

and the quality of the original narratives persist.

No descriptive statistics concerning keywords, length, or the frequency of other diagnoses were presented. Faulty decision algorithms for malaria or other diseases might have artificially increased the number of malaria deaths. If “cough” appears in 99% of Gujarati narratives, then it might lack diagnostic use in Gujarati narratives. Descriptive statistics could help address such diagnostic dilemmas.

A computerised database that uses text mining and biomedical ontologies<sup>2</sup> could address these concerns (figure). Biomedical ontologies are structured representations of knowledge that can be used for decision support and computerised data storage.<sup>2</sup> Many examples of biomedical ontologies exist<sup>3,4</sup> and future versions of the International Classification of Diseases will be ontology-based.<sup>5</sup> In Dhingra and colleagues’ study, untranslated medical narratives could be analysed by use of a biomedical ontology. Descriptive statistics and cross-tabulations could be calculated to provide insight into language and cultural bias, whether or not longer documents are more likely to be assigned a diagnosis of malaria, etc. The diagnostic outcomes of different decision algorithms could be explored quickly, and the number of malaria-attributed (or otherwise) deaths recalculated. This process is less inconsistent, less work-intensive, and less error-prone than a human approach. It could also help refine the

malaria estimates provided by Dhingra and colleagues.

I declare that I have no conflicts of interest.

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### Authors’ reply

Malaria can be cured easily if treated promptly. The Indian National Vector-Borne Disease Control Programme diagnoses about 1 million cases of *Plasmodium falciparum* annually. It successfully treats nearly all cases it diagnoses, reporting among them only about 0.1% mortality.<sup>1</sup> But, since infection with *P falciparum* can progress rapidly from mild symptoms to life-threatening disease, in some of the parts of India with limited health-care facilities, many cases are never diagnosed and malaria remains a major cause of death. Most of the deaths attributed to malaria in our study

were in rural villages among people whose acute fever was never seen by any health-care worker, so there was, of necessity, no reliable diagnosis of the pathogen. Nevertheless, national malaria mortality estimates for India should attribute to malaria some proportion of the many rural deaths from medically unattended acute fevers, while acknowledging the inevitable uncertainties that this involves.

Our study is a nationally representative sample, organised why the Registrar-General, of all deaths in India.<sup>2,3</sup> It therefore included large numbers of unattended rural deaths from an undiagnosed illness that had caused fever. Trained non-medical graduate fieldworkers interviewed family members. The fieldworker’s written narrative of the course of the fatal episode was scanned electronically then sent to two different places to be coded independently by two of 130 trained physicians. Of the rural unattended fever deaths before age 70 years, 11% were eventually attributed to malaria (table), with higher proportions in the state of Orissa, where *P falciparum* transmission is most intense.<sup>1</sup> Within states, the proportion of deaths the coders attributed to malaria also correlated at district level with *P falciparum* transmission.

Most of the deaths eventually attributed to malaria were independently attributed to malaria by both of the two physicians at initial coding. Despite this concordance, the classification of an *individual* fever death as malarial or non-malarial is

	Number of deaths	Proportion attributed to various types of infection					
		Malaria	Pneumonia	Tuberculosis	Diarrhoea	Other infection	Fever of unknown origin
Orissa	1388	601 (43%)	197 (14%)	204 (15%)	185 (13%)	170 (12%)	31 (2%)
Other high-malaria states*	4336	770 (16%)	1137 (28%)	655 (15%)	698 (16%)	776 (18%)	300 (8%)
Rest of India	11 114	773 (7%)	3247 (29%)	1994 (18%)	1801 (17%)	2400 (22%)	939 (8%)
All India	16 838	2104 (11%)	4581 (28%)	2853 (17%)	2684 (16%)	3346 (20%)	1270 (8%)

Proportions are sample-weighted to the Sample Registration System sampling fractions in the rural and urban parts of each state. Unweighted proportions yielded nearly identical results. \*Chhattisgarh, Jharkhand, Madhya Pradesh (which was not included with the high-malaria states in the study report) and the northeastern states.

**Table: Number of rural deaths with fever at ages 0–69 years that did not occur in a health-care facility, and proportions attributed by coders to various types of infection, by area**

inevitably unreliable, but that does not mean that the *total* numbers of malaria deaths are correspondingly unreliable.<sup>4</sup> The main question is whether the overall proportion of deaths ascribed to malaria was at least approximately correct. The case series described by your correspondents do not directly address this; most are hospital-based (and therefore underestimate the relative importance of malaria as a cause of death in untreated patients) and, importantly, none includes a representative sample of all deaths. Hence, although N K Shah and colleagues suggest a case-fatality rate of only 0.1–0.3% for *P falciparum*, the true risk of death in rural untreated individuals with fever due to *P falciparum* could well be an order of magnitude higher.

Our study provides substantial evidence that malaria causes far more deaths in rural India than had previously been estimated by indirect methods; it also shows that there are even larger numbers of avoidable rural deaths from acute febrile illnesses other than malaria.

We declare that we have no conflicts of interest.

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## Doctors talk climate change—students take action

Ian Roberts and Robin Stott (Nov 27, p 1801)<sup>1</sup> call for collective action from health professionals against the causes of climate change. Students can have a vital role in the debate on the effects of climate change on health.

The International Federation of Medical Students' Associations (IFMSA) represents more than 1.2 million medical students from more than 100 countries. Climate change is a key policy focus of the federation, which pursues meaningful political action in the national and international arenas. Students have developed intensive workshops on climate change and health. Run all over the world, these aim to empower more students with the skills needed for meaningful action. Attendees are encouraged to lead by personal example and influence the institutions where we study and work to reduce emissions. In Australia, for example, educational videos and posters cover the hospital common rooms, announcing a "Code green emergency".<sup>2</sup>

On the national scene, medical students urge ministers of health to discuss the health-related effects of climate change with their environment and energy ministers. In the UK, for example, medical students have targeted the general public through a petition and their politicians by marching in front of Parliament.<sup>3</sup>

On the basis of our experiences, we urge the following:

(1) Climate change and its effect on health should be included in students'

core medical curricula.<sup>4</sup> Future doctors should become familiar with the scientific evidence and be comfortable with their role in society as public health advocates.

(2) Health professionals as individuals and their representative organisations must lobby their local and national authorities to reduce emissions. The Climate and Health Council can have a mediating role in this process.

(3) Human health should be on the agenda of the international negotiations in the upcoming UN 17th Conference of Parties in Durban, South Africa, so as to achieve a fair, ambitious, and legally binding global treaty.

If we ignore the initial symptoms of climate change, the effects on health become greater. If we fail to adapt to climate change adequately, we as future physicians will be the first to cope with the catastrophic consequences.

We declare that we have no conflicts of interest.

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## Health benefits of policies to mitigate climate change

The Comment on health co-benefits of policies to tackle climate change (Nov 27, p 1802)<sup>1</sup> is timely in reinforcing points made in earlier publications in *The Lancet*. It is also an encouraging example of how academies, through their

For the IFMSA website see <http://www.ifmsa.org/>