

How to Make the Research Agenda in the Health Sciences Less Distorted*

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ABSTRACT: A well-known problem in the health sciences is the distorted research agenda: the agenda features too little research that is tailored to the health problems of the poor, and it features too little research that supports the development of other solutions to health problems than medicines (e.g., change of lifestyle). This article analyzes these two sub-problems in more detail, and assesses several strategies to deal with them, resulting in some specific recommendations that indicate what governments should do to make the research agenda in the health sciences less distorted.

Keywords: distorted research agenda; neglected diseases; health sciences; medical sciences; biomedical research; pharmaceuticals; patents; intellectual property.

1. Introduction

In the past decades, science became more and more commercialized; more and more research is designed to serve specific commercial interests of for-profit companies, rather than to serve the epistemic interests of independent scientists or humanitarian interests of society. This trend has caused several problems, as well as tumult in the academic community. By far the most attention is paid to problems in biomedical research. This article focuses on two problems in the health sciences that can be linked to the commercialization of science: (1) the agenda in the health sciences features too little research that is tailored to the health problems of the poor,¹ and (2) the agenda in the health sciences features too little research that supports the development of other solutions to health problems than medicines (e.g., change of lifestyle).

After elucidating these two ways in which the research agenda is skewed (section 2), I discuss several strategies to reduce these two kinds of distortion (section 3 discusses several proposals on how to deal with the first kind of distortion, and section 4 presents and assesses strategies to tackle the second kind of distortion), resulting in some specific recommendations for governments. My recommendations are compared with earlier policy proposals (James Robert Brown, Thomas Pogge and Julian Reiss) in section 5, and I conclude in section 6.

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¹ Throughout the article, I use the term 'the poor' to describe populations in developing countries, and not 'poor' people in developed countries. The reason is that in many developed countries, medicine costs are partly or fully covered by a publicly funded healthcare system, which enables 'poor' people in these countries to purchase expensive medicines.



2. *Two kinds of distortion*

2.1. *Health problems of the poor*

A first way in which the research agenda is distorted in the health sciences is that health researchers pay disproportionately little attention to the health problems of the poor. While the health problems of the affluent, including their most trivial ailments such as acne and hair loss, are extensively investigated, life-threatening diseases that disproportionately affect the poor receive only little research attention (Carrier 2008, 219; Pogge 2009a, 81; Reiss & Kitcher 2009, 264). This problem is also known as the problem of neglected diseases. Often cited examples of neglected diseases are tuberculosis and malaria, but data on R&D investments suggest that other equally high-burden diseases, such as pneumonia and diarrhoeal illnesses, are even more neglected (Moran et al. 2009).

The problem of neglected diseases can in part be explained by the increase of industry support of biomedical research. The pharmaceutical industry is mainly interested in biomedical research that contributes to the development of products that can be sold with a large profit margin. As poor people cannot afford such expensive products, investigating their diseases is not very interesting from a business perspective, contrary to investigating the diseases of those who do have the money to afford them (WHO 2006, 28-29; Pogge 2009a, 81).

Of course, there are also diseases from which both the rich and the poor suffer (e.g., diabetes, cancer). The poor can then benefit from the solutions developed for the people with purchasing power. But this is not always the case: the poor often lack the resources to obtain the products developed for the rich. So research and development (R&D) for preventive, diagnostic and therapeutic tools that are adapted to the resources and social and economic conditions of the poor, is needed (WHO 2006, 28). However, for-profit pharmaceutical companies are only minimally interested in such R&D, as it does not provide the large profit margin they seek.

But the increasing industry support of biomedical research is only part of the explanation. Public R&D funds go, just as private R&D funds, primarily to research on the health problems of the rich. This is because public R&D funds of high-income countries, which have the largest R&D budgets at their disposal, are primarily allocated to research that is tailored to their own health issues, rather than to the health issues of middle- and low-income countries. As the World Health Organization (WHO) has put it:

The significant fact about public funding of R&D is that its focus is predominantly shaped by domestic priorities. Thus, the priorities for public sector R&D funding in developed countries will necessarily be shaped by their own disease burden (mainly Type I diseases and HIV/AIDS), and on finding solutions that reflect the resources they have available for new methods of diagnosis, prevention and treatment. Although accurate figures are hard to come by, the global imbalance in publicly funded research in relation to the health needs of developing countries is likely to follow the same trends as the global imbalance in private funding driven by market forces. (WHO 2006, 59)

2.2. *Alternative solutions to health problems*

A second way in which the research agenda is distorted in the health sciences is that the agenda is skewed towards R&D for medicines. While R&D for medicines is extensively supported, few resources are allocated to research that supports the development of other solutions to health problems. Solutions for which research funding is hard to obtain, are: diets, exercise schemes, guidelines on how to avoid being infected by a certain disease, measures to reduce pollution, measures to eliminate social disparities in access to proper nutrition, decent housing, and medical care, measures to eliminate exploitation and unhealthy working conditions, etc. Research funding is hard to obtain for such solutions because they are not commercially interesting (also see Brown 2008a, 2008b; De Vreese, Weber & Van Bouwel 2010).

