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National funding for mental health research in Finland, France, Spain and the United Kingdom.

Running Head: National funding of Mental Health Research in EU

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Abstract

As part of the ROAMER project, we aimed at revealing the share of health research budgets dedicated to mental health, as well as on the amounts allocated to such research for four European countries. Finland, France, Spain and the United Kingdom national public and non-profit funding allocated to mental health research in 2011 were investigated using, when possible, bottom-up approaches. Specifics of the data collection varied from country to country. The total amount of public and private not for profit mental health research funding for Finland, France, Spain and the UK was €10·2, €84·8, €16·8, and €127·6 million, respectively. Charities accounted for a quarter of the funding in the UK and less than six per cent elsewhere. The share of health research dedicated to mental health ranged from 4·0% in the UK to 9·7% in Finland. When compared to the DALY attributable to mental disorders, Spain, France, Finland, and the UK invested respectively €12·5, €31·2, €39·5, and €48·7 per DALY. Among these European countries, there is an important gap between the level of mental health research funding and the economic and epidemiologic burden of mental disorders.

Keywords - mental health research; funding;

Introduction

Mental disorders are severe illnesses responsible for early mortality, as well as major disabilities, which have negative consequences on social, professional and family life (Hoedeman, 2012; Parks et al., 2006; Wahlbeck et al., 2011). In Europe the epidemiological burden is particularly high: it is estimated that each year 38% of the European population is affected by a mental disorder – without dementia – and in 2012 such disorders represented 12% of the overall disease burden in terms of disability-adjusted life years (DALYs) (WHO, 2013b; Wittchen et al., 2011). Moreover, the situation is expected to worsen over time and depressive disorders are predicted to be the leading cause of morbidity in Europe by 2020 (Directorate general for health and consumers, 2004; McCrone et al., 2008). In addition, mental disorders also represent a considerable economic burden, estimated at €700 million in Europe (European Union, Iceland, Norway and Switzerland) in 2010 by Olesen et al. (excluding dementias (F00-F09) and general learning disability (F70-79)), accounting for 4% to 13% of health expenditures (when including dementias) in 17 Western countries in 2004, and representing 4% of the gross national product in countries of the European Union (Directorate general for health and consumers, 2005; Knapp et al., 2009; Olesen et al., 2012).

Despite the sizable burden of mental disorders in Europe, there is ample opportunity to significantly reduce costs and improve treatment through evidence-based interventions, disorder prevention and mental health promotion (Knapp et al., 2011). The development of solutions based on research has been identified as a priority in the mental health field by the World Health Organization and this requires adequate levels of funding for mental health research (WHO, 2013a). Given the substantial social and economic burden that mental health problems pose, it can be argued that European countries are investing insufficiently in this field with significant variations between countries.

In this context, and as part of the European ROAMER project (Haro et al., 2014; Wykes et al., 2015b), our aim was to estimate and compare the level of public and private not-for-profit national funding for mental health research for the year 2011 in four European countries.

Experimental procedures

General method

Our study was carried out in four of the countries involved in the ROAMER project: Finland, France, Spain and the United Kingdom (UK). National public and non-profit sources of funding allocated to mental health research in 2011 were integrated into this study. Funding from commercial sources were not included as such data can be more difficult to obtain, and often cannot be apportioned between any given countries. Funding for mental health research was therefore defined as funding granted to institutions carrying out such research (core funding) and funding granted to specific projects with a mental health-related topic in their title and/or project summary (project-based grants), either by public funders or by non-profit organizations. The mental health-related topics were defined according to the mental health field covered by the ROAMER project in other parallel studies. Therefore, all mental disorders present in the chapter V of the International Classification of Diseases tenth revision (ICD-10) were included in this study (WHO, 2010), except nicotine addiction, intellectual disability and dementia, but including topics related to self-harm and suicide, as it has been recommended for estimating the true burden of mental disorders (Vigo et al., 2016). We considered research among all age groups including children and adolescents. We excluded grants aimed at academic training, clinical interventions and other health assistance if not associated with research.

Whenever possible, we used a bottom-up method to collect data on funding for mental health research as it is deemed more informative for policy making (Tarricone, 2006). We also collected the total amount of funding dedicated to health research, defined as all research related to any disease or medical specialty including biomedical and clinical research, for each considered funding body in order to determine the share of health research budget allocated to mental health.

Deviations from the general method were made for each country based on its organizational and funding specificities. These details are presented below.

Finland

In Finland, we adopted a bottom-up approach to determine funding. The main public and non-profit funders of generic health research, national, as well as regional, were identified. Funders specifically

targeting only one or some medical specialties, other than mental health, were excluded. The core funding provided to mental health research institutions, such as university hospital departments of psychiatry, as well as the listing of their grants allocated to research projects focusing on mental disorders in 2011 were retrieved in parallel to the total amount allocated to health research.

France

In France, all the main public and non-profit organizations funding health research at the national level were selected. As the accounting systems of public research institutions do not allow for direct identification of core funding dedicated to mental health research, we designed an alternative top-down method. Core funding was estimated by multiplying the total budget of each research institution, extracted from the French Public Finance Act, by the ratio of the number of psychiatry-related publications to the total number of publications focusing on health written by researchers belonging to this institution. This method relies on the hypothesis that the productivity of health researchers is similar in all fields, which was tested in a sensitivity analysis (20% higher and lower productivity for mental health researchers in comparison to other health researchers). A bottom-up method was used to estimate the amount of project-based grants and funding by non-profit organizations, which were contacted directly to obtain this information.

Spain

In Spain, we used a bottom-up method and identified all public and non-profit funding agencies for health research. Public funding in Spain comes either from the State or from the regional governments of the seventeen autonomous communities, and both types of funding were included. We collected the list of grants for research infrastructures, projects, personal fellowships and awards funded by each agency in the areas of health and mental health during 2011. For some public funders, only the research area (but not the project titles) associated with personal fellowships was available. In those cases, only fellowships from areas of biomedicine, clinical medicine, epidemiology and psychology were included in the study for the computation of the total amount of health research funding. Whenever possible, the amount devoted to mental health research for those fellowships was estimated by extrapolating the percentage of mental health versus health research funding obtained for other research grants of the same agency for which the

title of the project was provided. For the Ministry of Education, Culture and Sports the extrapolation was not possible (i.e. the percentage of mental health *vs.* health research was not available for any grant of that agency), therefore we assumed that the area of psychology covered exclusively mental health research projects.

