The state of public and philanthropic investments in AMR R&D

The 2020 annual report of the Global AMR R&D Hub's Dynamic Dashboard

- November 2020 -

Global AMR R&D Hub

Berlin – Germany

https://globalamrhub.org

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Executive Summary

- The Dynamic Dashboard currently presents three galleries that show investments on human and animal health-related AMR R&D, the pipeline of human antibacterials in clinical development as well as incentives for developing human antibacterial therapeutics.
- The Dynamic Dashboard continues to evolve and expand.

Investment gallery

- The Dynamic Dashboard continuously collects and presents information on AMR R&D investments across the One Health spectrum. Currently, it presents information on investments since January 2017 from public and not-for profit private funders into AMR R&D related to human bacterial infections and animal pathogens. As at September 2020, a total of 7496 projects from 141 funders with a total investment of 5.6 billion USD were captured.
- Geographical coverage across all continents has been achieved, representing 34 countries and the European Union and continues to be improved. The Dynamic Dashboard will be expanded to the plant and environment One Health sectors in early 2021.
- Information captured in the Dynamic Dashboard indicates that public and philanthropic investment in AMR R&D is similar in 2017 and 2018 at about 1.4 billion USD per year.
- A significant amount of global AMR R&D investment occurs at the international level, through joint funding of initiatives, joint calls or through the investments of the European Union.
- Data averaged at the global level shows that most funding is directed towards basic research, followed by funding for R&D on therapeutics and support for operational and implementation research.
- In animal health the majority of investments are in livestock and poultry.
- The distribution of investments by public and philanthropic funders into AMR R&D across pathogens overall aligns well with the priority ranking of the bacteria on the priority lists developed by the WHO and the US CDC.
- *Mycobacterium* spp. has the highest investment for any single bacteria within the human sector.
- Four percent of the number of projects and 22% of the investment in R&D for human therapeutics is expended in the later, more expensive, stages of product development.

Pipeline

- Translation of the investment into new antibiotics in clinical development is not yet functioning optimally. The pipeline remains fragile, with low numbers and relatively weak innovativeness and with only about two fifths of the compounds in development or recently approved addressing some of the most critical pathogens.

Incentives

- The total amount of push funding for therapeutics development since 2017 captured in the Dynamic Dashboard amounts to estimates of the investment needed to bring one antibiotic from discovery to the market.
- Late-stage push support for the later, more expensive stages of therapeutic development, is concentrated in a few funders.
- Pull support, to overcome some of the economic challenges in therapeutic markets following approval remains *ad hoc*, small-scale and initiated by just a few countries globally.

Conclusion and next steps

- This is the first consolidation of national AMR-related R&D funding and a start to providing a comprehensive global picture. This first report provides a baseline, essentially representing two full years of data (2017 and 2018). Over time, more data will enable meaningful trend analysis.
- Based on the reporting and analysis presented here, linkages between funders will be the first priority for detailed analyses. In parallel, further analysis of push and pull incentives will be prioritised – and how the data on funding captured in the Dynamic Dashboard can support these efforts.
- The outcomes and resulting analysis will help to identify opportunities and gaps in AMR R&D and inform about progress in the AMR R&D field. The value of the consolidated data lies in these types of analyses to provide the evidence-base for policy makers.

The Board of Members of the Global AMR R&D Hub has developed recommendations based on this report The recommendations can be found on the Global AMR R&D Hub website at:

https://globalamrhub.org/wp-content/uploads/2020/11/RecommendationsG20.Nov2020web.pdf

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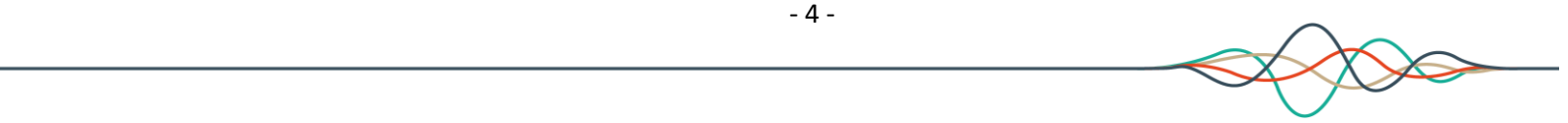
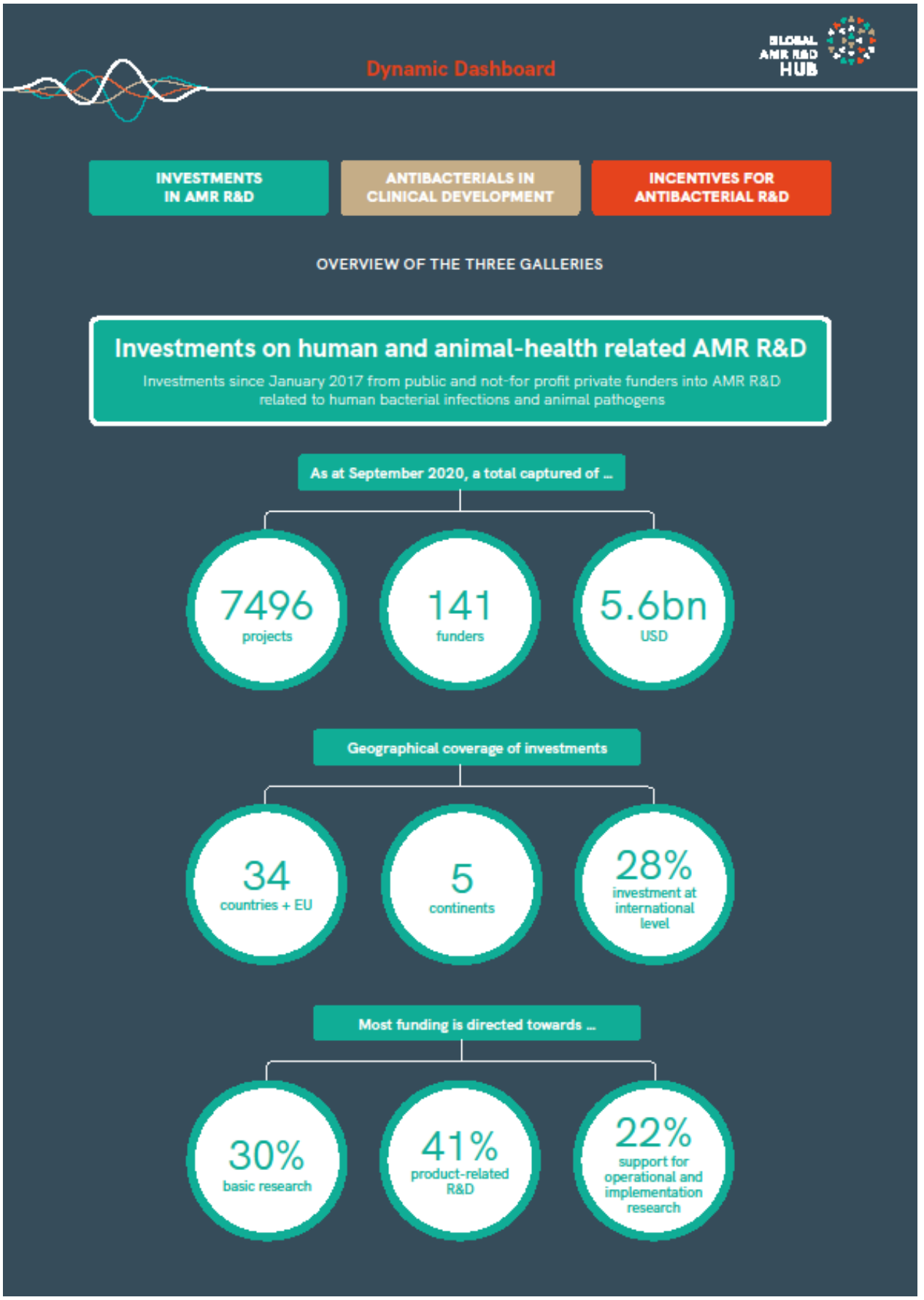



Dynamic Dashboard
GLOBAL AMR R&D HUB
INVESTMENTS IN AMR R&D
ANTIBACTERIALS IN CLINICAL DEVELOPMENT
INCENTIVES FOR ANTIBACTERIAL R&D
OVERVIEW OF THE THREE GALLERIES
Investments on human and animal-health related AMR R&D
Investments since January 2017 from public and not-for profit private funders into AMR R&D related to human bacterial infections and animal pathogens
As at September 2020, a total captured of ...
7496 projects
141 funders
5.6bn USD
Geographical coverage of investments
34 countries + EU
5 continents
28% investment at international level
Most funding is directed towards ...
30% basic research
41% product-related R&D
22% support for operational and implementation research

Pipeline of human antibacterials in clinical development

Remains fragile, with low numbers and relatively weak innovativeness and with only about two fifths of the compounds in development or recently approved addressing some of the most critical pathogens

Incentives for antibacterial R&D

Late-stage push incentives for the later, more expensive stages of therapeutic development, concentrated in a few funders.

Pull incentives remain *ad hoc*, small-scale and initiated by just a few countries globally.

Conclusion and next steps

First consolidation of national AMR-related R&D funding

Report provides a baseline, representing two full years of data (2017 and 2018).

The outcomes and resulting analysis will help to identify opportunities and gaps in AMR R&D and inform about progress in the AMR R&D field

Introduction

Antimicrobial resistance (AMR) represents a serious and growing threat worldwide. The number of infectious agents and in particular bacterial pathogens that have developed resistance to antimicrobials is increasing. Given the urgency of the situation there is a need for coordinated efforts in AMR research and development (R&D). Identifying duplication, recognizing and building on existing activities and promoting current work will help to ensure the most efficient use of efforts and resources.

The Global AMR R&D Hub was established following a call from G20 Leaders for a new international R&D collaboration hub to "maximise the impact of existing and new antimicrobial basic and clinical research initiatives as well as product development"[1]. Through the development of the Dynamic Dashboard the Global AMR R&D Hub presents the global landscape of AMR R&D in three 'galleries': investments in AMR R&D, the pipeline of antibacterials in clinical development and incentives for antibacterial R&D.

Caveats and limitations - methodology

Caveats and limitations as well as the methodology for developing the Dynamic Dashboard are described in Appendix 1.

The three galleries of the Global AMR R&D Hub's Dynamic Dashboard capture components of the research context supporting the effort to understand and combat the threat from AMR. As information is continually updated in all three galleries of the Dynamic Dashboard, this report is based on a snapshot of the information taken on 8 September 2020.

Investments

The investments in AMR R&D gallery of the Dynamic Dashboard reports on basic and applied research projects and investments from public and philanthropic funders. This information is intended for countries, foundations, organisations, initiatives and any policy- and decision makers to help set priorities and maximise the impact of resources invested in R&D to combat the AMR threat. The information also can be useful for researchers and companies as the knowledge about funded research projects provides an overview of research trends at an early stage.

Pipeline of antibacterials in clinical development

The Global AMR R&D Hub's Dynamic Dashboard also presents information on human antibacterial products in clinical development together with those products that have recently been approved for priority bacteria[2], tuberculosis and *Clostridioides difficile*.

Incentives human antibacterial therapeutics

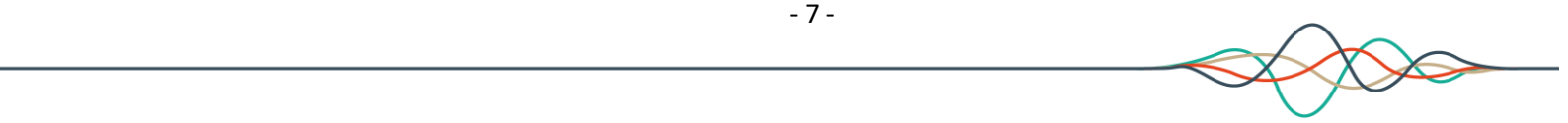
The incentives for antibacterial R&D gallery presents what is being done to fix the challenges hindering the development of, and access to, priority antibacterials for human health. The incentives gallery lists existing publicly-available information on incentives for developing antibacterials across the value chain, from early stages of discovery, through clinical development to market entry, access and signalling priorities.

The Dynamic Dashboard currently presents three galleries that show investments on human and animal-health related AMR R&D, the pipeline of human antibacterials in clinical development as well as incentives for developing human antibacterial therapeutics.

The Dynamic Dashboard continues to evolve and expand.

[1] https://www.consilium.europa.eu/media/23955/g20-hamburg-leaders_-communiqu%C3%A9.pdf

[2] This is not the Global AMR Hub priority bacteria list but the list of bacteria identified as priority pathogens by the WHO and used for the pipeline analysis, as well as the pathogens considered for the pipeline analysis carried out by the Pew Charitable Trusts (see https://globalamrhub.org/dynamic-dashboard/pipeline-gallery/)



Results

1. Investment gallery

Summary of information presented in the Dynamic Dashboard – all sectors

As at 8 September 2020, the information captured and presented in the Dynamic Dashboard is outlined in Table 1. To present AMR R&D information at a high level that is informative to the users of the Dynamic Dashboard, projects were categorised to the two One Health sectors currently represented, namely human and animal health. Some projects were assigned to both sectors and others to none of sectors. Also, research areas were defined (see below) and the table indicated whether projects were assigned to one or several of the defined research areas.

Table 1: Number of projects by research area, stratified whether one or multiple research areas were assigned

Sector	Projects one research area		Projects with multiple research areas		All	
	Investment (million USD)	Number of projects	Investment (million USD)	Number of projects	Investment (million USD)	Number of projects
Animal	301	465	143	100	444	565
Cross Sector	68	145	16	24	84	169
Human	4,432	6,217	573	325	5,005	6,542
Not specified	103	219	0.2	1	103	220
Total	**4,904**	**7,046**	**732**	**450**	**5,636**	**7,496**

Table 1 shows how many projects in the different sectors address one research area or more than one research area. Overall, this represents 6% of projects, which represent close to 10% of the investments made overall.

Data capture and investments in AMR R&D gallery evolution – all sectors

At launch, on 31 March 2020, the investments in AMR R&D gallery of the Dynamic Dashboard included 4976 human drug-resistant bacterial projects by 81 different funders with a total of 2.9 billion USD provided to research organisations in 53 countries. Following launch, additional investments from new and existing data sources and funders were collected, categorised and added to the Dynamic Dashboard. On 31 July 2020 animal health AMR relevant R&D projects were added.

The Dynamic Dashboard continuously collects and presents information on AMR R&D investments across the One Health spectrum. Currently, it presents information on investments since January 2017 from public and not-for profit private funders into AMR R&D related to human bacterial infections and animal pathogens. As at September 2020, a total of 7496 projects from 141 funders with a total investment of 5.6 billion USD were captured.

Geographical coverage across all continents has been achieved, representing 34 countries and the European Union and continues to be improved. The Dynamic Dashboard will be expanded to the plant and environment One Health sectors in early 2021.

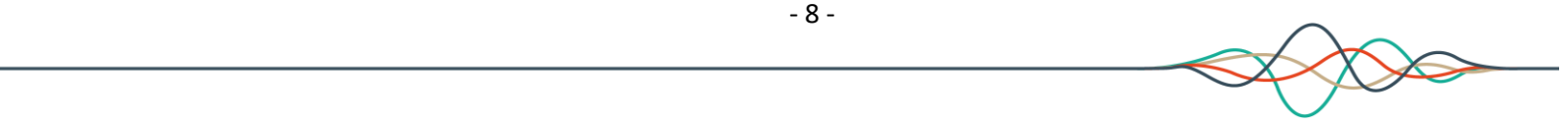


Figure 1 shows the expansion of the Dynamic Dashboard data since launch.

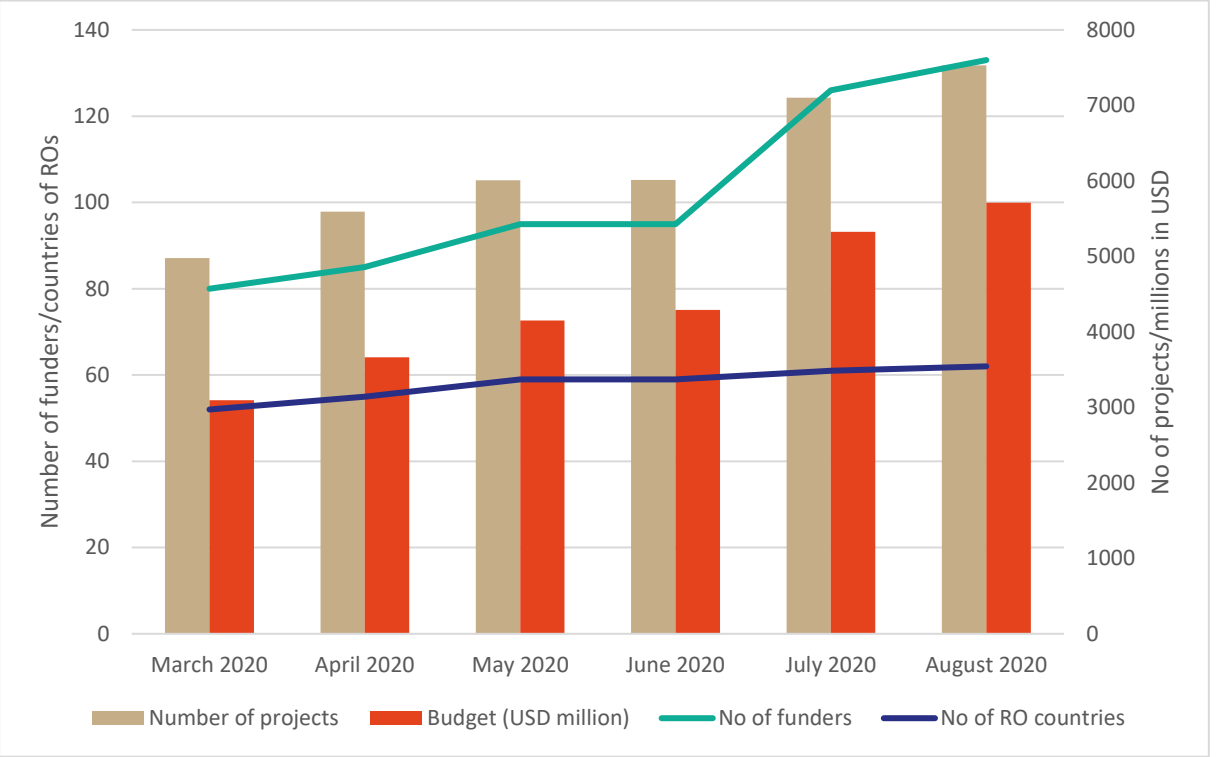


Figure 1: The bars represent the number and amount of investments (right-hand scale), the lines indicate the number of funders (green line) and countries of research organisations (RO, blue line) (left-hand scale)

Funding into AMR R&D over time – all sectors

The investment data captured in the Dynamic Dashboard showed an equal spending in the years 2017 and 2018, and, compared to these two years a 14% decrease in funding captured in the Dynamic Dashboard for 2019. Figure 2 shows aggregated funding amounts in each year.

As at 8 September 2020, there were 2859 projects included in the Dynamic Dashboard that started before 2017, with a total budget of over 3 billion USD (noting that only the proportion of this budget that was invested after 1 January 2017 is included in the presented data). Of these projects, 53% finished by the end of 2018 (24% in 2017, 29% in 2018). Data sources such as the funder database World Report[3] do not provide project information for investments awarded after 2018. This may explain the drop of project numbers displayed in Figure 2 from 2019 onwards and the decrease in investments.

[3] https://worldreport.nih.gov/app/#!/

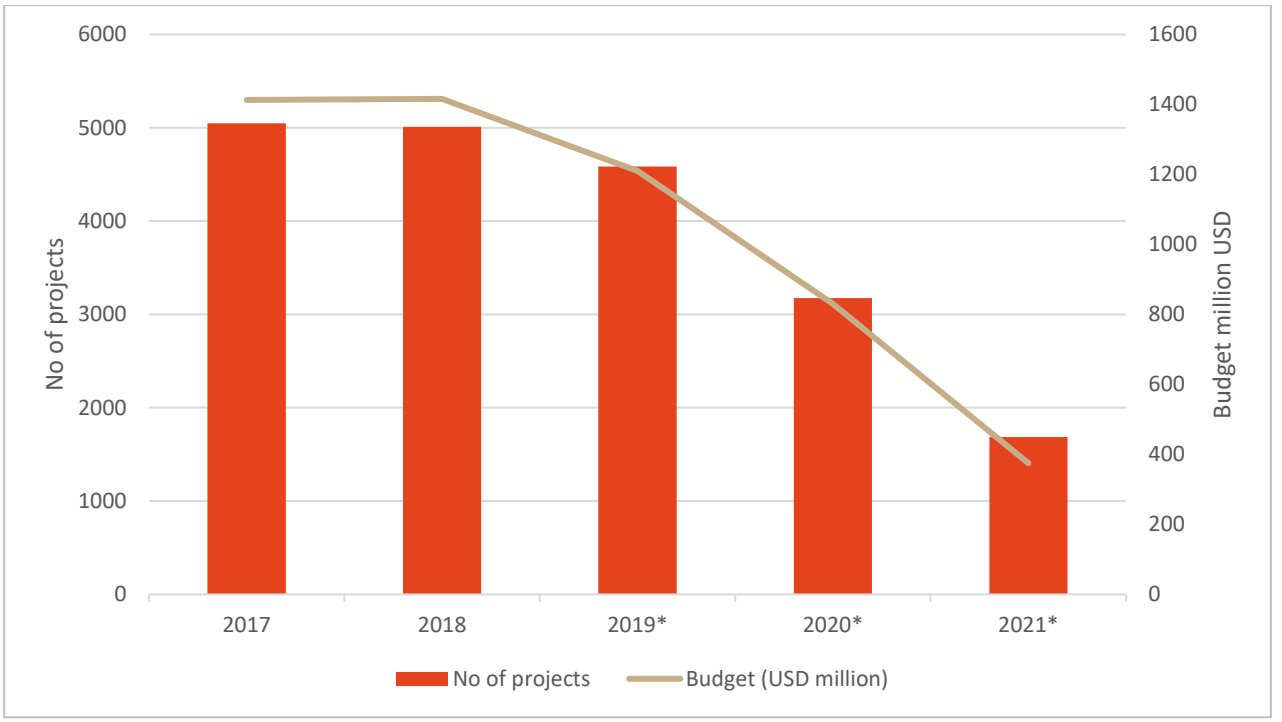


*Figure 2: Aggregated Investments and number of projects by year as presented in the Dynamic Dashboard visuals; *indicate years for which data collection by definition cannot be complete (2020 and 2021) and is considered less complete than previous years (2019)*

To account for this front-end loading of number of projects, and - to a lesser extent - investment, displayed by the Dynamic Dashboard, Figure 3 presents the number of projects and investment by the year an investment started. Due to data completeness only 2017, 2018 and 2019 are presented. This shows an 11% decrease in AMR R&D funding between 2017 and 2019. This corresponds to decreases presented in other databases that present R&D investment information. For example, the UberResearch Dimensions database[4], contains data on more than 5.5 million project grants and a decrease of 13% in the number of grants from 2017 (247058 projects) to 2019 (214941 projects) is also observed. This points to a time-lag for information about grants to appear in data bases.

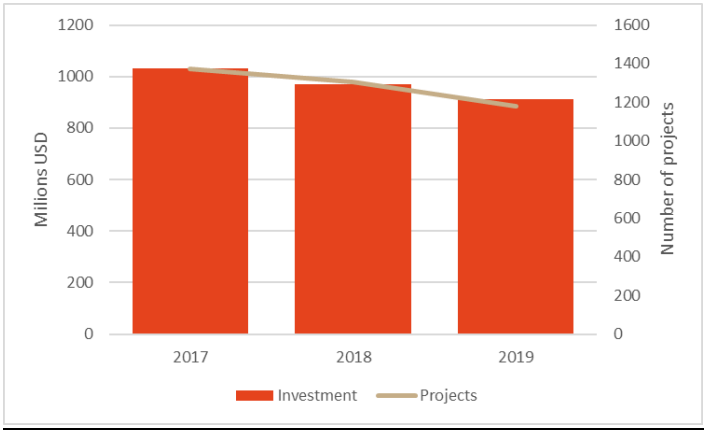


Figure 3: Investments and number of projects by starting year

[4] https://www.dimensions.ai/

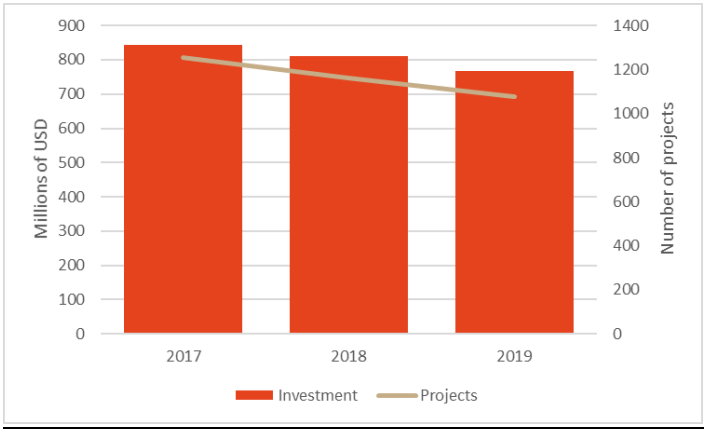


Figure 4: Investments and projects from 48 funders with projects starting in 2017, 2018 and 2019

Investments in AMR R&D are obtained from a large number of publicly available sources, either directly from funders or from other mapping activities. As such, the date range collected on investments from different funders varies, with some funders having data for all years presented and others only for one year or some of the years. The completeness of data collection is expected to improve over time. To try to account for this variability, Figure 4 presents investments and the number of projects from 2017 to 2019 only for the 48 funders who have projects that start in every year (as a proxy for information captured for every year). This analysis shows a similar decrease of 9% in AMR R&D funding recorded in the Dynamic Dashboard between 2017 and 2019.

A recent publication[5] has looked at total investment in human infectious disease R&D (not limited to antimicrobial resistance) for the period from 2000 to 2017 from G20-based public and philanthropic funders. The number of awards collected per year ranges from 2493 for the year 2000 to 8135 for the year 2016 (7961 for the year 2017). AMR R&D represents just 5.2% of the awards recorded. Looking at investments addressing specific pathogens, the cited publication presents 1.4 billion USD investments in *Staphylococcus* spp. R&D over an 18-year period. The analysis presented here records 380 million USD investment since 2017. One can draw the conclusion that the analysis presented here already today is based on a substantial data basis.

Information captured in the Dynamic Dashboard indicates that public and philanthropic investment in AMR R&D is similar in 2017 and 2018 at about 1.4 billion USD per year.

[5] Head MG, Brown RJ, Newll ML, JAG Scott, Batchelor J, and Atun R (2020) The allocation of US$ 105 billion in global funding from G20 countries for infectious disease research between 2000 and 2017: a content analysis of investments. Lancet Global Health 8: e1295-12304; DOI:https://doi.org/10.1016/S2214-109X(20)30357-0

Research areas – all sectors

Nine research areas were defined[6] spanning the entire spectrum from basic research over product development stages to policy. Some projects were assigned to more than one research area.

An overview of investment, number of projects and the percentage of the totals for each of the nine research areas is provided in Table 2. Figure 5 shows investment in millions USD per research area, out of a total of 5.636 billion USD. The majority of the total investment provided by the 141 funders captured by the Dynamic Dashboard supported projects covering: basic research (30%), therapeutics (24%) and operational and implementation research (22%).

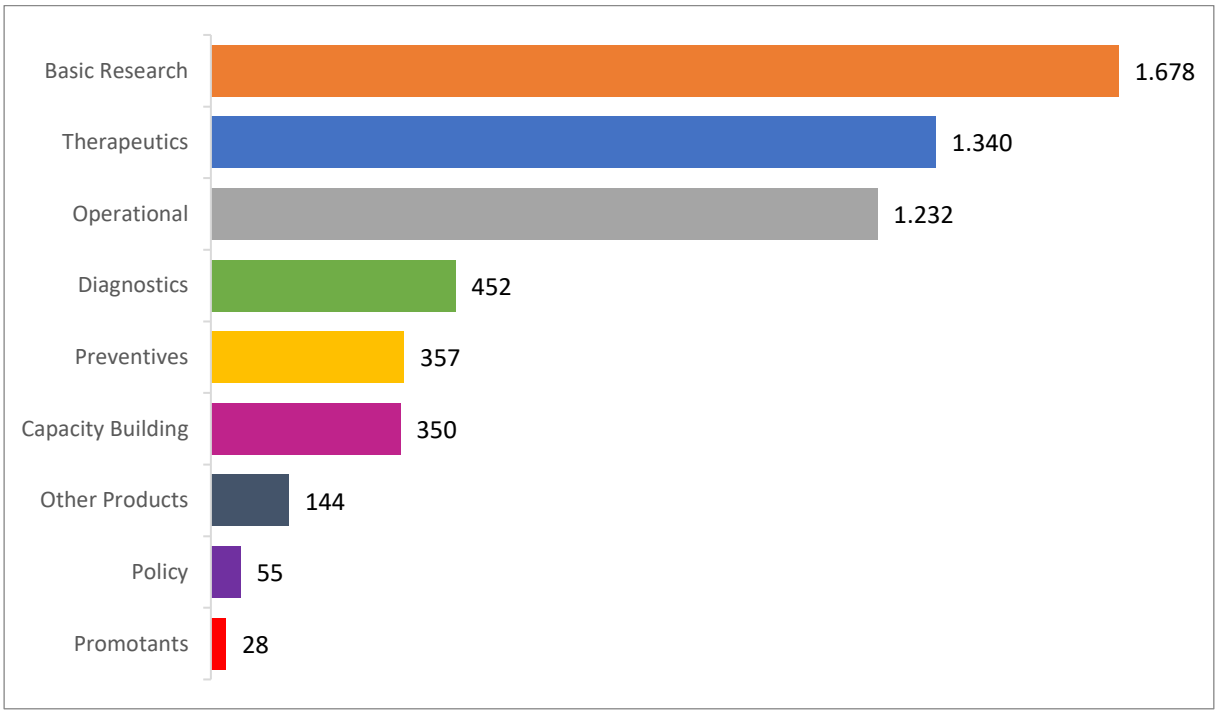


Figure 5: Investment per research area in million USD, all sectors

Data averaged at the global level shows that most funding is directed towards basic research, followed by funding for R&D on therapeutics and support for operational and implementation research.

Comparing this distribution with the one shown in an analysis of R&D funding flows for neglected diseases (data from the G-FINDER survey[7]), by disease, year and funding category shown on the Global Observatory on Health R&D[8] that is published by the WHO, one finds that the percentages of investment in different research areas are overall quite similar: basic research (22% G-Finder and 30% Global AMR R&D Hub), therapeutics (20% and 24%) and diagnostics (4% and 8%). A large difference in share of investment is seen as regards vaccines, summarised under "Preventives" in the analysis presented here. The investment represents 6% in this analysis and 35% in the G-Finder analysis. The latter encompasses diseases such as HIV and malaria not addressed here, where a large share of investment goes into vaccines R&D.

[6] Definitions for each research area can be found at https://globalamrhub.org/dynamic-dashboard/library/categories-and-definitions/categories-and-definitions-investments/
[7] https://www.policycuresresearch.org/g-finder
[8] https://www.who.int/research-observatory/monitoring/inputs/neglected_diseases/en/

Table 2: Investments by research areas, all sectors

Research Area*	No of projects	% share of number of projects	Investment (million USD)	% of investment	Median investment per project (USD)	Mean investment per project (USD)
Basic research	3765	50	1,678	29.8	330,000	606,421
Therapeutics	947	17	1,340	23.8	491,299	1,923,694
Operational	1654	29	1,232	21.6	340,316	1,152,821
Diagnostics	558	7	452	8.0	392,350	1,071,866
Preventives	335	4	357	6.3	436,474	1,429,381
Capacity building	258	3	350	6.2	405,570	2,599,753
Other products	338	4	144	2.6	247,238	584,547
Policy	105	1	55	1.0	274,453	758,373
Promotants	33	0	28	0.5	880,484	1,691,731
Total	**7496***		**5,636**		**346,500****	**913,288****

***Projects can be categorised in more than one research area.** The investments were split accordingly, but not the number of projects. Therefore, double counting of projects occurs, but no double counting for investments. Thus, the number of projects by research area does not add up to the total number of projects. Percentages may not add up to 100% due to rounding. ** Median and mean are calculated on total project budget including funding allocated before 1.1.2017 in contrast to the analysis within this report, which only takes into account the funding from 2017 onwards.