Distortion towards R&D for medicines seems mainly due to the fact that a lot of health research is supported by industry. In general, for-profit companies only invest in health research if this has high returns. Therefore, it is easier to find industry funding for research that holds out prospects of a lucrative product, that is, R&D for medicines that can be sold to people with sufficient purchasing power, than for research that is not commercially promising. But the problem is not restricted to industry funded research. The Bayh-Dole Act, which has been enacted by the United States in 1980, permits government funded agencies, such as universities, to obtain patents on products that are developed using federal grant money (Siepmann 2004, 209; WHO 2006, 38; Patino 2009, 139). Other countries have adopted similar legislation (Siepmann 2004, 220-224; Mowery & Sampat 2005, 123). These patents enable government funded agencies to make money on the basis of the products they develop. As such, government funded agencies are, just as for-profit companies, stimulated to develop lucrative products instead of solutions such as lifestyle changes or social measures.

3. *Health problems of the poor*

3.1. *Pull funding*

One strategy to promote research that is tailored to the health problems of the poor is to establish a prize fund that is used to reward companies that develop a medicine for a neglected disease.² For-profit companies will anticipate these prizes and invest in neglected-disease research. There are several ways in which this strategy could be implemented. The first is an Advance Market Commitment (AMC) for a neglected-disease medicine. The idea is that a prize fund is committed in advance to make payments to any company that can develop and sell a qualifying medicine for a certain neglected disease. To qualify, the medicine has to meet predetermined standards of efficacy and safety. The payments are payments per unit, which means that a company

² A neglected disease can be defined as a disease “that multinational pharmaceutical companies ignore on the grounds that, however many potential buyers there might be for a future drug, the overall revenue accruing would be too small to meet the constraints of profitability” (Reiss & Kitcher 2009, 265).

gets money from the fund for every unit of the medicine it sells. Once the prize fund is empty, the AMC is finished.³

A second way in which prize money can stimulate pharmaceutical companies to develop medicines for neglected diseases, is by means of a Health Impact Fund (HIF) that supplements the existing market system. The idea is that a government-supported prize fund is used to reward owners of patents on medicines on the basis of the impact of these medicines on global health (measured in, e.g., disability-adjusted life years). The more a medicine reduces the global burden of disease, the more money its patent holder receives from the HIF (Hollis 2008; Hollis & Pogge 2008; Pogge 2005, 2007a, 2007b, 2009a, 2009b). As neglected diseases constitute a considerable part of the global burden of disease, developing medicines for these diseases would be a promising strategy to claim payments from the HIF.

The main problem with prizes to stimulate neglected-disease research is that they will only stimulate pharmaceutical companies to invest in R&D for medicines to treat neglected diseases if they make such R&D projects at least as profitable as the projects currently pursued, that is, R&D projects for products that sell in affluent countries. Since the profits from the latter projects are extremely high (in 2008, the pharmaceutical industry had a profit margin of 19.3% of revenues),⁴ this means that the prizes would have to be high as well (also see Reiss & Kitcher 2009, 274; Reiss 2010, 439). This is problematic because the public (indirectly) pays for these prizes, and because there is, I believe, an alternative way to promote neglected-disease research that requires less money from the public (see 3.3).

Reiss & Kitcher (2009) think this problem may be solved by reducing the profit margin of the pharmaceutical industry (e.g., by reducing patent duration). Less prize money would then be needed for the profits from neglected-disease projects to match the profits from the projects currently pursued. There may, however, be a dilemma: either the average profit margin of the pharmaceutical industry would not be substantially reduced, so that the prize money for neglected-disease research would still have to be very high, or the average profit margin and the prize money would be so low that the effect is not that private investors invest more in neglected-disease research, but rather that they are chased away to other, more profitable sectors than the pharmaceutical sector. Empirical research should reveal whether this dilemma actually occurs in practice.

I would also like to stress that pull funding can be used for more than to stimulate the development of medicines for neglected diseases. We can also use prize money to reward, and thus stimulate, the development of other instruments that can help us solve poor people's health problems, such as diagnostic tools, measures to reduce pol-

³ This description is based on Hollis (2008, 126). Hollis does not favor AMCs, but he does offer the most comprehensive description of the underlying idea I think. AMCs are proposed and defended by Kremer & Glennerster (2004). For an example of an AMC, and the difficulties that could arise, see Light (2011).

⁴ See <http://money.cnn.com/magazines/fortune/fortune500/2009/performers/industries/profits/> [Accessed on Sep. 5, 2011]

lution, measures to eliminate social disparities in access to proper nutrition, decent housing, and medical care, measures to eliminate exploitation and unhealthy working conditions, etc. But the aforementioned problem of pull funding is relevant in this context as well: artificially high prizes may be required to attract private investors.

3.2. *Push funding*

As pull funding may require a lot of money from the public to stimulate research that is tailored to the health problems of the poor, push funding may be a more promising strategy to promote such research. Reiss & Kitcher (2009) and Reiss (2010) propose the establishment of an institute for global health that is analogous to the U.S. National Institutes of Health (NIH), but committed to global health issues. What can we expect from such Global Institutes of Health (GIH)?