United Kingdom

In the UK, a bottom-up method was also used. Funding allocated to mental health research by the public sector - in particular by medical and social science research councils and programs of the National Institutes of Health Research (NIHR), as well as non-profit medical research awarding bodies were extracted through detailed scrutiny of annual reports, grant lists and websites, and personal communication with research funding bodies in all four countries of the UK (England, Wales, Scotland and Northern Ireland). In the same fashion the websites, annual reports and grant programmes of major research charities, such as the Wellcome Trust, as well as the UK National Lottery (through its Big Lottery programme) were examined.

For the NIHR and the medical and social science research councils, only project-based funding was included.

Comparison between countries

We compared the level of mental health research funding between countries by using the total amount allocated to such research as well as the share of health research allocated to mental health. In addition, three other indicators that allowed us to take into account other countries' characteristics were considered: the total amount of funding for mental health research per capita, the total funding per DALY resulting from mental disorders (excluding idiopathic intellectual disability and dementias) and self-harm in 2012 (WHO, 2013b), and the percentage of the national gross domestic product (GDP) allocated to mental health research (The World Bank, 2011). Finally, we compared the share of health research invested in mental health with the burden of mental disorders over the total disease burden in terms of DALYs in each country in 2012 and the share of healthcare expenditures spent on mental health in all countries (Chevreul et al., 2013; Lafond et al., 2014; OECD, 2014; Oliva-Moreno et al., 2009).

UK pounds were converted into euros using an average 2011 conversion rate (Eurostat, 2011).

Results

Finland

The total amount of funding allocated by public and non-profit sources to mental health research in Finland was €10.2 million in 2011, of which 95.3% (€9.7 million) was funded by public agencies. During the same period, funding for health research amounted to €104.7 million of which 9.7% was allocated to mental health research (see Table 1 in supplementary material). This share reached 10.7% for public sources and was 3.4% for non-profit sources.

France

In France, the total amount of funding allocated to mental health research was €84.8 million in 2011, with the share of health research funding devoted to mental health representing 4.1%. Public sources were the main contributor (94.7% of the total funding - see Table 2 in supplementary material). Based on our sensitivity analysis on the productivity of mental health researchers, the total amount of funding for mental health research in France in 2011 was between €70.5 and €99.2 million (3.4% to 4.8% of total health research funding).

Spain

In Spain, €17 million were allocated to mental health research in 2011 of which 96.8% (€16.5 million) were provided by public agencies. 89% of public funding emanated from the national level bodies and 10.9% from the autonomous communities. The total share of health research expenditure allocated to mental health was 5.7% (5.9% for public sources and 2.3% for non-profit organizations). The State allocated 6.1% of its health research funding to mental health compared with 4.7% for funding from the autonomous communities (see Table 3 and Table 4 in supplementary material).

United Kingdom

In the UK, the total amount of funding dedicated to mental health research was €127.6 million of which 76.4% was from public agencies and research councils. Charities contributed €30.1 million to mental health research funding of which the Wellcome Trust contributed to €10.8 million. The total share of the

health research spending allocated to mental health was 4·0%. This represented 6·7% of total research spend by public agencies and only 1·7% of charity research spend (see Table 5 in supplementary material).

Comparison between countries

The UK and France had very similar shares of health research budgets allocated to mental health – around 4% – which were 2·4 times lower than in Finland, where it was the highest, and 1·4 times lower than in Spain. Mental health research funding per capita ranged from €0·4 in Spain to €2·0 in the UK while funding per DALY ranged from €12·7 in Spain to €48·7 in the UK. Spain and France allocated the lowest share of their GDP to mental health research: 0·001% and 0·003%, respectively (see Table 1). The UK stood out in having a much greater access to funding from non-profit organisations than in the other three countries. In all countries, the share of health research budget allocated to mental health was consistently lower than the share of DALYs resulting from mental disorders and, for France, Spain and the UK, it was also lower than the share of healthcare expenditures spent on those disorders (see Figure 1).

Discussion

In 2011, there were strong disparities in public and non-profit funding of mental health research between European countries: the share of health research funds dedicated to mental health in Finland was double that seen in France and the UK, countries with the lowest overall share of health research funds allocated to mental health. The differences between countries remained after adjusting for population size. In euros per capita, Finland and the UK invested in mental health research more than five times what Spain did and 1·5 times more than France. The observed differences also remained after adjusting on the size of the burden resulting from mental disorders: in euros spent per DALY, Spain presented the lowest figure and invested four times less than the UK, which presented the highest figure for this indicator. Finally, the differences between countries were still substantial after adjusting for GDP: in terms of share of GDP invested, the UK was above, investing four times more than Spain, which invested the least of its GDP in mental health research among all countries studied.

Public sources were consistently the main funders of mental health research but there was an important difference concerning private non-for-profit funding. In the UK, where there is a strong private non-for-

profit sector that raises money for research, as underlined by the UK Clinical Research Collaboration (2015), charities accounted for one quarter of the total funding invested in mental health research with a large contribution of the Wellcome Trust, while in the other countries such funding represented around 5% of the total investment.

For all countries considered, the share of all causes' DALYs due to mental disorders was superior to the share of health research dedicated to mental health. It was indeed almost four times superior in France, where the gap was the widest, while for Finland, which had the smallest difference, it was 1.7 times higher than the share of health research dedicated to such disorders.

Public and non-profit funding for mental health research seems to be particularly insufficient in Spain (in terms of total and per capita amounts of funding) and France (in terms of per capita amounts of funding). Advocacy for more investment in mental health research should be implemented in those countries. They could in particular benefit from the experience of the UK where non-profit organizations represents one of the levers to increase funding for mental health research. While mental health represents a modest 1.7% of all charitable research funds, it is substantial as the amount of funding for all health research from medical research charities is well over €1 billion in the UK. The figures found in the present study have to be compared with a recent mapping of global mental health research funding system performed by RAND Europe. This found that globally one third of mental health scientific papers acknowledging funders were reporting studies funded by charities, foundations and non-profits organizations while two thirds were funded by governments. Moreover, papers acknowledging funding from such non-profits organizations “tend to have a higher citation impact than those acknowledging other sectors” (Pollitt et al., 2016).