The largest difference (more than six-fold) between mean and median investment per project is observed for the research area 'Capacity building', indicating a large range of the funding spent on a given project.

The investment per research area can also be presented in a way where the different research areas are mapped to the product development pipeline.

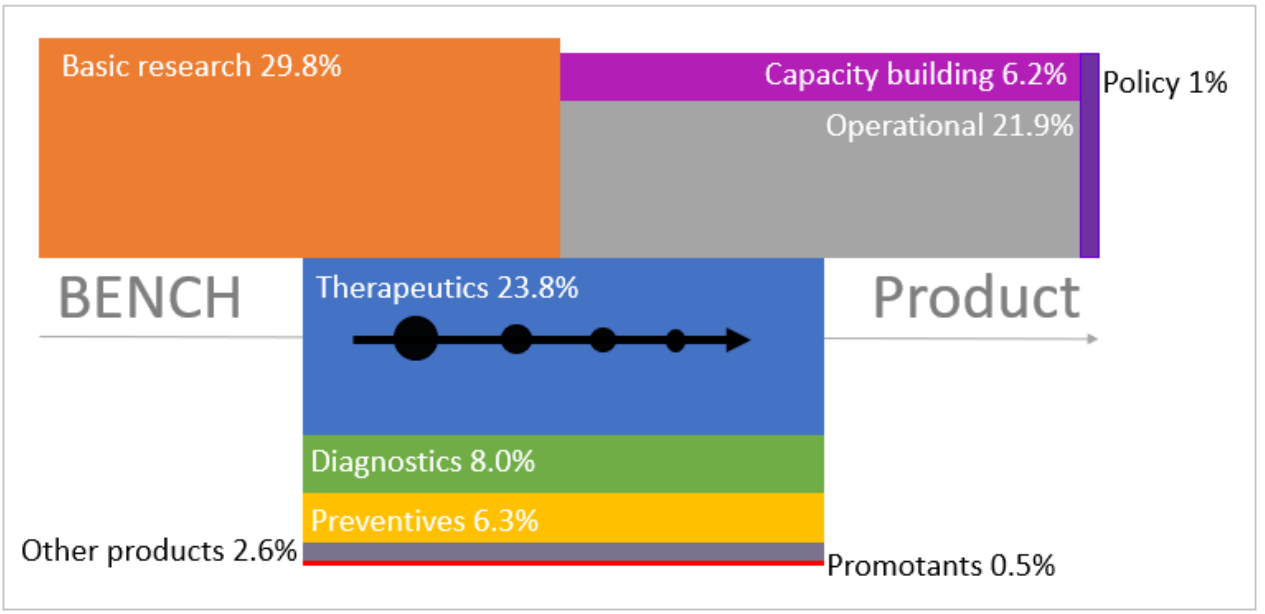


Figure 6: Investments into research areas mapped to the product development value chain. Percentage of total investments is shown. The areas are proportional to the investment amounts shown in figure 5 and in table 1. The black arrow with circles of decreasing size placed on top indicates that product development typically involves discrete steps, where the number of candidates under consideration decreases with each step.

Funder type analysis – all sectors

Of the 141 funders captured in the Dynamic Dashboard, the majority are public-government (64%, n=102), followed by public-other (21%, n=27) and private-non-profit (15%, n=12) (Figure 7). The proportion of public-government funders increases for animal health (77%, 50/64) and decreases for cross sector and sector not specified investments (50% and 53%, respectively). As at 8 September 2020, the Dynamic Dashboard does not capture investments from the private-for-profit sector.

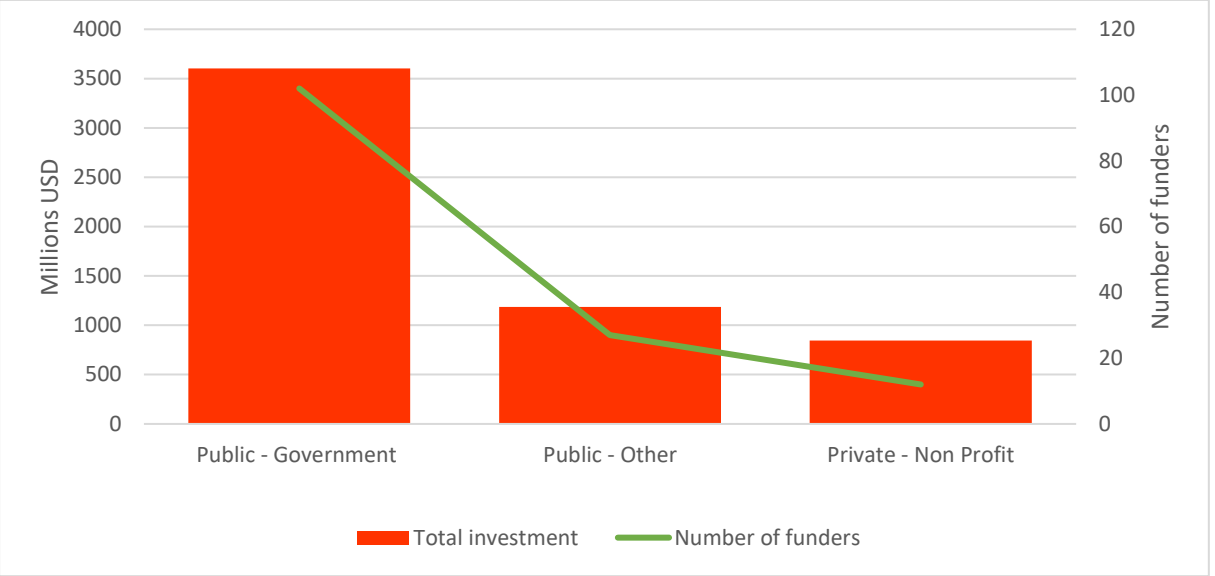


Figure 7: Investment captured in the Dynamic Dashboard (left-hand scale; bars) and number of funders (right-hand scale, line), for all sectors, by type of funder

Forty-three percent of funders (n=60) fund research in multiple One Health sectors, while 47% (n=67) fund research only related to the human sector and 10% (n=14) fund research only related to the animal sector (Figure 8).

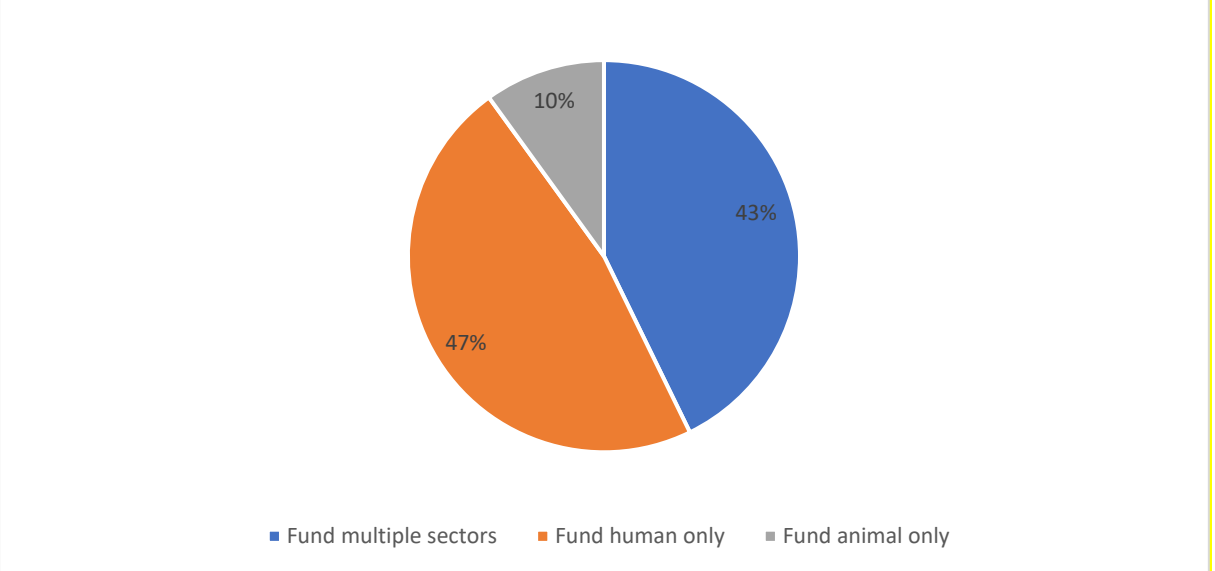


Figure 8: The percentage of funders by the sectors funded

All three funder types captured in the Dynamic Dashboard invest in similar research areas, with a focus on basic research and therapeutics. There are some differences in the relative share of investments going to different areas. A greater proportion of investment into preventives by private-non-profit and a stronger

focus on operational and implementation research and diagnostics (compared to the other funders) by public – government funders is observed (Figure 9).

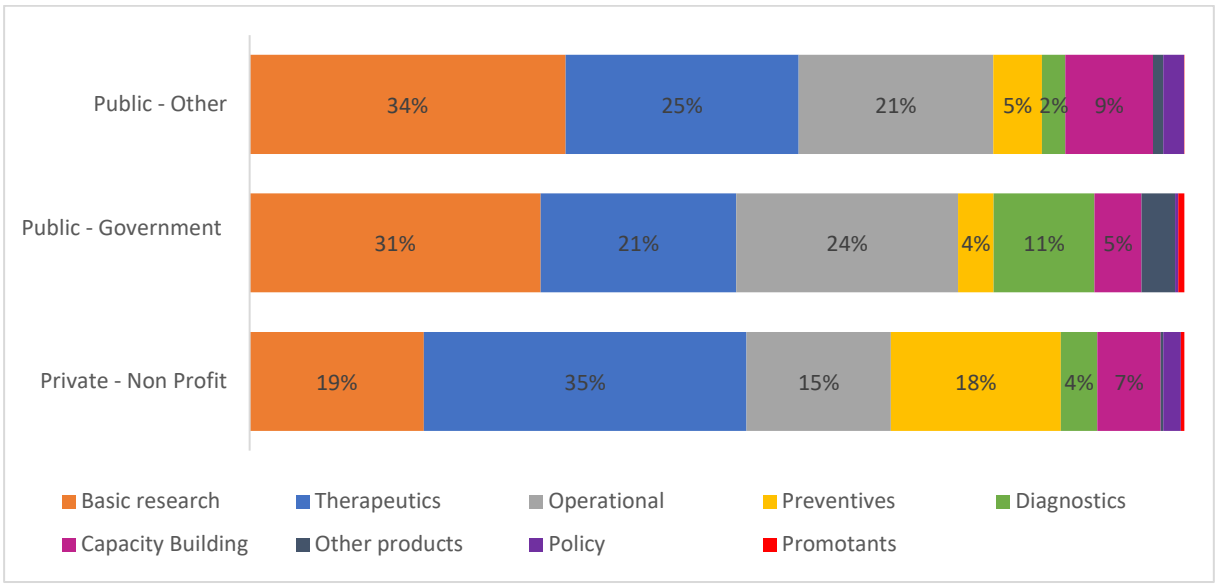


Figure 9: Proportion of investment into research areas by funder type for all sectors

Funder type by product stage

Data from the Dynamic Dashboard show that the majority of product-related[9] investment provided by all funder types is directed towards the discovery phase, which also includes pre-clinical research (range 47% to 57%). The proportion of public government funding (38%) provided to the development phase of product development is slightly less than that of public-other and private-non-profit funders (43% and 45%, respectively).

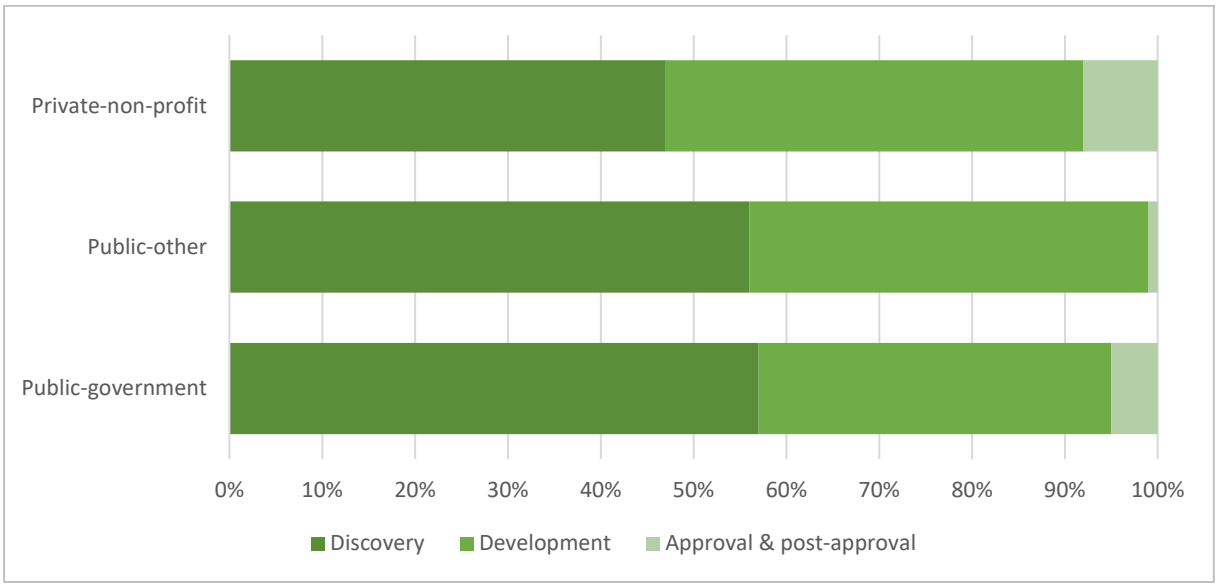


Figure 10: Share of investment of different types of funders into different stages of research and development, all sectors

[9] Product-related in the Dynamic Dashboard is considered the therapeutic, diagnostic and preventive research areas

Geographic funding flows – all sectors

Early insights into international partnerships between funders and recipients of funding in other countries can be obtained by looking at if funders invest domestically or internationally.[10] Also, one can look at international collaboration of funders in jointly funding initiatives or through joint calls for proposals. As shown in Figure 11, 72% (4068 million USD) of the investment from the 141 funders, captured in the Dynamic Dashboard, is provided to research organisations in the same country where the funder is located (considered domestic funding).

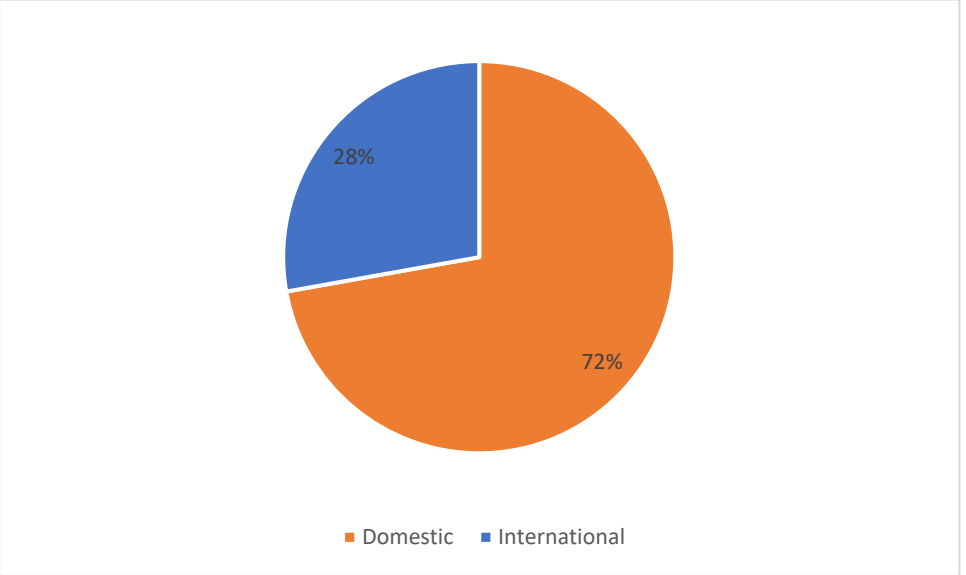


Figure 11: Percentage of funding provided by funders to domestic or international research organisations

Of the 1567 million USD provided by funders to research organisations outside of their country (considered international funding), 18% (284million USD) were disbursed to organisations in the Netherlands, 14% (223 million USD) to Switzerland , 12% (191 million USD) to Spain, 9% (148 million USD) to the United Kingdom and 8% (127 million USD) to France (Figure 14).

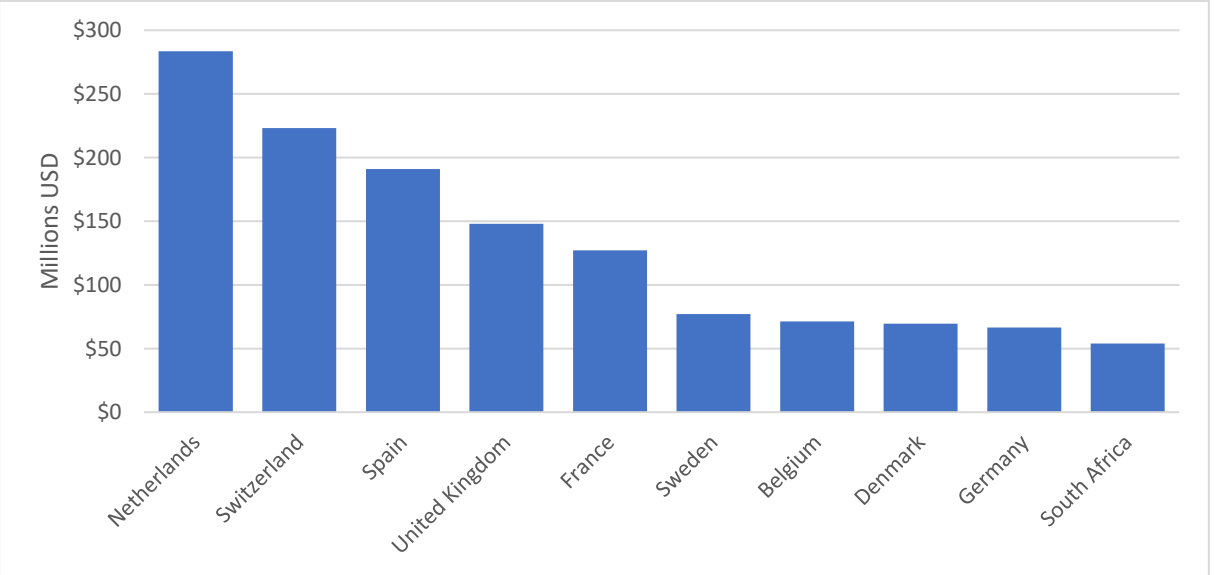


Figure 12: Top 10 countries whose research organisations are receiving international funding, all sectors

[10] EU funding is considered international funding. In view of the large role of EU funding for supporting AMR R&D, a separate analysis has been carried out excluding the EU-funding to better show international funding of countries.

Nearly 50% of the funding considered international goes to 20 organisations. Of these organisations two are international organisations (GARPD and FIND), six are private companies, nine are universities and three are research institutes. The top five individual organisation receiving the most international funding are the University Medical Center Utrecht (11% of all international funding), Carlos III University of Madrid (6% of international funding), GARDP (5% of all international funding), Uppsala University (4% of all international funding) and Basilea Pharmaceutica (3% of all international funding) (Figure 13).

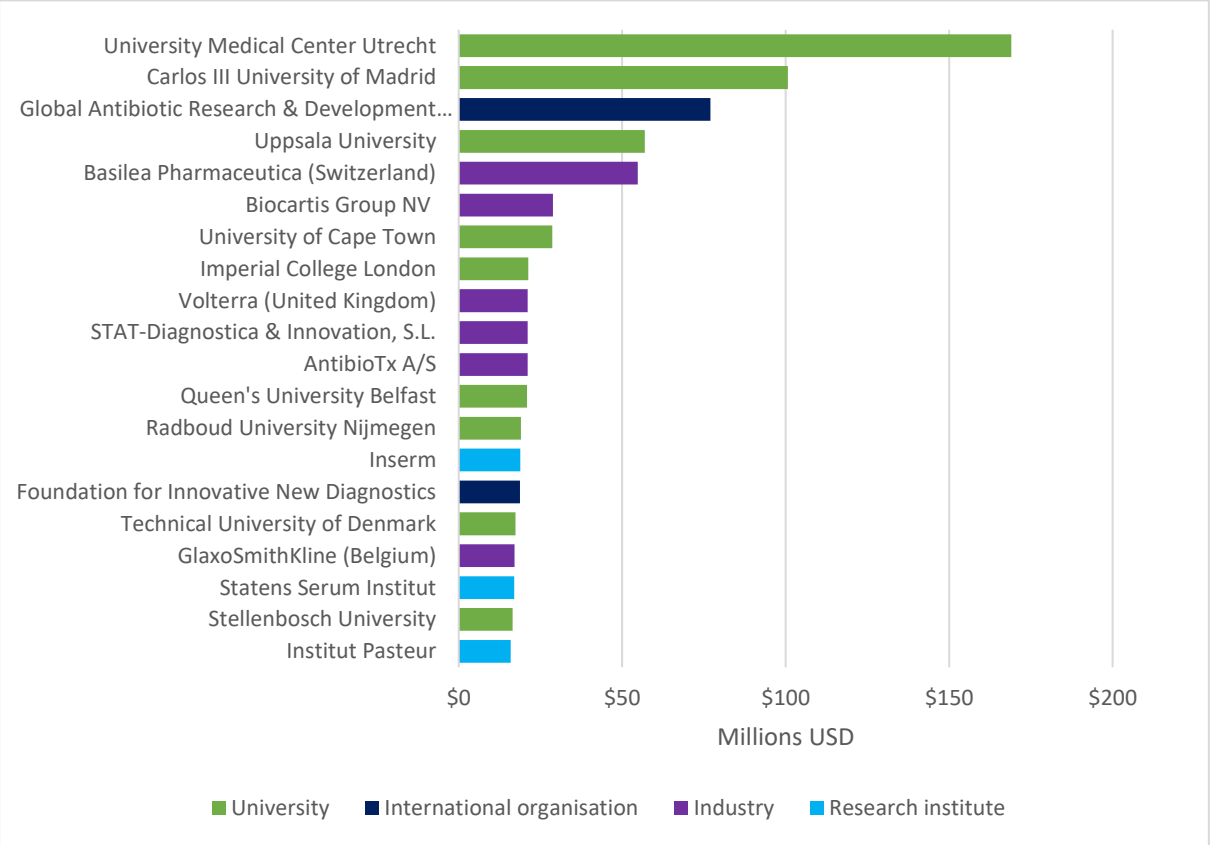


Figure 13: The 20 organisations receiving the most international funding

Looking at the same data excluding EU funding to EU Member States, 583 million USD is provided by funders to research organisations outside of their country (considered international funding), 38% (223 million USD) were disbursed to organisations in Switzerland, 14% (82 million USD) to the United Kingdom, 9% (54 million USD) to South Africa, and 9% (52 million USD) to the United States (Figure 14). The organisations in Switzerland receiving international funding include the Global Antibiotic Research & Development Partnership (GARDP), the World Health Organization (WHO), and the Foundation for Innovative New Diagnostics (FIND).

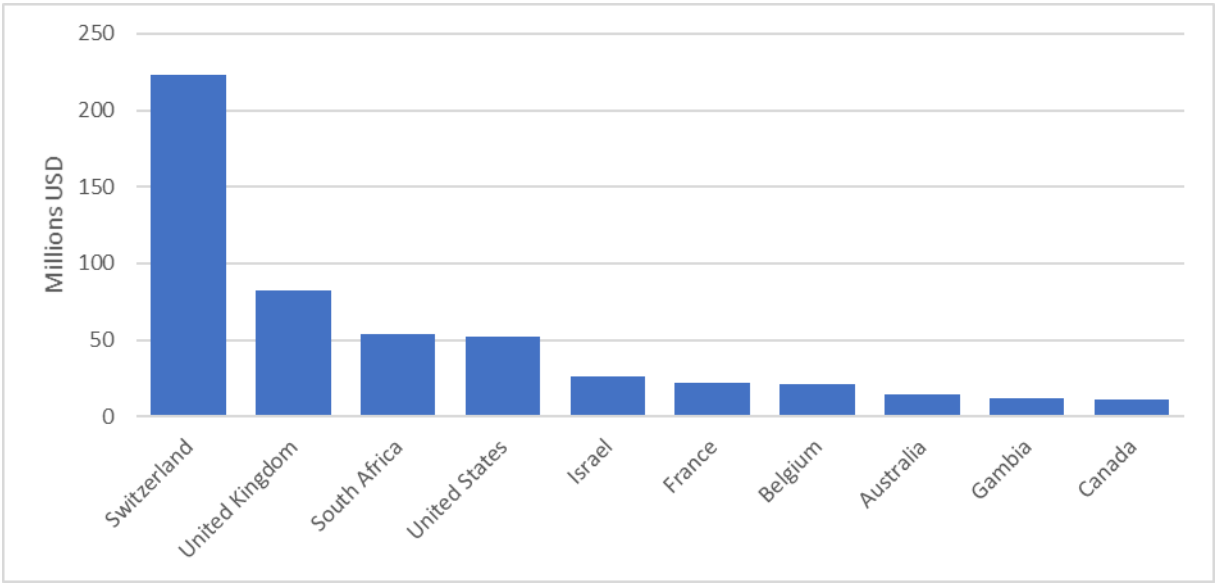


Figure 14: Excluding EU-Funding to EU Member States, top 10 countries whose research organisations are receiving international funding, all sectors

How different funders come together to jointly support an international initiative is illustrated in the example of GARDP.

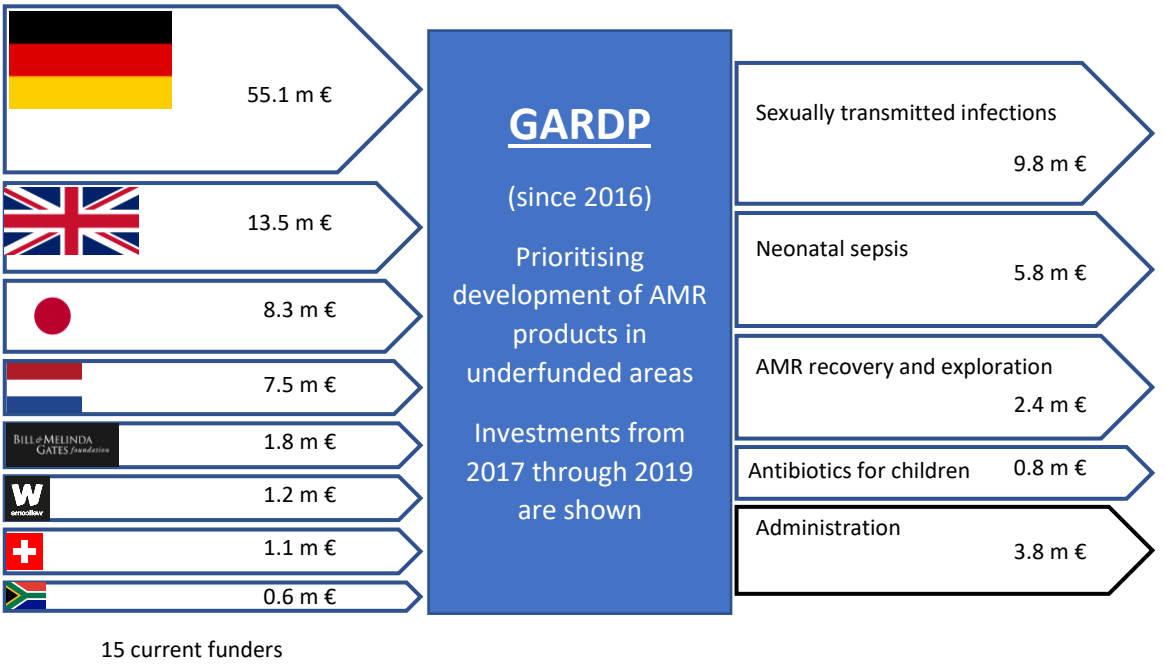


Figure 15:GARDP donor-support and expenditure in million Euro

A significant amount of global AMR R&D investment occurs at the international level, through joint funding of initiatives, joint calls or through the investments of the European Union.

Investment by sector – all sectors

From the 7496 projects presented in the Dynamic Dashboard, the majority of projects address relevant human bacterial infections. At the end of July 2020, these projects were supplemented by animal health-related projects (565 projects, 444 million USD) as well as projects relevant to both sectors (169 projects, 84 million USD). For a subset of projects, a sector was not specified (220 projects, 103 million USD) as shown in Table 3. Table 4 shows the breakdown per research area and sector in percent of budget.

The large majority of projects where a specific sector is not specified address basic research (92% of investment), followed by other products (4%), operational and implementation research (2%), policy (1%) and diagnostics (1%).

Table 3: Investment by sector

Sector	No of projects (% of total)	Investment (million USD) (%of total)
Human	6,542 (87%)	5,005 (89%)
Animal	565 (8%)	444 (8%)
Not Specified	220 (3%)	103 (2%)
Animal, Human	169 (2%)	84 (1%)
Total	**7,496**	**5,636**

Table 4: Percentage of investments in research areas by sector

	Total	*Human*	*Animal*	*Cross-sector*	*Sector not specified*
Basic Research	30%	29%	21%	21%	92%
Therapeutics	24%	26%	2%	2%	0%
Operational	22%	21%	29%	44%	2%
Diagnostics	8%	8%	13%	1%	1%
Preventives	6%	6%	17%	4%	0%
Capacity Building	6%	6%	4%	21%	0%
Other Products	3%	2%	4%	1%	4%
Policy	1%	1%	1%	3%	1%
Promotants	1%	0%	5%	2%	0%

Please note that percentages may not add up to 100% due to rounding.

Investment by infectious agent – all sectors

As at 8 September 2020, the only R&D included in the Dynamic Dashboard for the human sector is on drug-resistant bacteria. As shown in Table 5, a third of human sector investment, captured by the Dynamic Dashboard, is directed to research where there was not enough information provided to determine the gram reaction of the bacteria (gram reaction not specified). The next bacteria groupings with the highest investments are gram-variable (noting that 99.9% of this investment is for *Mycobacterium* spp.) and gram-negative.

For the animal sector, nearly three quarters of all investment is directed at bacterial R&D and most of this is for gram-negative bacteria (38%), followed by research where there was not enough information provided to determine the gram reaction of the bacteria (18%). Twenty-seven percent of the animal sector investment is going to infectious agents other than bacteria.

Thirty-three percent of investments that are cross-sectoral are for research where there was not enough information provided to determine the gram reaction of the bacteria. One third of investments is going to infectious agents other than bacteria.

