(0.18;23.96)
	Roraima (2006-2010)	*	0.00	*	0.00	*	4.26	*	1.23	(-1.19;3.65)	*	5.07	*	11.55	*	6.63	*	7.32	(0.13;14.51)
Northeast	Aracaju (2007-2011)	*	4.73	*	0.00	*	8.79	*	4.38	(-0.65;9.41)	*	11.65	*	3.73	5	20.44	9	11.78	(4.07;19.48)
	Fortaleza (2002-2006)	*	1.81	5	4.49	21	17.75	28	7.37	(4.61;10.12)	15	12.72	10	9.30	8	8.62	33	10.35	(6.81;13.89)
	João Pessoa (2006-2010)	*	3.82	*	3.56	*	9.90	5	5.37	(0.58;10.17)	8	24.74	*	9.53	5	17.99	16	17.54	(8.93;26.14)
	Natal (2001-2005)	*	0.00	7	20.50	*	7.93	10	9.00	(3.39;14.61)	*	10.15	*	5.60	*	0.00	6	5.42	(1.08;9.77)
	Recife (2006-2010)	*	5.50	6	10.07	6	9.38	15	8.06	(3.92;12.19)	8	11.30	6	8.60	6	9.32	20	9.84	(5.52;14.15)
	Salvador (2001-2005)	*	0.91	*	3.69	14	11.92	19	4.92	(2.68;7.17)	19	13.48	9	6.53	8	7.03	36	9.06	(6.09;12.03)
Teresina (2002-2006)	*	0.00	*	0.00	*	6.94	*	1.96	(-0.26;4.19)	10	5.79	8	5.80	*	1.92	20	4.56	(2.54;6.58)	
Midwest	Cuiabá (2003-2007)	*	0.00	*	0.00	8	29.66	8	8.56	(2.62;14.49)	5	18.22	*	0.00	*	9.14	7	9.36	(2.42;16.30)
	Distrito Federal (1998-2002)	*	7.37	5	6.43	15	18.84	26	10.50	(6.44;14.56)	15	16.86	11	12.20	6	7.61	33	13.1	(8.62;17.59)
	Goiânia (2005-2009)	*	0.00	*	4.03	9	17.40	11	6.31	(2.57;10.05)	13	22.03	6	9.82	7	13.55	26	15.59	(9.56;21.63)
Southeast	Belo Horizonte (2004-2008)	*	4.34	7	7.64	16	16.32	27	8.90	(5.51;12.29)	19	17.12	20	17.25	*	3.03	42	14.69	(10.24;19.14)
	Campinas (2001-2005)	*	0.00	*	7.63	*	4.68	5	3.80	(0.46;7.15)	6	13.27	*	6.35	*	4.65	11	8.37	(3.40;13.34)
	Grande Vitória (2008-2012)	*	7.67	*	0.00	7	10.01	12	5.74	(2.44;9.03)	9	11.83	5	6.96	*	4.96	17	8.2	(4.29;12.11)
	Jahu (2009-2013)	*	0.00	*	0.00	*	0.00	*	0.00	-	*	16.93	*	15.32	*	0.00	*	11.25	(-4.50;27.00)
	Poços de Caldas (2007-2011)	*	0.00	*	0.00	*	0.00	*	0.00	-	*	15.93	*	0.00	*	0.00	*	5.96	(-5.72;17.65)
São Paulo (2006-2010)	*	0.98	32	7.46	66	15.33	102	7.24	(5.83;8.65)	75	4.20	49	2.76	45	2.71	169	3.26	(2.77;3.75)	
South	Curitiba (2006-2010)	5	8.31	5	7.42	9	12.60	19	9.37	(5.06;13.68)	15	19.91	6	7.56	6	8.10	27	13.35	(8.31;18.40)
	Florianópolis (2008-2012)	*	0.00	*	0.00	*	13.64	*	3.93	(-1.52;9.39)	*	23.89	*	20.63	*	5.20	9	19.63	(6.78;32.47)
	Porto Alegre (2002-2006)	*	5.56	*	5.66	15	26.97	21	11.77	(6.69;16.84)	12	19.18	9	14.54	*	5.65	24	13.21	(7.91;18.51)
MEDIAN		0.98		4.03		11.92		5.74			15.93		8.48		7.03		11.25		