Even if comparison was limited by the scarcity of available studies, our results for the UK were in the same order of magnitude as findings from a recent report from the *MQ: Transforming mental health* charity, which estimated the investment in mental health research in the UK at €149 million per year (Kirtley, 2015). To our knowledge, no other scientific work has estimated such investment in France, Spain and Finland recently. However, in a previous study with a similar methodology, we estimated the mental health research funding for France, the UK and the USA in 2007 (Chevreul et al., 2012). Comparison with

the results of this study suggests an increase both in terms of total amount of funding and share of health research budget allocated to mental disorders in France over time (from €20.5 million (2%) in 2007 to 84.8 (4%) in 2011) while a slight decrease was observed in the UK (from €128.6 million (7%) in 2007 to €127.6 million (3.9%) in 2011). This observation in the UK was mainly due to exceptional, but transitional, additional funds being provided for mental health research in 2007 to compensate for a change in the way in which research infrastructure funds were allocated to NHS teaching hospitals. In addition, the share of health research funding allocated to mental health appeared to be higher in several developed countries outside of Europe than in three of the four European countries studied here. This share was indeed estimated at 16% in the USA in 2007, (Chevreul et al., 2012) 8% in Canada in 2006 (Schachar and Ickowicz, 2014), and 10% in Australia in 2009 (Christensen et al., 2011). These three countries also have strong private not-for-profit sources of funding in addition to relying on the public sector.

National funding for mental health research can also be complemented by funding from European research institutions. We previously estimated that under the 7th Framework Programme (FP7) that lasted from 2007 to 2013, the European Commission (EC) dedicated 5.4% of its sub-programme for health research (FP7 COOPERATION-HEALTH) to mental health. Finland, France, Spain and the UK received respectively €9.2, €16.4, €22.9 and €76.9 million of the total EC's investment in mental health research (€607.1 million) during the FP7. In terms of total amount received for mental health research from the EC, the UK is the leading beneficiary; in euro per inhabitant obtained from the EC for mental health research, Finland ranks 3rd behind Iceland and the Netherlands with €203 per 100 inhabitants, while the UK received €124 per 100 inhabitants (Hazo et al., 2016). These results could be strongly linked to what is observed at the national level: as Finland and the UK have relatively high national funding of mental health research, this might be helping the research units to be more competitive and therefore to obtain international grants. On the contrary, French and Spanish mental health researchers obtained only €25 and €31 respectively from the EC per 100 inhabitants: their relatively low levels of national funding might induce a vicious circle that makes the research units less prone to respond to calls for tender and *a fortiori* to obtain grants.

One factor that adds to the complexity of interpreting differences in mental health funding across Europe is that there are substantial differences between countries of the volume and predominant form of mental health research conducted and funded. As part of the ROAMER project, analyses were conducted into geographic variation in Europe of levels of research outputs measured in English-written peer-reviewed publications after correcting for differences in GDP (Haro et al., 2013; Wykes et al., 2015a). ROAMER analyses broke down mental health research into 5 areas of research: epidemiology, randomised controlled trials (RCTs), genetic and imaging studies, psychotherapy and stigma-related studies. Finland produced the greatest amount of epidemiology research and the UK produced the greatest amount of stigma-related research, they ranked high in other domains as well as in public mental health (Evans-Lacko et al., 2014; Forsman et al., 2014). Reversely, France was ranked low in comparison to other European countries and Spain was slightly higher across the board in research outputs.

The levels of total research output for France, Spain, Finland and the UK in the ROAMER analyses follow the respective size of the ratios of investment in mental health research to mental health DALYs in each country in the current study. This suggests that, out of all indicators of the level of funding in research, euro per DALY might be a useful metric to relate the investment in a field of health research with its epidemiological burden. It has already been used to determine an adequate level of research investment by several authors (Carter and Nguyen, 2012; Christensen et al., 2011; Nutt and Goodwin, 2011). In this perspective, in 2009, the Australian National Health and Medical Research Council invested €108 per DALY attributable to mental disorders, that is double what the UK spent per DALY attributable to mental disorders in 2011 (Christensen et al., 2011). Similarly, in 2012, the US National Institute for Mental Health invested €74.5 per DALYs (Insel, 2015; WHO, 2013b), which represented 1.5 to six times more than the four European countries considered in this study.

We chose to estimate the burden of mental disorders and self-harm in terms of DALYs in this study but it is worth mentioning that mental disorders were also responsible for between 23 and 29% of all years lived with disabilities (YLD) in the four countries considered here. By contrast, such disorders were only responsible for 3 to 8% of all years of life lost (YLL). This might partially explain why mental health receives less research investment, political support still suffers from stigmatisation compared to medical

conditions responsible for fewer YLD but more YLL, such as cancers or cardiovascular diseases. However, it is known that people living with mental disorders have poorer general health compared with the rest of the population, their somatic diseases are also undertreated and, as a result, their life expectancy is far lower (Chang et al., 2011; Fleischhacker et al., 2008; Harris and Barraclough, 1998). It is certainly the case that years of life lost due to mental disorders are underestimated by the way in which burden of disease is calculated (Whiteford et al., 2013).

Furthermore, the share of health research invested in mental health does not match the economic burden resulting from mental disorders; this share is already often inferior to the share of healthcare expenditures dedicated to mental health, which typically account for between a third and a half of the economic burden of mental disorders. Such disorders are associated with important direct non-medical costs (e.g. social services) and indirect costs (loss of productivity). Overall, they have been estimated at €461 billion in Europe in 2010 (Gustavsson et al., 2011), and at €37.8 billion in France, where the cost associated with loss of quality of life reached an additional €65.1 billion (Chevreul et al., 2013). In the UK, their economic and social costs per year have been estimated at €134 billion (Knapp et al., 2011). Moreover, mental disorders have been repeatedly found to be associated with an increase in other healthcare costs (Naylor Chris, 2012).