According to the website of the NIH, “[m]ore than 80% of the NIH’s funding is awarded through almost 50,000 competitive grants to more than 325,000 researchers at over 3,000 universities, medical schools, and other research institutions in every state and around the world.”⁵ Since the GIH are analogous to the NIH, we can expect most of the GIH’s funding to be awarded through competitive grants as well. As GIH grants will primarily be used for research that aims at the promotion of health in developing countries, the problem that too few resources are allocated to such research is solved, or at least mitigated.

An important advantage of research grants is that the public does not have to pay for high profits for private investors. One could remark that push funding implies that public money is allocated before the research is conducted or during research, while pull funding entails that public money is spent after research is finished. The fact that the government has to invest earlier in the case of push funding comes with a cost. Assume that the government gets the money for push funding by issuing government bonds. After research is finished, the government would not only have to reimburse the money it borrowed to fund research, but also interest. The interest rate of government bonds is, however, substantially lower than the average profit margin of the pharmaceutical industry. Therefore, push funding requires less money from the public than pull funding.

But just as prizes, research grants are not entirely trouble-free. Let me sum up some problems identified by Hollis & Pogge (2008). A first problem is that the financial incentives of employees of granting agencies to select the projects that are most likely to result in valuable innovation are relatively weak. For a for-profit company, spending less money on unsuccessful projects leads to higher profits, and its employees will financially benefit from this. Such a financial incentive is absent in granting agencies; employees of such agencies do not profit from selecting the most successful projects. Personal research interests, familiarity with the applicants and political factors are then more likely to influence decisions on which projects are funded, which

⁵ See <http://www.nih.gov/about/budget.htm>. [Accessed on Sep. 5, 2011]

could lead to resources not being allocated to the projects with the greatest health impact (Hollis & Pogge 2008, 101-102).

Secondly, the financial incentives of innovators to finish their research and translate their findings into health outcomes (for medicines, this is done by conducting clinical trials, marketing the medicine to physicians and distributing it to patients) are relatively weak. For a for-profit company, bringing a product to market is usually required to recover its investments and make a profit, and this incentive is sufficient to get the company to support expensive clinical trials, marketing activities and distribution to patients. Such a strong financial incentive is usually absent for recipients of research grants (Hollis & Pogge 2008, 102).

A third problem is that research grants do not guarantee that the medicines developed through the research granted are accessible to the poor. The medicines developed through publicly funded research can still be sold at high monopoly prices, hindering access for the poor. Pull mechanisms such as AMCs and the HIF, on the other hand, offer incentives to make medicines accessible to as much people as possible (Hollis & Pogge 2008, 102-103).

Fourthly, direct funding of research may lack stability over the long term, which could cause the termination of research before it is completed (Hollis & Pogge 2008, 103). I do not, however, consider this a comparative disadvantage of push funding, since it is, in my opinion, a problem for pull funding as well.

Hollis & Pogge (2008, 101) also identify a fifth problem. They state that a granting agency usually has incomplete information about the research proposals submitted to the agency. Accordingly, it is hard for a granting agency to estimate the probability that the projects proposed will result in valuable innovation. This difficulty may cause inefficient allocation of funding: the projects that are most likely to result in valuable innovation may not get funded, while projects with a lower probability of success do get funded.

I think, however, that this objection is misleading. To rebut it, we should distinguish two phases of project selection: first, researchers decide which projects they submit to the granting agency, and second, the granting agency decides which projects to fund. The problem of incomplete information is only a problem for the latter decision, in which granting agencies “tend to rely heavily on the past research record of the investigator – in general, only those investigators who have been successful in the past will be supported in the future” (Hollis & Pogge 2008, 101). How is project selection in for-profit companies? Roughly stated, they first decide which researchers they hire, and then, these researchers decide which projects are pursued. In the first phase, for-profit companies rely, just as granting agencies, heavily on the past research record of the investigator. It seems, then, that decisions are made quite similarly in both cases; the order of the decisions is reversed, but the information used is basically the same. Therefore, stating that decision making in granting agencies is based on incomplete information while decision making in for-profit companies is based on complete information, is misleading.

3.3. *An alternative proposal*

So far, we have seen that neither prizes nor research grants are without problems. It seems that we have to choose: either the costs for the public are high because government money is used to finance high profits for private investors, or the health impact of the research funded is limited due to relatively weak financial incentives. I believe, however, that we can avoid both problems at the same time; the research funded can have the greatest health impact at a low cost for the public.

Before I explain how this might be possible, it should be noted that the aforementioned objections of Hollis & Pogge (2008) do not so much challenge the idea of government funding for health research as such, but rather the way in which public funds are usually distributed, that is, through research grants allocated by central granting agencies that do not substantially benefit from selecting the most successful projects. This leaves open the possibility that there are alternative ways in which government funds can be distributed and to which the objections under consideration do not apply.