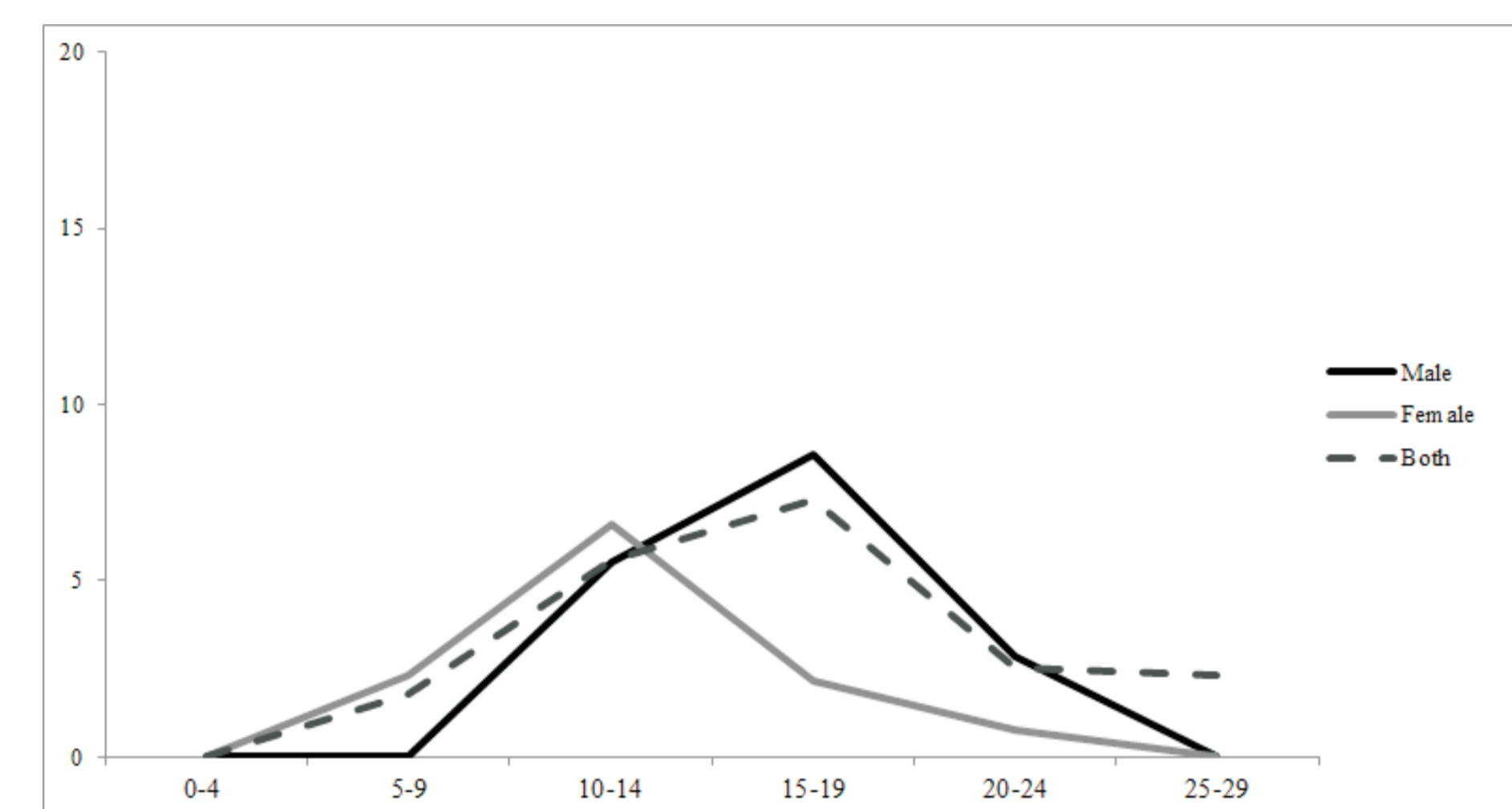


Figure 1: Age-specific incidence rate (ASIR) of Osteosarcoma in children, adolescents and young adults in Brazil, according to gender and age group.