Such relatively low investment in mental health research is particularly paradoxical given that this field of research benefits from a satisfying rate of return on investment in terms of health benefits and increase in GDP which is estimated to be at least as high as in other fields of health research (Buxton et al., 2008; Glover et al., 2014). The estimated time lag between mental health research investment and its benefits for society (9 to 14 years) may partly explain why funders – who often adopt a short-term perspective – are reluctant to invest in such research. Despite this, the benefits of investing in mental health research today are potentially considerable as both the epidemiological and economic burden associated with psychiatric illnesses (also associated with related physical health problems) are expected to increase dramatically over time (McCrone et al., 2008; Murray and Lopez, 1997). Without any additional investment in research, European countries will not be able to guarantee sufficient and efficient care for people with mental

disorders in the future. This necessary increase in funding for mental health research should be implemented along prioritization of key issues.

Our results should be interpreted in the light of several limitations. First of all, we were not able to use exactly the same method in all countries. The specificities of the accounting system of French research institutions did not allow us to use a bottom-up method for the identification of core funding allocated to mental health research. In addition, in Spain, not all funding bodies of all autonomous communities provided us with their research funding data, which may lead to a slight underestimation of the overall funding allocated to mental health research in this country. However, as the missing data concerned only 9.8% of Spanish funding bodies, we estimate that the impact of the missing values was minor. We might have also underestimated mental health research spend in the UK because it was not possible to disentangle mental health research from other research fields when examining core funding allocated by the National Institute for Health Research and the Medical Research Council, so the funding of capital projects and research infrastructures coming from these institutions were in general not included in the analysis.

It should be mentioned as a limit that the share of health expenditures dedicated to mental health services and care have been found in the available literature and are from different years according to the countries: 2002 for Spain, 2007 for France, 2011/2012 for the UK and 2012 for Finland, which has to be kept in mind while comparing this indicator across countries.

Finally, it is regrettable that we could not compare our results with figures of other areas of health research such as cancer or cardiovascular that could be assumed more costly than mental health research. Indeed, all health research fields are not equal in costs and infrastructures requirements to set up, maintain and deliver. For instance, epidemiological research is costly to set up, but not so costly to continue or maintain. It is also made less costly by having access to good quality national health registers and databases. Similar considerations would apply for other kinds of research that require appropriate infrastructure to set up and manage, for instance large-scale genetic studies, imaging studies, and large RCTs.

However, the final set of high-level priorities for mental health research identified in the ROAMER roadmap in most cases recommended research advances that would require setting up infrastructures (Wykes et al., 2015a). This includes the ROAMER recommendations of preventative and lifespan research; investigating causal factors in mental disorders, including –omics and biomarkers (Schumann et al., 2014); developing and maintaining international interdisciplinary research networks; developing and implementing research using scientific technological advances, including large clinical trials (Emmelkamp et al., 2014; van der Feltz-Cornelis et al., 2014); personalised care, and systems-level research into mental health services. As these priorities require substantial infrastructures to be set up, they will require increased national and European funding for mental health (Wykes et al., 2015b).

Hence, despite those limitations, we were as accurate as possible in our estimations given the accounting systems of health research funding in the included countries. Our results underscore that mental health research is not funded equally across European countries at the national level and that the level of funding is consistently too low in comparison to both the expected rate of return on investment of such research and the epidemiological and economic burden incurred by mental disorders. The evidence presented here supports the need for urgent action across all of Europe to make the case for greater investment in mental health research by public and non-profit funders.

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National funding for mental health research in Finland, France, Spain and the United Kingdom.

Running Head: National funding of Mental Health Research in EU

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Abstract

As part of the ROAMER project, we aimed at revealing the share of health research budgets dedicated to mental health, as well as on the amounts allocated to such research for four European countries. Finland, France, Spain and the United Kingdom national public and non-profit funding allocated to mental health research in 2011 were investigated using, when possible, bottom-up approaches. Specifics of the data collection varied from country to country. The total amount of public and private not for profit mental health research funding for Finland, France, Spain and the UK was €10·2, €84·8, €16·8, and €127·6 million, respectively. Charities accounted for a quarter of the funding in the UK and less than six per cent elsewhere. The share of health research dedicated to mental health ranged from 4·0% in the UK to 9·7% in Finland. When compared to the DALY attributable to mental disorders, Spain, France, Finland, and the UK invested respectively €12·5, €31·2, €39·5, and €48·7 per DALY. Among these European countries, there is an important gap between the level of mental health research funding and the economic and epidemiologic burden of mental disorders.

Keywords - mental health research; funding;

Introduction

Mental disorders are severe illnesses responsible for early mortality, as well as major disabilities, which have negative consequences on social, professional and family life (Hoedeman, 2012; Parks et al., 2006; Wahlbeck et al., 2011). In Europe the epidemiological burden is particularly high: it is estimated that each year 38% of the European population is affected by a mental disorder – without dementia – and in 2012 such disorders represented 12% of the overall disease burden in terms of disability-adjusted life years (DALYs) (WHO, 2013b; Wittchen et al., 2011). Moreover, the situation is expected to worsen over time and depressive disorders are predicted to be the leading cause of morbidity in Europe by 2020 (Directorate general for health and consumers, 2004; McCrone et al., 2008). In addition, mental disorders also represent a considerable economic burden, estimated ~~to at~~ €700 million in Europe (European Union, Iceland, Norway and Switzerland) in 2010 by Olesen et al. (excluding dementias ~~and mental retardation~~), (F00-F09) and general learning disability (F70-79), accounting for 4% to 13% of health expenditures (when including dementias) in 17 Western countries in 2004, and representing 4% of the gross national product in countries of the European Union (Directorate general for health and consumers, 2005; Knapp et al., 2009; Olesen et al., 2012).

Despite the sizable burden of mental disorders in Europe, there is ample opportunity to significantly reduce costs and improve treatment through evidence-based interventions, ~~disorders~~disorder prevention and mental health promotion (Knapp et al., 2011). The development of solutions based on research has been identified as a priority in the mental health field by the World Health Organization and this requires adequate levels of funding for mental health research (WHO, 2013a). Given the substantial social and economic burden that mental health ~~illnesses~~problems pose, it can be argued that European countries are investing insufficiently in this field with significant variations between countries.

In this context, and as part of the European ROAMER project (Haro et al., 2014; Wykes et al., 2015b), our aim was to estimate and compare the level of public and private not-for-profit national funding for mental health research for the year 2011 in four European countries.