Table 5: Investments by sector and order of magnitude by bacteria Gram stain reactions plus other agents

#	***Human*** *(total investment 5,005 million USD)*	***Animal*** *(total investment 444 million USD)*	***Cross-sector*** *(total investment 84 million USD)*	***Sector not specified*** *(total investment 103 million USD)*
1	*Gram reaction not specified (33%)*	*Gram-negative (38%)*	*Gram reaction not specified (34%)*	*Gram reaction not specified (49%)*
2	*Gram-variable (25%)*	*Other agent (27%)*	*Other agent (33%)*	*Gram-negative (27%)*
3	*Gram-negative (25%)*	*Gram reaction not specified (18%)*	*Gram-negative (19%)*	*Gram-positive (21%)*
4	*Gram-positive (17%)*	*Gram-positive (10%)*	*Gram-positive (12%)*	*Other agent (2%)*
5	*Other agent (0%)*	*Gram-variable (8%)*	*Gram-variable (2%)*	*Gram-variable (1%)*

Please note that percentages may not add up to 100% due to rounding.
Gram reaction not specified - does not specify either the individual bacteria or the gram reaction of the bacteria of interest
Gram-negative – includes any project/investment that includes individual gram-negative bacteria or gram-negative bacteria in general (not specified)
Gram-positive – includes any project/investment that includes individual gram-positive bacteria or gram-positive bacteria in general (not specified)
Gram-variable – includes any project/investment that includes individual gram-variable, gram atypical or acid-fast bacteria, noting that 99% of this investment for R&D on *Mycobacterium* spp.
Other agent – includes infectious agents other than bacteria – such as viruses, fungi, parasites and others, only collected for animal sector.

Investments in animal health

As at 8 September 2020, data captured in the Dynamic Dashboard indicate that a total of 486 million USD (n=734 projects) was invested by 70 funders in AMR R&D projects relevant for animal health (Figure 16). The majority of this investment, 444 million USD (n=565 projects), supported research in animals only. The remainder of the animal health funding, 42 million USD (n=169 projects), was invested in cross-sectoral research (human and animal health, total funding for both 84 million USD).

Farmed animals, particularly animals for food production such as cattle, pigs and poultry (mostly chicken), are considered to be a major source of AMR because of the relatively large quantities of antibiotics used to treat and to prevent infection. The AMR R&D conducted in animals captured in the Dynamic Dashboard reflects these findings, where the majority (90%) of investments was in farmed animals (437 million USD) and about 65% (317 million USD) in the top three animal groups (cattle, pig, poultry). Half of the total animal health investment was in livestock (246 million USD) and 31% (152 million USD) in poultry. Within livestock the majority went to research in cattle (40% or 98 million USD) and pigs (30% or 73 million USD) representing 35% of the total investment. AMR R&D research in chicken received 36% (55 million USD) of the poultry investment (152 million USD) representing 11% of the total animal health funding. It should be noted that within the 81 projects (91 million USD) addressing AMR research on poultry and where the species was not specified it is likely that research was conducted on chicken. This would raise the total investment in AMR R&D in chicken to 146 million USD (30% of total funding for animal health-related AMR R&D).

Aquaculture, a rapidly growing industry, received 5% (26 million USD) of the total investment in the animal sector and research related to bees and silkworms, categorised as 'farmed insects' received 0.3% of total

investment. About 4% (19 million USD) of investment could not be assigned to a specific animal group within farmed animals.

Companion animals and wildlife play a minor role in AMR R&D, likely reflecting the focus of the Tripartite organisations on food-producing animals. Looking at the Dynamic Dashboard data 3.6 and 7.7 million USD, respectively were invested, representing less than 3% of the total investment in the animal sector. A specific animal group was not provided for about 6% (30 million USD) of the total investments. Figure 16 provides an overview of the investment (in million USD) and number of projects in the different animal groups.

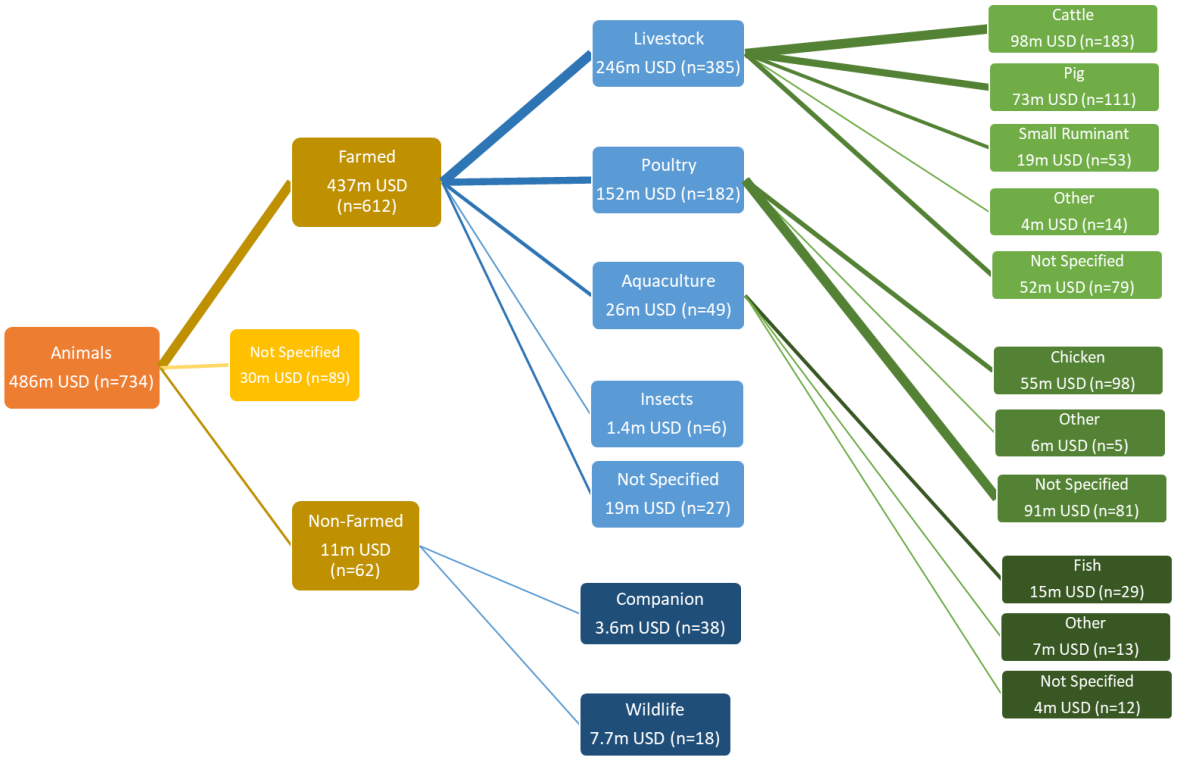


Figure 16: Investment in animal health AMR R&D by relevant animal groups; weight of line represents higher amount of investment

In animal health the majority of investments are in livestock and poultry (together 82%).

As shown in Figure 17, the majority of the total investment in animal health (43%, 206 million USD, n=339) supported research areas that are product-focused, of which 37% or 60 million USD (13% of total, n=92) funded projects in vaccine development, followed by projects in diagnostics (27% of product-focused, 56 million USD, n=89) and therapeutics (14% of product-focused, 29 million USD, n=46). 'Operational and implementation' research, which includes projects on infection prevention and control (IPC) and implementation research, received 30% (145 million USD, n=275) and together with funding into 'basic research' (21%, 104 million USD, n=205) represents about 50% of the total investment. It should be noted that projects with animal only and cross-sectoral projects have been analysed, considering half of the cross-sector budget (compare Table 1, Table 3).

Preliminary analysis of the projects supporting therapeutic and preventive products indicate that the majority addressed development of non-traditional antibacterials (other than direct-acting small molecules) rather than traditional antibacterials (direct-acting small molecules). A more in-depth analysis will follow and take into account the outcomes of the discussions led by the STAR-IDAZ International

Research Consortium on animal health[11] working group on AMR and the development of alternatives to antibiotics.

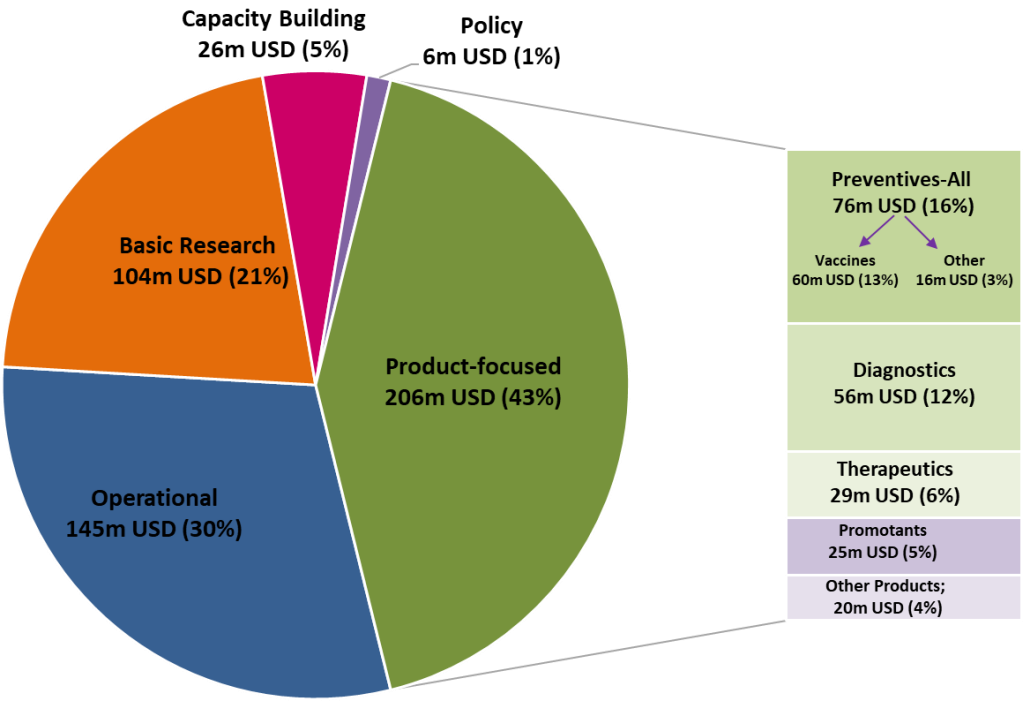


Figure 17: Investment in animal health AMR R&D by research areas (note split into vaccines and other for preventives)

The majority of investments in the animal sector supported R&D addressing bacterial infectious diseases (70%, 342 million USD), followed by viral and parasitic infectious diseases (7%, 34 million USD and 6%, 29 million USD, respectively). For about 16% (80 million USD) of the investments a specific infectious agent was not specified. Further analysis taking prioritisation of diseases for which vaccines could reduce antimicrobial use in animals as published by OIE.[12]

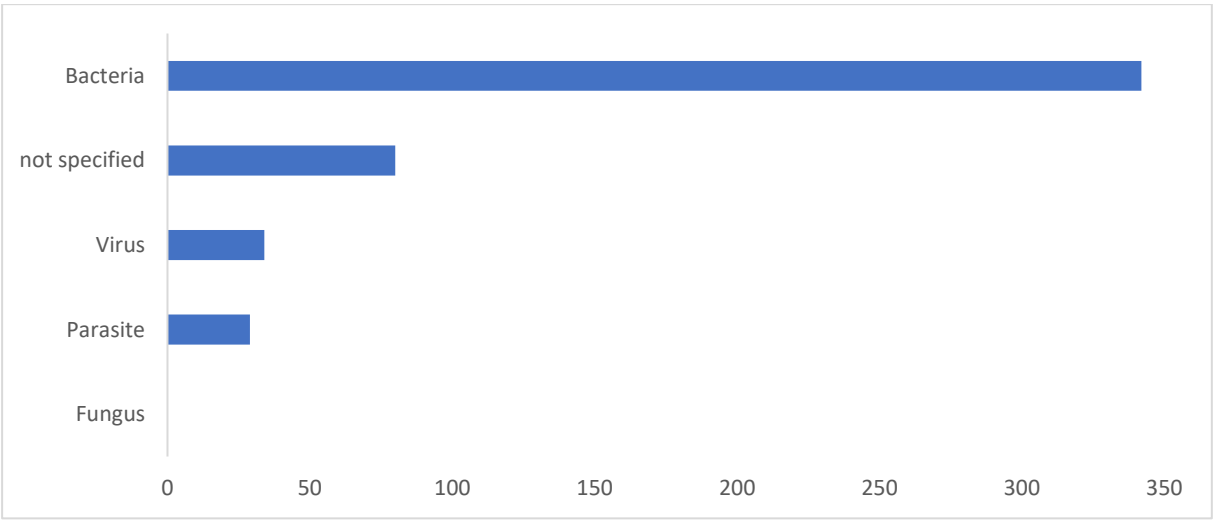


Figure 18: Investment in animal health R&D by infectious agent in million USD

[11] https://www.star-idaz.net/

[12] Report of the meeting of the OIE ad hoc group on prioritisation of diseases for which vaccines could reduce antimicrobial use in animals. Paris, 21 – 23 April 2015; available at OIE_Vaccine_Prioritization_2015 and Report of the meeting of the OIE ad hoc group on prioritisation of diseases for which vaccines could reduce antimicrobial use in cattle, sheep and goats. Paris, 7 -9 May 2018; available at: OIE_Vaccine_Prioritization_Ruminants_2018

Investment by bacteria priority level - human sector only

Funder type by priority pathogen – human sector only

The Global AMR R&D Hub developed a list of priority bacteria that encompasses the bacteria identified by the WHO, the United States Centers for Disease Control and Prevention CDC and the European antimicrobial resistance surveillance network EARS-Net.

All types of funders are funding R&D into projects where the bacteria of interest are not specified, followed by *Mycobacterium* spp. (separated out from the high priority bacteria to aid analysis). As seen in Table 6, both public funder types appear to have a decreasing level of investment by decreasing priority level. While private – non-profit funders have a higher proportion of investment in the medium priority level bacteria.

Table 6: Amount of investment in million USD by funder type into priority level bacteria

Priority level	Funder type			**Total**
	Private - Non Profit	Public - Government	Public - Other	
Critical	130	483	130	**743**
High*	102	468	112	**682**
Mycobacterium spp.	225	721	320	**1266**
Medium	135	91	40	**266**
Watch	0	1	22	**23**
Not specified	220	1335	371	**1926**
Not a priority	11	64	24	**99**
Total	**823**	**3163**	**1019**	**5005**

The bars are visualizing/comparing the amount of investment by the funder type.

***Mycobacterium* spp. has the highest investment for any single bacteria within the human sector.**

The distribution of investments by public and philanthropic funders into AMR R&D across pathogens overall aligns well with the priority ranking of the bacteria on the priority lists developed by the WHO and the US CDC.

Of the 5,005 million USD investment in the human sector captured by the Dynamic Dashboard, nearly 80% is directed to either bacteria listed as high priority (39%) on the Global AMR R&D Hub's list[13] or to research where the individual bacteria of interest are not specified (39%). *Mycobacterium* spp. is included as a high priority bacteria and accounts for 65% of investment in this category (Figure 19).

If *Mycobacterium* spp. are separated out from the high priority category, then when a bacterium is specified, investment decreases as it moves down the priority list from critical to watch (noting there is only one bacterium, *Bordetella* spp. included in the watch list).

[13] https://globalamrhub.org/dynamic-dashboard/library/infectious-agent-in-scope/

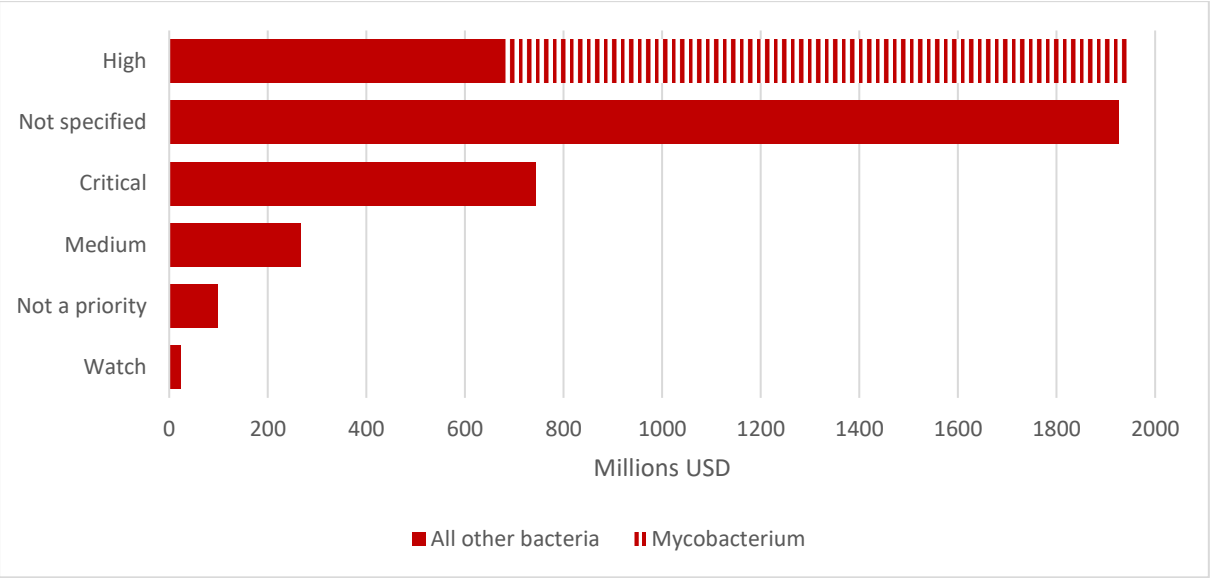


Figure 19: Investments (million USD) in the human sector by bacteria priority level[14]

Critical priority level bacteria

As at 8 September 2020, the Dynamic Dashboard shows that 743 million USD had been invested into R&D into bacteria listed as a critical priority on the Global AMR R&D Hub's list, of which the *Enterobacteriaceae* family accounted for 37% and *Pseudomonas* spp. for 30%.

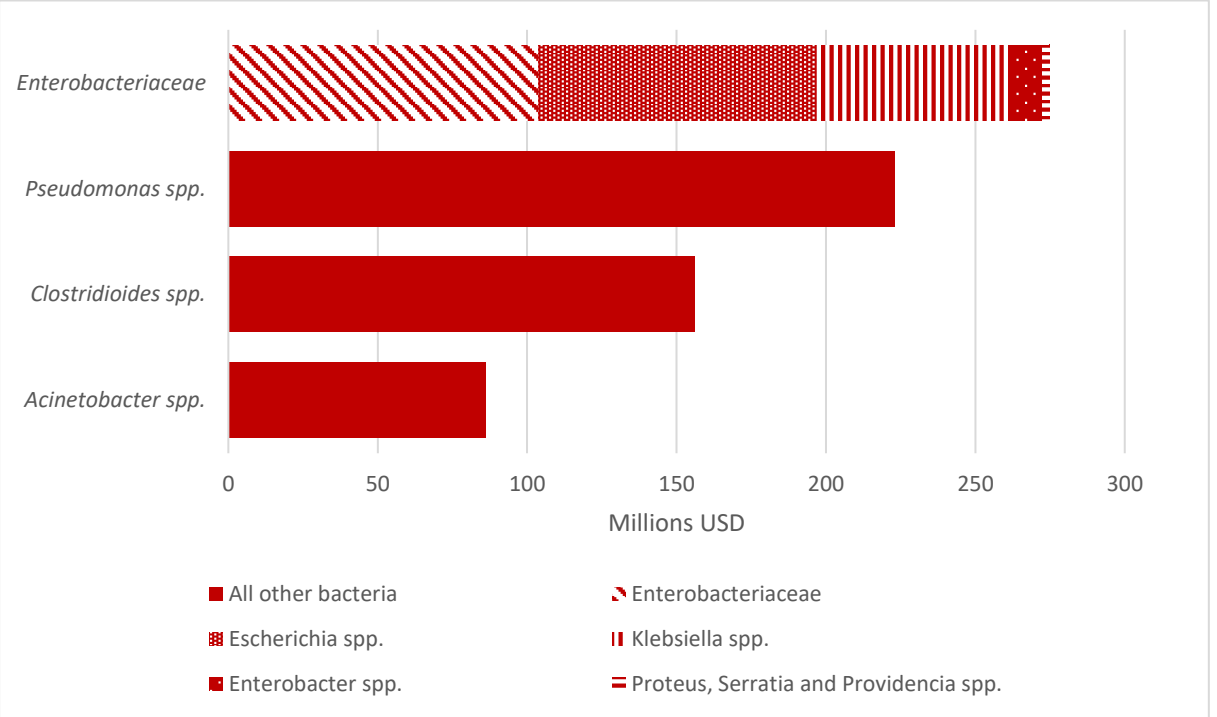


Figure 20: Investments in million USD of the critical level bacteria

The majority of funding for the critical priority bacteria is directed to research into therapeutics (range 37% to 58%) and basic research (range 18% to 43%) (Figure 21). The proportion of investment into the research areas varied slightly across the different bacteria. For *Clostridioides* spp., *Enterobacteriaceae* and *Acinetobacter* spp., there was also a focus on operational and implementation research (range 10% to 18%).

[14] The Global AMR R&D Hub bacteria priority list is a compilation of other priority pathogen lists and is available at https://globalamrhub.org/dynamic-dashboard/library/infectious-agent-in-scope/

Pseudomonas spp. investment proportion was slightly different with more directed to capacity building and preventives.

Analysis of the individual critical level bacteria is provided in Appendix 3.

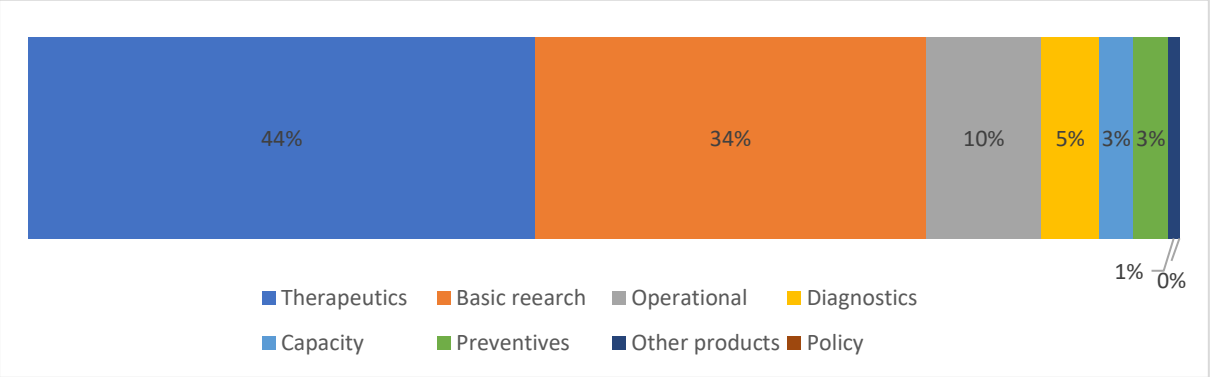


Figure 21: Percentage of investment in critical level bacteria by research areas, human sector

High priority level bacteria

As at 8 September 2020, Dynamic Dashboard data show that 1,948 million USD had been invested into R&D into bacteria listed as a high priority on the Global AMR R&D Hub's list. *Mycobacterium* spp. accounted for 65% of this investment (Figure 22).

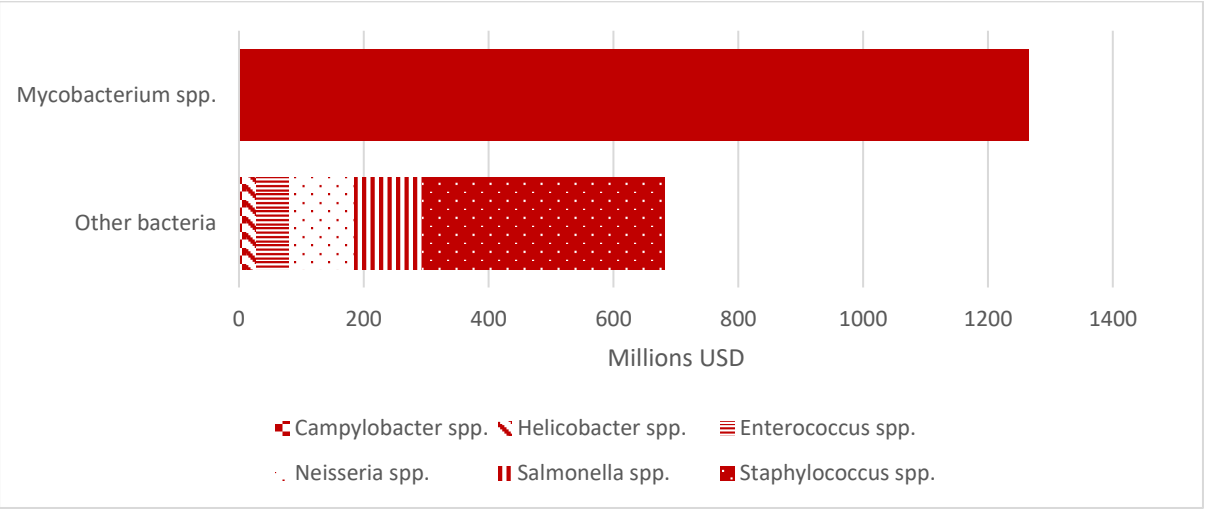


Figure 22: Investment in million USD into the high-level priority bacteria, human sector

As investment into *Mycobacterium* spp. is a substantial component of the Dynamic Dashboard, it is analysed separately from other bacteria identified as a high priority on the Global AMR R&D Hub's list.

<u>*Mycobacterium* spp.</u>

As at 8 September 2020, investments into *M. tuberculosis, M. abscessus, M. avium, M. leprae, M. ulcerans, M. africanum, M. kyorinese* and non-tuberculosis *Mycobacterium* group are included in the Dynamic Dashboard. While it is currently not possible to separate out investments to show the investment into *M. tuberculosis* only it is estimated that this bacterium receives 90% of the *Mycobacterium* spp. investment.

The investment for *Mycobacterium* spp. was 1,266 million USD which represents 25% of investment for the human sector. *Mycobacterium* spp. receive the most investment for a single bacterial genus.

The top four research areas being funded for *Mycobacterium* spp. by percentage of investment are: basic research (31%); therapeutics (26%); operational and implementation research (22%); and diagnostics (9%).

This reflects a similar distribution compared to the overall funding in the human sector (see Table 4), namely basic research (29%), therapeutics (26%), operational and implementation research (21%) and diagnostics (8%).

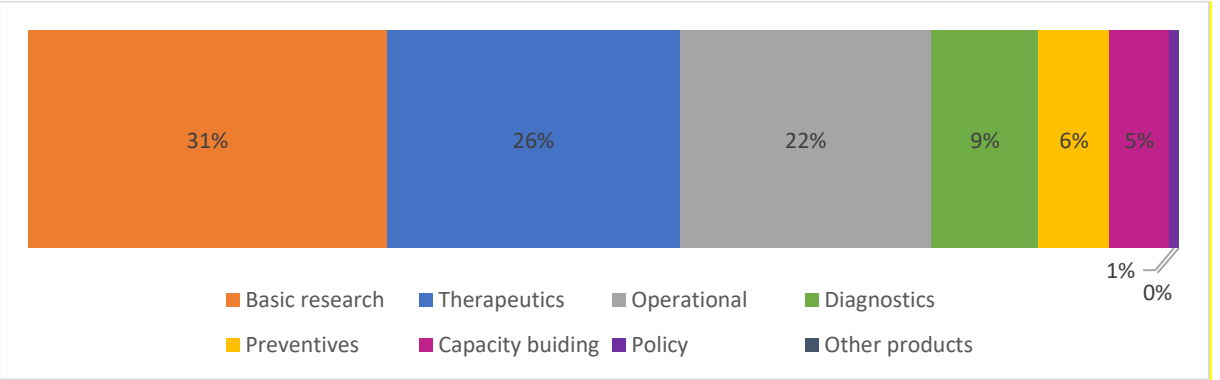


Figure 23: Research on Mycobacterium spp. presented as % of investment by research area – human sector

Other bacteria identified as a high priority

As at 8 September 2020, 682 million USD was invested in research for all other bacteria identified as a high priority on the Global AMR R&D Hub's list (Figure 24).

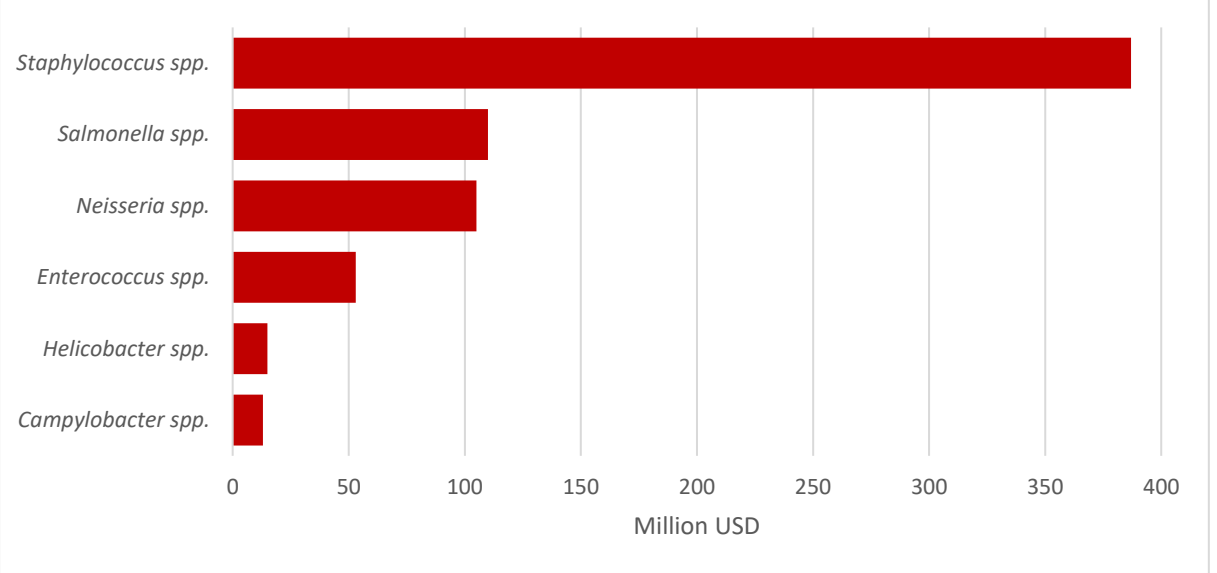


Figure 24: Investment in million USD into individual high-level bacteria excluding Mycobacterium spp, human sector

For these high priority bacteria, investment into basic research continues to be a focus (Figure 25). However, some differences are observed in the other research areas investment is directed to with operational and implementation, therapeutics, and preventives featuring for different bacteria. This could be due to the diverse nature and acquisition route for the bacteria identified as a high priority.

For example (not including basic research) the top research areas for the individual high priority bacteria were:

- *Campylobacter* spp. operational and implementation (20%)
- *Enterococcus* spp. therapeutics (27%)
- *Helicobacter* spp. operational and implementation (21%)
- *Neisseria* spp. therapeutics (33%)
- *Salmonella* spp. preventives (28%)
- *Staphylococcus* spp. therapeutics (40%)

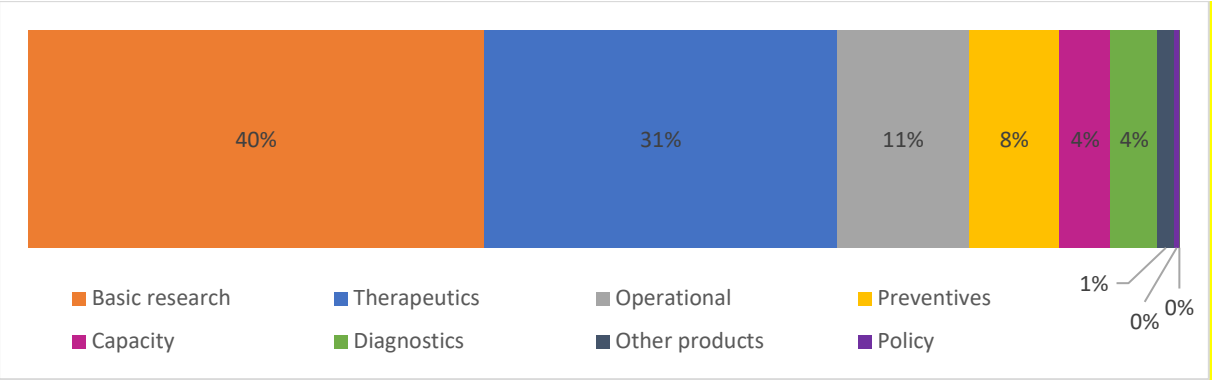


Figure 25: Percentage of investment in high level bacteria (excluding Mycobacterium spp.) by research areas, human sector, due to rounding the total may not equal 100%

Medium priority level bacteria

As at 8 September 2020, Dynamic Dashboard data show that 266 million USD had been invested into R&D into bacteria listed as a medium priority on the Global AMR R&D Hub's list. *Streptococcus* spp. accounted for 74% of this funding (Figure 26).

