

A Time-Series Analysis of Malaria Control and its Effects on Pediatric Blood Transfusions in Rural Zambia

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Background

Malaria related mortality remains a serious burden in sub-Saharan Africa, particularly among children. Blood transfusions can reduce mortality among children with severe malarial anemia. There has been little research conducted to date to measure the impact of malaria control on the use of blood transfusions in health facilities.

Map of Macha Mission Hospital and referral Rural Health Centers



Methods

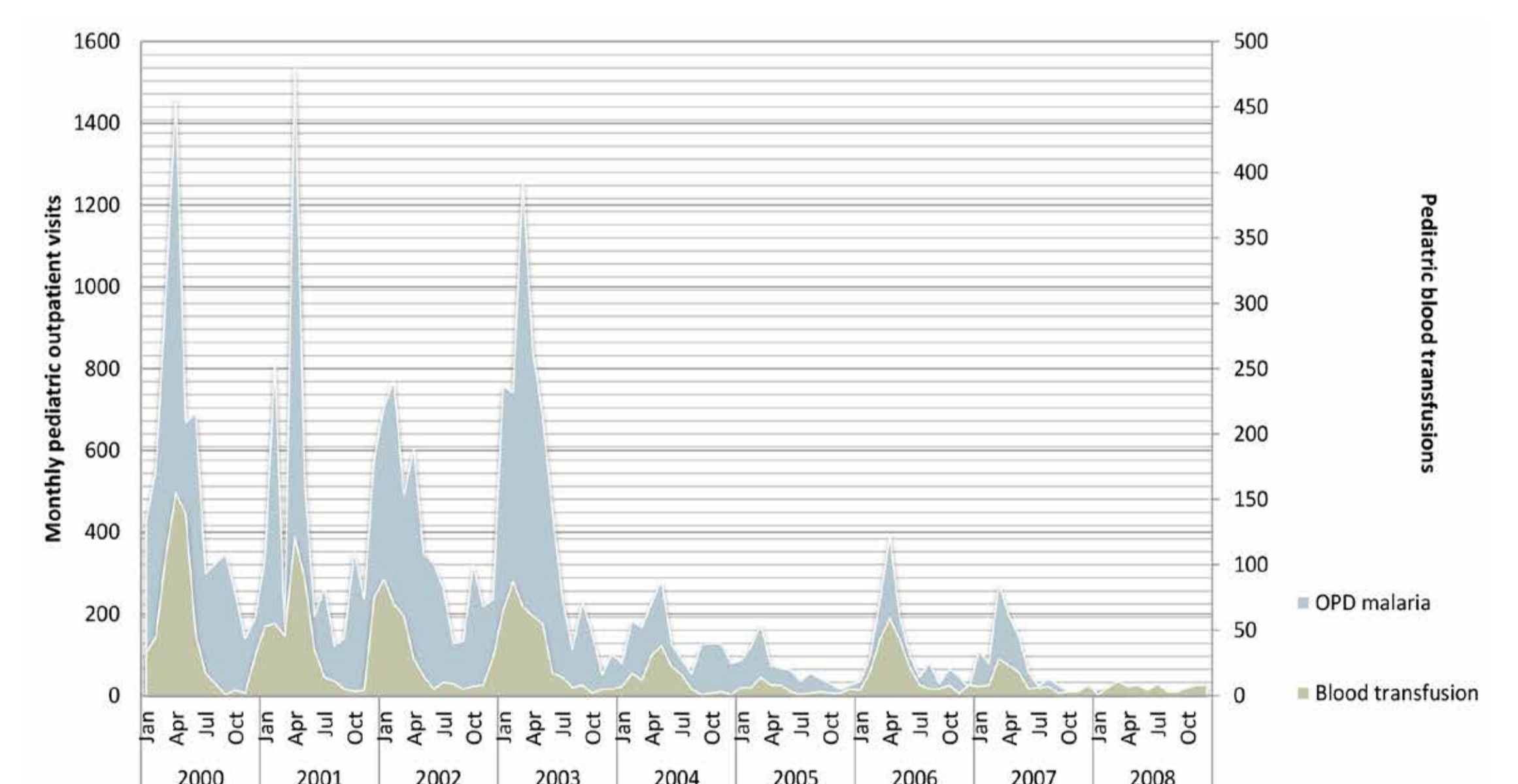
We carried out a time series analysis of facility and patient record data from Macha Mission Hospital, a rural referral hospital, over an eight-year period (2000-2008). We used multivariate analyses with an auto-regression-moving-average model to assess the relationship between the scale-up of malaria control and the use of pediatric blood transfusions. We also investigated the association between malaria control scale-up and the use of blood transfusions in other patient wards.