I think the comparative disadvantages of research grants mentioned by Hollis & Pogge can be avoided by increasing government funding of not-for-profit non-governmental organizations that aim at promoting public health in the Third World, and more specifically, of those organizations that are most successful.⁶ Examples of such organizations are the Medicines for Malaria Venture (MMV), the TB Alliance, the Drugs for Neglected Diseases Initiative (DNDi), the Institute for OneWorld Health (iOWH), and the Special Programme for Research and Training in Tropical Diseases (TDR).⁷ These five organizations aim at the development of drugs for neglected diseases. They “do not conduct drug development themselves, that is, they do not have their own laboratories, manufacturing plant or distribution networks, although they may manage or conduct some aspects in house, for example regulatory work” (Moran et al. 2005, 32). Rather, these organizations “integrate the development process across multiple partners and/or subcontractors” (this role “is similar to the role played by multinational companies in a modular commercial pipeline”), and “act as a fund manager or resource allocator, sourcing philanthropic and public funds for neglected disease drug development, and channelling these funds to industry and public institutions for the ‘right’ kind of projects (‘right’ from a public health perspective)” (Moran et al. 2005, 32).

Consider DNDi as an example. DNDi is a non-profit R&D organization that aims primarily at the development of safe, effective and affordable drugs for patients suffering from the most neglected communicable diseases, such as human African trypan-

⁶ How the performance of these organizations should exactly be assessed, is a question for future research.

⁷ These organizations are usually referred to as public-private partnerships or PPPs. I prefer to use the term ‘not-for-profit non-governmental organizations’ because I would like to focus on the fact that they do not seek profits, and that they are not part of any government, rather than on the fact that they cooperate with industry groups. For doubts about the appropriateness of using the term ‘public-private partnership’, see Moran et al. (2005, 31).

nosomiasis (HAT), visceral leishmaniasis (VL), and Chagas disease. In 2003, it was founded by one humanitarian organization, Médecins Sans Frontières (MSF), one international research organization, TDR, and five public sector research organizations, the Kenya Medical Research Institute (KEMRI), the Indian Council of Medical Research (ICMR), the Ministry of Health of Malaysia (MOH), the Oswaldo Cruz Foundation (FIOCRUZ) from Brazil, and the Pasteur Institute from France (Pécoul 2004). It has the legal status of an independent, not-for-profit foundation in accordance with articles 80 ff. of the Swiss Civil Code. It is administered by a Board of Directors including a patient representative and nominees of MSF, KEMRI, ICMR, MOH, FIOCRUZ and the Pasteur Institute, and it is managed by an Executive Team consisting of (1) an Executive Director that is appointed by the Board of Directors, and (2) staff members appointed by this Executive Director (DNDi 2003).

DNDi is funded through grants, in-kind contributions and cash donations coming from governments, public institutions, foundations, non-governmental organizations, companies, individuals and other mechanisms. In 2010, it obtained approximately half of its funding from public sources (mainly from the governments of the United Kingdom, the Netherlands, Spain and France), with the other half coming from private sources (mainly from MSF and the Bill & Melinda Gates Foundation) (DNDi 2010). DNDi operates according to the virtual research mode, which means that most research is outsourced and actively managed by DNDi personnel experienced in different aspects of pharmaceutical development. DNDi identifies the R&D opportunities that are most promising to develop improved treatments for the targeted diseases, builds the full development plan, and finds and contracts the most appropriate partner(s) for each stage of the R&D process (DNDi 2007a).

That this model can work, is shown by the valuable innovations resulting from DNDi's efforts. In 2007, Artesunate-Amodiaquine Winthrop® (ASAQ), a non-patented fixed-dose antimalarial meeting the highest standard of quality, was launched as a result of an innovative partnership between DNDi and pharmaceutical giant sanofi-aventis. The project leading to this innovation, the FACT (Fixed-Dose Artesunate Combination Therapy) project, was operated under a grant from the European Commission's International Cooperation and Development (INCO-DEV) programme. One of the terms of the contract between DNDi and INCO-DEV was collaboration with an industrial partner for industrial validation, production and distribution. DNDi was able to keep with these terms; its negotiations led to a contract agreement with sanofi-aventis in 2004. This agreement stated that neither DNDi nor sanofi-aventis would take a patent covering ASAQ, that sanofi-aventis would supply ASAQ at cost to the public sector, to non-governmental organizations such as MSF, and to international organizations such as the WHO, and that, in exchange for the information and data that DNDi releases to the private sector, sanofi-aventis would pay 3% of net sales to DNDi for seven years after launch of the drug (which is used by DNDi to further reduce the price of ASAQ to the public sector). It should be noted that besides DNDi and sanofi-aventis, several other entities were involved in the development of ASAQ as well: academics from the University of Oxford and Mahidol University offered expert advice throughout the entire period of development; Phase I

trials were conducted at the University of Sains Malaysia; Phase III trials were performed by the Centre for Malaria Research in Burkina Faso (which is part of Burkina Faso's Ministry of Health) and publicly traded company Cardinal Health (France); etc. (Banerji & Pécoul 2007; DNDi 2007b; Pécoul et al. 2008).