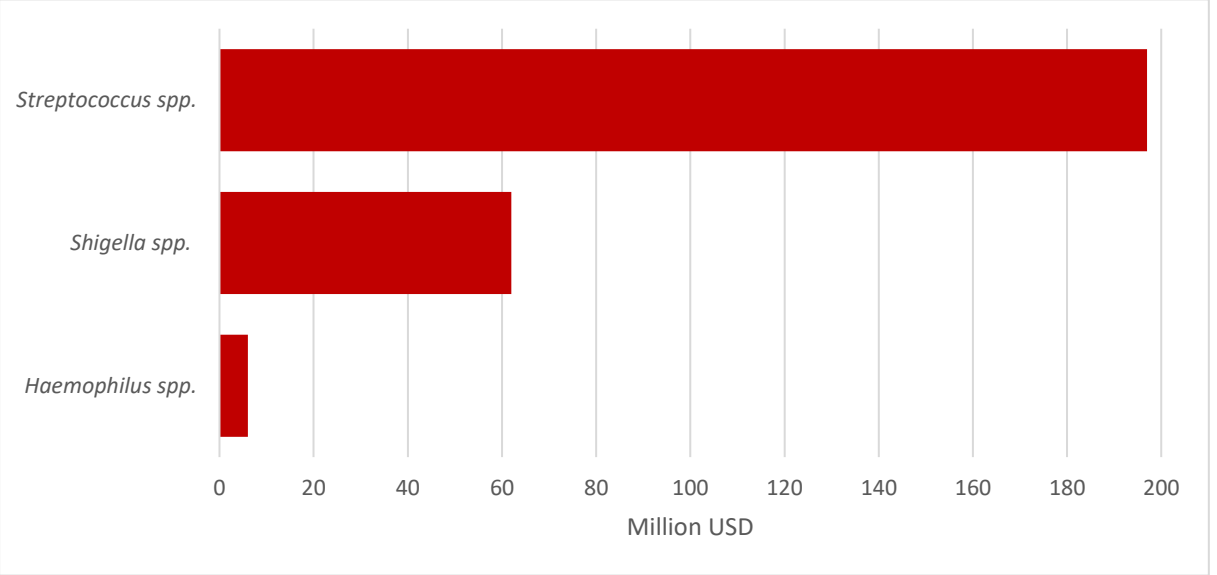


Figure 26: Investment in million USD into medium priority level bacteria, human sector

The bacteria identified as medium priority either have a vaccine already on the market (*Streptococcus* spp. and *Haemophilus* spp.) or a vaccine has been identified as the most appropriate product needed (*Shigella* spp.). As such, there is a high proportion of investment, captured by the Dynamic Dashboard, in basic research, preventives and operational and implementation research for all three bacteria (Figure 27).

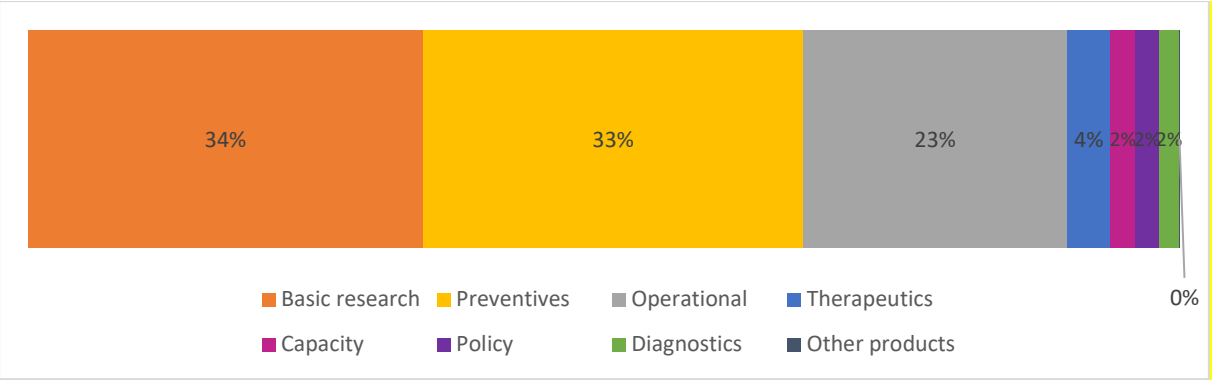


Figure 27: Percentage of investment in medium level bacteria by research areas, human sector

Watch bacteria

As at 8 September 2020, only *Bordetella* spp. were included on the watch category in the Global AMR R&D Hub's priority list. The focus of the 23 million USD investment into *Bordetella* spp. is preventive research (83%), all directed at vaccines (Figure 28).

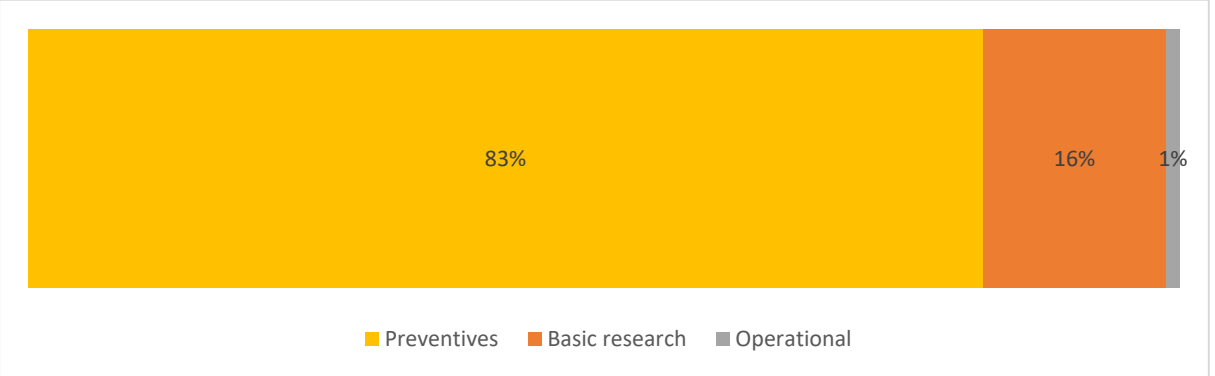


Figure 28: Percentage of investment in bacteria on the watch list by research areas

Bacteria not specified

For the 1,926 million USD investment, captured in the Dynamic Dashboard, where specific bacteria(ium) are not specified, the top five areas of research are: operational and implementation (29%); basic research (21%); therapeutics (21%); diagnostics (10%) and capacity building (10%).

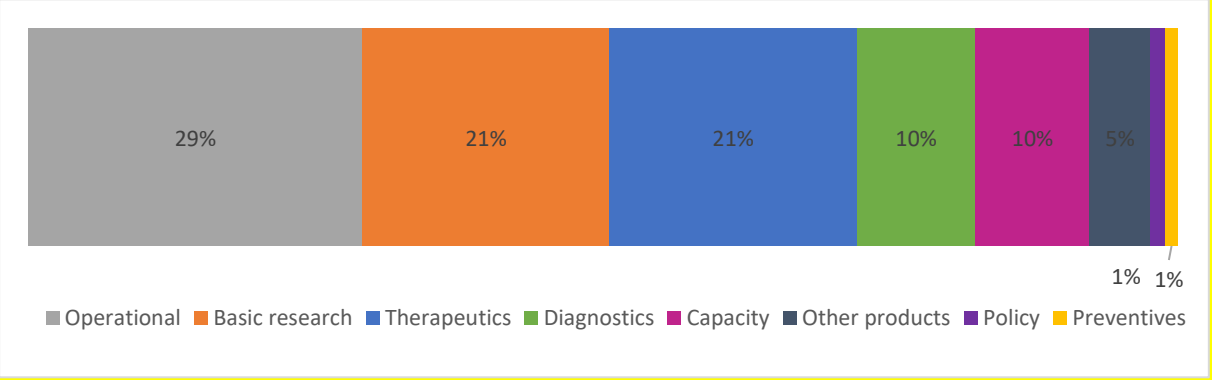


Figure 29: Percentage of investment in projects with bacteria not specified by research areas, human sector

Projects that are about broader AMR research and operational and implementation research have been included in the Dynamic Dashboard under bacteria not specified[15]. While this may skew the amount of investment and proportion attributed to different research areas, it is encouraging to see a broader approach being taken especially for operational and implementation research, therapeutics, diagnostics, and capacity building. To better visualise the R&D addressing AMR holistically, rather than on a specific infectious agent, these projects will soon be recategorized as infectious agent not specified.

Bacteria not identified as a priority

Ninety-nine million USD was invested into research for bacteria not included on the Global AMR R&D Hub's priority list. Examples of the bacteria captured in the Dynamic Dashboard, but not identified as a priority, include *Vibrio* spp., *Clostridium* spp., and *Chlamydia* spp. The top four areas of research, by percentage of investment, are: basic research (49%); operational and implementation (20%); diagnostics (12%); and therapeutics (12%).

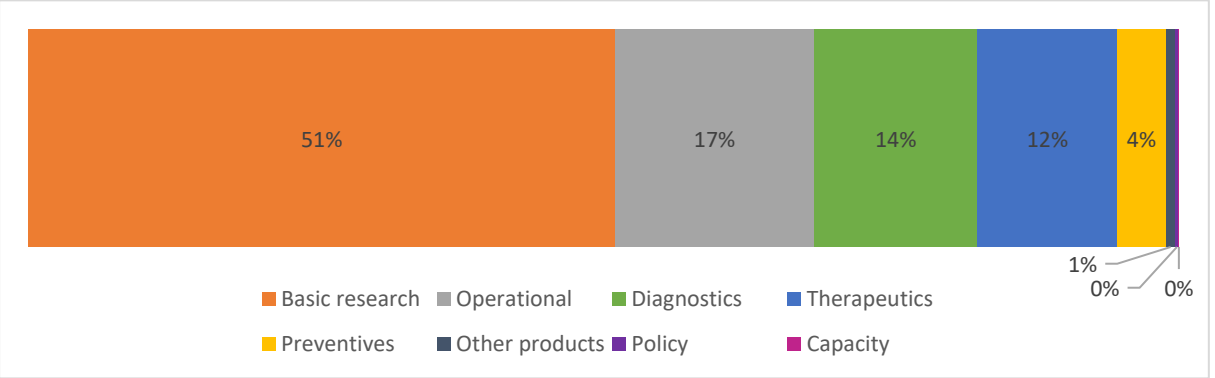


Figure 30: Percentage of investment in bacteria not identified on the priority list by research areas, human sector; due to rounding the total may not equal 100%

Investment by number of bacteria – human sector only

Nearly 50% of all human sector investment captured in the Dynamic Dashboard is going towards R&D into a single bacterium. Of this, half is going to *Mycobacterium* spp. which is expected given both the unique biology of the species and the high unmet medical need of the disease. The top five single bacteria that R&D is conducted on are presented in Table 7.

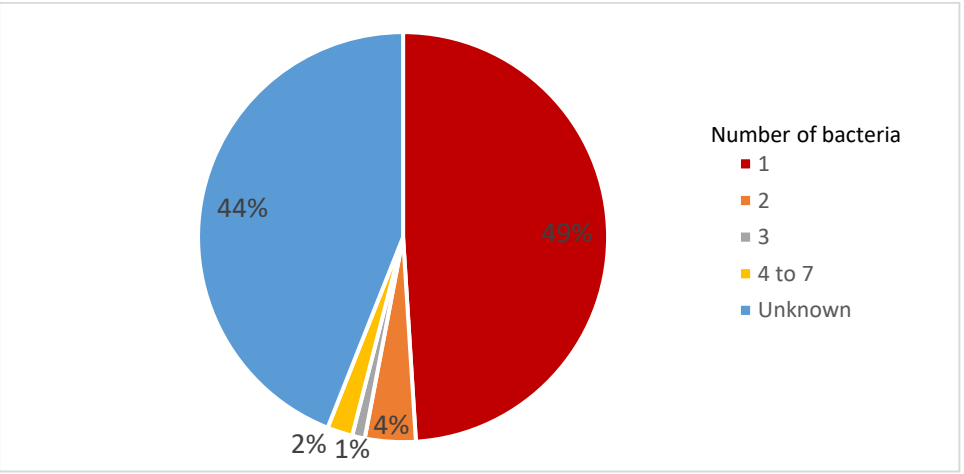


Figure 31: Percentage of projects that address 1, 2, 3, 4-7 and unknown number of bacteria, human sector

[15] When the Dynamic Dashboard was launched only projects related to human bacterial infections had been included. Thus, the category "infectious agent not specified" was not yet included and projects of this kind were categorized into the category "bacteria not specified". Data is being cleaned.

Table 7: Top-five single bacteria R&D is happening on as captured in the Dynamic Dashboard, human sector

Bacteria	% of investment for single bacterium research
Mycobacterium spp	51%
Staphylococcus spp.	11%
Streptococcus spp.	7%
Clostridioides spp.	6%
Pseudomonas spp.	5%

It has been noted in other analyses that there is a shift in the pre-clinical pipeline with a larger number of potential products focused on a single pathogenic species rather than the more traditional search for broad-spectrum antibiotics. The information captured in the Dynamic Dashboard shows that of the therapeutics projects, 32% in discovery are conducting R&D on a single bacterium and this increases to 56% for development projects (note smaller numbers of projects overall).

Over half of the therapeutic projects in the development phase looking at a single bacterium were *Mycobacterium* spp. (54%) followed by *Clostridioides* sp. (20%). While 59% of the projects in the discovery phase (12% of these were researching the *Enterobacteriaceae* family) are conducting R&D where the number of bacteria is unknown[16] and this decreases to 36% for development phase projects.

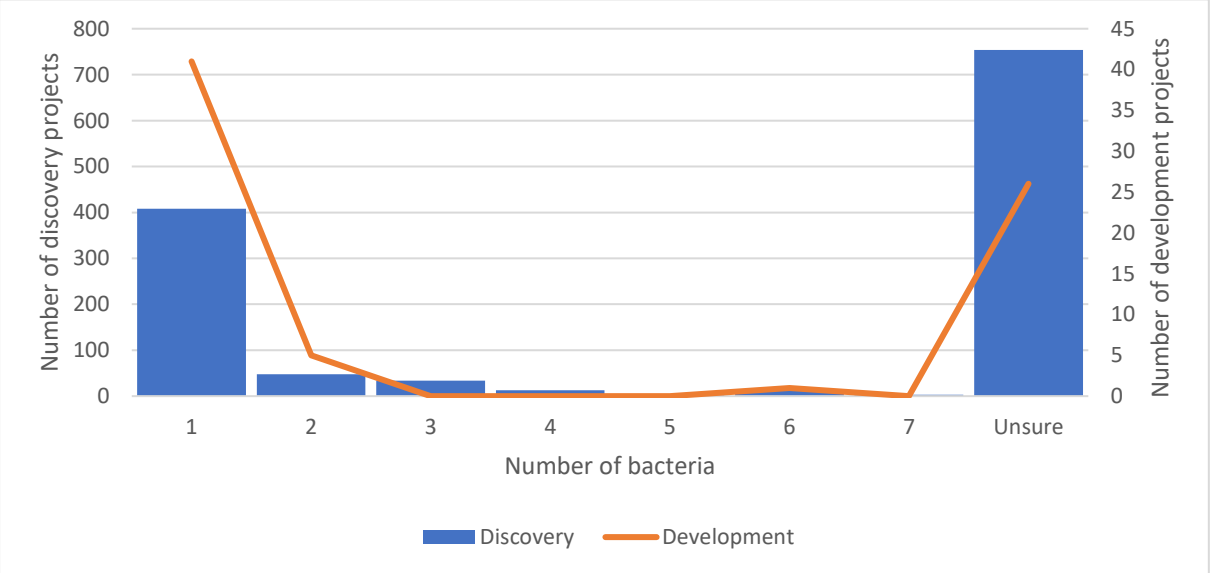


Figure 32: Human sector therapeutics projects by number of bacteria

[16] The number of bacteria was considered to be unknow when the project did not specify the bacteria or included the *Enterobacteriaceae* family.

Product-related R&D – human sector only

Please note: Product-development for new interventions in the healthcare sector is typically undertaken and financed by private companies and capital owners. The limitation arising from the fact that as for the entire report the analyses currently are limited to investments made by public and philansthropic funders need to be considered. This section analyses the role the public and private not-for-profit sector is playing in AMR product development.

The analysis in this section focuses on the 1831 projects (24% of the total number) captured in the Dynamic Dashboard that support 'product-related' R&D relevant for human bacterial infections. 'Product-related' R&D comprises all projects that have been categorised as supporting R&D on therapeutics, diagnostics, preventives or other products. The total investment amounts to 2,095 million USD, representing 37% of the value of all investments into AMR R&D captured in the Dynamic Dashboard.

Amongst the global funders supporting AMR R&D, for whom data is captured in the Dynamic Dashboard, 89 (63%) support human health products-related R&D.

Total Investment in human health products-related R&D

The data demonstrate the large share of investments into therapeutic interventions (61%), followed by diagnostics (18%) and those into prevention-targeting products (15%), most of which (14% overall) are for vaccines. The other product category (6%) includes health technological solutions such as biocides, biofilm-targeting products, medical devices, wound care etc. The therapeutic category includes old and new agents, small-molecule ('traditional') and non-traditional products i.e. natural products, antibodies, vaccines, probiotics and faecal transplant therapy, bacteriophages, antimicrobial peptides, lysins, antitoxins and immune modulators.

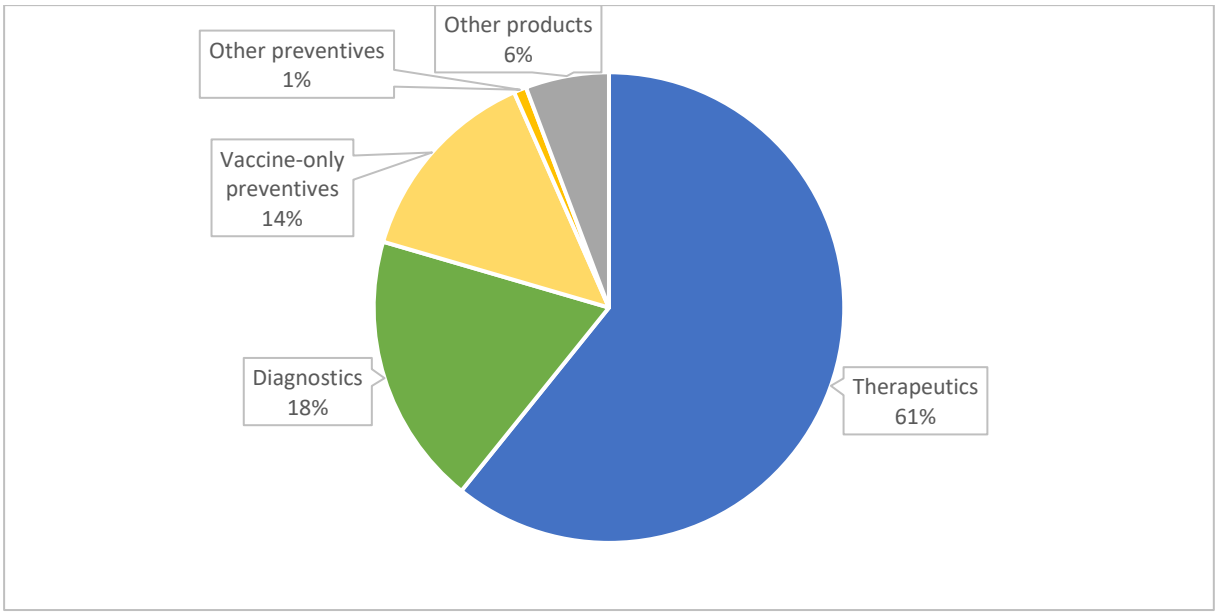


Figure 33: Proportion of total human product investments targeting the different intervention modalities

Investment by product type and R&D stage

For therapeutics it was analysed at what stage in the product-development value chain investments are directed at.[17].

[17] Early stage R&D: discovery and pre-clinical research – early development (clinical trials until phase IIa); late stage R&D: late development (clinical trials from phase IIb) – approval – post approval).

Of the 1,274 million USD investment into therapeutic products, 78% is spent in early stage R&D – as would be expected for public and philanthropic investments (Figure 34, bars). The dominance of support for early stage R&D is more pronounced when the number of projects is considered. Out of the total of 892 projects addressing therapeutics research, 873 (96%) were targeted at early stage R%D, compared to 37 (4%) targeted at late-stage R&D (Figure 34, line).

Four percent of the number of projects and 22% of the investment in R&D for human therapeutics is expended in the later, more expensive, stages of product development.

The fact that the small share of projects addressing late-stage R&D account for a much larger share of the investment reflects the different scale and cost of projects along the value chain. For context, many studies including this more recent one[18] indicate that the current costs of developing a single therapeutic from discovery to post-approval is around 1.2 billion USD, similar to the total investments into therapeutics R&D captured in the Dynamic Dashboard since 2017.

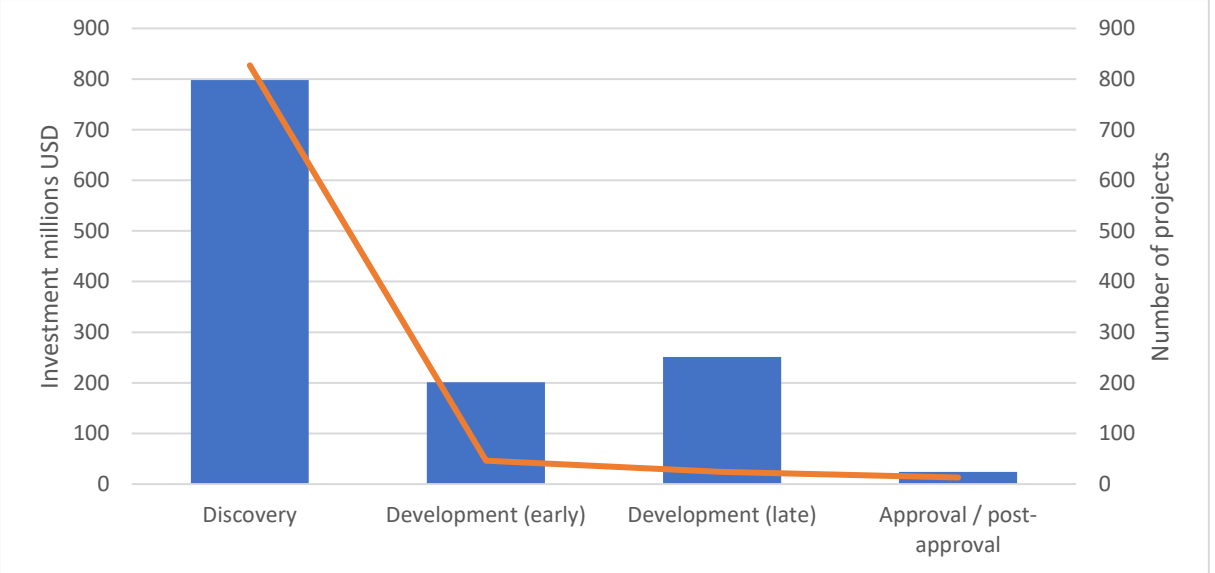


Figure 34: Total therapeutic investments in million USD (bars) and number of projects (line), by R&D stage

[18] Wellcome Trust (2020), The Growing Crisis in Antibiotic R&D. Available from: https://wellcome.ac.uk/sites/default/files/the-growing-crisis-for-antibiotic-r-and-d.pdf

The share of investments into late-stage R&D is similar for vaccines and lower for diagnostics, compared to the share for therapeutics.

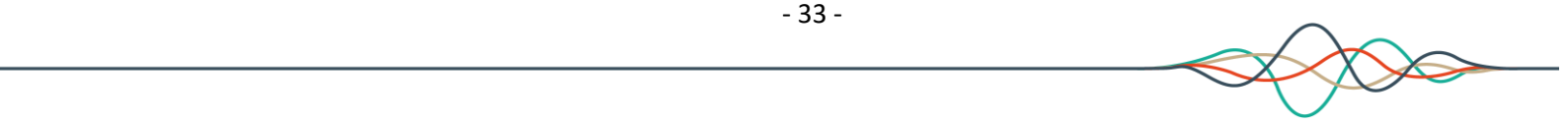
A similar analysis[19] for diagnostics and vaccines shows that of the 393 million USD and 291 million USD total investment, 22% and 14%, respectively were invested into late-stage R&D. The discrepancy between share of investment and share of number of projects is smaller for diagnostics and vaccines compared to therapeutics.

Table 8: Summary of product-related R&D - investment and number of projects

Product type	Stage of product development	Investment (million USD)	No. of projects
Therapeutics	Discovery	798	827
	Development (early)	201	46
	Development (late)	251	24
	Approval / post approval	24	13
		1,274	***892****
Diagnostics	Discovery	199	330
	Development (early)	107	93
	Development (late)	46	43
	Approval / post-approval	41	12
		393	***466****
Vaccines	Discovery	156	148
	Development (early)	94	22
	Development (late)	36	12
	Approval / post approval	5	9
		291	***188****
Other preventives (non-vaccine)	Discovery	13	18
	Development (early)	0.2	1
	Development (late)	5	3
	Approval / post approval	0	0
		18	***23****
Other Products	All development phases	***120***	***284***
Total		**2,095**	**1,831***

*Numbers do not add up, since projects may be categorised to more than one research area and/or sub-area. Such projects are not counted twice in the sub-totals and the total.

[19] Even more so than for therapeutics, data should be interpreted with some caution due to the imperfect ability to categorise development projects as early or late based on an academic grant abstract



Total product investment by priority of infectious agent

The review of the total investment data by infectious agent is shown in section "Investment by bacteria priority level human sector only". Here a sub-set of this data is analysed based on the total human, product-only, investments by priority level of infectious agent.

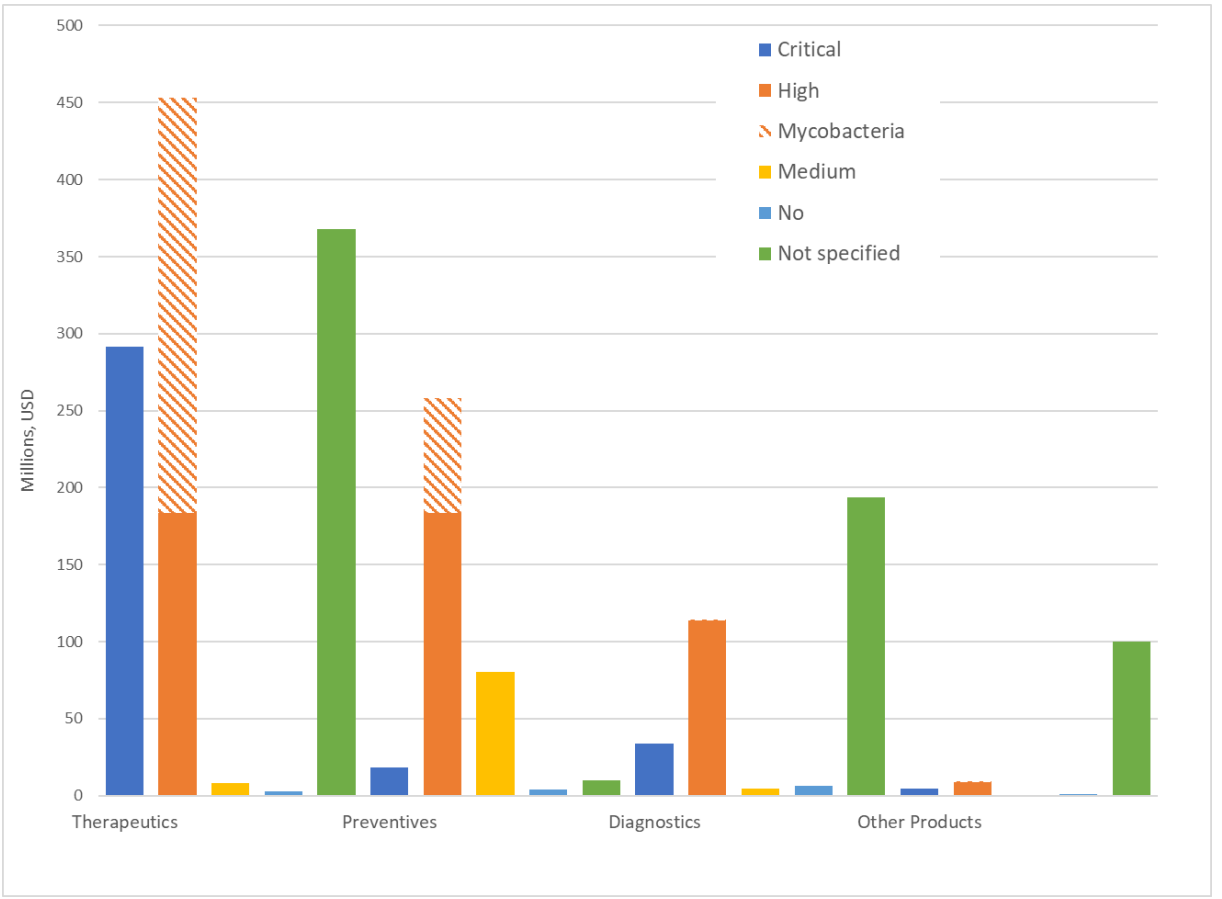


Figure 35: Total human product investments by priority-level of infectious agent. Please note that for this analysis investments targeting mycobacteria spp have been disaggregated from within the priority-level 'high'

NB: Please note this analysis has been performed on a sub-set of our product data and represents only those projects (albeit the majority) categorised as product-related R&D only, i.e. excludes those product-development projects also with a basic research, operational and implementation research or policy component.

The results of the Dynamic Dashboard analysis here, and the similar analysis in the "Investment by bacteria priority level human sector only" suggest that product development investments is broadly oriented to the priorities as determined by (our definition) of priority pathogen. The slight dominance towards the high 'priority' levels is largely attributable to *Mycobacterium* spp.

2. Pipeline gallery

Products & product markets – human sector only – current therapeutic pipeline

A key measure of the quality of research being financed in an area is to look at the outputs of that research. For antimicrobials research a key output measure is the number of products in different phases of clinical development. Latest data collected by the WHO and Pew Charitable Trusts are collated and presented in the Global AMR R&D Hub's 'Pipeline Gallery' that was launched in August 2020. It is based on the most recent pipeline analyses carried out (full WHO report form December 2019, with a data update Q1 2020; Pew pipeline analysis from April 2020).

