Over the past five years, we have seen changes – albeit modest – in the type of research that is funded and developed for patients in developing countries. Many of these changes stem from changing funding patterns of the public and philanthropic sectors, including shifts in funding for basic research and product development, and in funding mechanisms (for example, through PDPs). Changes in the share of funding by each of the three sectors, particularly the increased role of industry in funding neglected disease R&D, have also resulted in shifts in funding focus within and between diseases.

**DISCUSSION**

**PUBLIC FUNDING**

Public funding accounts for two-thirds of all neglected disease R&D funding, therefore public funding trends have a significant influence on what research is done.

The public sector was the top funding sector in each year of the survey, providing two-thirds (65.6%) of total funding across the five years. Despite a moderate dip in 2010, public funding remained by far the largest source of funding both before, during and after the global financial crisis.

Public funding has shifted substantially from product development to basic research.

In 2007, the public sector invested one-quarter (26.0%) of its funding into basic research but by 2010 this had increased to one-third (32.6%). Although there has been some stabilisation since, basic research still accounted for 31.2% of total public funding in 2011, with $124.2m more invested into basic research in 2011 than in 2007. Much of this shift has been due to the US NIH and the EC.

Public funding for PDPs has remained steady overall but with significant changes in funding sources.

Apart from a dip in 2008, overall public funding for PDPs has remained relatively constant over the past five years, at an average of a little over $200m per year. However, there have been important shifts in public funding sources, with significant decreases in funding from aid agencies, offset by increased funding from science & technology (S&T) agencies.

Aid agency funding for PDPs dropped by nearly 15% between 2009 and 2011 (down $25.3m, -13.3%), from a peak of $190.1m in 2009 to $164.8m in 2011. Reductions were widespread, with all aid agencies cutting their PDP funding in either 2010, 2011 or both years (although some of these drops were due to cyclical funding). In a potential early and offsetting trend, some key S&T agencies (including the US NIH and the EC) have increased support for PDPs since 2009, with their share of overall funding increasing substantially. S&T agencies accounted for only 2% to 4.5% of total public PDP funding between 2007 and 2009 but were providing 12.2% of total public PDP funding by 2011.

**PHILANTHROPIC FUNDING**

Since the global financial crisis, philanthropic funding has dropped significantly overall and for PDPs, driven by lower funding from the Gates Foundation.

The Gates Foundation has been the mainstay of philanthropic funding for the past five years, accounting for over $2.5bn and over 80% of global philanthropic funding for R&D during that time ($2.53bn, 83.3%). As a result, philanthropic funding trends largely reflect Gates Foundation funding trends.
Gates Foundation funding has dropped by over a quarter since 2008 (down $169.1m, -27.4%) as a result, their 2011 funding was at almost the same level as their 2007 funding. The Gates Foundation attributes these changes to cyclical funding and the uneven disbursement of large, multi-year grants. Gates Foundation funding for PDPs has mirrored this overall trend, dropping by over a third from its peak in 2008 (down $129.1m, -36.7%) – a particularly significant drop, given that the Gates Foundation provides over half (53.6%) of all PDP funding.

As a result of these reductions, overall philanthropic funding for neglected disease R&D has also dropped since 2008, as has overall philanthropic funding for PDPs. Although reductions from the Gates Foundation have been spread across many diseases and product areas, funding for kinetoplastids (including for drug development, diagnostics and basic research), HIV/AIDS microbicides and dengue vaccines has been particularly affected (excluding the large drop in funding for malaria vaccines in 2010, due to conclusion of grants for the RTS,S programme). As a result of these reductions, overall philanthropic funding for neglected disease R&D has also dropped since 2008, as has overall philanthropic funding for PDPs. Although reductions from the Gates Foundation have been spread across many diseases and product areas, funding for kinetoplastids (including for drug development, diagnostics and basic research), HIV/AIDS microbicides and dengue vaccines has been particularly affected (excluding the large drop in funding for malaria vaccines in 2010, due to conclusion of grants for the RTS,S programme).

Philanthropic funding plays a contributing rather than a dominant role overall

Despite providing sometimes very large sums, the philanthropic sector (unlike public or industry) is nevertheless not the dominant funder in any disease. Its contributions range from 6.4% of total funding for dengue, through to salmonella and HIV/AIDS (12.1% and 12.4% respectively), up to 23.5% for TB, and around 30% of total funding for most other diseases: diarrhoeal diseases (30.1%), helminths (30.7%), kinetoplastids (31.7%), malaria (32.4%), bacterial pneumonia & meningitis (35.0%).

However, philanthropic funding (and particularly Gates Foundation funding) plays a very specific role, often being focused on target products for a given disease. For instance, although the Gates Foundation provides only 26.3% of overall malaria funding, it has been – along with GSK – the primary funder of the RTS,S malaria vaccine. Similarly, through its investments into PDPs, the Foundation has been the key funder of the first paediatric anti-malarial medicine, and of new insecticide development to address emerging resistance that is threatening the effectiveness of indoor residual spraying and insecticide-treated bednets.