The launch of ASAQ is not the only success of DNDi. Other accomplishments that DNDi made possible include the launch of a fixed-dose combination of Artesunate-Mefloquine (ASMQ) to treat malaria in 2008,⁸ and the launch of Nifurtimox-Eflornithine Combination Therapy (NECT), an improved treatment for stage 2 HAT, in 2009.⁹

Not-for-profit non-governmental organizations can also promote public health in developing countries by supporting other kinds of research than drug development. Aeras, the International AIDS Vaccine Initiative (IAVI) and the International Vaccine Institute (IVI) develop vaccines that can be used in the Third World; the International Partnership for Microbicides (IPM) develops microbicides to protect healthy people in developing countries from becoming infected with HIV during sex; and the Foundation for Innovative New Diagnostics (FINN) develops innovative and affordable diagnostic products for developing countries. An organization that is especially interesting in this context is the Program for Appropriate Technology in Health (PATH). PATH is an international non-profit organization that does not only support the development of products such as vaccines, diagnostic tests and contraceptive devices, but also supports social approaches to health problems. An example is the health-education street theater that C. Y. Gopinath organized for PATH in order to get the community to talk about health issues such as AIDS (Davidow 2005).

The costs for the public associated with a strategy based on not-for-profit non-governmental organizations may be lower than the costs for the public associated with pull funding. For pull funding to stimulate projects that are tailored to the health problems of the poor, it has to make such projects at least as profitable as alternative activities. This means that payments from the patient and from the government-supported prize fund do not only have to cover the expenses associated with such projects, but also high profits. The public does not have to pay for high profits if non-profit organizations tackle the health problems of the poor. (Again, the government may have to pay interests on the money it borrows to support non-profit organizations, but these interests are substantially lower than the average profits of the pharmaceutical industry.)

The aforementioned comparative disadvantages of research grants are avoided as well. Under my scheme, not-for-profit non-governmental organizations are stimulated to make sure that a research project is only approved if it is expected to result in valuable innovation, that research is finished, and that the results are translated into health outcomes in the Third World (which requires that the medicines developed are accessible to the poor). The less valuable innovation results from the research supported by such an organization, the more likely it is that governments and other funding sources

⁸ See <http://www.dndi.org/index.php/asmq.html?ids=3>. [Accessed on Sep. 5, 2011]

⁹ See <http://www.dndi.org/index.php/nect.html?ids=3>. [Accessed on Sep. 5, 2011]

reallocate funding to other, more successful organizations. If research is not finished, or if the results are not translated into third-world health outcomes, we can expect funding sources to cut funding as well. Organizations that are more successful are, on the other hand, more likely to attract additional funding and to flourish, which is beneficial to their employees (they do not lose their income, there is room for promotions, etc.).

One may object that the financial incentives at these organizations are still not as strong as the financial incentives at for-profit companies because there is no risk of losing one's investments and no opportunity to make a profit. That this difference between not-for-profit non-governmental organizations and for-profit pharmaceutical companies is less significant than it seems becomes clear once we take a look at the situations of those actually doing the work for modern for-profit pharmaceutical companies. These are usually not the private investors whose fate ranges from losing all their investments to making huge profits. Rather, they are employees who get paid even before products are developed and sold, and whose rewards for successfully bringing certain products to market are restricted to keeping or possibly increasing their income. It seems, then, that they are more or less in the same situation as those doing the work for not-for-profit non-governmental organizations; their financial incentives to perform well are comparable. The people with stronger financial interests in the company's success (the investors) are usually people that do not substantially contribute to this success; their tasks are restricted to deciding whether and how much to invest, and voting on matters such as mergers, takeovers, and who is in the company's board of directors. In the not-for-profit non-governmental organizations I support, these tasks are performed by governments (and possibly philanthropists) who do not seek profits, and who could, I think, perform these tasks just as adequately as profit seekers (but for considerably less money).

3.4. Some remarks

Before I turn to the third sub-problem, I would like to make three remarks. The first is that my scheme can supplement the existing system, in which basic research is publicly funded and mainly conducted at universities, and in which for-profit pharmaceutical companies support commercially interesting R&D. Although my scheme can be accompanied by a reform of this system (see below), such a reform is not required; the existing system can remain intact.

A second remark is that the arguments I offered in favor of my proposal are mainly speculative, which means that they do not enable us to definitely determine which policy option (prizes, research grants, or not-for-profit non-governmental organizations) is best. Empirical research is required for this: different policy options should be put into practice (initially at a small scale), and they should be compared on the basis of how well they solve the problem, their health impact and their cost for the public. But this does not imply that speculative arguments are worthless. Such arguments are important to determine which policy options are worth further empirical investigation. We should not empirically test every possible policy option we can think of, as this would lead to an enormous waste; only the policy options for which we have rea-

son to believe that they will have the best outcomes (those options from which we can expect, based on speculative discussions, that they will most substantially reduce distortion while having the greatest health impact at a minimal cost for the public), should be empirically tested. The discussion offered in 3.1-3.3 presents some speculative reasons to believe that the policy I proposed is the one with the best outcomes.