The data collected by the Dynamic Dashboard for 79 products in clinical development or that have been recently approved are summarised in Figure 36 and are broadly representative of most product pipelines which typically display a narrowing of the number of compounds in development as the years and stages progress (due to failures of products to attain sufficient safety and efficacy standards or for commercial reasons). Caution must be drawn when comparing the AMR-therapeutic pipeline to that of pipelines in other therapeutic areas. The AMR-therapeutic pipeline does not target a single condition – it represents multiple conditions caused by a large group of possible infections and resistant infections. In terms of the quantity or size of the pipeline (Figure 36), a reasonably broad and diverse pre-clinical pipeline - as it has recently been reported by the WHO[20]- gives way to a narrower pipeline in the development phases. The 'sufficiency' of the pipeline continues to be explored and analysed more thoroughly elsewhere.[21]

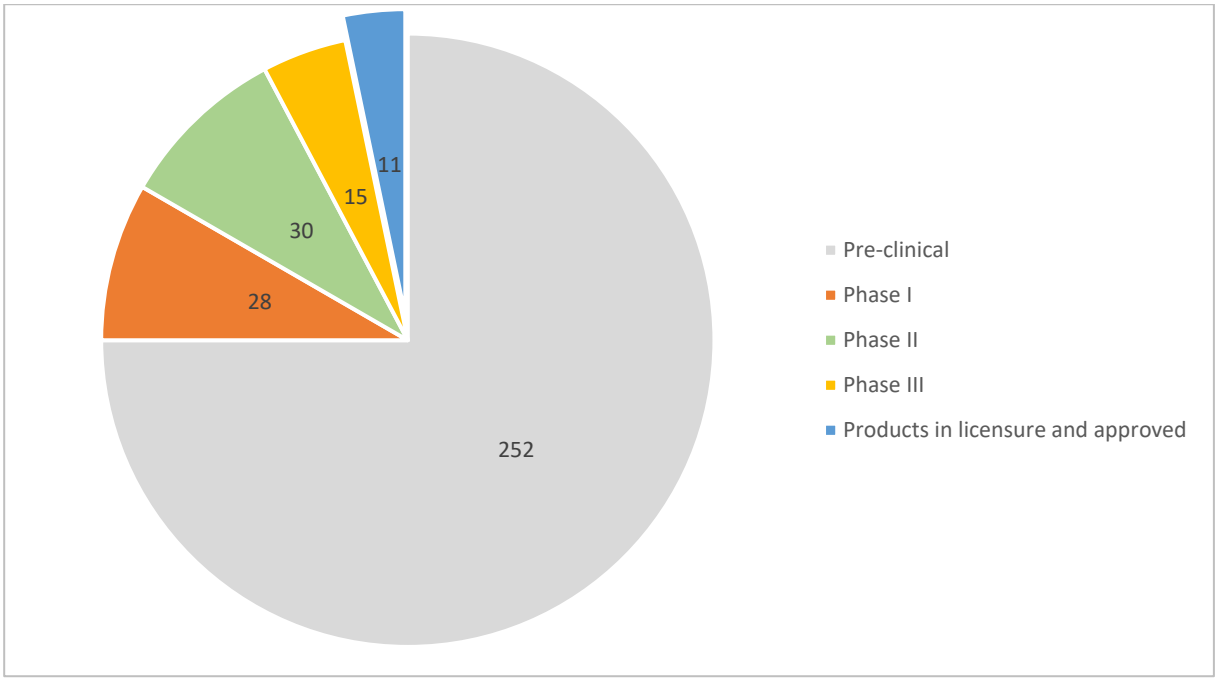


Figure 36: Current total product pipeline for therapeutics for human bacterial infections by development stage

NB: including the WHO's 2019 pre-clinical pipeline analysis[17], which is not part of the Hub's Dynamic Dashboard so far

Translation of the investment into new antibiotics in clinical development is not yet functioning optimally. The pipeline remains fragile, with low numbers and relatively weak innovativeness and with

[20] https://www.who.int/research-observatory/monitoring/processes/antibacterial_products_preclinical/en/
[21] https://www.who.int/research-observatory/monitoring/processes/antibacterial_products/en/

only about two fifths of the compounds in development or recently approved addressing some of the most critical pathogens.

In recent years WHO has taken the lead in efforts to improve the signalling of priority, unmet, therapeutic needs to the (typically) commercial market through tools such as its Priority Pathogen List (PPL). At a national level the US CDC has a similar tool of categorising threats of antimicrobial resistance as urgent. The Global AMR R&D Hub combines these tools in its definition of 'priority infectious agents' and presents it in the pipeline gallery. Figure 37 displays the number of products in different phases of clinical development up to approval, stratified by groups of pathogens of interest.

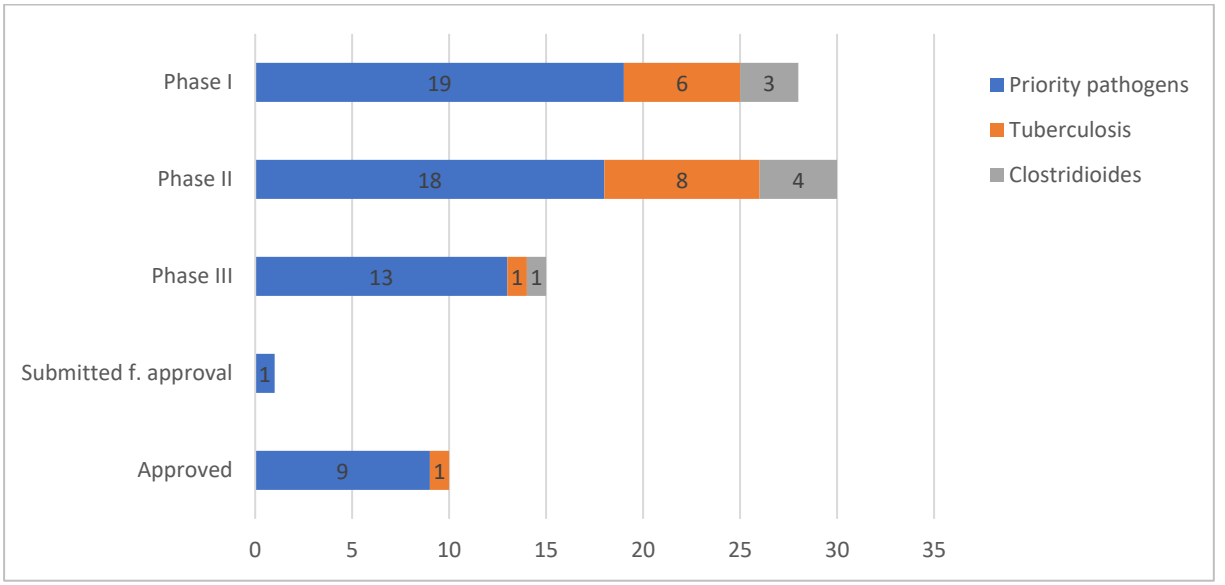


Figure 37: Current product development pipeline and recently approved therapeutics for human bacterial infections by phase and by (type of) pathogen addressed. N.B. Some products are listed by the PEW and WHO analyses as being in several phases of development, therefore the numbers shown are larger than the total number of products in development or recently approved (n=79).

Looking at how innovative the recently approved products and those in the clinical pipeline are, for the 69 small molecule drugs out of the total of 79 it has been evaluated whether products work through a new mechanism of action and/or represent a new type of chemical entity. Only 15 molecules (22%) represent a new type of chemical entity and work through a new mechanism of action. The share is slightly higher for products that do not address WHO critical and/or CDC urgent pathogens (23%) and correspondingly slightly lower for products that do (20%).

If in this same group one considers products that address the most critical pathogens ("WHO urgent" and/or "CDC critical") out of the total of 69 products, this represents a significant share of 30 products (43% of small molecules for which innovativeness has been determined, 44% of all products including biologicals, and 50% of approved products).

In the end only 6 products remain that have been evaluated to work through a new target and to represent a new chemical class and also address some of the most critically urgent threats from AMR: Four compounds address *Clostridioides* (2 compounds in phase 1 clinical development and one each in phase 2 and 3), one compound addresses gram-positive pathogens (gepotidacin – Phase 3) and one addresses *Neisseria gonorrhoea* (zoliflodacin – Phase 3).

Out of the 10 approvals since 2017 half address some of the most important threats, none are truly innovative in that they would work through a new mechanism of action and would represent a new type of chemical entity.

Table 9: Number of small molecule products recently approved or in development classified whether they address WHO critical and/or CDC urgent pathogens and whether they represent a new chemical class and work through a new mechanism of action

All 69 small molecule products			
Addressing WHO critical and/or CDC urgent pathogens	New chemical entity and new target		
	No	Yes	
No	30	9	39 (57 %)
Yes	24	6	30 (43%)
	54 (78%)	15 (22%)	69
Looking only at the 10 recently approved products			
No	5	0	5
Yes	5	0	5
	10	0	10

Noting that antibiotics are often used beyond the licensed indications, the indications for the products approved since 2017 are as follows:

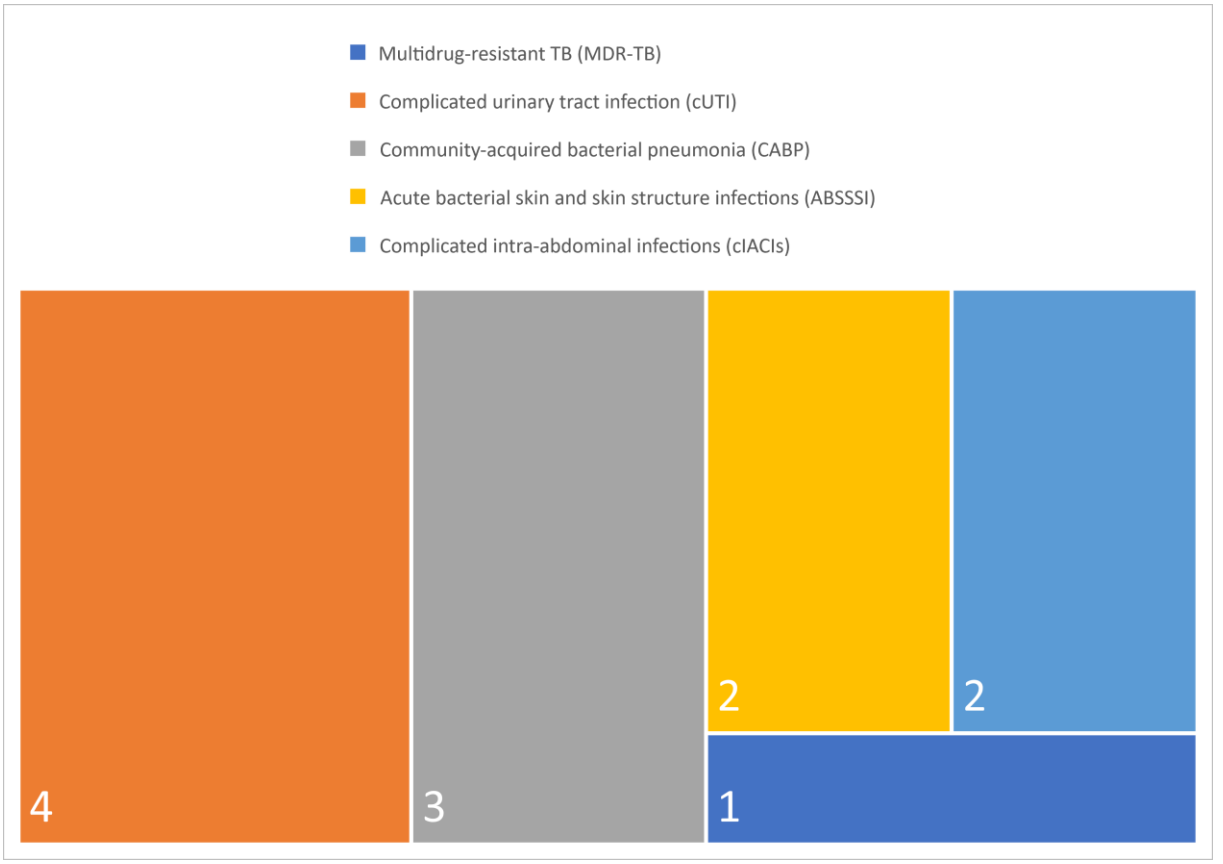


Figure 38: Recently approved antibiotics by their initial, launch, indication(s)

To improve the use of antibiotics through antibiotic stewardship the WHO developed the AWaRe classification[22]. The acronym stands for 'Access', 'Watch' and 'Reserve'. The system classifies 190 antibiotics as having activity against many pathogens showing lower resistance potential (Access -48), to be prioritised

[22] https://www.who.int/medicines/news/2019/WHO_releases2019AWaRe_classification_antibiotics/en/

as key targets for stewardship programmes and monitoring (Watch - 110) and being kept in reserve to treat infections due to multi-drug-resistant organisms (Reserve – 22).

Of the 10 recently approved medicines 4 are categorised as 'Reserve' and one as 'Watch', with the other 5 not having been categorised. Two products in the 'Reserve' category have also been placed on the WHO Essential Medicines List (EML)[23], representing medicines that satisfy priority health care needs of the population.

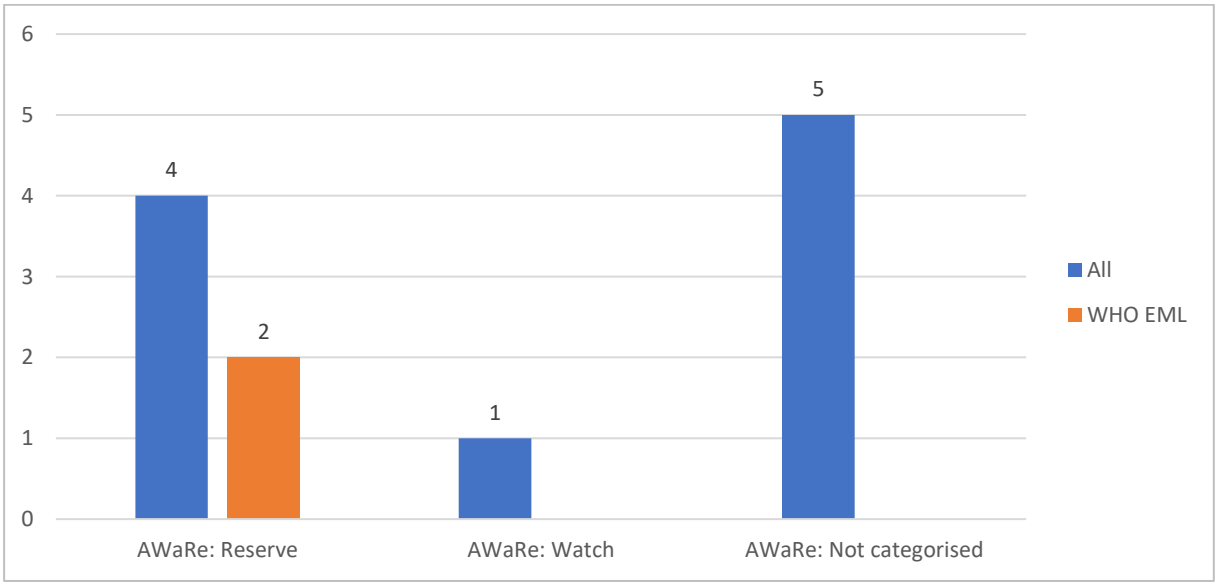


Figure 39: Number of human antibacterial therapeutic products launched since 2017 by their 'priority' (top left)

[23] https://www.who.int/medicines/publications/essentialmedicines/en/

3. Incentives gallery

Focus on Incentives to improve market functioning – human sector only

The Global AMR R&D Hub's work on incentives has focused on a collation of activities occurring along the value chain that try to support the therapeutic development ecosystem and mitigate some of the well-known challenges hindering the development, uptake and distribution of new[24] agents that are urgently needed. Some of this ecosystem support is in the form of financing, and extracting investment data has enabled a quantitative enrichment of the information about incentives displayed on the Dynamic Dashboard.

Financial push incentives overview – supporting early-stage R&D

Figure 40 displays the categories of push incentives along the value chain, as shown in the incentives gallery. For the first category of push incentives–support for early stage R&D– financial support is summarised with the funder countries investing most and the largest financing instruments by total investment value since 2017 shown.

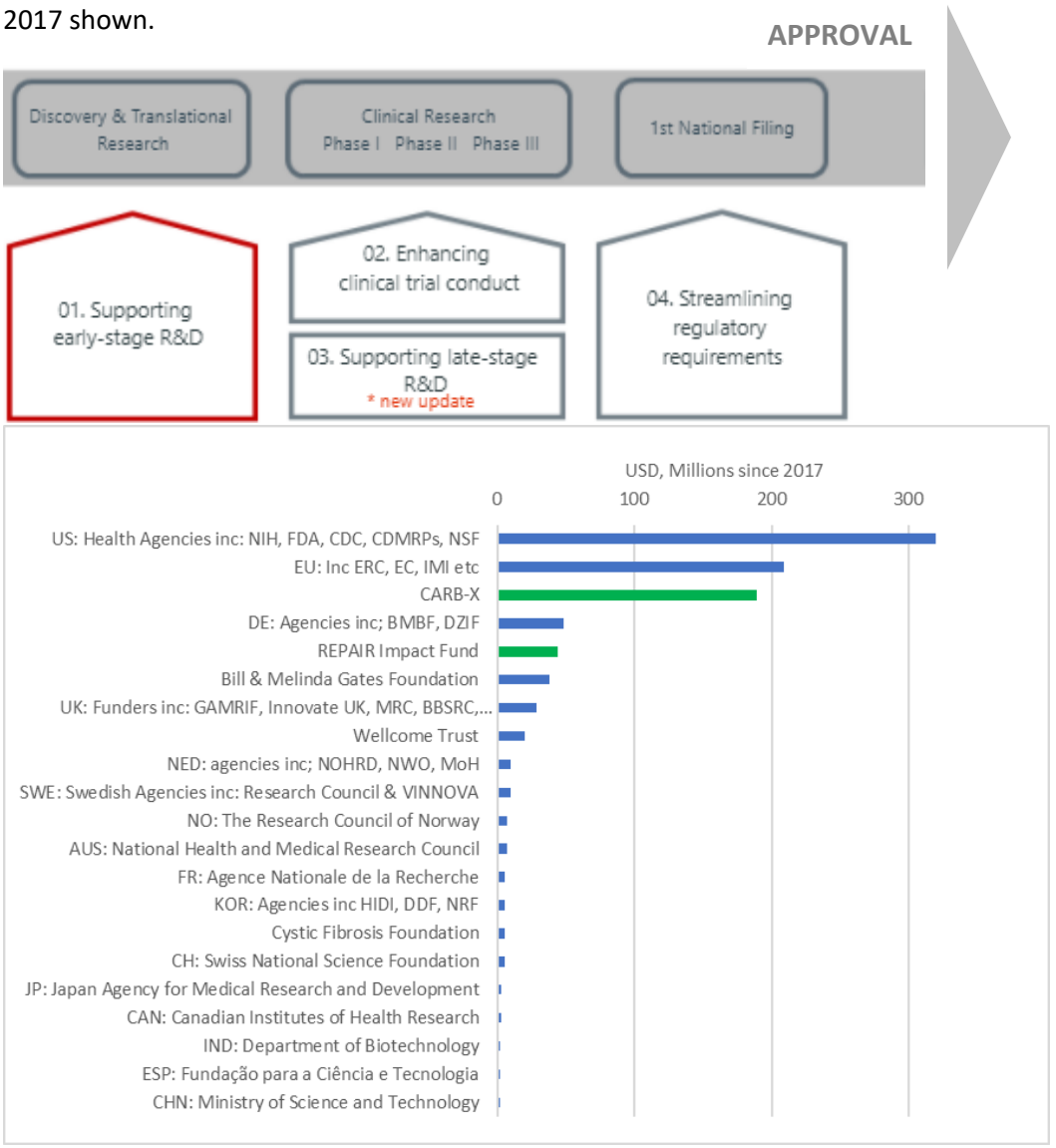


Figure 40: Total 'push' investment in discovery and early-stage therapeutic development since January 2017 for the Top 21 largest funders by country (blue) and financing instruments (green). NB: Funders' contributions to the financing instrument CARB-X are not captured separately to avoid double counting.

[24] The investment gallery also includes old antibiotics whose precarious supply is of concern to policy makers, but this is not covered here

The data show that early-stage push funding for therapeutic development is dominantly supported by the USA's health agencies (319 million USD) and the EU (209 million USD), with their combined support equalling 54% of all financial support. Specific mechanisms initiated in the last five years that also target the early-development space such as CARB-X and the Novo Repair Impact Fund provide additional support mechanisms for these early-stage products. Germany, UK, The Netherlands and Scandinavian countries also feature in the top 10, together with the two foundations Bill & Melinda Gates Foundation and Wellcome Trust.

Financial push incentives overview – supporting late-stage therapeutics R&D

A similar analysis into the investment data set looking at support for late- stage[25] therapeutic product development is displayed in Figure 41 below. The analysis reveals 25 projects with an investment of 252 million USD since 2017. A total of 13 funders[26] (15% of the 89 funders investing in human product-related R&D), from four countries and the EU, have made investments in this space.

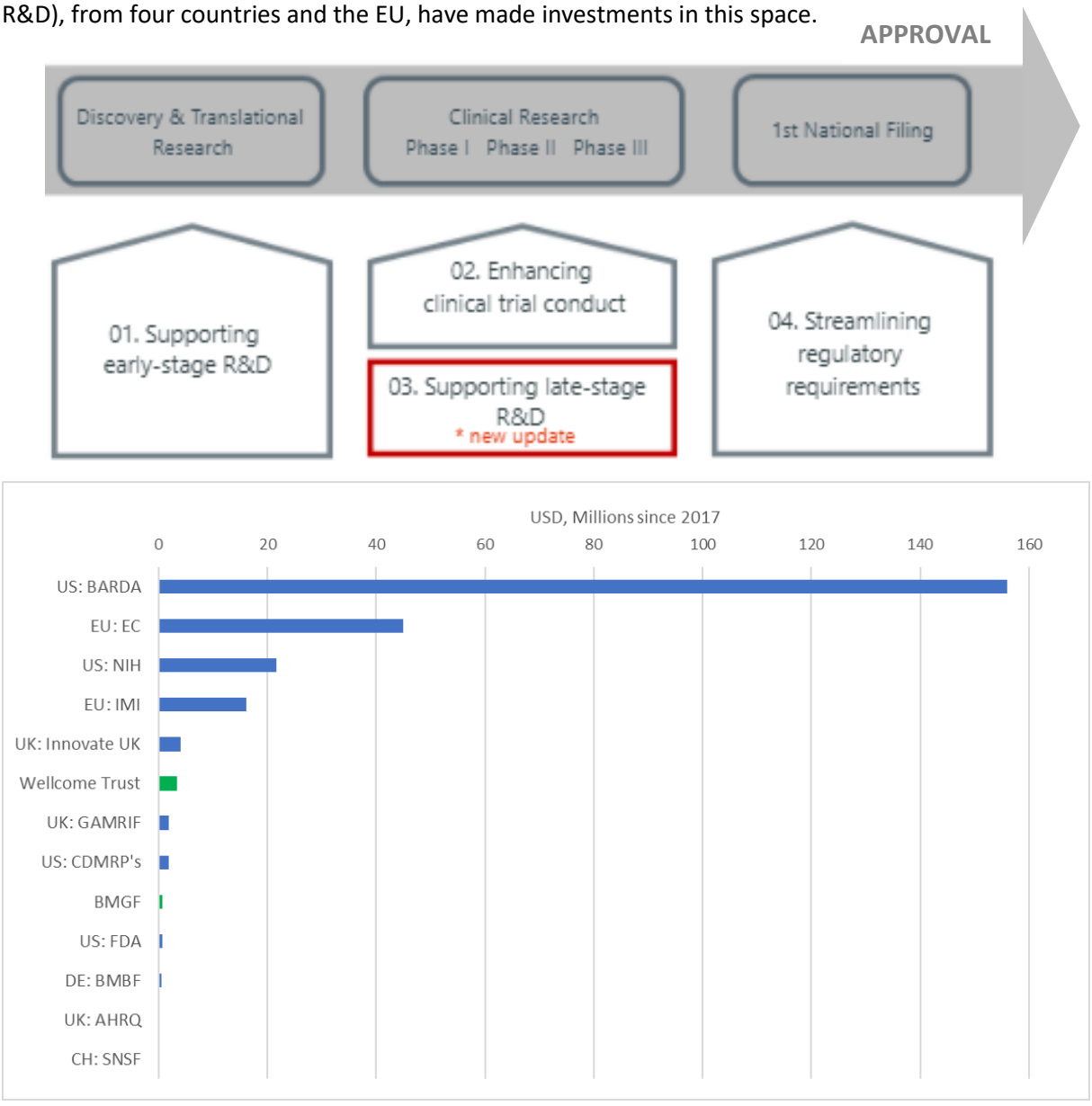


Figure 41: Total 'push' investment into late-stage therapeutic development since January 2017 by funder

[25] Please note the distinction between early and late stage was made based on information contained in the abstracts attached to the grants.

[26] With all EU-funding instruments being considered as '1'

When looking at the country of origin of those funders supporting late-stage development of therapeutic solutions, (Figure 42, below) shows the concentration of investments by few countries. Currently over 73% of all late-stage therapeutic development support comes from four US funders, the Biomedical Advanced Research and Development Authority (BARDA), Congressionally Directed Medical Research Programs (CDMRP's), the Food and Drug Administration (FDA) and the National Institutes of Health (NIH). The EU, through the Research Framework Programmes including the Innovative Medicines initiative (IMI), comprises around a quarter of total investment.

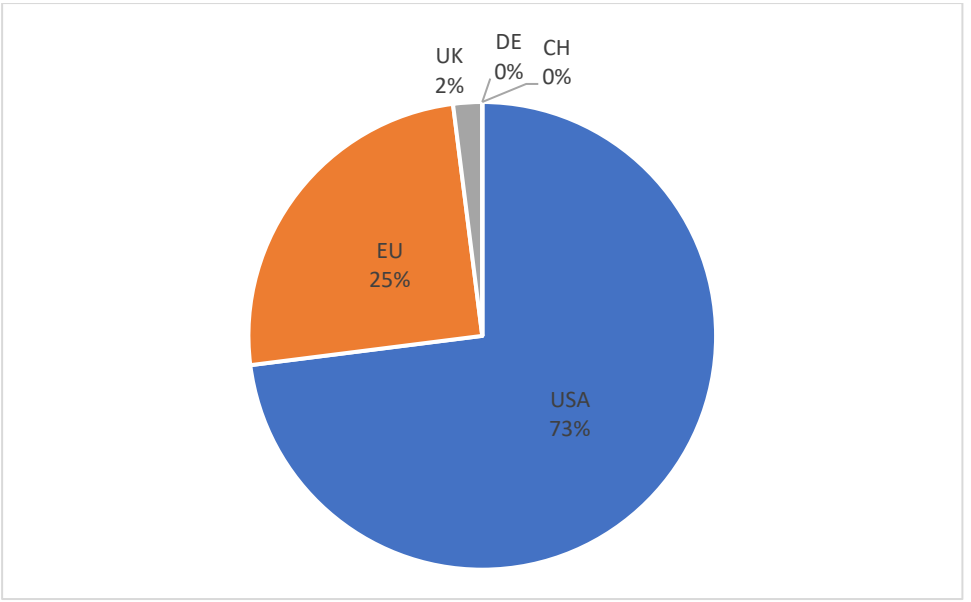


Figure 42:Total 'push' investment into late-stage therapeutic development since January 2017 by funders' country of origin

When taking a slightly broader viewpoint, late-stage development across all product types (Figure 43), shows a wider participation (21 funders) and a less-pronounced dominance by the US. The two percentage points of this overall late-stage product funding sees support from Germany, Canada, China as well as India, Korea and smaller European countries, such as The Netherlands, Sweden and Norway.

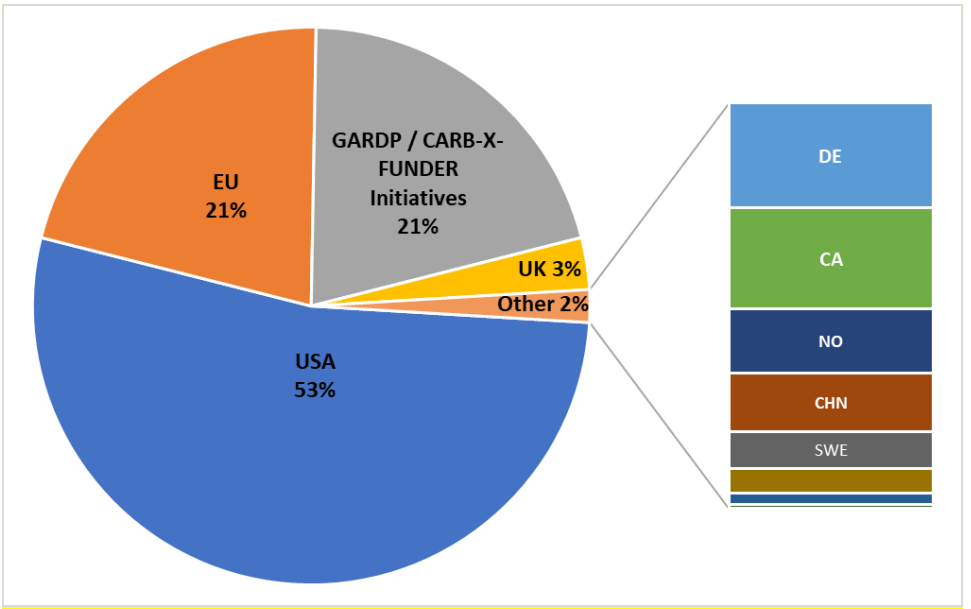


Figure 43: Total 'push' investment into late-stage product development since January 2017 by funders' country of origin, for comparison

The total amount of push funding for therapeutics development since 2017 captured in the Dynamic Dashboard amounts to estimates of the investment needed to bring one antibiotic from discovery to the market.[27]

Late-stage push support for the later, more expensive stages of therapeutic development, is concentrated in a few funders.

This type of investment in late-stage development fluctuates over time, as can be illustrated by looking at the spending per year for BARDA, one of the largest investors (total of 156 million USD captured since 2017). For this analysis a longer period of nine years than that currently covered in the Dynamic Dashboard is looked at.

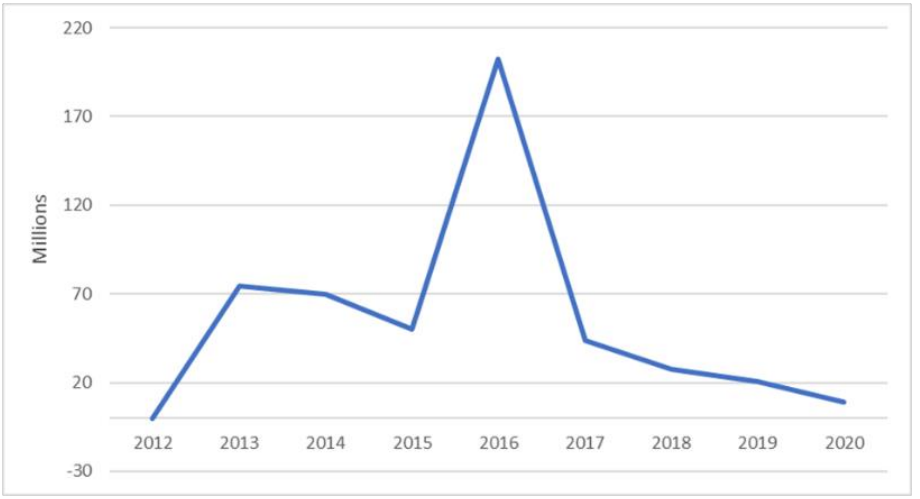


Figure 44: BARDA investments (million USD) in support of AMR product-development between 2012 - 2020

The figure shows that by far the largest investment was made in 2016, surpassing the total recorded in the Dynamic Dashboard since 2017. This variability from year to year may be due to the variation in opportunities that are considered worthwhile to be invested in by the agency. The decrease in investment since 2017 might also represent a more strategic shift away from this space.

The announcement in August 2020 of a 1 billion USD 'AMR Action Fund' supported by pharmaceutical industry[28] targeting this part of the product development value chain is to be welcomed. Since a healthy and sustainable, R&D ecosystem is likely to require a diversity of funders representing all corners of the globe. continued investment from different actors are likely to be necessary.

Pull incentives overview – supporting the post-approval context for AMR-therapeutics

The global pull incentive landscape that is captured in the Incentives Gallery of the Dynamic Dashboard is summarised for the first two categories in Figure 38, highlighted in red. These phases are critical as many companies in recent years have failed at this stage and it is the phase when new interventions are first made available to patients.