Philanthropic funding is heavily focused on product development

In 2007, the philanthropic sector invested almost three-quarters (74.4%) of its funding into product development and by 2011 this had increased to 79.1% with $25.1m more invested into product development in 2011 than in 2007. Much of this shift has been due to the Gates Foundation, which cut its basic research funding by almost two-thirds over the five survey years (from $58.3m in 2007 to $22.1m in 2011) while increasing its product development funding from $361.2m in 2007 to $380.1m in 2011. While the Wellcome Trust still invests more in basic research than product development, they also increased their relative investment in product development, with their basic research funding increasing by a half over the past five years (from $38.1m in 2007 to $56.8m in 2011) while their product development funding nearly doubled (from $14.0m to $25.9m) over the same time.

R&D funding for diseases with stronger commercial drivers has been very resilient

Three of the neglected diseases are ‘semi-commercial’ compared to other neglected diseases, and these three have the strongest industry support. Dengue and bacterial pneumonia & meningitis received nearly half their total five-year funding from industry (48.6% and 44.2% respectively) while TB received nearly a quarter from industry (23.4%). Even in the post-financial crisis years, from 2009 to 2011, funding for dengue and bacterial pneumonia & meningitis continued to grow (by 47.2% and 63.5% respectively) while funding for all other diseases was growing at less than 15% or in actual decline.
**Gates Foundation funding has dropped by over a quarter since 2008 (down $169.1m, -27.4%): as a result, their 2011 funding was at almost the same level as their 2007 funding. The Gates Foundation attributes these changes to cyclical funding and the uneven disbursement of large, multi-year grants. Gates Foundation funding for PDPs has mirrored this overall trend, dropping by over a third from its peak in 2008 (down $129.1m, -36.7%) – a particularly significant drop, given that the Gates Foundation provides over half (53.6%) of all PDP funding. As a result of these reductions, overall philanthropic funding for neglected disease R&D has also dropped since 2008, as has overall philanthropic funding for PDPs. Although reductions from the Gates Foundation have been spread across many diseases and product areas, funding for kinetoplastids (including for drug development, diagnostics and basic research), HIV/AIDS microbicides and dengue vaccines has been particularly affected (excluding the large drop in funding for malaria vaccines in 2010, due to conclusion of grants for the RTS,S programme).**

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Despite initial fears, the global financial crisis has not had a dramatic impact on overall neglected disease R&D funding.

Overall funding for neglected disease R&D has not declined significantly following the global financial crisis. Although public funding dipped moderately in 2010, it essentially stabilised in 2011, while decreases in philanthropic funding after 2008 (possibly due to cyclical grant funding) have been mostly offset by increased industry funding, which has been largely impervious to the effect of the global financial crisis.

It will be important to maintain a watching brief over the next few years, to monitor for both the anticipated cyclical increases in philanthropic funding and for the robustness of public funding. Should either of these fail, then funding stability is uncertain; particularly as industry funding is very uneven across diseases.

Differing investment patterns are favouring some neglected diseases over others

One result of changes in funding share over the past five years is that the overall mix of R&D funding has shifted towards the semi-commercial diseases (dengue, TB, and bacterial pneumonia & meningitis). These diseases have increased their share of global neglected disease R&D funding from 22.4% of total funding in 2008 to 28.0% in 2011.
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Differing investment patterns between sectors not only influence the volume of funding for a given disease but also the type of research funded. An average 70% of funding for the semi-commercial diseases is invested into product development, reflecting high industry involvement. In comparison, product development accounts for only around 50% of funding in the non-commercial diseases, with even further distinctions within this. For those non-commercial diseases where the philanthropic sector has a significant stake, average investment in product development is relatively high (around 60%). However, for non-commercial diseases that rely almost exclusively on the public sector, on average only 45% of funding is invested into product development. Where funding levels for a given disease are high this is less important, but if a disease has both low funding and a low focus on product development, outcomes are likely to be poor.

While the type of funder is a strong factor, other elements also influence the investment balance between product development and basic research. Some diseases, such as Buruli ulcer, have a greater need for basic research because their related epidemiology, pathology, immunology or means of transmission are still poorly understood. And it is clearly the role of public funders to fund basic research, an area which is of less interest to many philanthropic organisations and is outside the remit of industry. Nevertheless, it remains a fact that funding patterns do not always correlate strongly with need, and that lack of product development funding for diseases that rely on the public sector will reduce their chance of finding both preventives and cures for affected patients.

We are likely to see a product development crunch for non-commercial diseases in the coming years if public funding continues to shift towards basic research and philanthropic funding continues to decline.

PDPs appear to be diversifying their funding sources beyond philanthropy and aid agencies, but their funding streams remain tenuous

PDPs are highly dependent on the Gates Foundation and aid agencies, which provided almost 90% (53.6% and 35.0% respectively) of all PDP funding in the past five years. Both groups have steadily reduced their PDP funding in the past few years, although the Gates Foundation suggests that its reductions are chiefly cyclical and we may see a change in future years. Notably, PDPs appear to have moderately diversified their funding sources over recent years, with increases since 2009 from S&T agencies (the NIH and EC particularly) almost offsetting parallel funding cuts from aid agencies. Nevertheless, PDPs have still seen collective funding cuts of $71.9m (-14.1%) since 2009.