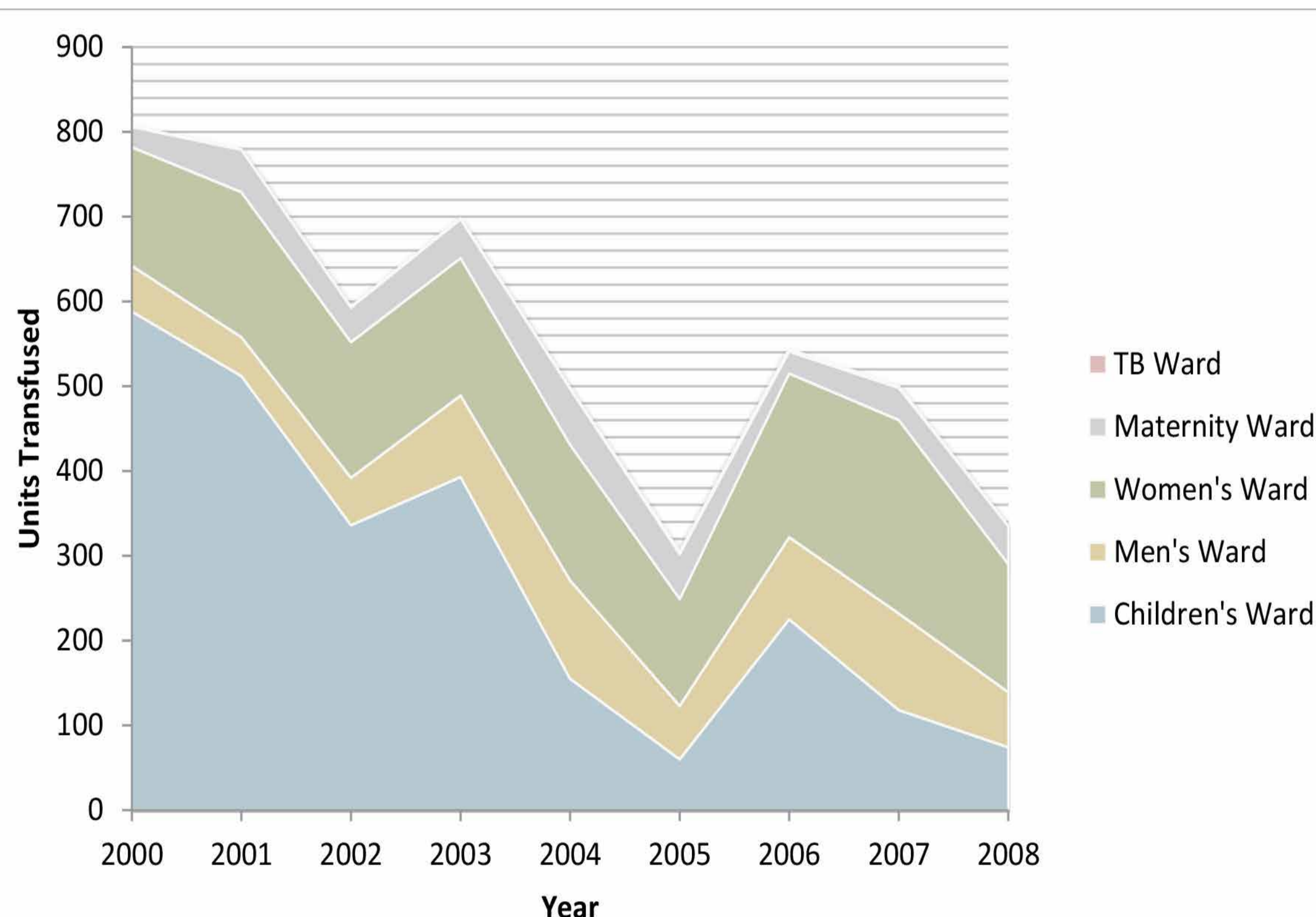
Results

This study showed that, in years when malaria control was scaled up, there were an average of 21.9 fewer pediatric blood transfusions per month as compared to the years when malaria control was not scaled up (95% CI 8.1-35.8; $p < 0.01$), representing a 56% reduction in the monthly use of pediatric blood transfusions. Pediatric admissions for severe malarial anemia declined over the same period. In the maternity ward, there were 1.1 additional blood transfusions per month during the years of malaria scale-up (95% CI 0.1-2.1; $p < 0.05$) as compared to years when malaria control was not scaled up.