[27] See footnote 17:Wellcome Trust (2020), The Growing Crisis in Antibiotic R&D
[28] https://www.amractionfund.com/

Figure 45: Qualitative overview of the current pull incentive landscape as extracted from the Incentives Gallery of the Dynamic Dashboard

The initiatives extracted from the dashboard are currently a heterogenous group of interventions into these markets originating from only three countries. The Strategic National Stockpile (SNS), Strategic Reserve Fund (SRF) and the JSTO programme of the United States (USA) government are initiatives that provide support to bridge late-stage development and the early-commercialisation space for both novel and older antimicrobial agents. In addition to these long-standing programmes, a handful of countries are beginning to investigate how their health systems value and subsequently reward antibacterial agents. Both the United Kingdom and Sweden are currently in a 'piloting' period for their health system reforms. Work has been underway for some time by the USA Centres for Medicare and Medicaid Services (CMS) with various pieces of legislation ratified and others in development. Germany (DE) is in a phase of developing the details of its recently approved legislation. These latter activities from the USA and DE are for now not included in the Dynamic Dashboard as they fall outside of the definition of being "currently implemented" but are included in Figure 45 to show additional developments under way.

With the pipeline dominated by products developed by SMEs – without the resources of larger companies – this immediate launch or early commercial phase is widely believed to be the most precarious part of the value chain. This is true not only for the companies and their products but also for the public and philanthropic push funders who earlier invested in these compounds that struggle to make it through the first few years after licensure.

Pull support, to overcome some of the economic challenges in therapeutic markets following approval remains *ad hoc*, small-scale and initiated by just a few countries globally.

Conclusion and next steps

This report is the first consolidation of national AMR-related R&D funding and a start to providing a comprehensive global picture. This first analysis report provides a baseline, essentially representing two full years of data (2017 and 2018). Over time, more data will enable meaningful trend analysis.

The Dynamic Dashboard currently collects and presents information on investments for AMR R&D from public and philanthropic funders. In the first stage the data collection focused on R&D related to human drug-resistant bacterial infections. The release of the first larger set of the animal health R&D projects at the end of July constituted the important transition into the second stage of the Dynamic Dashboard. This was followed in August by the presentation of incentives and a representation of the pipeline of antibacterial products in clinical development. Over time, the Dynamic Dashboard will evolve to capture a broader geographical scope, more pathogens and all One Health sectors.

The current report analysed data as at 8 September 2020 and included data from 141 funders in 34 countries and the European Union. In drawing conclusions, limitations need to be considered, especially as regards completeness of data. Even within the dataset of individual funders, some projects may be missing. Institutional and private funding as well as funding where data could not be accessed from public and philanthropic funders are not covered. To complement the efforts at the current data collection for the Dynamic Dashboard, the Global AMR R&D Hub will source the funding/investment information collected in the UberResearch Dimensions database[29], which includes 5.5 million grants overall, of which a small part will be relevant for AMR.

Based on the reporting and analysis presented here, linkages between funders will be the first priority for detailed analyses. In parallel, further analysis of push and pull incentives will be prioritised – and how the data on funding captured in the Dynamic Dashboard can support these efforts.

The outcomes and resulting analysis will help to identify opportunities and gaps in AMR R&D and inform about progress in the AMR R&D field. The value of the consolidated data lies in these types of analyses to provide the evidence-base for policy makers.

Acknowledgements

The Global AMR R&D Hub gratefully acknowledges the support it has received from funding organisations around the world who contributed data to this exercise.

[29] https://www.dimensions.ai/

Appendix 1: Approach to developing the Dynamic Dashboard and methods for capturing, processing and presenting the data

Caveats/limitations

Interpretation: Care should be taken in drawing conclusions about the AMR R&D landscape from the information currently presented in the Dynamic Dashboard especially in regards to identifying gaps in research needs and making statements on global activity or product-specific R&D. This is because of data gaps including geographical representativeness and the current lack of information about private sector or institutional investments.

Comparison: From the data presented it is evident that we may still have considerable gaps in data collection. Also, the search terms have evolved during the period of initial data collection, the data extraction methods differ between sources, due to the nature of the data source, and the timing of data collection and updates from funders. Thus, it is currently not possible to compare investments or the number of projects between different countries or over time.

Updates: The analysis is based on the status of information as at 8 September, as referenced throughout the analysis report. Due to the nature of the Dynamic Dashboard, both the data and definitions for categorisation will be updated regularly and is subject to retrospective revision. Therefore, both new and existing data may vary between the update dates. When referencing information from the Dynamic Dashboard it is vital to refer to the specific date of data extraction.

As shown in Table 11, extraction of data was done at a given point in time. Projects/investments awarded after this date are currently not recorded. A process for regularly updating the data base will be established.

Data Scope / Maturation: The Global AMR R&D Hub takes a staged approach to presenting information. The information is currently limited to R&D regarding human bacterial infections and AMR R&D related to animal health.

Completeness (by type of funder): Currently only research and development funded by public funders and philanthropic organizations is included in the Dynamic Dashboard. Work is underway to obtain and represent private sector R&D funding, which is vital to be able to see the true AMR R&D landscape.

Completeness (global): Data from a considerable number of sources has been collected, as shown in Table 11. Collecting data from the Members of the Global AMR R&D Hub was prioritised. It needs to be highlighted that information from a number of funders is missing. Particularly coverage of funders from the Southern hemisphere and low- and middle-income countries is still limited.

Completeness (per country): In addition, not all funders, investments and/or projects have been captured from countries. Both the global and coverage per country will improve as the amount information captured by the Dynamic Dashboard increases over time.

Completeness (per type of funding): Our initial data set are likely skewed to certain types of funding steams/vehicles, such as direct grant support for projects and personnel. As our data set mature the hope is that we will be able to represent all 'push-type' funding (support for R&D inputs) regardless of the type of vehicle, this is again due the readiness of availability of initial data.

Completeness of capturing AMR-relevant R&D: The search terms used determine and may limit the range of relevant projects that could be identified.

Data accuracy: The Secretariat has relied on the completeness and accuracy of the original data from the funders. However, any obvious discrepancies, errors or gaps were investigated. The limited information

contained in abstracts limits the interpretation and categorization. With the large number of projects/investments collected, it is not possible to go to more detailed information, such as detailed descriptions, reports, publications coming out of projects etc.

Multi-beneficiary challenges: For projects where several institutions are supported, funding information for all individual partners is normally not available. This will lead to inflated numbers for some countries/research organisations and too low numbers for others.[30]

Limitations in data processing/presentation:

As mentioned above, if a project is relevant to more than one research area, R&D stage or bacteria, the project budget is split accordingly. However, we did not split the number of projects. A project which is relevant to more than one research area, R&D stage or bacteria will be counted multiple times in the specific report, but this does not affect the overall total number of projects.

The category 'other bacteria' includes cases where the categorized project/investment addresses bacteria for which no individual category was created and where there is a resistance issue (see the **List of infectious agents with a relevant AMR issue**), and cases where the project was relevant to bacteria more generally.

The report on subprojects with individual project IDs and individual investments were calculated as independent projects that may result in duplication of the number of projects.

It was decided to choose the exchange rates to US Dollar and Euro on the start date of the project. For currencies where the exchange rate fluctuates (sometimes strongly) over time, this may mean that investments are over- or under-estimated. This method was chosen as it can be clearly defined.

It was decided not to factor in adjustments for inflation rates, since it is considered that having reliable information about inflation rates from across the world since January 2017 is challenging. It would also have required additional processing of the budget information adding complexity to the IT solution.

Sometimes a project/investment is composed of sub-projects, each with their own entry in the data-base. It is planned to develop tools that will link such sub-projects into the overarching project.

Projects are included that are active on 1 January 2017 or later. With the time period of 2017 being far enough in the past, all projects that could be found with the search terms used will have been collected. For later years, especially as from 2019, there are still many projects that have not yet been collected because the awards have only just been announced or the search was carried out before the awards were announced. As more data is collected, the closed year two years before the current time should have completed data.

[30] For example, for collaborative projects funded by the European Commission the entire EU contribution is allocated to the coordinator and for IMI projects to the managing entity for the EU-contribution.

Overall approach to developing the Dynamic Dashboard

The overall approach and timeline had been defined in the Dynamic Dashboard roadmap published in March 2019[31]. The Dynamic Dashboard was to provide an interactive platform that enables identification of gaps and duplications in AMR R&D activities, including incentives. Investments in R&D for all One Health Sectors were to be presented along with the pipeline of products in clinical development. It had been decided to develop the Dynamic Dashboard in a step-wise approach.

The process for establishing the Dynamic Dashboard was defined in a first methodology paper[32], published December 2019. The approach taken for developing the data categorisation fields is presented. Briefly, based on a literature review and analysis as well as stakeholder consultations a first draft on the scope for the Dynamic Dashboard, the categorisation fields and accompanying definitions was prepared. This was submitted to consultation and the drafts were amended based on the feedback, which then led to approval of the scope, the categorisation fields and the definitions.

R&D and AMR scope

For an R&D project and/or investment[33] to be included in the Dynamic Dashboard, it must have a clear research and/or development component and satisfy the disease, geographical, funding and incentives scope defined in Table 10**Table *12***. The R&D scope is listed in Table 12 and exclusion criteria in Table 13 (below). In addition, the R&D must be related to AMR which was defined as any project or investment that:

- Addresses or investigates drug resistant bacteria, viruses, fungi and parasites (protozoa and helminths only) including improving understanding of transmission and environmental risk;
- Investigates how to improve the access to all products globally;
- Looks at how to improve processes, strategies and/or develop products for better stewardship and appropriate use of all antimicrobials (including monitoring antimicrobial use);
- Aims to develop any new antimicrobial, and;
- Investigates ways to reduce antimicrobial use, such as alternatives to growth promotants and vaccines for diseases that drive inappropriate antimicrobial use, and reduces contamination of the environment with antimicrobial substances or drug resistant agents or organisms.

[31] https://globalamrhub.org/wp-content/uploads/2019/08/Roadmap_Dynamic_Dashboard_Global_AMR_RD_Hub.pdf
[32] https://globalamrhub.org/wp-content/uploads/2020/03/Dynamic-Dashboard_First-methodology-paper.pdf
[33] Project/investment is defined as:

- A project funded by a granting body/agency and identified as such by the body/agency. This is the case for a large number of data entries used for the Dynamic Dashboard.
- A coherent set of activities financed by in-house resources of an institution and reported as such by the institution. This is the case for institutionally funded research.
- Activities carried out by a company or not-for profit entity and defined as a programme, initiative, or measure by the entity. This is typically the case for activities linked to the development of a new intervention. An example could be the formal pre-clinical development of a compound to enter clinical trials (i.e. submit the first investigational new drug application in the US or the first clinical trials authorization in the EU).

Table 10: Overall scope of the Dynamic Dashboard

Disease scope	All bacteria, viruses, fungi, protozoa parasites, and helminths[34] affecting or colonising humans, animals and plants and their associated environments are in scope but research must be related to AMR
Geographical scope	Global
Funding and incentives	All types of public and private funding including project grants, programme grants, institutional funding, consortia grants, fellowships (following the defined R&D scope above), seed funding, centre funding, prizes and awards (only when associated with money) and pilot projects that have a clear research component – All push incentives for R&D – All pull incentives for R&D that target removal of the following barriers to R&D and uptake: technical, financial and lego-regulatory – Programme / initiative evaluation reviews – Case studies – Access programmes

[34]Parasites in scope are protozoa and helminths. Ectoparasites are considered out of scope.

Investment gallery data sources and collection

The guiding principle for collecting data to be included in the Dynamic Dashboard was not to duplicate efforts that have already been taken and to make provision of data as straightforward as possible for investors/funders.

Based on information publicly available in the field, relevant data sources/websites, typically per country were identified. Many funders/countries offer such publicly available data portals. The initial list of data portals was shared with the Board and the Stakeholder Group with a request for additional input.

To carry out searches in the data sources, in consultation with the Board, the Stakeholder Group and additional experts a list of standard search terms was developed[35]. Relevant terms were added over the period of about six months during which the initial data collection was carried out. The list of terms used for every source is shown in the data source table. As we are taking a staged approach, the search terms will be further updated accordingly. A standard set of data points to collect was defined[36]. For countries/funders where we could not identify publicly accessible data portals we reached out directly to the relevant ministries/organisations.

The data collection also benefited from the mapping that has been carried out earlier by the European Joint Programming Initiative on AMR (JPIAMR). The information needed to complete the core data set was collected from the data sources for the respective funders.

The data set collected was shared with the respective funder/investor to ask for permission that we (re-) publish the information, and to what extent, and to verify that we had not made a systematic mistake in data collection.

In agreement with the Board it was decided that the Dynamic Dashboard will show projects/investments ongoing on 1 January 2017 or later. This time frame was used for the searches/requests for data.

[35] Acinetobacter, aeroguinosa, ampicillin, AMR, antibacterial, antibiotic, antibiotic resistance, antibiotic susceptibility, antifungal, anti-fungal, antimicrobial, anti-microbial, aureus, baumannii, C. difficile, campylobacter, carbapenem, cephalosporin, clarithromycin, clindamycin, clostridia, clostridium, cotrimoxazole, drug-resistant bacteria, Enterobacteriaceae, Enterococcus, erythromycin, ESBL, ESKAPE, faecium, fungal pathogens, gonorrhea, gonorrhoea, gonorrhoeae, Gram-negative bacteria, H. influenzae, Haemophilus influenzae, Helicobacter, hospital acquired infection, hospital-acquired infection, Klebsiella, Listeria, Lyme disease, MDR-TB, methicillin, MRSA, multi drug resistance, multi drug resistant, multidrug resistance, multi-drug resistance, multi-drug resistant, multidrug-resistant, Mycobacterium, Neisseria, One Health, penicillin, pneumococcal, proteus, Pseudomonas, rifampicin, Salmonella, Serratia, Shigella lactamase, Staphylococcus, stewardship, Streptococcus, superbug, tuberculosis, vancomycin,

[36] Country of the funder/Funder/Project ID/Project title (original)/Project title (English)/Project acronym/Recipient (organisation)/Principal investigator/Country of the recipient organisation/Start date/End date/Total amount awarded/In kind contribution/Total project cost/Currency/Abstract-summary (original)/Abstract-summary (English)

Table 11: List of data sources

Funder name and acronym	Country	Data collection	Data source; how we did it; link to data source	Search terms
Agencia Nacional de Promoción Científica y Tecnológica, Argentina - ANPCYT	AR	28.08.19	provided by funder	
National Scientific and Technical Research Council - CONICET	AR	07.07.20	provided by GAMRIF	
Australian National Health and Medical Research Council - NHMRC	AU	21.04.20	NHMRC Grant Application Round download data from 2014, 2015, 2016, 2017, 2018, and 2019; combined data in one master file with 5794 projects, key world search in master file; deleted projects with end date before 2017 and doubles https://www.nhmrc.gov.au/funding/data-research/outcomes-funding-rounds	Acinetobacter, aeruginosa, ampicillin, AMR, antibacterial, antibiotic, antibiotic resistance, antibiotic susceptibility, antifungal, anti-fungal, antimicrobial, anti-microbial resistance, aureus, baumannii, C. difficile, Campylobacter, carbapenem, cephalosporin, clarithromycin, Clindamycin, Clostridia, Clostridium, cotrimoxazole, drug-resistant bacteria, Enterobacteriaceae, Enterococcus, Erythromycin, ESBL, ESKAPE, faecium, fungal pathogens, Gonorrhea, Gonorrhoea, gonorrhoeae, Gram-negative bacteria, H. influenzae, Haemophilus influenzae , Helicobacter, Hospital acquired infection, Hospital-acquired infection, Listeria, Lyme disease, MDR-TB, methicillin, MRSA, multi drug resistance, multi drug resistant, multidrug resistance, multi-drug resistance, multi-drug resistant, Multidrug-resistant, Mycobacterium, Neisseria, One Health (many false positives – bone health), penicillin, pneumococcal, Pseudomonas, Rifampicin, Salmonella, Shigella lactamase, Staphylococcus, Stewardship, Streptococcus, superbug, tuberculosis, vancomycin
Department of industry, Innovation and Science - CRC	AU	05.09.19	CRC grants selection round outcomes Projects reviewed without search terms at https://www.business.gov.au/Assistance/Cooperative-Research-Centres-Programme/Cooperative-Research-Centres-CRCs-Grants/current-CRC-selection-round and then manually inserted into spreadsheet	-
Australian Research Council - ARC	AU	04.09.19	ARC Data Portal projects not running or active in 2017 or later were manually discarded. There are no titles listed on either the web or the data extract. First sentence of abstract used as title. https://dataportal.arc.gov.au/NCGP/Web/Grant/Grants	Acinetobacter , aeruginosa , ampicillin , AMR , Antibiotic , antifungal , anti-fungal , antimicrobial , anti-microbial resistance , antipara , antiparasitic , aureus , baumannii , Beta-lactamase , Campylobacter , carbapenem-resistant , cephalosporin, clarithromycin , Clindamycin , Clostridia , Clostridioides , Clostridium , cotrimoxazole, cotrimoxazole , difficile , Enterobacteriaceae , Enterococcus , Erythromycin , ESBL , faecium , flu, fluconazole , Gonorrhea, Gonorrhoea, gonorrhoeae, Haemophilus , healthcare acquired , healthcare acquired" , healthcare associated , healthcare associated" , Helicobacter , hospital acquired , hospital acquired" , hospital associated" , infections , influenzae , MDR-TB , methicillin , MRSA , multi-drug , mycobacterium , Neisseria , One Health , One Health" , oquinolone , penicillin , pneumococcal , pneumococcal , pneumoniae , Pseudomonas , pylori, Rifampicin , Salmonellae , Shigella , Staphylococcus , stewardship , Stewardship , Streptococcus , tuberculosis , vancomycin
Australia and Pacific Science Foundation - APSF	AU	14.07.20	funders homepage http://www.apscience.org.au/projects/	
Medical Research Future Fund - MRFF	AU	12.06.20	provided by funder	

Funder name - acronym	Country	Data collection	Data source; how we did it; link to data source	Search terms
FWF Austrian Science Fund - FWF	AT	04.02.20 and 09.04. 20	Europe PMC grant finder search term search, deleted projects with an end date before January 1st 2017 https://europepmc.org/grantfinder	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus
Research Foundation – Flanders - FWO	BE	13.05.2020	FRIS Research Portal https://researchportal.be/en	antibiotic resistance, Antibiotic susceptibility, antimicrobial, tuberculo, Acinetobacter, baumannii, carbapenem-resistant, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL-producing, Enterococcus, faecium, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, pylori, clarithromycin, Campylobacter, fluoroquinolone, Salmonellae, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, pneumoniae, penicillin, Haemophilus, influenzae, ampicillin, Shigella, fluconazole, Beta-lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium Clostridioides difficile, antifungal, antipara, AMR, Antimicrobial resistant, Antibiotic resistant, drug resistant
Institute for Innovation by Science and Technology – IWT Flanders	BE	13.05.2020		
National Council for Scientific and Technological Development - CNPq	BR	16.08.2019	Global Grand Challenges Projects identified from the BMGF Grand Challenge website; budget as well as start and end were provided by funder https://gcgh.grandchallenges.org/grants?f%5B0%5D=field_challenge%253Afield_initiative%3A37244	
Sao Paulo Research Foundation - FAPESP	BR	15.03.2020/14.08.2020	Research Supported by FAPESP The referential information source for Research Supported by FAPESP Budget information was provided by funder (14.08.2020) https://bv.fapesp.br/en/	antibiotic resistance, Antibiotic Susceptibility, résistance aux antimicrobiens, antimicrobial, tuberculo, Acinetobacter, baumannii, carbapenem-resistant, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL-producing, Enterococcus, faecium, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, pylori, clarithromycin, Campylobacter, fluoroquinolone, Salmonellae, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, pneumoniae, penicillin, Haemophilus, influenzae, ampicillin, Shigella, fluconazole, Beta-lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium Clostridioides difficile, antifungal, antipara, AMR, Antimicrobial resistant, Antibiotic resistant, drug resistant

Funder name	Country	Data collection	Data source; how we did it; link to data source	Search terms
Canadian Institutes of Health Research - CIHR	CA	21.06.19 (data provided by funder at 21.01.20); last update 15.6.20	Canadian Research Information System Search with search terms; projects with end date before 1.1.2017 and doubles; deleted; grants for travel and meetings as well as grants obviously dealing with cancer were deleted; list of candidate projects provided to funder; revised list with fewer projects received http://webapps.cihr-irsc.gc.ca/cris/Search?p_language=E&p_version=CRIS	antibiotic resistance, Antibiotic Susceptibility, résistance aux antimicrobiens, antimicrobial, tuberculo, Acinetobacter, baumannii, carbapenem-resistant, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL-producing, Enterococcus, faecium, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, pylori, clarithromycin, Campylobacter, fluoroquinolone, Salmonellae, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, pneumoniae, penicillin, Haemophilus, influenzae, ampicillin, Shigella, fluconazole, Beta-lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium Clostridioides difficile, antifungal, antipara, AMR, Antimicrobial resistant, Antibiotic resistant, drug resistant
Global Affairs Canada - GAC	CA	29.07.20	provided by IDRC	
International Development Research Centre - IDRC	CA	29.07.20	provided by funder	
Ministry of Science and Technology - MoST	CN	11.07.20	provided by GAMRIF	
University Grants Committee - UGC	CN	06.01.20	database of Research Grants Council search with search terms, transfer project information to excel manually, for the exact start date of the project we contacted the funder; the official project start date is 1 January of the following year, e.g. 1 January 2017 for funded project of 2016/17 year exercise https://cerg1.ugc.edu.hk/cergprod/scrrm00541.jsp	resistance, antimicrobial, antibiotic, tuberculosis, MRSA, lactamase, ESBL, Salmonella, Acinetobacter, baumannii, carbapenem, Staphylococcus, Pseudomonas, Klebsiella, Campylobacter, aeruginosa, methicillin, Streptococcus, difficile, Clostridium, Rifampicin, Clindamycin, ampicillin, Shigella, Neisseria, Enterobacteriaceae, Chlamydia, Erythromycin, cotrimoxazole, gram negative, gram-negative, penicillin, ESKAPE, vancomycin, Helicobacter, superbug, antibacterial, Hospital acquired, Hospital-acquired, antifungal, aureus, pneumococcal, Enterococcus, gonorrhoeae, Haemophilus influenzae, H. influenzae, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, faecium, Serratia, Proteus, MDR-TB, drug-resistant, Gonorrhoea, , Listeria, One Health, fungal pathogens, resistant, multidrug, multi-drug, Candida
Czech Science Foundation - GACR	CZ	28.04.20	Czech Republic Starfos range was limited to project running from 2017 onwards. Search carried out with the listed terms; we had to manually extract results for each term separately from the database and then import the CSV files and combine; some search terms were translated into Czech https://starfos.tacr.cz/en	antibiotic resistance, antimicrobial resistance (search with antimicrobial alone as well), Antibiotic Susceptibility, tuberculosis, Acinetobacter, baumannii, carbapenem-resistant, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, faecium, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, pylori, clarithromycin, Campylobacter, fluoroquinolone, Salmonellae, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, pneumoniae, penicillin, Haemophilus, influenzae, ampicillin, Shigella, fluconazole, Beta-lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium Clostridioides difficile, antifungal, antiparasitic, AMR, multi-drug, resistant, One Health, hospital acquired infections, healthcare acquired infections, mycobacterium, stewardship, pneumococcal, MDR-TB, cotrimoxazole, antipara, AMR, Antimicrobial resistant, Antibiotic resistant, Antimicrobial mechanism, Multi Drug Resistant, multi-drug resistant, One Health (attention – many projects not relevant bone diseases and fractures), Drug resistant, Hospital acquired infections, Healthcare acquired infections, Healthcare associated infection, C. difficile, Antibacterial compound, ANTIBIOTIC DRUG DEVELOPMENT, ANTIBIOTIC DRUG DISCOVERY, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB,
Ministry of Agriculture - eAGRI	CZ	30.07.19		
Ministry of Health	CZ	30.07.19		
Technology Agency of the Czech Republic	CZ	30.07.19		

Ministry of Education, Youth and Sports	CZ	30.07.19		cotrimoxazole, antimicrobial compound, antibiotic development, novel antibiotics, fungal pathogens, hospital-acquired infection, antibacterial drug, antibiotic tolerance, antimicrobial resistant. antimikrobiální rezistence, antibakteriální rezistence, tuberkulóza, rezistentní na karbapenem, vankomycin, cefalosporin, penicilin, chřipka, ampicilin, flukonazol, beta-laktamáza, erytromycin, klindamycin, antimykotika, antiparazitika, multidrog, mykobakterium, správcovství, pneumokok, cotrimoxazole, "Jedno zdraví", "získaná nemocnice", "získaná zdravotní péče", "související se zdravotní péčí", "spojená s nemocnicí"
Ministry of Industry and Trade	CZ	30.07.19		
Ministry of Culture	CZ	31.07.19		
Ministry of Interior	CZ	01.08.19		
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
Repair Impact Fund	DK	09.04.20	Portfolio of Repair Impact Fund Search for press releases, information transferred manually to data template https://www.repair-impact-fund.com/portfolio/	-
Academy of Scientific Research and Technology, Egypt - ASRT	EG	25.07.19	provided by funder	
Estonian Research Council - ERC	EE	27.09.19	Estonian Research Information System Search terms were also translated into Estonian using Google Translate; data cleaning: deletion of non-Estonian funders, deletion of older projects, deletion of obvious not AMR related projects (cancer, bone health) https://www.etis.ee/Portal/Projects/Index?lang=EST	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, ~~clarithromycin~~, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ~~ESKAPE~~, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria,
Enterprise Estonia	EE	28.09.19		
Ministry of Rural Affairs, Estonia	EE	29.09.19		
Environmental Investment Centre	EE	30.09.19		
European Commission - EC	EU	03.01.20 and 02.04.20	EU Open Data Portal Downloaded project information of all projects funded in FP7 and Horizon2020, deleted projects with an end date before 01.01.2017, searched with the listed terms, deleted doubles; 02.04.20: downloaded all H2020 projects as excel, deleted all projects with record control number (rcn) below 223000, already captured projects) https://data.europa.eu/euodp/en/data/dataset/cordisH2020projects and https://data.europa.eu/euodp/de/data/dataset/cordisfp7projects	antibiotic resistance, antimicrobial resistance, antibiotic susceptibility, Hospital acquired infection, Tuberculosis, Antimicrobial compound, Antifungal, Antimicrobial, Drug resistance, Salmonella, Clostridium, Aureus, résistance aux antimicrobiens, Chlamydia, pneumococcal, superbug, Gram-negative bacteria, antibacterial, Staphylococcus, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, methicillin, Helicobacter, clarithromycin, Campylobacter, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella, lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, cotrimoxazole, faecium, Klebsiella, Serratia, and Proteus, MDR-TB, drug-resistant, ESKAPE, Gonorrhea, Gonorrhoea, Listeria, One Health, Hospital-acquired infection, fungal pathogens, multi drug resistant, multi-drug resistant, multi drug resistance, Multidrug-resistant, multidrug resistance, Lyme disease, C. difficile

Funder name	Country	Data collection	Data source; how we did it; link to data source	Search terms
Innovative Medicine Initiative - IMI	EU	13.01.20 and 02.04.20	IMI Project Factsheets Searched all the IMI project factsheets for the identification of AMR relevant projects, downloaded all project information from the cordis database. Only the budgets were taken from the IMI factsheets, since they are different to those published in cordis https://www.imi.europa.eu/projects-results/project-factsheets	
InnovFin Infectious Diseases – EC/EIB	EU	02.04.20	InnovFin Infectious Diseases - press releases Information extracted from press releases. Start and end dates were set to 01.01. to 31.12. of the year of the press release. It is a loan payed once https://www.eib.org/en/products/blending/innovfin/products/infectious-diseases.htm	-
European Research Council - ERC	EU	03.01.20 and 02.04.20	EU Open Data Portal 02.04.20: download all H2020 projects as excel, deleted all projects with record control number below 223000 (already captured projects); 04.04. ERC as an independent funder defined; projects funded by ERC extracted from overall list of EU grants https://data.europa.eu/euodp/en/data/dataset/cordisH2020projects and https://data.europa.eu/euodp/de/data/dataset/cordisfp7projects	antibiotic resistance, antimicrobial resistance, antibiotic susceptibility, Hospital acquired infection, Tuberculosis, Antimicrobial compound, Antifungal, Antimicrobial, Drug resistance, Salmonella, Clostridium, Aureus, résistance aux antimicrobiens, Chlamydia, pneumococcal, superbug, Gram-negative bacteria, antibacterial, Staphylococcus, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, methicillin, Helicobacter, clarithromycin, Campylobacter, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella, lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, cotrimoxazole, faecium, Klebsiella, Serratia, and Proteus, MDR-TB, drug-resistant, ESKAPE, Gonorrhea, Gonorrhoea, Listeria, One Health, Hospital-acquired infection, fungal pathogens, multi drug resistant, multi-drug resistant, multi drug resistance, Multidrug-resistant, multidrug resistance, Lyme disease, C. difficile
The European & Developing Countries Clinical Trials Partnership - EDCTP	EU	03.04.20	WorldReport database select for 2015, 2016, 2017, 2018 and EDCTP as funder; delete all projects without budget, abstracts copied manually from link. Email to EDCTP about project data sent https://worldreport.nih.gov/app/#!/	tuberculosis, antibiotic
Academy of Finland - AKA	FI	03.09.19	Akareport Selected decision year 2010 - 2019; keyword search; deleted projects with end date before 01.0.1. 17 and doubles; downloaded corresponding abstracts https://akareport.aka.fi/ibi_apps/WFServlet?IBIF_ex=x_RahPaatYht_formi&UILANG=en	antibiotic resistance, antimicrobial (45), antibiotic (73), antibiotic susceptibility, antibacterial (13), tuberculosis (13), Acinetobacter (0), baumannii (0), carbapenem (1), Pseudomonas (2), aeruginosa (0), Enterobacteriaceae (1), ESBL (3), Enterococcus (0), vancomycin (1), Staphylococcus (7), aureus (8), methicillin (1), Helicobacter (0), clarithromycin (0), Campylobacter (1), Salmonella (0), Neisseria (0), gonorrhoeae (0), cephalosporin (0), Streptococcus (3), penicillin (0), Haemophilus (0) influenzae (0) , ampicillin (0), Shigella (0), lactamase (1), MRSA (2), Erythromycin (0), Clindamycin (0), Rifampicin (0), Clostridium (8), antifungal (3), AMR (20), Hospital-acquired (4) infection, difficile (3), Mycobacterium (8), Stewardship (1), pneumococcal (2), anti-fungal (1), Clostridia (1), anti-microbial (2), MDR-TB (0), drug-resistant (4), Multidrug-resistant (2), Gonorrhea (0), Listeria (2), multidrug (3), ESKAPE (0), fungal pathogens, cotrimoxazole (0), faecium (0), superbug (0), Gram-negative (13), Gonorrhoea (0)