Some empirical research assessing the performance of not-for-profit non-governmental organizations has already been conducted. Moran et al. (2005) compare five not-for-profit non-governmental organizations aiming at neglected-disease drug development (MMV, the TB Alliance, DNDi, iOWH and TDR) with industry working alone and public groups working alone, using the following metrics: health value for developing country patients (safety, efficacy, suitability and affordability), level of innovation, capacity (ability to make drugs), development times, cost and cost-efficiency. The study shows that not-for-profit non-governmental organizations perform better than industry working alone and public groups working alone on most metrics used. It should, however, be noted that Moran et al. (2005) have limited data on primarily public drug development, since this is rare. We should also distinguish industry-alone neglected-disease projects under the existing system from industry-alone neglected-disease projects under a system such as the one Thomas Pogge proposes (see 3.1); it is not because the former have, e.g., relatively low health value (compared to projects supported by not-for-profit non-governmental organizations), that the latter projects will have relatively low health value as well. So if we want to determine whether not-for-profit non-governmental organizations perform better than public groups working alone and than for-profit companies competing for prize money, more empirical research is required.

A third remark is that different policies may be appropriate for different kinds of research. For instance, it is possible that the best way to promote R&D for medicines for neglected diseases is by means of not-for-profit non-governmental organizations, while the best way to promote environmental approaches to third-world health problems is to establish an institute for global health that allocates grants to such research performed at the university. A reason for this could be that not-for-profit non-governmental organizations that develop medicines for neglected diseases can engage in commercial activities (they can sell the medicines developed), while environmental approaches are harder to combine with commercial activities. If we would then assume that not-for-profit non-governmental organizations can only efficiently achieve goals that can be combined with commercial activities,¹⁰ we could expect them to be good at developing medicines for neglected diseases, but bad at studying third-world health problems from an environmental perspective. Future empirical research is needed to determine which policies are most appropriate for which kinds of research. (It should be noted, however, that the arguments offered above suggest that a strategy based on not-for-profit non-governmental organizations is most appropriate in general, that is, with respect to all different kinds of research concerning poor people's health problems. More research is needed because these arguments are speculative.)

¹⁰ I do not endorse this assumption.

4. *Alternative solutions to health problems*

The second kind of distortion (distortion towards R&D for medicines) will be discussed in two parts: first with respect to the health problems of the poor, and next with respect to the health problems of the non-poor. Let us start with the health problems of the poor. In the previous section, I proposed to increase public funding of not-for-profit non-governmental organizations that deal with these problems. In order to avoid that such organizations only support R&D for medicines, governments can demand that they spend a certain percentage of their resources on alternative approaches to health problems (e.g., social or environmental approaches) in exchange for funding. Another, maybe more simple strategy is to allocate funding to organizations that already pay significant attention to such alternative approaches, such as PATH. Note that the more governments use the latter funding strategy, the stronger the incentive for organizations to pay significant attention to alternative approaches to health problems (assumed that they want to claim government funding).

Since I believe the best way to promote research concerning poor people's health problems is by increasing public support of not-for-profit non-governmental organizations that aim at tackling these problems (see section 3), I think adopting one or both of these strategies is sufficient to make sure that a sufficient percentage of the research concerning poor people's health problems focuses on other solutions than medicines. But I also left open the possibility that other strategies are more cost-effective at tackling the health problems of the poor (future empirical research is needed to exclude this possibility). Therefore, I would like to mention that there are also other ways to promote research that supports the development of alternative solutions to poor people's health problems: (part of the) prize money that is used to reward research that is tailored to the health problems of the poor can be dedicated more specifically to research on the effects of certain lifestyles, environmental approaches to health problems, etc., or the management agreement of an institute for global health can state that the institute should allocate specific percentages of its grants to such kinds of research.

Now, let us consider the third sub-problem with respect to the health problems of the non-poor. Possible strategies to make sure that enough research focuses on other solutions to their problems than medicines are: offering prize money to anyone who has developed such a solution, devoting more research grants to research that supports the development of such solutions, and supporting not-for-profit non-governmental organizations that aim at the development of such solutions. Since these strategies are analogous to the strategies to tackle the second sub-problem we discussed, most of the points made in the previous section can be transferred to this context. For instance, pull funding may be more costly to the public than necessary because payments from the public do not only have to cover the costs of research, but profits for private investors as well. Research grants only have to cover research costs. But the health impact of research that is supported by grants may be limited for any of the following reasons: employees of granting agencies have relatively weak financial incentives to select the projects with the highest health impact, and the recipients of

research grants have relatively weak financial incentives to finish research and translate the results into health outcomes.

An alternative strategy, which is analogous to the strategy I defended in the previous section, is to increase government funding of not-for-profit non-governmental organizations that aim at the development of other solutions to the health problems of the non-poor than medicines, and more specifically, of those organizations that are most successful. Examples of such organizations are the Henry J. Kaiser Family Foundation, the American Institute for Cancer Research, and Public Health Solutions. This scheme may, in the long term, be less costly to the public than pull funding since no public money is used to finance profits for private investors. It also avoids the aforementioned disadvantages of research grants: the persons who decide whether or not a research project is supported are stimulated to only approve a project if they expect it to result in knowledge that is useful for health development (contributing to health development is crucial if the organization wants to claim further funding, and further funding is beneficial to the organization's employees), and the organization is stimulated to make sure that research is finished and that the results are translated into health outcomes (again, this is important if the organization wants to claim further funding).

