November had been caused predominantly by the H1N1pdm strain, observation of the entire mortality series in that region (from 2007 to 2009) revealed similarly high peaks of mortality in previous years. For instance, mortality at week 4 of 2008 was as high as the supposedly pandemic peak in November 2009, even though the population in 2008 was smaller. Therefore, the reported increment of deaths in November 2009 was not particularly anomalous considering the usual background variance of mortality in Antananarivo.

A recently released compilation of studies on influenza in Africa [2] describes a wealth of interesting data from this continent. Unfortunately, these studies were not supplemented with time series of mortality from vital statistics sources that would have allowed comparison of the anomalous mortality attributable to H1N1pdm relative to previous years. Still, the data presented are overly indicative that the introduction of the H1N1pdm strain was not followed by a sharp rise in cases and deaths in the tropical belt. For instance, the delayed timing of the circulation of this strain in West Africa and its impact, comparable to inter-pandemic periods [6], is markedly similar to that described for equatorial Brazil [5].

If further analyses do not reveal an exceptionally high number of deaths in Madagascar and other tropical African countries during the circulation of H1N1pdm, should we instead conclude that African populations are at lower risk from pandemic influenza? The answer is 'no'. Independently of the controversy regarding the merits of the criteria used to define this strain as pandemic [2, 3], we believe that the 2009 experience is of poor value to predict incidence patterns, transmissibility and burden of a severe pandemic in the future. In fact, by strongly focusing on the pandemic categorization of this H1N1 strain, we might be actually missing the opportunity to understand the dynamics and impact of seasonal influenza based on the unprecedented surveillance efforts that the 2009 H1N1 experience provided. Therefore, although the study in Antananarivo, and similar studies in Africa, are undoubtedly of great importance to understand the dynamics of influenza in these poorly studied areas, to get a picture of whether African populations might be at higher risk in a putative severe influenza outbreak in the future, one would still have to look at the impact of the 1918 pandemic [7] (and in fact act quickly before this information is irreversibly lost [8]). This is still the closest reference we have of an epidemiological catastrophe of global proportions caused by a respiratory disease in modern times.

Declaration of Interest

None.

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What can the 2009 influenza outbreak teach us about the risk of a severe pandemic? The Madagascar experience: a reply

It is well-established that the prevalence and incidence of influenza in most tropical countries like Madagascar are largely unknown. Clinically,

influenza is not distinguishable from most other infectious diseases with fever in African countries. So, the load of influenza on morbidity and mortality is more often unknown in African region. Important reports on spatial and temporal data that describe the global circulation of influenza highlight the fact that there is virtually no data from Africa [1].

Regarding the recent pandemic period in Madagascar, the symptoms of the H1N1pdm strain resembled more those of a seasonal influenza strain than those of a pandemic or severe seasonal strain. But, in Madagascar, the difference between seasonal period and this pandemic period has been shown by the level of virus circulation. More people seemed to be affected by pandemic influenza virus than during the influenza seasonal period. Thus, the sentinel surveillance system implemented in 2007 has allowed identification of the peaks in most of the sentinel sites during this period [2]. Unfortunately, in Antananarivo the new tools had just been implemented when the pandemic was spreading, but in other sentinel sites, the percentage of fever syndromes reported was lower during the seasonal period than during the pandemic period. It is not wrong to believe that when the number of cases is high the burden of disease becomes increasingly important.

The recent pandemic was probably like a seasonal epidemic but its burden is still unclear in low-income countries. In Madagascar, the influenza burden has already been described during epidemic periods in 2002 [3], and the WHO-GOARN team showed that in Ikongo District, 54% of the reported deaths due to acute respiratory infections were in children aged <5 years, but the highest mortality rate was in persons aged $\geqslant 60$ years. We showed the same trend during the pandemic in Antananarivo. Is this an 'interesting local exception'? – it is much more likely a seasonal-like pattern.

The limits of our study [4] were presented in the Discussion section. Thus, the mortality surveillance system in Antananarivo is known to be imperfect. However, in this low-income country it was a genuine opportunity to find a collection of mortality data for three consecutive years. Regarding analysis, mortality data have been compared month after month for the three years and a significant difference was found only for November. Therefore our Figure 2 focused on this month.

Is it surprising that the elderly die more often than younger people as shown by Rajatonirina *et al.* in Figure 2? The 'J' curve described by our data is usually associated with the mortality trend in the population. Data from Madagascar showed that the number of deaths and the mortality rate were higher in elderly people, especially in November 2009.

The comparison month by month did not reveal any difference for January as suggested by the letter of Alonso *et al.* [5] at about week 4. The variance of mortality rate was emphasized by Alonso *et al.* and would be in relation to different endemics, for example the plague during the rainy season from December to March. Unfortunately, influenza was not the unique threat which struck the Malagasy population. The comorbidity was unknown and this was also a weakness of this study. Data were not available because deaths had occurred more frequently outside the hospital setting. This is the reality for developing countries where healthcare services are not generally used by patients because of financial constraints.

The result shown by Schuck-Paim *et al.* [6] are interesting and well-documented but it seems to be incorrect to compare Antananarivo with an equatorial region as suggested by Alonso *et al.* in their letter. The climatic diversity in Madagascar is great with some equatorial climate areas and also some temperate climate areas as in the capital located at 1300 m above sea level. Furthermore, the country is one of the poorest countries and this is relevant to the economic gradient suggested by Schuck-Paim *et al.* [6] in explaining spatial heterogeneities.

In accordance with Alonso *et al.*'s statement 'the 2009 experience is of poor value to predict the incidence patterns, transmissibility and burden of a severe pandemic in the future', we particularly focus on low-income countries. Estimating the burden of influenza in low-income countries is difficult, laboratory confirmation of influenza infection is rarely conducted, so most influenza-related hospitalizations and deaths are not attributed to influenza. Now we must tackle the most crucial aspect of this topic, which is surveillance enhancement in order to improve the tools used and to provide the best data about seasonal influenza and its burden. Data from sub-Saharan Africa are insufficient to allow most countries to prioritize strategies for influenza prevention. Much needs to be done to increase awareness of the importance of influenza in low-income countries.

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