Funder name	Country	Data collection	Data source; how we did it; link to data source	Search terms
French National Research Agency - ANR	FR	30.07.19	ANR research database Searched with search terms; deleted all projects with end date before 2017; deleted doubles https://anr.fr/en/funded-projects-and-impact/funded-projects/	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus
German Federal Ministry of Education and Research - BMBF	DE	30.08.19 (feedback from funder until Feb 2020)	Förderportal des Bundes Search terms used in English and German. List of identified projects sent to the different services responsible for the funding and the project management agencies for review and feedback; in case of disagreements about relevance to AMR, projects were discussed with representatives of the project management agencies https://foerderportal.bund.de/foekat/jsp/SucheAction.do;jsessionid=1E1266F3FFD6E795EC1F654E35A66285?actionMode=searchmask	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, Proteus, Antibiotikaresistenz, carbapenem, Acinetobacter, ESBL, MRSA, ESKAPE, One Health, MDR-TB, Tuberkulose, Enterobacteriaceae, vancomycin, methicillin, lactamase, gram-negative bakterien, MRGN, Salmonella, Clindamycin, Rifampicin, Clostridium, Clostridia, cephalosporin, Shigella, Campylobacter, clarithromycin, Streptococcus, Erythromycin, ampicillin, Enterococcus, Staphylococcus, aureus, C. difficile, Mycobacterium, aeruginosa, Pseudomonas, penicillin, baumannii, Neisseria, faecium, cotrimoxazol, gonorrhoe, gonorrhoeae, Klebsiella, Serratia, Listeria, H. influenzae, Haemophilus influenzae, antibakteriel, antifungal, antimikrobiell, Nosokomiale Infektionen, Krankenhausinfektion, Stewardship, Pneumokokken, Antimykotisch, Medikamentenresistenz, Pilzpathogen, Candida, Helicobacter, Antibiotika-Anfälligkeit, Antibiotikatoleranz
German Center for Infection Research - DZIF	DE	13.02.20	provided by funder	
German Federal Ministry for Economic Cooperation and Development - BMZ	DE	09.01.20	provided by funder Only a small number of projects included, the majority were not R&D	

Funder name	Country	Data collection	Data source; how we did it; link to data source	Search terms
Federal Joint Committee – G-BA	DE	08.04.20	Federal Joint Committee/Innovation Committee Checked lists of funded projects (Neue Versorgungsformen und Versorgungsforschung) and checked project descriptions for relevance to AMR; start and end date by internet search https://innovationsfonds.g-ba.de/	
Federal Ministry of Food and Agriculture - BMEL	DE	29.07.20	FISA Information System for Agriculture and Food Research Selected only projects with budget data https://www.fisaonline.de/	Antibiotikaresistenz, Tuberkulose
Ministry for Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia - MULNV	DE	29.07.20		
Thuringian Ministry for Infrastructure and Agriculture - TMIL	DE	29.07.20		
Bavarian State Ministry for Nutrition, Agriculture and Forestry - StMELF	DE	29.07.20		
Ministry of Food, Agriculture, and Consumer Protection, Lower Saxony - ML	DE	29.07.20		
Ministry of Economics, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia - MWIDE	DE	11.08.20	FISA Information System for Agriculture and Food Research take only projects with budget data https://www.fisaonline.de/	Antibiotikaresistenz, Tuberkulose
German Research Foundation - DFG	DE	10.08.20	GEPRIS; Search with project title for budget https://gepris.dfg.de/gepris/OCTOPUS	
National Research, Development and Innovation Office – NRDI Office	HU	14.07.20	provided by Star-IDAZ	
Department of Biotechnology - DBT, Ministry of Science and Technology Government of IN	IN	19.05.20	Database and data provided by funder https://dbtepromis.nic.in/bindcurrentyear.aspx	antibiotic, tuberculosis
The Wellcome Trust/DBT India Alliance – Wellcome/DBT	IN	09.04.20	Europe PMC grant finder key word search with each search term separately; deletion of projects with end date before 01.01.2017; merging of all tables and deletion https://europepmc.org/grantfinder	antibiotic resistance, antimicrobial, antibiotic susceptibility, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, AMR, Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Gonorrhoea, Listeria, ESKAPE, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, Proteus, Clostridioides, Nosocomial infections
Health Research Board Ireland – HRB Irelan	IE	23.04.20	HRB All Funding Schemes Searched for the 5 projects listed at JPIAMR and completed missing information; searched HRB database with search terms (deleted 1 HIV) https://www.hrb.ie/funding/funding-schemes/all-funding-schemes/	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection,

				Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
Science Foundation, Ireland - SFI	IE	18.06.20	JPIAMR AMR Research Funding Dashboard Projects from 2017 mapping taken, missing information such as abstracts and PI names and institutions searched at eRapport	
Chief Scientist Office-Ministry of Health, Israel - CSO-MOH	IL	23.09.19	provided by funder	
The Israel Science Foundation - ISF	IL	22.09.19	ISF Research database Key word search; for missing information the funder was contacted; abstracts are confidential and therefore not available; funder provided start and end dates of projects – all grants starts on October 1st of the "start" year and ends on September 30th https://www.isf.org.il/#/studies	resistance, antimicrobial, antibiotic, tuberculosis, MRSA, lactamase, ESBL, Salmonella, Acinetobacter, baumannii, carbapenem, Staphylococcus, Pseudomonas, Klebsiella, Campylobacter, aeruginosa, methicillin, Streptococcus, difficile, Clostridium, Rifampicin, Clindamycin, ampicillin, Shigella, Neisseria, Enterobacteriaceae, Chlamydia, Erythromycin, cotrimoxazole, gram negative, gram-negative, penicillin, ESKAPE, vancomycin, Helicobacter, superbug, antibacterial, Hospital acquired, Hospital-acquired, antifungal, aureus, pneumococcal, Enterococcus, gonorrhoeae, Haemophilus influenzae, H. influenzae, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, faecium, Serratia, Proteus, MDR-TB, drug-resistant, Gonorrhoea, , Listeria, One Health, fungal pathogens, resistant, multidrug, multi-drug, Candida
Ministero della Salute	IT	14.07.20	provided by Star-IDAZ	
Japan Society for Promotion of Science - JSPS	JP	06.07.19	Source: Created by Global AMR R&D Hub, based on KAKEN: Grants-in-Aid for Scientific Research Database (The National Institute of Informatics) (https://kaken.nii.ac.jp/en/index/) search with search terms in English and Japanese. Project periods up to a start date of 1 April 2019. Duplicates identified using conditional formatting on the project number and then manually removed. Abstracts translated using Microsoft Azure Translator	Acinetobacter, aeruginosa, ampicillin, AMR, Antibacterial compound, antibacterial drug, antibiotic development, ANTIBIOTIC DRUG DEVELOPMENT, ANTIBIOTIC DRUG DISCOVERY, antibiotic resistance, Antibiotic resistant, Antibiotic Susceptibility, antibiotic tolerance, anti-fungal, antifungal antipara, antimicrobial compound, Antimicrobial mechanism, anti-microbial resistance, Antimicrobial resistant, antimicrobial resistant, antimicrobial resistance, aureus, baumannii, Beta-lactamase, C. difficile, Campylobacter, carbapenem-resistant, cephalosporin, Clindamycin, Clostridia, Clostridium Clostridioides difficile, cotrimoxazole, Drug resistant, Enterobacteriaceae, Enterococcus, Erythromycin, ESBL-producing, faecium, fluconazole, fluoroquinolone, fungal pathogens, gonorrhoeae, Haemophilus influenzae, Healthcare acquired infections, Healthcare associated infection, Helicobacter, Hospital acquired infections, hospital-acquired infection, MDR-TB, methicillin, MRSA, Multi Drug Resistant, multi-drug resistant, Mycobacterium, Neisseria, novel antibiotics, One Health, penicillin, pneumococcal, pneumoniae, Pseudomonas, pylori clarithromycin, Rifampicin, Salmonellae, Shigella, Staphylococcus, Stewardship, Streptococcus, tuberculo, vancomycin, 抗生物質,結核,アシネトバクター,バウマニ,カルバペネム耐性,緑膿菌,シュードモナス,アエルギノサ,アシネトバクター・バウマンニ,腸内細菌科,ESBL生産,腸球菌,フェシウム,エンテロコッカスフェシウム,バンコマイシン,ブドウ球菌,黄色ブドウ球菌,メチシリン,ピロリ,クラリスロマイシン,カンピロバクター,フルオロキノロン,抗菌剤,サルモネラ菌,淋菌,ナイセリア,淋病,セファロスポリン,連鎖球菌,肺炎連鎖球菌,肺炎,ペ

				ニシリン,血友病,インフルエンザ菌,アンピシリン,赤痢菌,フルコナゾール,ベータラクタマーゼ,エリスロマイシン,クリンダマイシン,リファンピシン,クロストリジウム,クロストリジウムディフィシル,抗真菌,駆虫剤,院内感染,医療関連感染,マイコバクテリウム,スチュワードシップ,肺炎連鎖球菌,抗菌剤耐性
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
Japan Agency for Medical Research and Development - AMED	JP	19.03.20	Source: AMED find (https://amedfind.amed.go.jp/amed/index.htm; AMED Research and Development Project database provided by funder, abstracts were searched by using Japanese PI name and Japanese project title, budget break down per year were copied from the AMED database as well as project Ids. Abstract translation done by Global AMR R&D Hub with Microsoft Azure Translator. Budget covers the whole projects but may include research other than AMR	
Netherlands Organisation for Health Research and Development - ZonMW	NL	13.01.20	The Global AMR R&D Hub searched several databases. The list of projects was sent to the funders for compilation and conformation. The funder sent back a list of AMR relevant projects. - Search of several databases with set of search terms https://www.zonmw.nl/nl/onderzoek-resultaten/geneesmiddelen/programmas/programma-detail/antibiotica-resistentie-abr/projecten/ for Antibiotica Resistentie (ABR) and https://www.zonmw.nl/en/research-and-results/infectious-diseases-and-resistant-bacteria/programmas/programme-detail/priority-medicines-antimicrobial-resistance/t/granted-proposals/ for Priority Medicines Antimicrobial Resistance and https://www.zonmw.nl/nl/onderzoek-resultaten/doelmatigheidsonderzoek/programmas/programma-detail/goed-gebruik-geneesmiddelen/projecten/ for Goed Gebruik Geneesmiddelen and https://www.zonmw.nl/nl/onderzoek-resultaten/fundamenteel-onderzoek/programmas/programma-detail/top-subsidies/projecten/	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus-
Dutch Research Council - NWO	NL	13.01.20		
Ministry of Economic Affairs and Climate Policy - MinEZ	NL	14.07.20	provided by Star-IDAZ	
Health Research Council of New Zealand - HRC	NZ	12.02.20	HRC Research Repository goto http://www.hrc.govt.nz/funding-opportunities/recipients and searched with a set of keywords. Excluded all projects with an end date before 1.1.2017. Sent list to funder for confirmation and review. Missing data provided by funder like	Acinetobacter, aeruginosa, ampicillin, AMR, antibacterial, antibiotic, antibiotic resistance, antibiotic susceptibility, antifungal, anti-fungal, antimicrobial, anti-microbial resistance, aureus, baumannii, C. difficile, Campylobacter, carbapenem, cephalosporin, clarithromycin, Clindamycin, Clostridia, Clostridium, cotrimoxazole, drug-resistant bacteria, Enterobacteriaceae, Enterococcus, Erythromycin, ESBL, ESKAPE, faecium, fungal pathogens, Gonorrhea, Gonorrhoea, gonorrhoeae, Gram-negative bacteria, H. influenzae, Haemophilus influenzae , Helicobacter, Hospital acquired infection, Hospital-acquired infection, Listeria, Lyme disease, MDR-TB, methicillin, MRSA, multi drug resistance, multi drug resistant, multidrug resistance, multi-drug resistance, multi-drug resistant, Multidrug-resistant, Mycobacterium, Neisseria, One Health (many false positives – bone health), penicillin, pneumococcal, Pseudomonas,

				Rifampicin, Salmonella, Shigella lactamase, Staphylococcus, Stewardship, Streptococcus, superbug, tuberculosis, vancomycin
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
Royal Society of New Zealand	NZ	12.02.2020	Awarded Marsden Fund grants goto https://royalsociety.org.nz/what-we-do/funds-and-opportunities/marsden/awarded-grants/ and searched with a set of keywords. Excluded all projects with an end date before 1.1.2017. Sent list to funder for confirmation and review. Funder provided information on additional projects and missing data (project ID, start and end date)	Acinetobacter, aeruginosa, ampicillin, AMR, antibacterial, antibiotic, antibiotic resistance, antibiotic susceptibility, antifungal, anti-fungal, antimicrobial, anti-microbial resistance, aureus, baumannii, C. difficile, Campylobacter, carbapenem, cephalosporin, clarithromycin, Clindamycin, Clostridia, Clostridium, cotrimoxazole, drug-resistant bacteria, Enterobacteriaceae, Enterococcus, Erythromycin, ESBL, ESKAPE, faecium, fungal pathogens, Gonorrhea, Gonorrhoea, gonorrhoeae, Gram-negative bacteria, H. influenzae, Haemophilus influenzae , Helicobacter, Hospital acquired infection, Hospital-acquired infection, Listeria, Lyme disease, MDR-TB, methicillin, MRSA, multi drug resistance, multi drug resistant, multidrug resistance, multi-drug resistance, multi-drug resistant, Multidrug-resistant, Mycobacterium, Neisseria, One Health (many false positives – bone health), penicillin, pneumococcal, Pseudomonas, Rifampicin, Salmonella, Shigella lactamase, Staphylococcus, Stewardship, Streptococcus, superbug, tuberculosis, vancomycin
Trond Mohn foundation (previously Bergen Research Foundation) - TMS	NO	09.01.20	provided by funder	
HelseVest	NO	14.01019	eRapport projects from the JPIAMR mapping 2017 were taken, missing information such as abstracts and PI names and institutions were searched at eRapport https://helse-vest.no/vart-oppdrag/vare-hovudoppgaver/forsking/forskingsprosjekt	
Research Council Norway - RCN	NO	29.07.19	Project Databank of Research Council Norway search term search, select English, downloaded search results, deleted older projects and doubles; contacted funder for start an end date of projects, provided by funder https://prosjektbanken.forskningsradet.no/#/Sprak=en	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus
Fundação para a Ciência e Tecnologia - FCT	PT	21.08.19 and 08.04.20	provided by funder using search terms provided by the Global AMR R&D Hub	antibiotic resistance, antimicrobial, antibiotic, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus, ampicillin, Shigella, lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, One Health, Hospital acquired infection, C.

				difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
Animal And Plant Quarantine Agency, Korea - APQA	KR	27.07.19	provided by funder abstracts were translated using Microsoft Azure Translator PI names were converted using the Korean Romanization Converter (http://roman.cs.pusan.ac.kr/input_eng.aspx	
Centers for Disease Control & Prevention, Korea - KCDC	KR	27.07.19		
Drug Development Fund, Korea - KDDF	KR	27.07.19		
Korea Environmental Industry & Technology Institute - KEITI	KR	27.07.19		
Evaluation Institute of Industrial Technology, Korea - KITECH	KR	27.07.19		
Health Industry Development Institute, Korea - KHIDI	KR	27.07.19		
Institute of Marine Science & Technology Promotion, Korea - KIMST	KR	27.07.19		
Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry, Korea - iPET	KR	27.07.19		
Research Institute of Bioscience and Biotechnology, Korea - KRIBB	KR	27.07.19		
Technology and Information Promotion Agency for SMEs, Korea - TIPA	KR	27.07.19		
Nano-Convergence Foundation, Korea - StatNano	KR	27.07.19		
Korean National Research Foundation - NRF	KR	27.07.19		
Rural Development Administration, Korea - RDA	KR	27.07.19		
MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION	RU	10.03.20	RESEARCH AND DEVELOPMENT IN PRIORITY AREAS FOR THE DEVELOPMENT OF THE SCIENTIFIC AND TECHNOLOGICAL COMPLEX OF RUSSIA FOR 2014-2020 Search terms (translated with Google Translate prior to search); according to funder: Budget MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION: budget (awarded budget) and "extra-budget" (additional budget). These amounts can be added together to get the total amount of research funding (total project costs (but there will be several sources of funding), you can also emphasize the share of government support for projects (" http://fcpir.ru/participation_in_program/contracts/	resistance, antimicrobial, antibiotic, tuberculosis, MRSA, lactamase, ESBL, Salmonella, Acinetobacter, baumannii, carbapenem, Staphylococcus, Pseudomonas, Klebsiella, Campylobacter, aeruginosa, methicillin, Streptococcus, difficile, Clostridium, Rifampicin, Clindamycin, ampicillin, Shigella, Neisseria, Enterobacteriaceae, Chlamydia, Erythromycin, cotrimoxazole, gram negative, gram-negative, penicillin, ESKAPE, vancomycin, Helicobacter, superbug, antibacterial, Hospital acquired, Hospital-acquired, antifungal, aureus, pneumococcal, Enterococcus, gonorrhoeae, Haemophilus influenzae, H. influenzae, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, faecium, Serratia, Proteus, MDR-TB, drug-resistant, Gonorrhoea, , Listeria, One Health, fungal pathogens, resistant, multidrug, multi-drug, Candida
Russian Science Foundation - RSF	RU	10.03.20	Project search at Russian Science Foundation Search terms (translated with google translate prior to search); according to funder: Budget MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION: budget (awarded budget) and "extra-budget" (additional budget). These amounts can be added together to get the total amount of research funding (total project costs (but there will be	resistance, antimicrobial, antibiotic, tuberculosis, MRSA, lactamase, ESBL, Salmonella, Acinetobacter, baumannii, carbapenem, Staphylococcus, Pseudomonas, Klebsiella, Campylobacter, aeruginosa, methicillin, Streptococcus, difficile, Clostridium, Rifampicin, Clindamycin, ampicillin, Shigella, Neisseria, Enterobacteriaceae, Chlamydia, Erythromycin, cotrimoxazole, gram negative, gram-negative, penicillin, ESKAPE, vancomycin, Helicobacter, superbug, antibacterial, Hospital acquired, Hospital-acquired, antifungal, aureus, pneumococcal, Enterococcus, gonorrhoeae, Haemophilus influenzae,

			several sources of funding), you can also emphasize the share of government support for projects	H. influenzae, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, faecium, Serratia, Proteus, MDR-TB, drug-resistant, Gonorrhoea, , Listeria, One Health, fungal pathogens, resistant, multidrug, multi-drug, Candida
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
South African Medical Research Council - SAMRC	SA	18.06.20	Starting point: grants of JPIAR 2017 mapping. search conducted on title, funder, and if required the country's relevant health, research and or education sites. Information found was used to identify further sources of data https://rscf.ru/contests/search-projects/	
National Research Foundation South Africa - NRF SA	SA	15.03.20	NRF SA Award database https://www.nrf.ac.za/nrf-awards	resistance, antimicrobial, antibiotic, tuberculosis, MRSA, lactamase, ESBL, Salmonella, Acinetobacter, baumannii, carbapenem, Staphylococcus, Pseudomonas, Klebsiella, Campylobacter, aeruginosa, methicillin, Streptococcus, difficile, Clostridium, Rifampicin, Clindamycin, ampicillin, Shigella, Neisseria, Enterobacteriaceae, Chlamydia, Erythromycin, cotrimoxazole, gram negative, gram-negative, penicillin, ESKAPE, vancomycin, Helicobacter, superbug, antibacterial, Hospital acquired, Hospital-acquired, antifungal, aureus, pneumococcal, Enterococcus, gonorrhoeae, Haemophilus influenzae, H. influenzae, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, faecium, Serratia, Proteus, MDR-TB, drug-resistant, Gonorrhoea, , Listeria, One Health, fungal pathogens, resistant, multidrug, multi-drug, Candida
La Agencia Estatal de Investigación - AEI-MINECO	ES	18.06.20	JPIAMR AMR Research Funding Dashboard Starting point: grants of JPIAR 2017 mapping. Search conducted on the title, funder, and if required the country's relevant health, research and or education sites. If information was found that could assist in identifying further sources of data they would be investigated until no further relevant data or leads could be found	
Instituto de Salud Carlos III, Spain - ISCIII	ES	28.10.19	provided by funder	
National Institute for Agriculture and Food Research and Technology - INIA	ES	14.07.20	provided by Star-IDAZ	

Funder name	Country	Data collection	Data source; how we did it; link to data source	Search terms
Swedish Foundation for Strategic Research - SSF	SE	15.07.20	SweCRIS database search performed with search terms, delete projects with an end date before 2017 https://www.swecris.se/ For the Swedish Research Council, the WorldReport database was also searched https://worldreport.nih.gov/app/#!/	Acinetobacter OR Actinobacillus OR Aeromonas OR aeruginosa OR Alphainfluenzavirus OR Anaplasmataceae OR Arteriviridae OR aspergillosis OR Aspergillus OR Babesia OR bacteriophage OR baumannii OR Birnaviridae OR Blastomycosis OR Bordetella OR Brachyspira OR Brucella OR Brucellosis OR difficile OR Campylobacter OR Candidiasis OR cephalosporin OR clarithromycin OR Clindamycin OR Clostridia OR Clostridioides OR Clostridium OR Coccidia OR Coccidioidomycosis OR colistin OR Coronaviridae OR Corynebacterium OR cotrimoxazole OR Cryptococcosis OR Cryptococcus OR Cryptococcus OR Cryptosporidium OR Dermatophilus OR Dermatophytosis OR Dichelobacter OR Edwardsiella OR Ehrlichia OR Eimeria OR Enterobacteriaceae OR Enterococcus OR ESBL OR faecium OR Flaviviridae OR Flavobacterium OR "foodborne infections" OR "foodborne pathogen" OR "fungal pathogen" OR fungicide OR fungicidal OR Fusobacterium OR gonorrhoeae OR "Gram-negative bacteria" OR "H. influenzae" OR Histophilus OR Histoplasmosis OR "hospital acquired infection"~5 OR Klebsiella OR lactamase OR Lawsonia OR Leptospira OR Leptospirosis OR Listeria OR Mannheimia OR mastitis OR "MDR-TB" OR methicillin OR "minimum inhibitory concentrations" OR Morbillivirus OR MRSA OR Mucorales OR mucormycosis OR Mycobacterium OR Mycoplasma OR Mycotoxicoses OR Mycotoxins OR Neisseria OR "Nosocomial infection" OR Orthomyxoviridae OR Paracoccidioidomycosis OR Paramyxoviridae OR Pasteurella OR Pasteurellaceae OR Pestivirus OR Photobacterium OR Piscirickettsia OR pneumococcal OR Poxviridae OR Pseudomonas OR Reoviridae OR Salmonella OR Salmonellosis OR Serratia OR Shigella OR Staphylococcus OR Streptococcus OR Theileria OR Trueperella OR Trypanosoma OR tuberculosis OR Vibrio OR Yersinia OR Yersiniosis OR zoonoses) AND (alternative to antibiotics OR "antimicrobial resistance" OR "antibiotic resistance" OR "antibiotic susceptibility" OR "antibiotic tolerance" OR "antibiotic use" OR antifungal OR "anti-fungal" OR vancomycin OR antifungal OR "anti-infective" OR "antimicrobial use" OR Rifampicin OR antiparasitic OR drug-resistant bacteria OR resistome OR Erythromycin OR penicillin) OR (ESKAPE AND "antimicrobial resistence"
Swedish Research Council for Health, Working Life and Welfare - FORTE	SE	15.07.20		
The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning - FORMAS	SE	15.07.20		
Swedish Research Council - SRC	SE	15.07.20		
Vinnova, Sweden	SE	15.07.20	VINNOVA project database and SweCRIS database search performed with search terms, delete projects with an end date before 2017 https://www.vinnova.se/en/our-activities/funded-projects/ and https://www.swecris.se/	Acinetobacter OR Actinobacillus OR Aeromonas OR aeruginosa OR Alphainfluenzavirus OR Anaplasmataceae OR Arteriviridae OR aspergillosis OR Aspergillus OR Babesia OR bacteriophage OR baumannii OR Birnaviridae OR Blastomycosis OR Bordetella OR Brachyspira OR Brucella OR Brucellosis OR difficile OR Campylobacter OR Candidiasis OR cephalosporin OR clarithromycin OR Clindamycin OR Clostridia OR Clostridioides OR Clostridium OR Coccidia OR Coccidioidomycosis OR colistin OR Coronaviridae OR Corynebacterium OR cotrimoxazole OR Cryptococcosis OR Cryptococcus OR Cryptococcus OR Cryptosporidium OR Dermatophilus OR Dermatophytosis OR Dichelobacter OR Edwardsiella OR Ehrlichia OR Eimeria OR Enterobacteriaceae OR Enterococcus OR ESBL OR faecium OR Flaviviridae OR Flavobacterium OR "foodborne infections" OR "foodborne pathogen" OR "fungal pathogen" OR fungicide OR fungicidal OR Fusobacterium OR gonorrhoeae OR "Gram-negative bacteria" OR "H. influenzae" OR Histophilus OR Histoplasmosis OR "hospital acquired infection"~5 OR Klebsiella OR

				lactamase OR Lawsonia OR Leptospira OR Leptospirosis OR Listeria OR Mannheimia OR mastitis OR "MDR-TB" OR methicillin OR "minimum inhibitory concentrations" OR Morbillivirus OR MRSA OR Mucorales OR mucormycosis OR Mycobacterium OR Mycoplasma OR Mycotoxicoses OR Mycotoxins OR Neisseria OR "Nosocomial infection" OR Orthomyxoviridae OR Paracoccidioidomycosis OR Paramyxoviridae OR Pasteurella OR Pasteurellaceae OR Pestivirus OR Photobacterium OR Piscirickettsia OR pneumococcal OR Poxviridae OR Pseudomonas OR Reoviridae OR Salmonella OR Salmonellosis OR Serratia OR Shigella OR Staphylococcus OR Streptococcus OR Theileria OR Trueperella OR Trypanosoma OR tuberculosis OR Vibrio OR Yersinia OR Yersiniosis OR zoonoses) AND (alternative to antibiotics OR "antimicrobial resistance" OR "antibiotic resistance" OR "antibiotic susceptibility" OR "antibiotic tolerance" OR "antibiotic use" OR antifungal OR "anti-fungal" OR vancomycin OR antifungal OR "anti-infective" OR "antimicrobial use" OR Rifampicin OR antiparasitic OR drug-resistant bacteria OR resistome OR Erythromycin OR penicillin) OR (ESKAPE AND "antimicrobial resistence"
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
Swedish International Development Cooperation Agency - SIDA	SE	30.07.19	WorldReport database search performed with search terms, delete projects with an end date before 2017 https://worldreport.nih.gov/app/#!/	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus

Funder name	Country	Data collection	Data source; how we did it; link to data source	Search terms
Ragnar Söderberg Foundation	SE	15.07.20		Acinetobacter OR Actinobacillus OR Aeromonas OR aeruginosa OR Alphainfluenzavirus OR Anaplasmataceae OR Arteriviridae OR aspergillosis OR Aspergillus OR Babesia OR bacteriophage OR baumannii OR Birnaviridae OR Blastomycosis OR Bordetella OR Brachyspira OR Brucella OR Brucellosis OR difficile OR Campylobacter OR Candidiasis OR cephalosporin OR clarithromycin OR Clindamycin OR Clostridia OR Clostridioides OR Clostridium OR Coccidia OR Coccidioidomycosis OR colistin OR Coronaviridae OR Corynebacterium OR cotrimoxazole OR Cryptococcosis OR Cryptococcus OR Cryptococcus OR Cryptosporidium OR Dermatophilus OR Dermatophytosis OR Dichelobacter OR Edwardsiella OR Ehrlichia OR Eimeria OR Enterobacteriaceae OR Enterococcus OR ESBL OR faecium OR Flaviviridae OR Flavobacterium OR "foodborne infections" OR "foodborne pathogen" OR "fungal pathogen" OR fungicide OR fungicidal OR Fusobacterium OR gonorrhoeae OR "Gram-negative bacteria" OR "H. influenzae" OR Histophilus OR Histoplasmosis OR "hospital acquired infection"~5 OR Klebsiella OR lactamase OR Lawsonia OR Leptospira OR Leptospirosis OR Listeria OR Mannheimia OR mastitis OR "MDR-TB" OR methicillin OR "minimum inhibitory concentrations" OR Morbillivirus OR MRSA OR Mucorales OR mucormycosis OR Mycobacterium OR Mycoplasma OR Mycotoxicoses OR Mycotoxins OR Neisseria OR "Nosocomial infection" OR Orthomyxoviridae OR Paracoccidioidomycosis OR Paramyxoviridae OR Pasteurella OR Pasteurellaceae OR Pestivirus OR Photobacterium OR Piscirickettsia OR pneumococcal OR Poxviridae OR Pseudomonas OR Reoviridae OR Salmonella OR Salmonellosis OR Serratia OR Shigella OR Staphylococcus OR Streptococcus OR Theileria OR Trueperella OR Trypanosoma OR tuberculosis OR Vibrio OR Yersinia OR Yersiniosis OR zoonoses) AND (alternative to antibiotics OR "antimicrobial resistance" OR "antibiotic resistance" OR "antibiotic susceptibility" OR "antibiotic tolerance" OR "antibiotic use" OR antifungal OR "anti-fungal" OR vancomycin OR antifungal OR "anti-infective" OR "antimicrobial use" OR Rifampicin OR antiparasitic OR drug-resistant bacteria OR resistome OR Erythromycin OR penicillin) OR (ESKAPE AND "antimicrobial resistence"
Bank of Sweden Tercentenary Foundation	SE	15.07.20		
Swedish Energy Agency	SE	15.07.20		
Swedish Heart-Lung Foundation	SE	15.07.20		
The Foundation To Prevent Antibiotic Resistance	SE	21.08.20	SweCRIS database search performed with search terms, delete projects with an end date before 2017 and doublets https://www.swecris.se/ provided by funder	
Swiss National Science Foundation - SNSF	CH	19.09.19 and 09.04.20 (grantfinder)	P3 Research Database, Europe PMC grant finder go to http://p3.snf.ch/Pages/DataAndDocumentation.aspx and download csv file with all projects including abstracts, save as excel, delete old projects, perform http://p3.snf.ch/ https://europepmc.org/grantfinder	antibiotic resistance, antimicrobial resistance, antibiotic susceptibility, Hospital acquired infection, Tuberculosis, Antimicrobial compound, Antifungal, Antimicrobial, Drug resistance, Salmonella, Clostridium, Aureus, résistance aux antimicrobiens, Chlamydia, pneumococcal, superbug, Gram-negative bacteria, antibacterial, Staphylococcus, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, methicillin, Helicobacter, clarithromycin, Campylobacter, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella, lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, cotrimoxazole, faecium, Klebsiella, Serratia, and Proteus, MDR-TB, drug-resistant, ESKAPE, Gonorrhea, Gonorrhoea, Listeria, One Health, Hospital-acquired infection, fungal pathogens, multi drug resistant, multi-drug resistant, multi drug resistance, Multidrug-resistant, multidrug resistance, Lyme disease