Experimental procedures

General method

Our study was carried out in four of the countries involved in the ROAMER project: Finland, France, Spain and the United Kingdom (UK). National public and non-profit sources of funding allocated to mental health research in 2011 were integrated into this study. Funding from commercial sources were not included as such data can be more difficult to obtain, and often cannot be apportioned between any given countries. Funding for mental health research was therefore defined as funding granted to institutions carrying out such research (core funding) and funding granted to specific projects with a mental health-related topic in their title and/or project summary (project-based grants), either by public funders or by non-profit organizations. The mental health-related topics were defined according to the mental health field covered by the ROAMER project in other parallel studies. Therefore, all mental disorders present in the chapter V of the International Classification of Diseases tenth revision (ICD-10) were included in this study (WHO, 2010), except nicotine addiction, intellectual disability and dementia, but including topics related to self-harm and suicide, as it has been recommended for estimating the true burden of mental disorders (Vigo et al., 2016). We considered research among all age groups including children and adolescents. We excluded grants aimed at academic training, clinical interventions and other health assistance if not associated with research.

Whenever possible, we used a bottom-up method to collect data on funding for mental health research as it is deemed more informative for policy making (Tarricone, 2006). We also collected the total amount of funding dedicated to health research, defined as all research related to any disease or medical specialty including biomedical and clinical research, for each considered funding body in order to determine the share of health research budget allocated to mental health.

Deviations from the general method were made for each country based on its organizational and funding specificities. These details are presented below.

Finland

In Finland, we adopted a bottom-up approach to determine funding. The main public and non-profit funders of generic health research, national, as well as regional, were identified. Funders specifically

targeting only one or some medical specialties, other than mental health, were excluded. The core funding provided to mental health research institutions, such as university hospital departments of psychiatry, as well as the listing of their grants allocated to research projects focusing on mental disorders in 2011 were retrieved in parallel to the total amount allocated to health research.

France

In France, all the main public and non-profit organizations funding health research at the national level were selected. As the accounting systems of public research institutions do not allow for direct identification of core funding dedicated to mental health research, we designed an alternative top-down method. Core funding was estimated by multiplying the total budget of each research institution, extracted from the French Public Finance Act, by the ratio of the number of psychiatry-related publications to the total number of publications focusing on health written by researchers belonging to this institution. This method relies on the hypothesis that the productivity of health researchers is similar in all fields, which was tested in a sensitivity analysis (20% higher and lower productivity for mental health researchers in comparison to other health researchers). A bottom-up method was used to estimate the amount of project-based grants and funding by non-profit organizations, which were contacted directly to obtain this information.

Spain

In Spain, we used a bottom-up method and identified all public and non-profit funding agencies for health research. Public funding in Spain comes either from the State or from the regional governments of the seventeen autonomous communities, and both types of funding were included. We collected the list of grants for research infrastructures, projects, personal fellowships and awards funded by each agency in the areas of health and mental health during 2011. For some public funders, only the research area (but not the project titles) associated with personal fellowships was available. In those cases, only fellowships from areas of biomedicine, clinical medicine, epidemiology and psychology were included in the study for the computation of the total amount of health research funding. Whenever possible, the amount devoted to mental health research for those fellowships was estimated by extrapolating the percentage of mental health versus health research funding obtained for other research grants of the same agency for which the

title of the project was provided. For the Ministry of Education, Culture and Sports the extrapolation was not possible (i.e. the percentage of mental health *vs.* health research was not available for any grant of that agency), therefore we assumed that the area of psychology covered exclusively mental health research projects.

United Kingdom

In the UK, a bottom-up method was also used. Funding allocated to mental health research by the public sector - in particular by medical and social science research councils and programs of the National Institutes of Health Research (NIHR), as well as non-profit medical research awarding bodies were extracted through detailed scrutiny of annual reports, grant lists and websites, and personal communication with research funding bodies in all four countries of the UK (England, Wales, Scotland and Northern Ireland). In the same fashion the websites, annual reports and grant programmes of major research charities, [such as the Wellcome Trust](#), as well as the UK National Lottery (through its Big Lottery programme) were examined.

For the NIHR and the medical and social science research councils, only project-based funding was included.

Comparison between countries

We compared the level of mental health research funding between countries by using the total amount allocated to such research as well as the share of health research allocated to mental health. In addition, three other indicators that allowed us to take into account other countries' characteristics were considered: the total amount of funding for mental health research per capita, the total funding per DALY resulting from mental disorders (excluding idiopathic intellectual disability and dementias) and self-harm in 2012 (WHO, 2013b), and the percentage of the national gross domestic product (GDP) allocated to mental health research (The World Bank, 2011). Finally, we compared the share of health research invested in mental health with the burden of mental disorders over the total disease burden in terms of DALYs in each country in 2012 and the share of healthcare expenditures spent on mental health in all countries (Chevreul et al., 2013; Lafond et al., 2014; OECD, 2014; Oliva-Moreno et al., 2009).

UK pounds were converted into euros using an average 2011 conversion rate (Eurostat, 2011).

Results

Finland

The total amount of funding allocated by public and non-profit sources to mental health research in Finland was €10.2 million in 2011, of which 95.3% (€9.7 million) was funded by public agencies. During the same period, funding for health research amounted to €104.7 million of which 9.7% was allocated to mental health research (see Table 1 in supplementary material). This share reached 10.7% for public sources and was 3.4% for non-profit sources.

France

In France, the total amount of funding allocated to mental health research was €84.8 million in 2011, with the share of health research funding devoted to mental health representing 4.1%. Public sources were the main contributor (94.7% of the total funding) (— see Table 2 in supplementary material). Based on our sensitivity analysis on the productivity of mental health researchers, the total amount of funding for mental health research in France in 2011 was between €70.5 and €99.2 million (3.4% to 4.8% of total health research funding).

Spain

In Spain, €17 million were allocated to mental health research in 2011 of which 96.8% (€16.5 million) were provided by public agencies. 89% of public funding emanated from the national level bodies and 10.9% from the autonomous communities. The total share of health research expenditure allocated to mental health was 5.7% (5.9% for public sources and 2.3% for non-profit organizations). The State allocated 6.1% of its health research funding to mental health compared with 4.7% for funding from the autonomous communities (see Table 3 and Table 4 in supplementary material).