Pediatric outpatient malaria visits and number of blood transfusions in the pediatric ward at Macha Mission Hospital



Total number of blood transfusions by ward at Macha Mission Hospital



Relationship between malaria control-scale-up and pediatric blood transfusions

	Pediatric blood transfusions
Malaria control years (dummy)	-21.93*** (7.06)
Constant	38.57*** (9.80)
Observations	108
Mean of dependent variable	22.79
Wald Chi-Squared	434.63

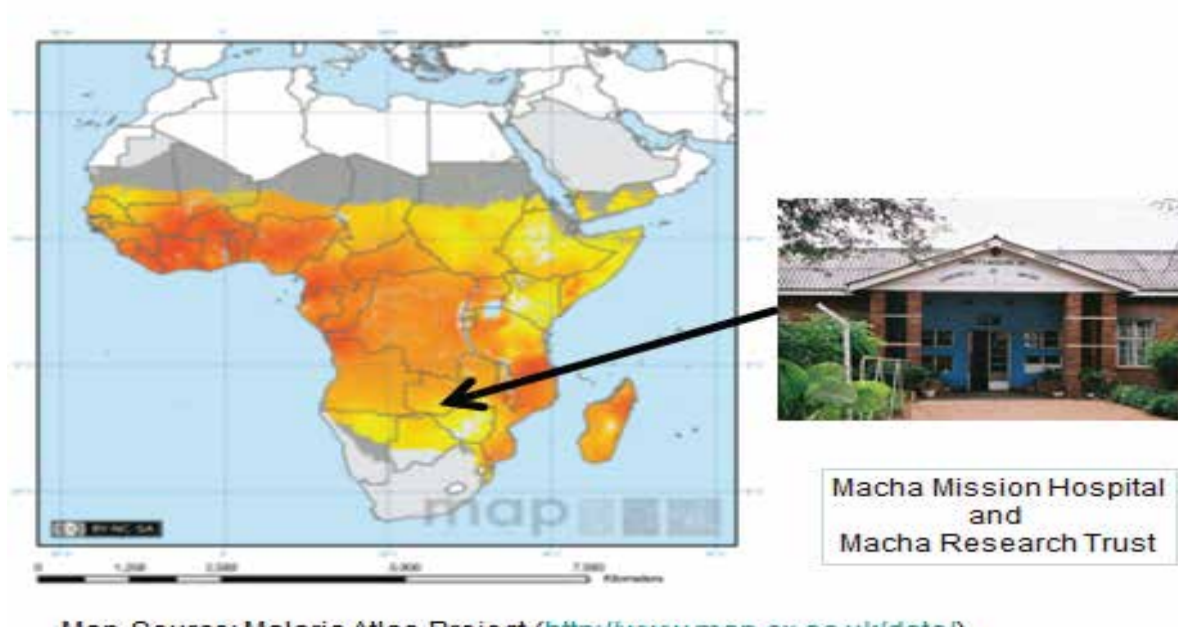
*significant at 10%; **significant at 5%; ***significant at 1%
Coefficient standard errors are noted in parentheses.
Note: The malaria control years independent variable is a dummy variable that takes on a value of 1 for years when malaria control was scaled up relative to years when malaria was not scaled up in Macha Mission Hospital's catchment area. Malaria control years include 2004, 2005, 2007, and 2008. Regressions use an autoregressive-moving-average model with 2 lags and robust standard errors. We control for the month of the year in all regressions to account for seasonal correlations.

Total pediatric blood transfusions over time (1999-2009)

Year	Total pediatric blood transfusions	Pediatric blood transfusions (as percentage of all blood transfusions)
1999*	73	42%
2000	588	73%
2001	512	66%
2002	336	57%
2003	393	56%
2004	155	31%
2005	60	20%
2006	225	41%
2007	118	24%
2008	74	22%
2009**	33	15%

Conclusion

This study provides important evidence that malaria control contributes to lowering pediatric admissions for severe malarial anemia and thereby lower the use of pediatric blood transfusions.



Acknowledgments

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