Despite the similarities between the proposal defended in the previous section and the one defended in this section, it is possible that not-for-profit non-governmental organizations are perfect for tackling poor people's health problems, while they are far from perfect for developing non-profitable solutions to health problems that mainly affect the wealthy, and vice versa. There is a huge difference between developing medicines for the third-world market on the one hand, and developing diets or exercise schemes for people in affluent countries on the other hand. Different kinds of environments and different kinds of research are involved. Although I have offered some arguments in favor of the claim that not-for-profit non-governmental organizations will be most cost-effective at both tackling poor people's health problems and developing other solutions to the health problems of the non-poor than medicines, further empirical research is needed to definitely determine which kinds of activities can be successfully performed by not-for-profit non-governmental organizations.

5. Comparison with earlier proposals

Before I conclude, let me compare my recommendations with earlier policy proposals. First, consider James Robert Brown's proposal. Brown offers the following recommendations:

Socialize research. Eliminate intellectual property rights in medicine. Make all funding public (including government and independent foundations and charities). (Brown 2008a, 762)

If all funding is made public, a lot of private funding for medical research would be lost. Therefore, public funding should be raised. According to Brown (2008b, 209-210), public funding should be adjusted to appropriate levels. He does not think that this means that current levels of funding (including both private and public funding) should be matched. He states that:

Drug companies claim that it costs on average more than \$800 million to bring a new drug to market. This, however, is a gross exaggeration. Something like \$100 million is a more reasonable estimate, since marketing costs (which they include) are not part of genuine research. Moreover, many research projects are for “me too” drugs, which bring little or no benefit to the public. When we take these factors into account, it is clear that we can maintain a very high level of research for considerably less public money. (Brown 2008b, 210)¹¹

Implementing Brown’s proposal is not sufficient to substantially reduce the first kind of distortion (the agenda features too little research that is tailored to the health problems of the poor). We have seen that the lack of interest in solving the health problems of the poor is not only a problem for industry funded research, but also for research that is publicly funded. Making all funding public will not significantly promote research concerning the health issues of the poor as long as public funding in high-income countries is primarily allocated to research that is tailored to their own disease burden. The needs of the poor living in middle- or low-income countries will remain more or less neglected. Hence, Brown’s scheme should be supplemented by a strategy to make sure that sufficient funding goes to research concerning the health issues of these countries. In 3.3, I have presented such a strategy.

Brown’s scheme does eliminate the second kind of distortion (the agenda features too little research that supports the development of other solutions to health problems than medicines). Let me explain this. The reason that publicly funded agencies (which are the only agencies conducting health research under Brown’s system) currently have to prefer R&D for medicines over alternative kinds of health research, is that R&D for medicines can lead to revenues from patents. If patents would be eliminated in medicine, as Brown recommends, this reason to prefer R&D for medicines over alternative kinds of health research would disappear. Accordingly, we can expect distortion towards R&D for medicines to disappear if Brown’s proposal would be implemented.

An advantage of Brown’s scheme is that it also deals with the epistemic failures of current biomedical research. Currently, for-profit companies often design and report research inadequately (e.g., compare a new product with inadequate doses of existing products, duplicate publication of positive findings and suppression of negative or non-significant findings) (Bekelman, Li & Gross 2003; Lexchin et al. 2003; Schott et al. 2010). Because these failures are typical for for-profit research, we can expect them to occur less frequently if all funding of medical research is made public and if intellectual property rights are eliminated in medicine, as Brown proposes. My scheme does not deal with the epistemic failures of current biomedical research. It should, however, be noted that it can be supplemented by a strategy that does, such as implementing Brown’s scheme, the strategy that Justin Biddle (2007) proposes (which will not be discussed in this article), or the strategy that Julian Reiss proposes (see below); my proposal does not preclude these policy options.

¹¹ I do not endorse this quotation. DiMasi, Hansen & Grabowski (2003) estimate that total R&D cost per new drug is \$802 million, and these costs do not include marketing costs. Although this may be more than is strictly needed to bring a new drug to market, Brown’s estimate of \$100 million seems far from the mark, as the mean cost of Phase III clinical trial is \$115.2 million for approved drugs (DiMasi, Hansen & Grabowski 2003, 171).

An important difference between my proposal and Brown's proposal is that my proposal does not *require* a radical departure from the existing system, in which a lot of biomedical research is pursued by for-profit pharmaceutical companies. The not-for-profit non-governmental organizations I support can supplement these companies; it is not required that these companies are replaced, nor that the existing intellectual property regime is eradicated. While the existing system is certainly not optimal, for-profit pharmaceutical companies do develop medicines and successfully bring them to market, resulting in better public health. If research performed at these companies would be replaced by, say, university research, and if intellectual property rights would be eliminated in medicine, the danger exists that useful medicines would no longer be successfully brought to market (after all, the Bayh-Dole Act was enacted in 1980 because the results of government-funded university research weren't transformed into useful products, see Reiss & Kitcher 2009, 280), and that the health outcomes that would be achieved under the existing system would no longer be achieved.¹² My proposal avoids this danger as profitable lines of biomedical research could be left to for-profit pharmaceutical companies. So implementing my proposal is less risky than implementing Brown's proposal; it does not put the merits of the existing system at risk.