United Kingdom

In the UK, the total amount of funding dedicated to mental health research was €127.6 million of which 76.4% was from public agencies and ~~the~~ research councils. Charities contributed €30.1 million to mental health research funding: of which the Wellcome Trust contributed to €10.8 million. The total share of the

health research spending allocated to mental health was 4·0%. This represented 6·7% of total research spend by public agencies and only 1·7% of charity research spend (see Table 5 in supplementary material).

Comparison between countries

The UK and France had very similar shares of health research budgets allocated to mental health – around 4% – which were 2·4 times lower than in Finland, where it was the highest, and 1·4 times lower than in Spain. Mental health research funding per capita ranged from €0·4 in Spain to €2·0 in the UK while funding per DALY ranged from €12·7 in Spain to €48·7 in the UK. Spain and France allocated the lowest share of their GDP to mental health research: 0·001% and 0·003%, respectively (see [Table 1](#)). The UK stood out in having a much greater access to funding from non-profit organisations than in the other three countries. In all countries, the share of health research budget allocated to mental health was consistently lower than the share of DALYs resulting from mental disorders and, for France, Spain and the UK, it was also lower than the share of healthcare expenditures spent on those disorders (see [Figure 1](#)).

Discussion

In 2011, there were strong disparities in public and non-profit funding of mental health research between European countries: the share of health research funds dedicated to mental health in Finland was double that seen in France and the UK, countries with the lowest overall share of health research funds allocated to mental health. The differences between countries remained after adjusting for population size. In euros per capita, Finland and the UK invested in mental health research more than five times what Spain did and 1·5 times more than France. ~~The higher level of funding in Finland and UK seems to pay off in terms of research publications. Two recent research mapping exercises found that Finland and UK were among the top European countries in the fields of public mental health and research on mental health stigma (Evans-Lacko et al.; Forsman et al., 2014).~~ The observed differences also remained after adjusting on the size of the burden resulting from mental disorders: in euros spent per DALY, Spain presented the lowest figure and invested four times less than the UK, which presented the highest figure for this indicator. Finally, the differences between countries were still substantial after adjusting for GDP: in terms of share

of GDP invested, the UK was above, investing four times more than Spain, which invested the least of its GDP in mental health research among all countries studied.

Public sources were consistently the main funders of mental health research but there was an important difference concerning ~~the charities: in~~ private non-for-profit funding. In the UK, where there is a ~~very~~ strong ~~charitable~~ private non-for-profit sector that raises money for research, as underlined by the UK Clinical Research Collaboration (2015), ~~they~~ charities accounted for one quarter of the total funding invested in mental health research with a large contribution of the Wellcome Trust, while in the other countries ~~they~~ such funding represented around 5% of the total investment.

For all countries considered, the share of all causes' DALYs due to mental disorders was superior to the share of health research dedicated to mental health. It was indeed almost four times superior in France, where the gap was the widest, while for Finland, which had the smallest difference, it was 1.7 times higher than the share of health research dedicated to such disorders.

Public and non-profit funding for mental health research seems to be particularly insufficient in Spain (in terms of total and per capita amounts of funding) and France (in terms of per capita amounts of funding). Advocacy for more investment in mental health research should be implemented in those countries. They could in particular benefit from the experience of the UK where non-profit organizations represents one of the levers to increase funding for mental health research. While mental health represents a modest 1.7% of all charitable research funds, it is substantial as the amount of funding for all health research from medical research charities is well over €1 billion in the UK. The figures found in the present study have to be compared with a recent mapping of global mental health research funding system performed by RAND Europe. This found that globally one third of mental health scientific papers acknowledging funders were reporting studies funded by charities, foundations and non-profits organizations while two thirds were funded by governments. Moreover, papers acknowledging funding from such non-profits organizations “tend to have a higher citation impact than those acknowledging other sectors” (Pollitt et al., 2016).

Even if comparison was limited by the scarcity of available studies, our results for the UK were in the same order of magnitude as findings from [a recent report from](#) the *MQ: Transforming mental health* charity, which estimated the investment in mental health research in the UK at €149 million per year (Kirtley, 2015). To our knowledge, no other scientific work [has](#) estimated such investment in France, Spain and Finland recently. However, in a previous study with a similar methodology, we estimated the mental health research funding for France, the UK and the USA in 2007 (Chevreul et al., 2012). Comparison with the results of this study suggests an increase both in terms of total amount of funding and share of health research budget allocated to mental disorders in France over time (from €20·5 million (2%) in 2007 to 84·8 (4%) in 2011) while a slight decrease was observed in the UK (from €128·6 million (7%) in 2007 to €127·6 million (3·9%) in 2011). This observation in the UK was mainly due to exceptional, but transitional, additional funds being provided for mental health research in 2007 to compensate for a change in the way in which research infrastructure funds were allocated to NHS teaching hospitals. In addition, the share of health research funding allocated to mental health appeared to be higher in several developed countries outside of Europe than in three of the four European countries studied here. This share was indeed estimated at 16% in the USA in 2007, (Chevreul et al., 2012) 8% in Canada in 2006 (Schachar and Ickowicz, 2014), and 10% in Australia in 2009 (Christensen et al., 2011). These three countries [also](#) have ~~also~~ strong [private](#) not-for-profit sources of funding in addition to relying on [the](#) public sector.

~~Taking into account disease burden is one of the consensual elements to determine an adequate level of research investment (Carter and Nguyen, 2012; Christensen et al., 2011; Nutt and Goodwin, 2011), overall, among the European countries considered in this study, the investment in mental health research remained particularly weak compared to the epidemiological burden incurred by psychiatric illnesses. In 2009, the Australian National Health and Medical Research Council invested €108 per DALY attributable to mental disorders, less than what was invested in cardiovascular diseases, arthritis, cancer, asthma and diabetes, but still double what the UK spent per DALY attributable to mental disorders in 2011 (Christensen et al., 2011). In 2012, the US National Institute for Mental Health invested €74·5 per DALYs (Insel, 2015; WHO, 2013b), which represented 1·5 to six times more than the four European countries considered in this study.~~