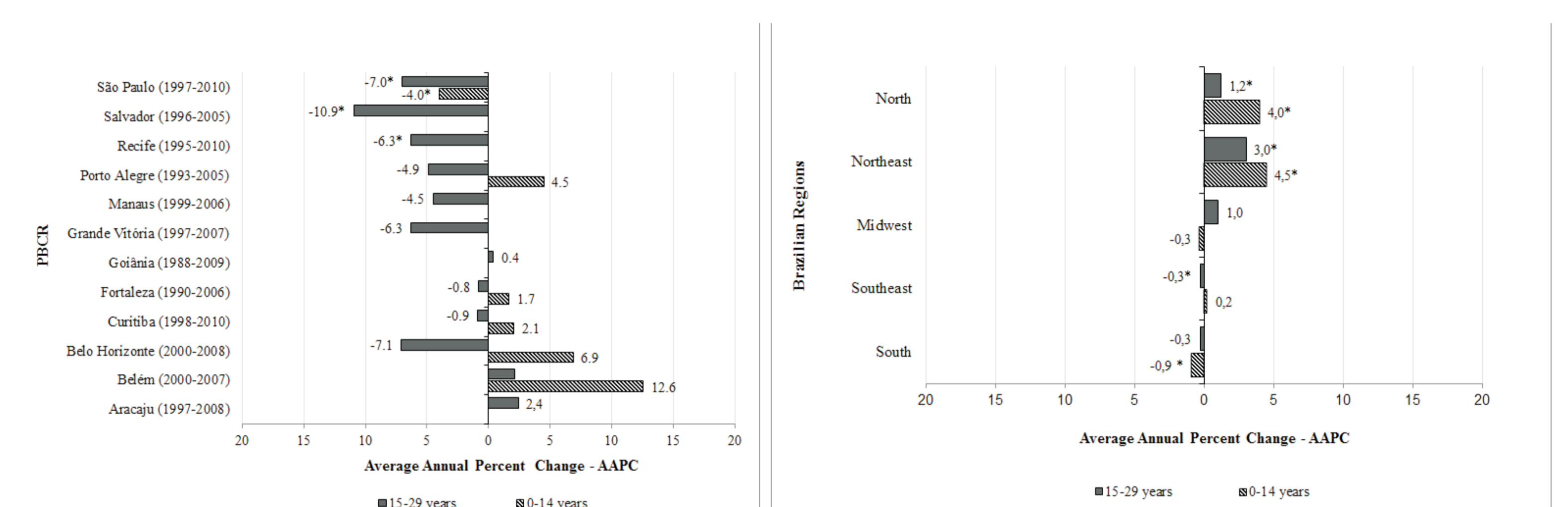


Figure 2: Joinpoint regression analysis of incidence (A) and mortality (B) trends by bone tumors in children, adolescents and young adults with 0 to 29 years in Brazil, according to PBCR and Brazilian regions.

Table 2: Absolut values and distribution of different topographies in children, adolescents and young adults with bone tumors in Brazil, according to age group and ICD-O3 codes.

Topography Codes (ICD-O3)	0-14 years		15-29 years		0-29 years	
	n	%	n	%	n	%
C400 (Long bones - Upper limbs)	42	12.1	48	8.4	90	9.8
C401 (Short bones - Upper limbs)	4	1.2	16	2.8	20	2.2
C402 (Long bones - Lower limbs)	170	49.1	233	40.7	403	43.9
C403 (Short bones - Lower limbs)	10	2.9	18	3.0	27	2.9
C408 (Overlapping lesions - limbs)	1	0.3	4	0.7	5	0.5
C409 (Bone of limbs, NOS)	21	6.1	22	3.8	43	4.7
C410 (Skull and face)	14	4.0	25	4.4	39	4.2
C411 (Mandible)	5	1.4	20	3.5	25	2.7
C412 (Vertebral column)	12	3.5	22	3.8	34	3.7
C413 (Rib, sternum, clavicle)	8	2.3	19	3.3	27	2.9
C414 (Pelvic bones)	16	4.6	58	10.1	74	8.1
C418 (Overlapping lesions)	1	0.3	2	0.3	3	0.3
C419 (Bone, NOS)	42	12.1	87	15.2	129	14.0

Table 3: Age-specific and age-adjusted mortality rates of bone tumors in children, adolescents and young adults from Brazil, SIM 2009-2013.

BRAZILIAN REGION	0-4	5-9	10-14	0-14	15-19	20-24	25-29	15-29
	ASMR	ASMR	ASMR	AAMR	ASMR	ASMR	ASMR	AAMR
North	0.76	1.31	3.75	1.16	6.27	4.82	2.67	4.65
Northeast	0.50	1.63	3.93	1.21	7.00	4.51	2.87	4.88
Midwest	0.91	2.93	5.24	1.65	10.01	5.30	5.07	6.92
Southeast	0.86	1.63	3.44	1.09	6.64	4.40	2.86	4.72
South	0.56	1.60	4.78	1.46	8.45	5.66	2.78	5.74
BRAZIL	0.70	1.69	3.93	1.22	7.22	4.71	3.01	5.07

Conclusion

This study describes, for the first time, a complete Brazilian epidemiologic profile of children, adolescents and young adults with bone tumors. Regarding incidence rates of OS in children and AYA, our results are similar with international findings. ES had a lower incidence rates compared to others studies. Non-specific tumors had highest incidence rates, mainly in AYA. Brazilian treatment groups may have an important role in trends of incidence and mortality rates. Improves in quality of information can impact the death rates.