Another research policy that does not imply a radical departure from the existing system, is the one proposed by Thomas Pogge. I already summarized Pogge's proposal in 3.1 (we should establish, as a supplement to the current market system, a Health Impact Fund that is used to reward owners of patents on medicines proportional to the impact of these medicines on global health), and argued that it may be more costly to the public than necessary. Pogge's scheme implies that public money is used to finance high profits for the pharmaceutical industry, and such expenses are avoided under the scheme I proposed. It should also be noted that implementing Pogge's scheme would not reduce distortion towards R&D for medicines (Pogge does not claim that it would), but only distortion towards research on the health issues of the rich, and that it would solve the latter problem in a non-optimal way. Implementing Pogge's proposal would only stimulate R&D for medicines, since only patentees of medicines are eligible for payments from the HIF. This is not optimal because alternative kinds of research (e.g., social or environmental approaches to poor people's health problems) are often more useful for health development in the Third World than R&D for medicines.

¹² Brown (2008a, 763-764) provides an argument for the claim that implementing his proposal will not lead to inefficiency, but this argument is not convincing, as is shown in De Winter (forthcoming).

Finally, consider Julian Reiss's (2010) proposal. It consists of five recommendations:¹³

- (1) Patent duration and/or breadth¹⁴ should be reduced;
- (2) Clinical trials should be run by an independent body committed to neutral hypothesis testing and overlooked by a board whose members represent different stakeholders;
- (3) Drugs should only be approved if they are better than all existing therapies, including non-medical options;
- (4) Research into neglected diseases should be stimulated by establishing Global Institutes of Health (in analogy with the U.S. National Institutes of Health but committed to global health issues), by advance purchase commitments (APCs), by awards for research into neglected diseases and/or by tax breaks for such research;
- (5) Socially harmful practices such as direct-to-customer advertising, industry sponsorship of continuing education events, advertising in medical journals, and payments from industry to doctors in the form of consulting fees, gifts, dinners or finders' fees should be prohibited, and these prohibitions should be enforced.

Reiss's proposal can be distinguished from my proposal in at least three respects. The first difference is that I have defended an alternative strategy to promote research into neglected diseases (see 3.3 of this article versus Reiss's fourth recommendation). The second difference is that Reiss's proposal includes recommendations on how to avoid several failures of current biomedical research that are not discussed in this paper (e.g., his second recommendation indicates how to eliminate the epistemic failures). My proposal does not include such recommendations. It should, however, be noted that it is compatible with the ones presented by Reiss (his first, second, third and fifth recommendation). And finally, my proposal explicitly puts the need to reduce distortion towards R&D for medicines, both with respect to the health problems of the poor and with respect to the health problems of the non-poor, on the agenda (see section 4), contrary to Reiss's proposal.

6. Conclusion

While there is wide agreement among philosophers of science that the research agenda in the health sciences is seriously skewed, and that governments of advanced countries should deal with this problem by increasing their investments in neglected lines of re-

¹³ Reiss groups the third and the fourth recommendation in one section, under the heading "Aligning commercial and (global) patients' incentives" (Reiss 2010, 444).

¹⁴ By breadth, Reiss means "the range of ideas that are considered worthy of patent protection" (Reiss 2010, 441). Patent breadth can be reduced by making things that are patentable under the existing regime (e.g., new uses of existing drugs, combinations of existing drugs) non-patentable.

search, it is not clear how these investments should exactly be allocated. Several investment strategies have been discussed in this article. I have argued that, in order to promote research that is currently insufficiently funded because it is not profitable enough (either because it concerns the health problems of people without sufficient purchasing power, or because it is not the kind of research that supports the development of medicines), governments should increase funding of not-for-profit non-governmental organizations that support such research. Non-profit organizations that aim at promoting public health in the Third World and non-profit organizations that aim at the development of other solutions to the health problems of the non-poor than medicines should get more financial support from governments of advanced countries. These governments should especially reward the most successful organizations with funding, creating competition for funding among non-profit organizations. This competition should guarantee that the organizations proceed as efficiently as possible and try to achieve the best health outcomes.

Further empirical research is needed to assess my recommendations. Do the changes I suggest actually make the agenda less distorted? Do they result in cost-effective public health development? Answering these questions requires empirical research. Another interesting topic for further research is a cost-benefit analysis of my scheme for other agents than the public, such as for-profit pharmaceutical companies, hospitals, insurance companies and universities. These issues are not addressed in this article, which means that it does not enable us to definitely determine whether the reforms I propose are actually the best strategies to deal with the distorted research agenda. The main virtues of this article lie elsewhere: (1) the article draws attention to some alternative strategies to deal with the distorted research agenda in the health sciences, and (2) it shows that these strategies are at least worth further (empirical) investigation (by offering speculative arguments for the claim that these strategies are more promising than alternative strategies).

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