National funding for mental health research can also be complemented by funding from European research institutions. We previously estimated that under the 7th Framework Programme (FP7) that lasted from 2007 to 2013, the European Commission (EC) dedicated 5.4% of its sub-programme for health research (FP7 COOPERATION-HEALTH) to mental health. Finland, France, Spain and the UK received respectively €9.2, €16.4, €22.9 and €76.9 million of the total EC's investment in mental health research (€607.1 million) during the FP7. In terms of total amount received for mental health research from the EC, the UK is the leading beneficiary; in euro per inhabitant obtained from the EC for mental health research, Finland ~~is ranking~~ranked 3rd behind Iceland and the Netherlands with €203 per 100 inhabitants, while the UK received €124 per 100 inhabitants (Hazo et al., 2016). These results could be strongly linked to what is observed at the national level: as Finland and the UK have relatively high national funding of mental health research, this might be helping the research units to be more competitive and therefore to obtain international grants. On the contrary, French and Spanish mental health researchers obtained ~~respectively~~ only €25 and €31 respectively from the EC per 100 inhabitants: their relatively low levels of national funding might induce a vicious circle that makes the research units less prone to respond to calls for tender and *a fortiori* to obtain grants.

One factor that adds to the complexity of interpreting differences in mental health funding across Europe is that there are substantial differences between countries of the volume and predominant form of mental health research conducted and funded. As part of the ROAMER project, analyses were conducted into geographic variation in Europe of levels of research outputs measured in English-written peer-reviewed publications after correcting for differences in GDP (Haro et al., 2013; Wykes et al., 2015a). ROAMER analyses broke down mental health research into 5 areas of research: epidemiology, randomised controlled trials (RCTs), genetic and imaging studies, psychotherapy and stigma-related studies. Finland produced the greatest amount of epidemiology research and the UK produced the greatest amount of stigma-related research, they ranked high in other domains as well as in public mental health (Evans-Lacko et al., 2014; Forsman et al., 2014). Reversely, France was ranked low in comparison to other European countries and Spain was slightly higher across the board in research outputs.

The levels of total research output for France, Spain, Finland and the UK in the ROAMER analyses follow the respective size of the ratios of investment in mental health research to mental health DALYs in each country in the current study. This suggests that, out of all indicators of the level of funding in research, euro per DALY might be a useful metric to relate the investment in a field of health research with its epidemiological burden. It has already been used to determine an adequate level of research investment by several authors (Carter and Nguyen, 2012; Christensen et al., 2011; Nutt and Goodwin, 2011). In this perspective, in 2009, the Australian National Health and Medical Research Council invested €108 per DALY attributable to mental disorders, that is double what the UK spent per DALY attributable to mental disorders in 2011 (Christensen et al., 2011). Similarly, in 2012, the US National Institute for Mental Health invested €74.5 per DALYs (Insel, 2015; WHO, 2013b), which represented 1.5 to six times more than the four European countries considered in this study.

~~Public and non-profit funding for mental health research seems to be particularly insufficient in Spain (in terms of total and per capita amounts of funding) and France (in terms of per capita amounts of funding). Advocacy for more investment in mental health research should be implemented in those countries. They could in particular benefit from the experience of the UK where non-profit organizations represents one of the levers to increase funding for mental health research. While mental health represents a modest 4-7% of all charitable research funds, it is substantial as the amount of funding for all health research from medical research charities is well over €1 billion in the UK. The figures found in the present study have to be compared with a recent mapping of global mental health research funding system performed by the RAND Europe. It found that globally one third of mental health scientific papers acknowledging funders were reporting studies funded by charities, foundations and non-profits organizations while two thirds were funded by governments. Moreover papers acknowledging funding from such non-profits organizations “tend to have a higher citation impact than those acknowledging other sectors” (Pollitt et al., 2016).~~

We chose to estimate the burden of mental disorders and self-harm in terms of DALYs in this study but it is worth mentioning that mental disorders were also responsible for between 23 and 29% of all years lived with disabilities (YLD) in the four countries considered here. ~~Contrastingly~~By contrast, such disorders

were only responsible for 3 to 8% of all years of life lost (YLL) ~~in those countries~~. This might partially explain why mental health receives less research investment, political support ~~and~~ still suffers from stigmatisation compared to medical ~~affections~~ conditions responsible for ~~less~~ fewer YLD but more YLL, such as cancers or cardiovascular diseases. However, it is known that people living with mental disorders have ~~a lower~~ poorer general health compared with the rest of the population, their somatic diseases are also undertreated and, as a result, their life expectancy ~~can be~~ is far lower (Chang et al., 2011; Fleischhacker et al., 2008; Harris and Barraclough, 1998). It is certainly the case that years of life lost due to mental disorders are underestimated by the way in which burden of disease is calculated (Whiteford et al., 2013).

Furthermore, the share of health research invested in mental health does not match the economic burden resulting from mental disorders; this share is already often inferior to the share of healthcare expenditures dedicated to mental health, which typically account for between a third and a half of the economic burden of mental disorders. Such ~~illnesses~~ disorders are associated with important direct non-medical costs (e.g. social services) and indirect costs (loss of productivity). Overall, they have been estimated at €461 billion in Europe in 2010 (Gustavsson et al., 2011), and at €37.8 billion in France, where the cost associated with loss of quality of life reached an additional €65.1 billion (Chevreul et al., 2013). In the UK, their economic and social costs per year have been estimated at €134 billion (Knapp et al., 2011). Moreover, mental disorders have been repeatedly found to be associated with an increase in other healthcare costs (Naylor Chris, 2012).

Such relatively low investment in mental health research is particularly paradoxical given that this field of research benefits from a satisfying rate of return on investment in terms of health benefits and increase in GDP which is estimated to be at least as high as in other fields of health research (Buxton et al., 2008; Glover et al., 2014). The estimated time lag between mental health research investment and its benefits for society (9 to 14 years) may partly explain why funders – who often adopt a short-term perspective – are reluctant to invest in such research. Despite this ~~significant time lag~~, the benefits of investing in mental health research today are potentially considerable as both the epidemiological and economic burden associated with psychiatric illnesses (also associated with related physical health problems) are expected to increase dramatically over time (McCrone et al., 2008; Murray and Lopez, 1997). Without any additional

investment in research, European countries will not be able to guarantee sufficient and efficient care for people with mental disorders in the future. ~~Such~~This necessary increase in funding for mental health research should be implemented along prioritization of key issues. ~~The recommendations of the ROAMER project give practical guidelines on potential topics for mental health research that should be targeted by funding efforts in the next decade (Wykes et al., 2015).~~

Our results should be interpreted in the light of several limitations. First of all, we were not able to use exactly the same method in all countries. The specificities of the accounting system of French research institutions did not allow us to use a bottom-up method for the identification of core funding allocated to mental health research. In addition, in Spain, not all funding bodies of all autonomous communities provided us with their research funding data, which may lead to a slight underestimation of the overall funding allocated to mental health research in this country. However, as the missing data concerned only 9.8% of Spanish funding bodies, we estimate that the impact of the missing values was minor. We might have also underestimated mental health research spend in the UK because it was not possible to disentangle mental health research from other research fields when examining core funding allocated by the National Institute for Health Research and the Medical Research Council, so the funding of capital projects and research infrastructures coming from these institutions were in general not included in the analysis.

~~Finally, it~~It should be mentioned as a limit that the share of health expenditures dedicated to mental health services and care have been found in the available literature and are from different years according to the countries: 2002 for Spain, 2007 for France, 2011/2012 for the UK and 2012 for Finland, which has to be kept in mind while comparing this indicator across countries.

~~Despite~~Finally, it is regrettable that we could not compare our results with figures of other areas of health research such as cancer or cardiovascular that could be assumed more costly than mental health research. Indeed, all health research fields are not equal in costs and infrastructures requirements to set up, maintain and deliver. For instance, epidemiological research is costly to set up, but not so costly to continue or maintain. It is also made less costly by having access to good quality national health registers and databases. Similar considerations would apply for other kinds of research that require appropriate

infrastructure to set up and manage, for instance large-scale genetic studies, imaging studies, and large RCTs.

However, the final set of high-level priorities for mental health research identified in the ROAMER roadmap in most cases recommended research advances that would require setting up infrastructures (Wykes et al., 2015a). This includes the ROAMER recommendations of preventative and lifespan research; investigating causal factors in mental disorders, including –omics and biomarkers (Schumann et al., 2014); developing and maintaining international interdisciplinary research networks; developing and implementing research using scientific technological advances, including large clinical trials (Emmelkamp et al., 2014; van der Feltz-Cornelis et al., 2014); personalised care, and systems-level research into mental health services. As these priorities require substantial infrastructures to be set up, they will require increased national and European funding for mental health (Wykes et al., 2015b).

Hence, despite those limitations, we were as accurate as possible in our estimations given the accounting systems of health research funding in the included countries. Our results underscore that mental health research is not funded equally across European countries at the national level and that the level of funding is consistently too low in comparison to both the expected rate of return on investment of such research and the epidemiological and economic burden incurred by mental disorders. The evidence presented here supports the need for urgent action across all of Europe to make the case for greater investment in mental health research by public and non-profit funders.

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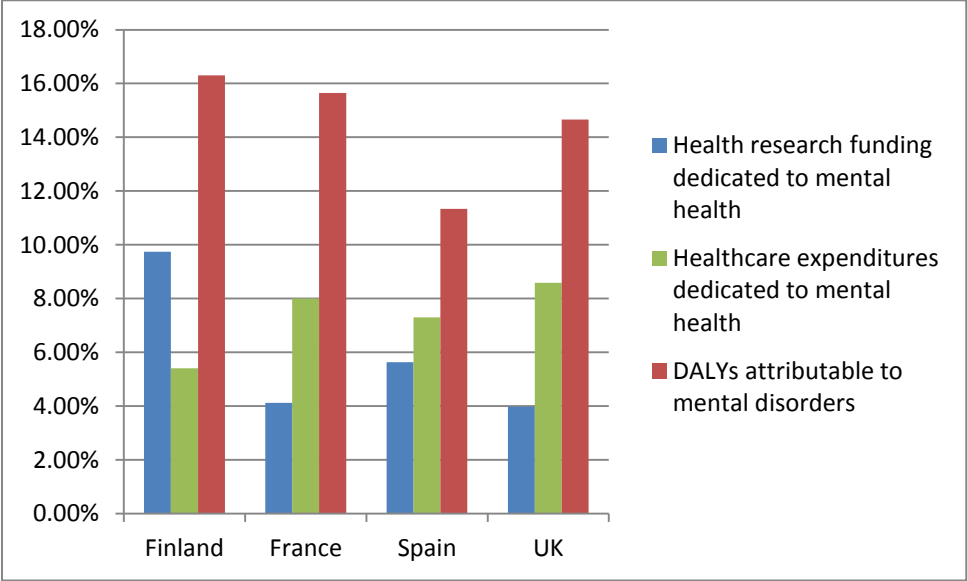
Table

Table 1. Comparison of mental health research funding between countries in 2011

Indicator	Finland	France	Spain	UK
Total public funding for mental health research (M€)	9.7	80.4	16.5	97.5
Total charitable funding for mental health research (M€)	0.5	4.5	0.5	30.1
Total funding for mental health research (M€)	10.2	84.8	17.0	127.6
Health research allocated to mental health (%)	9.7	4.1	5.7	4.0
Total funding per capita for mental health research (€ per capita)	1.9	1.3	0.4	2.0
Total funding per DALY (€ per DALY)	39.5	31.2	12.7	48.7
GDP allocated to mental health research (%)	0.0037	0.0030	0.0011	0.0049

Figure

Figure 1 Comparison of the share of health research funding allocated to mental health, the share of healthcare expenditures in mental health, and the share of DALYs attributable to mental disorders by country



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Contributions of authors

Jean-Baptiste Hazo, Coralie Gandré, Marion Leboyer, David McDaid, Carla Obradors-Tarrago, Kristian Wahlbeck and Josep Maria Haro contributed to the design of the overall study, coordinated and monitored data collection in their respective country and analysed and interpreted the data and wrote the present paper. Coralie Gandré, Maria Victoria Maliandi, A-La Park and Kristian Wahlbeck collected the data respectively in France, Spain, the UK and Finland. Til Wykes, Stefano Belli, Jim van Os and the Roamer Consortium added the perspectives of the final Roadmap and other Roamer work-packages thanks to its state-of-art and recommendations. Karine Chevreul led the conception of the design of the overall study. They all approve the final version of the paper and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of interest

All the authors declare no conflict of interests related to this study.

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Supp. material

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