Funder name	Country	Data collection	Data source; how we did it; link to data source	Search terms
Federal Office of Public Health - SFOPH	CH	18.06.20	JPIAMR AMR Research Funding Dashboard Starting point: grants of JPIAR 2017 mapping. A search was conducted on the title, funder, and if required the country's relevant health, research and or education sites. If information was found that could assist in identifying further sources of data they would be investigated until no further relevant data or leads could be found.	
INNOSUISSE	CH	15.07.20	Aramis database only projects were included where information on the recipient research organisation were provided https://www.aramis.admin.ch/	antibiotic resistance, antimicrobial resistance, antibiotic susceptibility, Hospital acquired infection, Tuberculosis, Antimicrobial compound, Antifungal, Antimicrobial, Drug resistance, Salmonella, Clostridium, Aureus, résistance aux antimicrobiens, Chlamydia, pneumococcal, superbug, Gram-negative bacteria, antibacterial, Staphylococcus, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, methicillin, Helicobacter, clarithromycin, Campylobacter, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella, lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, cotrimoxazole, faecium, Klebsiella, Serratia, and Proteus, MDR-TB, drug-resistant, ESKAPE, Gonorrhea, Gonorrhoea, Listeria, One Health, Hospital-acquired infection, fungal pathogens, multi drug resistant, multi-drug resistant, multi drug resistance, Multidrug-resistant, multidrug resistance, Lyme disease
Federal Food Safety and Veterinary Office - FSVO	CH	15.07.20	Aramis database only projects were included where information on the recipient research organisation were provided https://www.aramis.admin.ch/ JPIAMR AMR Research Funding Dashboard Starting point: grants of JPIAR 2017 mapping. A search was conducted on the title, funder, and if required the country's relevant health, research and or education sites. If information was found that could assist in identifying further sources of data they would be investigated until no further relevant data or leads could be found.	antibiotic resistance, antimicrobial resistance, antibiotic susceptibility, Hospital acquired infection, Tuberculosis, Antimicrobial compound, Antifungal, Antimicrobial, Drug resistance, Salmonella, Clostridium, Aureus, résistance aux antimicrobiens, Chlamydia, pneumococcal, superbug, Gram-negative bacteria, antibacterial, Staphylococcus, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, methicillin, Helicobacter, clarithromycin, Campylobacter, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella, lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, cotrimoxazole, faecium, Klebsiella, Serratia, and Proteus, MDR-TB, drug-resistant, ESKAPE, Gonorrhea, Gonorrhoea, Listeria, One Health, Hospital-acquired infection, fungal pathogens, multi drug resistant, multi-drug resistant, multi drug resistance, Multidrug-resistant, multidrug resistance, Lyme disease
Federal Office for Agriculture - FAOG	CH	15.07.20		
The Scientific and Technological Research Council of Turkey - TUBITAK	TK	18.06.20		
Wellcome	UK	21.06.19, 01.04.20 and 09.04.20 (grantfinder)	Source: Created by Global AMR R&D Hub, based on Wellcome Grant Funding database (https://wellcome.ac.uk/grant-funding/funded-people-and-projects), and Europe PMC grant finder download See list of grants awarded by Wellcome from 1 October 2005 to 30 September 2018. Projects from financial year 2018/2019 were downloaded 01.04.2020. Select all projects which project end date from 2017 or later, search with key words. excluded: Vacation Scholarships with budget = 0	antibiotic resistance, antimicrobial resistance, antibiotic susceptibility, Hospital acquired infection, Tuberculosis, Antimicrobial compound, Antifungal, Antimicrobial, Drug resistance, Salmonella, Clostridium, Aureus, Chlamydia, pneumococcal, superbug, Gram-negative bacteria, antibacterial, Staphylococcus, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, methicillin, Helicobacter, clarithromycin, Campylobacter, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella, lactamase, MRSA, Erythromycin, Clindamycin,

			https://wellcome.ac.uk/funding/people-and-projects/grant-funding-data, https://europepmc.org/grantfinder	Rifampicin, AMR, Mycobacterium, Stewardship, anti-fungal, Clostridia, anti-microbial, cotrimoxazole, faecium, Klebsiella, Serratia, MDR-TB, drug-resistant, ESKAPE, Gonorrhea, Gonorrhoea, Listeria, One Health, Hospital-acquired infection, fungal pathogens, multi drug resistant, multi-drug resistant, multi drug resistance, Multidrug-resistant, multidrug resistance, Lyme disease, C. difficile
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
Academy of Medical Sciences - AMS	UK	23.09.19 and 09.04.20	UK Research and Innovation Gateway, For some funders, also Europe PMC grant finder Searched search term search, deleted all projects with an end date before January 1st 2017 https://gtr.ukri.org/ https://europepmc.org/grantfinder	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus
Chief Scientist Office-Scotland - CSO	UK	23.09.19 and 09.04.20		antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus
Arts and Humanities Research Council - AHRC	UK	09.07.20		
Biotechnology and Biological Sciences Research Council - BBSRC	UK	09.07.20		
Engineering and Physical Sciences Research Council - EPSRC	UK	09.07.20		
Economic and Social Research Council - ESRC	UK	23.09.19		
Innovate UK	UK	09.07.20		
Medical Research Council - MRC	UK	09.07.20		
Medical Research Foundation - MRF	UK	23.09.19		
National Centre for the Replacement Refinement & Reduction of Animals in Research – NC§R	UK	23.09.19 and 09.04.20 (grantfinder)		
Natural Environment Research Council - NERC	UK	09.07.20		
Veterinary Medicines Directorate - VMD	UK	23.09.19		
National Institute for Health Research (Department of Health) - NIHR	UK	23.09.19 and 09.04.20		

				Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
Action on Hearing Loss	UK	14.04.20	Europe PMC grant finder search term search, deleted all projects with an end date before January 1st 2017 https://europepmc.org/grantfinder	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus
British Heart Foundation	UK	14.04.20		
The Dunhill Medical Trust	UK	14.04.20	JPIAMR AMR Research Funding Dashboard Starting point: grants of JPIAR 2017 mapping. A search was conducted on the title, funder, and if required the country's relevant health, research and or education sites. If information was found that could assist in identifying further sources of data they would be investigated until no further relevant data or leads could be found.	
Versus Arthritis	UK	14.04.20		
Health and Care Research-Wales, UK - HCR	UK	19.06.20		
Health Education England, UK - HEE	UK	19.06.20	JPIAMR AMR Research Funding Dashboard Starting point: grants of JPIAMR 2017 mapping. Search conducted on title, funder, and if required the country's relevant health, research and or education sites. If information was found that could assist in identifying further sources of data they would be investigated until no further relevant data or leads could be found. Provided by funder and project information also available via UK Research and Innovation Gateway changed funder from BBSRC or Innovate UK to funder https://gtr.ukri.org/	
HSC R&D Division, Northern Ireland, UK - HSC	UK	19.06.20		
Global AMR Innovation Fund - GAMRIF	UK	07.07.20		
Science and Technology Facilities Council - STFC	UK	09.07.20	UK Research and Innovation Gateway search term search, deleted all projects with an end date before January 1st 2017 https://gtr.ukri.org/	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus

Funder name	Country	Data collection	Data source; how we did it; link to data source	Search terms
UK Research and Innovation - UKRI	UK	09.07.20	UK Research and Innovation Gateway search term search, deleted all projects with an end date before January 1st 2017 https://gtr.ukri.org/	antibiotic resistance, antimicrobial, antibiotic, antibiotic susceptibility, antibacterial, tuberculosis, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus influenzae , H. influenzae, ampicillin, Shigella lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium, antifungal, AMR, multi drug resistant, multi-drug resistant, multi drug resistance, multi-drug resistance, One Health (many false positives – bone health), Hospital acquired infection, Hospital-acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Gonorrhoea, Listeria, multidrug resistance, ESKAPE, fungal pathogens, cotrimoxazole, faecium, superbug, Gram-negative bacteria, Klebsiella, Serratia, and Proteus
Combating Antibiotic-Resistant Bacteria Biopharmaceutical Accelerator – CARB-X	USA	20.06.20	Collect information from the CARB-X Gallery and transfer to data template table https://carb-x.org/portfolio/gallery/	
Biomedical Advanced Research and Development Authority - BARDA	USA	21.05.20	BARDA Domestic Portfolio Map Online search for AMR relevant projects at https://www.medicalcountermeasures.gov/projectmaps/Domestic.aspx. Project list were sent to BARDA for confirmation	-
National Institutes of Health - NIH	USA	16.07.20	Research Portfolio Online Reporting Tools (RePORT) Search term search, deleted all projects with an end date before January 1st 2017 https://report.nih.gov/categorical_spending.aspx	Acinetobacter OR Actinobacillus OR Aeromonas OR aeruginosa OR Alphainfluenzavirus OR Anaplasmataceae OR Arteriviridae OR aspergillosis OR Aspergillus OR Babesia OR bacteriophage OR baumannii OR Birnaviridae OR Blastomycosis OR Bordetella OR Brachyspira OR Brucella OR Brucellosis OR difficile OR Campylobacter OR Candidiasis OR cephalosporin OR clarithromycin OR Clindamycin OR Clostridia OR Clostridioides OR Clostridium OR Coccidia OR Coccidioidomycosis OR colistin OR Coronaviridae OR Corynebacterium OR cotrimoxazole OR Cryptococcosis OR Cryptococcus OR Cryptococcus OR Cryptosporidium OR Dermatophilus OR Dermatophytosis OR Dichelobacter OR Edwardsiella OR Ehrlichia OR Eimeria OR Enterobacteriaceae OR Enterococcus OR ESBL OR faecium OR Flaviviridae OR Flavobacterium OR “foodborne infections” OR “foodborne pathogen” OR “fungal pathogen” OR fungicide OR fungicidal OR Fusobacterium OR gonorrhoeae OR “Gram-negative bacteria” OR “H. influenzae” OR Histophilus OR Histoplasmosis OR “hospital acquired infection”~5 OR Klebsiella OR lactamase OR Lawsonia OR Leptospira OR Leptospirosis OR Listeria OR Mannheimia OR mastitis OR “MDR-TB” OR methicillin OR “minimum inhibitory concentrations” OR Morbillivirus OR MRSA OR Mucorales OR mucormycosis OR Mycobacterium OR Mycoplasma OR Mycotoxicoses OR Mycotoxins OR Neisseria OR “Nosocomial infection” OR Orthomyxoviridae OR Paracoccidioidomycosis OR Paramyxoviridae OR Pasteurella OR Pasteurellaceae OR Pestivirus OR Photobacterium OR Piscirickettsia OR pneumococcal OR Poxviridae OR Pseudomonas OR Reoviridae OR Salmonella OR Salmonellosis OR Serratia OR Shigella OR Staphylococcus OR Streptococcus OR Theileria OR Trueperella OR Trypanosoma OR tuberculosis OR Vibrio OR Yersinia

				OR Yersiniosis OR zoonoses) AND (alternative to antibiotics OR "antimicrobial resistance" OR "antibiotic resistance" OR "antibiotic susceptibility" OR "antibiotic tolerance" OR "antibiotic use" OR antifungal OR "anti-fungal" OR vancomycin OR antifungal OR "anti-infective" OR "antimicrobial use" OR Rifampicin OR antiparasitic OR drug-resistant bacteria OR resistome OR Erythromycin OR penicillin) OR (ESKAPE AND "antimicrobial resistence"
Funder name	**Country**	**Data collection**	**Data source; how we did it; link to data source**	**Search terms**
Agency for Healthcare Research and Quality - AHRQ	USA	16.07.20		Acinetobacter OR Actinobacillus OR Aeromonas OR aeruginosa OR Alphainfluenzavirus OR Anaplasmataceae OR Arteriviridae OR aspergillosis OR Aspergillus OR Babesia OR bacteriophage OR baumannii OR Birnaviridae OR Blastomycosis OR Bordetella OR Brachyspira OR Brucella OR Brucellosis OR difficile OR Campylobacter OR Candidiasis OR cephalosporin OR clarithromycin OR Clindamycin OR Clostridia OR Clostridioides OR Clostridium OR Coccidia OR Coccidioidomycosis OR colistin OR Coronaviridae OR Corynebacterium OR cotrimoxazole OR Cryptococcosis OR Cryptococcus OR Cryptococcus OR Cryptosporidium OR Dermatophilus OR Dermatophytosis OR Dichelobacter OR Edwardsiella OR Ehrlichia OR Eimeria OR Enterobacteriaceae OR Enterococcus OR ESBL OR faecium OR Flaviviridae OR Flavobacterium OR "foodborne infections" OR "foodborne pathogen" OR "fungal pathogen" OR fungicide OR fungicidal OR Fusobacterium OR gonorrhoeae OR "Gram-negative bacteria" OR "H. influenzae" OR Histophilus OR Histoplasmosis OR "hospital acquired infection"~5 OR Klebsiella OR lactamase OR Lawsonia OR Leptospira OR Leptospirosis OR Listeria OR Mannheimia OR mastitis OR "MDR-TB" OR methicillin OR "minimum inhibitory concentrations" OR Morbillivirus OR MRSA OR Mucorales OR mucormycosis OR Mycobacterium OR Mycoplasma OR Mycotoxicoses OR Mycotoxins OR Neisseria OR "Nosocomial infection" OR Orthomyxoviridae OR Paracoccidioidomycosis OR Paramyxoviridae OR Pasteurella OR Pasteurellaceae OR Pestivirus OR Photobacterium OR Piscirickettsia OR pneumococcal OR Poxviridae OR Pseudomonas OR Reoviridae OR Salmonella OR Salmonellosis OR Serratia OR Shigella OR Staphylococcus OR Streptococcus OR Theileria OR Trueperella OR Trypanosoma OR tuberculosis OR Vibrio OR Yersinia OR Yersiniosis OR zoonoses) AND (alternative to antibiotics OR "antimicrobial resistance" OR "antibiotic resistance" OR "antibiotic susceptibility" OR "antibiotic tolerance" OR "antibiotic use" OR antifungal OR "anti-fungal" OR vancomycin OR antifungal OR "anti-infective" OR "antimicrobial use" OR Rifampicin OR antiparasitic OR drug-resistant bacteria OR resistome OR Erythromycin OR penicillin) OR (ESKAPE AND "antimicrobial resistence") Antimicrobial. Antibiotic, tuberculo, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus, ampicillin, Shigella, lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium. Antifungal, AMR. Multi Drug Resistant, multi-drug resistant, One Health, Hospital acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, , Drug-resistant
Centers for Disease Control & Prevention - CDC	USA	16.07.20		
U.S. Food and Drug Administration - FDA	USA	16.07.20		
Congressionally Directed Medical Research Programs - CDMRP	USA	16.07.20	Federal RePorter search term search, deleted projects with an end date before January 1st 2017 https://federalreporter.nih.gov/projects/switchQueryForm?mode=Advanced	
National Institute on Disability, Independent Living, and Rehabilitation Research - NIDILRR	USA	16.07.20		
United States Department of Agriculture - USDA	USA	01.07.20		
National Science Foundation - NSF	USA	20.02.20		

Funder name	Country	Data collection	Data source; how we did it; link to data source	Search terms
				bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Listeria, antibacterial, ESKAPE, fungal pathogen, superbug, Gram-negative bacteria, , multidrug resistance, Hospital-acquired infection, cotrimoxazole, faecium, multi drug resistance, multi-drug resistance, H. influenzae
Bill & Melinda Gates Foundation - BMGF	USA	26.06.19	WorldReport database Selected BMGF as funder, select FY 2017, 2018, 2019. Added short project descriptions manually. https://worldreport.nih.gov/app/#!/	Antimicrobial. Antibiotic, tuberculo, Acinetobacter, baumannii, carbapenem, Pseudomonas, aeruginosa, Enterobacteriaceae, ESBL, Enterococcus, vancomycin, Staphylococcus, aureus, methicillin, Helicobacter, clarithromycin, Campylobacter, Salmonella, Neisseria, gonorrhoeae, cephalosporin, Streptococcus, penicillin, Haemophilus, ampicillin, Shigella, lactamase, MRSA, Erythromycin, Clindamycin, Rifampicin, Clostridium. Antifungal, AMR. Multi Drug Resistant, multi-drug resistant, One Health, Hospital acquired infection, C. difficile, Mycobacterium, Stewardship, pneumococcal, anti-fungal, Clostridia, anti-microbial resistance, MDR-TB, , Drug-resistant bacteria, Lyme disease, Multidrug-resistant, Gonorrhea, Listeria, antibacterial, ESKAPE, fungal pathogen, superbug, Gram-negative bacteria, , multidrug resistance, Hospital-acquired infection, cotrimoxazole, faecium, multi drug resistance, multi-drug resistance, H. influenzae
Cystic Fibrosis Foundation - CFF	USA	16.06.20	News section of CFF homepage search all news items for AMR https://www.cff.org/News/	

Data processing and quality control

Depending on the data source/data portal, it was possible to download Excel files with the desired information. In other instances, the information for the individual data fields had to be manually extracted.

For titles and abstracts that are not available in English, translation tools were used. The IT-solution for the Dynamic Dashboard offers an integrated translation solution.

The Dynamic Dashboard presents funding amounts in US Dollar (US $) and in Euro (€). The integrated currency converter of the IT-solution is used to convert the funding amounts/budgets into US $ and €. The conversion rate at the starting date of the project has been chosen.

For projects with several participating institutions, the entire budget is allocated to the institution of the principle investigator/coordinator[37].

To arrive at the investments per year, the total budgets of all investments/projects are distributed *pro rata* over the years of duration (a project starting on 1 May 2019 and ending on 30 April 2020 would see 2/3 of its budget allocated to 2019 and 1/3 to 2020). One-time investments are recorded in the year they were made.

To check the quality of the data, the Excel files created per funder were carefully examined for duplicates, missing data, and consistency of data (such as reasonable figures for the budget, texts for abstract summary, plausible dates for start and end-date etc.). A sample of projects was re-searched separately and it was checked that the data are identical.

The Excel files were imported into a data base that was used for categorizing the data (see next paragraph). During import further checks were carried out (for example plausible dates and budgets). The consistency of title with the abstract/summary was checked during categorising and the content of the abstracts was checked.

Categorizing of data

To be able to present the information about the projects/investments related to different areas of AMR research, a set of categories and definitions was prepared, as briefly described above and in more detail in the relevant methodology paper.[38] To decide whether a project addresses research and development related to AMR, a **List of infectious agents with a relevant AMR issue** was prepared. The categories will be further refined when additional areas of AMR research (such as plant and environmental health) will be added.

The Global AMR R&D Hub Secretariat (the Secretariat) categorised each investment by One Health sector, area of research, and infectious agent (down to genus level where relevant) as previously described[39]. At the start of categorisations regular meetings in the team were held to raise questions and align on the approach. Questions related to categorising projects were discussed in the team.

To be able to assign budgets to projects/investments in a given category and to avoid counting of budgets multiple times, if a project is relevant to more than one research area, R&D stage or bacteria, the project budget is split accordingly. For example, if a project is relevant to three different bacteria, the budget will be assigned to 33% to each of the bacteria. If a project falls into two different research areas, the budget

[37] For projects supported by the Innovative Medicines Initiative (IMI), the entire budget of the project has been allocated to the institution that is the managing entity for the contribution from the European Union.
[38] https://globalamrhub.org/wp-content/uploads/2020/03/Dynamic-Dashboard_First-methodology-paper.pdf
[39] https://globalamrhub.org/wp-content/uploads/2020/03/Dynamic-Dashboard_First-methodology-paper.pdf

will be assigned to 50% to each of the research areas. By this we make sure that the budget of a specific project will not be counted multiple times.

The number of projects was not split, as a 'project' is an indivisible unit. Therefore, for analyses included in this report, the number of projects is in relation to be referred to the criteria that are being looked at. Every project in the collection will fulfil the criteria but that does not exclude that the project may fulfil other criteria at the same level. Therefore, project numbers may not add up, when one looks at projects at the same level of category.

A project which is relevant to more than one research area, R&D stage or bacteria will be counted multiple times in the specific report, but this does not affect the overall total number of projects. As the Dynamic Dashboard evolves, the budget split also affects multiple sectors (human, animal, plant, environment) and multiple infectious agents (bacteria, fungi, viruses, parasites).

Projects that are relevant to AMR R&D but not related to human bacterial infections or animal health have been parked for now. Projects not falling in the expected time frame (project active on 1 January 2017 or later) or not addressing AMR have been marked as "not relevant to AMR". They are nevertheless kept in the data base for later checking. When categorizing it was possible to assign the category "unsure". This means that categorising the investment/project will be looked at again by other colleagues.

For projects that are only partially relevant to AMR R&D the estimated percentage of the relevant project part were used for further calculation of the budgets.[40]

We have started to record additional details, which will be used for future presentations on the Dynamic Dashboard. For example, if a project is funded in a given country and carries out research in a different country, this has been manually recorded. Also, products under development listed in the abstract/summary have been manually extracted.

Pipeline gallery

The representation of antibacterial products in different phases of clinical development and those that have recently been approved by regulators brings together information that is being gathered and analysed by the World Health Organization (WHO) in the reports published since 2017[41] as well as the corresponding data collection and analysis by The Pew Charitable Trusts (Pew) since 2014[42]. The Access to Medicines Foundation in its Antimicrobial Resistance Benchmark[43] also gives information about products in clinical development (reports issued since 2018). The purpose of this representation is to complement the information shown on the Dynamic Dashboard regarding global investments in AMR R&D as well as the summary of incentives for antibiotic R&D. For detailed analysis, users should access the original sources

[40] As an example, a project about chemical synthesis of a scaffold useful for antibiotics as well as anticancer agents would be counted as relevant to AMR for the part of the project addressing the work on antibiotics.
[41] Most recent edition:2019 ANTIBACTERIAL AGENTS IN CLINICAL DEVELOPMENT an analysis of the antibacterial clinical development pipeline (available at: https://apps.who.int/iris/bitstream/handle/10665/330420/9789240000193-eng.pdf?sequence=1&isAllowed=y)and https://www.who.int/research-observatory/monitoring/processes/antibacterial_products/en/
[42] 2Most recent edition: antibiotics currently in development April 2020, available from https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2014/antibiotics-currently-in-clinical-developmentand the analysis of non-traditional products for bacterial infections in clinical development, most recent edition March 2020 available from https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2017/nontraditional-products-for-bacterial-infections-in-clinical-development
[43] 3https://accesstomedicinefoundation.org/amr-benchmark

which provide a large amount of additional information. In this representation the intention was to show a high-level summary, bringing together the information from the WHO and Pew Charitable Trusts analyses.

The most up-to-date versions of WHO Antibacterial products in clinical development for priority pathogens and Pew Charitable Trusts Antibiotics Currently in Global Clinical Development were used as the source of information. This representation does not yet fully integrate the information from the Pew Charitable Trusts analysis of Non-traditional Products for Bacterial Infections in Clinical Development. Some information was extracted from the Antimicrobial Resistance Benchmark of the Access to Medicines Foundation, especially as regards clinical indications. Data was downloaded through the Excel spreadsheets available on the WHO and Pew websites and combined into one table. Out of the 79 products currently represented in the Dynamic Dashboard, 34 and 12 were contained only in the WHO and PEW Trusts analyses, respectively. Thirty-three products were found in both and information from the two analyses was manually combined into one data set. In case of divergence, for the phase of clinical investigation in which a product currently is, the value from the newer analysis (Pew) was chosen. Clinical indications and information on the targeted bacteria were combined. In a few cases the assessment of innovation (new target and/or new chemical class) diverges. In such cases the divergent assessments are both shown with their respective source. The methodologies of the two analyses differ, explaining the occasional divergence in assessment. Since the data come from different sources and not every source provides the same information, the summaries may not have information for every element. The products are presented in three large categories, analogous to the manner that products are presented in the WHO analysis:

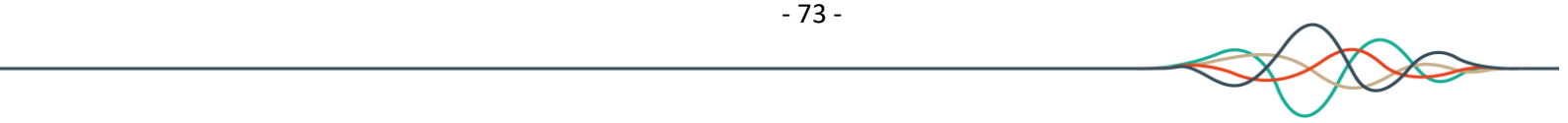
1. Products addressing priority pathogens
2. Products addressing tuberculosis
3. Products addressing Clostridioides

The following criteria can be used for filtering products:

- Phase of clinical testing, product in the approval process or having recently been approved (products that are in more than one phase of clinical development are listed in each of the applicable phases; thus, the numbers of products listed for the different phases may not add up to the total number of products)
- New target: yes/no/inconclusive
- New chemical class: yes/no/inconclusive
- Product type: small molecule/biological product
- Expected activity against priority pathogens:
  - Addressing a pathogen that is considered critical by the WHO and that is considered urgent by the US CDC
  - Addressing a pathogen that is considered critical by the WHO
  - Addressing a pathogen that is considered urgent by the US CDC
  - Possibly addressing a pathogen that is considered critical by the WHO and that is considered urgent by the US CDC

This last set of filtering is not relevant for products addressing tuberculosis.

Data will be updated when new analyses are published by either WHO or The Pew Charitable Trusts.



Incentives gallery

The incentives gallery of the Dynamic Dashboard captures, displays and tracks in a single, interactive, page, incentives being implemented around the world that aim to improve the functioning of markets – and the broader R&D ecosystem – responsible for the development and distribution of therapeutics for the treatment of priority, human, bacterial infections. By clearly displaying the information along the whole value chain it aims to provide a regularly-updated global snapshot of the status of currently implemented or trialled activity.

The incentives gallery employs a broad definition of incentives to encompass the spectrum of interventions with the possibility to make an impact. The inclusion criteria are more narrowly defined in order to focus on those efforts already piloted or implemented. Incentives are grouped under nine categories or incentive strategies as shown in the incentives categories and definitions:

1. Incentives in scope

Any currently implemented or trialled activity with the potential to improve the functioning (efficiency, productivity) of the R&D ecosystem responsible for the development and distribution of therapeutics for the treatment of priority, human, bacterial infections. The activities could include but are not limited to:

- Direct financial support, through a dedicated or majority-focused financing tool/stream
- Dedicated initiatives, structures, organizations, networks or activities with an AMR product R&D relevant mandate (in part or full)
- Legislative or regulatory actions that have been ratified into law

2. Supporting definitions:

Push incentive (covers categories 01-04)
Input-based; push mechanisms target current work and reduce a developers cost & risk of researching and developing new drugs either by lowering the costs, decreasing the barriers to participation or by sharing the costs/risks across multiple parties.

Pull incentive (covers categories 05-09):
Output-based; rewarding the successful development of a drug by increasing or ensuring future revenue. Can be achieved through market-making (financial) tools or market-shaping (lego-regulatory policies) rewards.

R&D ecosystem:
Public and private product developers including the R&D context or facilitatory environment in which they conduct their work. Includes actors, collaborations, infrastructures, lego-regulatory frameworks, institutions and competencies.

Priority infections:
Human bacterial infections considered a current or emerging public health priority as defined by the WHO´s priority pathogen list.

3. Exclusion criteria:

Information will not be collected for incentives on:

- Policy proposals, discussions, draft legislation or legislation in development/revision
- Single or ad hoc financial awards that do not present the possibility for a sustained impact

- Activities that are very-narrow in their focus such as those targeting a specific/single indication, syndrome, product or trial
- Non-dedicated or majority-earmarked activities (for investments these are captured by our investment gallery)
- One-off or time-limited interventions (less than 5 years)
- Tax-based incentives
- Interventions specifically targeting the tuberculosis (TB) market
- Interventions targeting non-human or non-therapeutic product markets •Sub-national (state-level) interventions

4. Categories

Categories have been created to represent targets, or strategies, for incentives along the value-chain. As much as possible, these try to be mutually exclusive and encompass all incentives that may conceivably be implemented now and in the future. As with all taxonomies, categorization can sometimes be an artificial exercise that will fit some incentives better than others.

1.Supporting early-stage R&D

Includes support (financial or otherwise) for research, development and translation relating to discovery and preclinical research, and Phase I clinical trials.

2. Enhancing clinical trial conduct

Includes strategies to enhance clinical trial conduct and infrastructure to improve efficiency, reduce duplication and generate better data.

3. Supporting late-stage R&D

Includes support (financial or otherwise) for the conduct of Phase II and III registration trials through to product filing.

4. Streamlining regulatory requirements

Includes the clarification, optimisation and convergence of regulatory requirements across indications and regulators to decrease the time and expense for products to reach patients.

5. Earlier & broader uptake

Includes support for new data-generation and better use of all available data so patients may benefit from newer agents more rapidly. Also includes mechanisms to cushion smaller developers in the initial post-launch phase.

6. Improving continuity of supply

Includes system, regulatory and market-making measures with the objective of fostering a sustainable and predictable market for older efficacious antibiotics (particularly for those products where there are few or no alternatives).

7. Enhancing relative market attractiveness

Includes strategies to enhance the attractiveness of the market relative to other therapeutic areas, and within the antibiotic class, by implementing regulatory, system and financial levers nationally, trans-nationally or globally.

8. Expediting sustainable global patient access

Includes measures to improve the speed of access and affordability to patients globally while ensuring appropriate stewardship.

9. Priority signalling & orientation

Includes actions to signal and reinforce the global public good nature of antibiotics and public health need for an R&D ecosystem oriented towards the development, distribution and preservation of priority antibiotics, globally.

Implementation - creation of visualisations

The Dynamic Dashboard builds on a cloud-based data base implemented in the Microsoft Azure environment. Microsoft Power BI is used for the visualisations. The Dynamic Dashboard is hosted under the dedicated url: https://dashboard.globalamrhub.org and is also accessible from the Global AMR R&D Hub homepage https://globalamrhub.org.

Investment gallery - categories and definitions

The definitions are intended to be applicable across the different One Health sectors. They are updated appropriately when investments/projects addressing other One Health areas are included in the Dynamic Dashboard.

Table 12: R&D in scope for the Dynamic Dashboard

R&D in scope	Basic and applied research on AMR that covers all One Health sectors (human, animal, plant and environment). The infectious agents in scope are provided in the **List of infectious agents with a relevant AMR issue**. The activities could include but are not limited to: • All types of product-oriented and product-based R&D, including research, discovery, development (including field trials), first registration and post registration studies for therapeutics, preventives, promotants and diagnostics • Basic research that improves understanding of the pathogen, virulence, transmission, impact of external factors and roles and interaction of different One Health sectors and is not necessarily geared towards a specific product, policies or operational processes • Operational/implementation research such as exploring improvements to surveillance, access to and optimal use of products, epidemiology-related studies, digital products, infection prevention and control and disease management programs • Research of new or existing medical interventions • Research into quality and fake or sub-standard products • Research to inform policy or regulation development or revision • Relevant research training (such as support for PhDs & post-docs) and network establishment (capacity building) • Research on breeding genetic variances targeting AMR • Research that leads to reduced antibiotic/antimicrobial use (agent not specified)

Table 13: Exclusion criteria

Exclusion criteria	Information will not be collected for projects or investments on: • Research on microbiome and the use of viral vectors in the context of non-communicable diseases, such as obesity, autoimmune diseases, cancer, allergies • R&D on virally caused cancers, reactivated viral infections in immunocompromised individuals such cytomegalovirus or progressive multifocal leukoencephalopathy • Grants solely for symposia or meetings or travel • Funding for buildings / capital investments • Training and professorships where there is not a strong focus on AMR R&D, or • Research into insect vector control

Table 14: Definition of research areas

Basic research	Research that addresses fundamental aspects of a concept or phenomenon and aims at increasing scientific knowledge, understanding about the disease, immune response, processes or pathogen but is not yet directed towards a specific product, policies, or and corresponds to Technology Readiness Levels (TRL, see Annex for definition) 1-3. This is sub-categorised into either 'fundamental' or 'towards a product' and could include but is not limited to: <u>Fundamental - no clear path to product development (TLR 1-2)</u> • Research into the development and mechanisms of persistence, transmission, virulence, immunology, biology and pathology; genetics (including genetically resistant animals and plants); role of the microbiome in maintenance of health; role of antibiotics in growth promotion; epidemiology and burden; and the interaction between One Health sectors • Fundamental understanding of biological processes or chemistry involved in the synthesis of compounds, including adjuvants and antigens <u>Towards a Product - has the potential to become a product (TLR 3)</u> • Search for a potential therapeutic, preventive, promotant or diagnostic target • Early research for the development of imaging or detection technologies/assays • Development of technologies and *in silico/in vitro/in vivo* models that assist with the design and testing of e.g. drugs and vaccines such as tissue culture and animal models (e.g. mouse models for sepsis, challenge models) • Identification of mode of action of putative new products targeting the pathogen, host and/or the microbiome • "Platform technologies" e.g. for vaccines that broadly refer to a system that uses the same basic components as a backbone, but can be adapted for use against different pathogens by inserting new sequences (which then would become product-specific)
Therapeutics	Any product-specific R&D designed for the treatment of infection with an antimicrobial across all product-specific R&D stages such as screening of compounds/antigens, early stages of optimising a hit or work to better understand a target to post registration studies. This could include but is not limited to: • Improvement of current antimicrobials, treatment regiments and therapies • Investigation of combination therapies • Dose optimisation studies • Investigation of old or off market antimicrobials for optimisation or new targets • Development of new antimicrobials and therapeutic alternatives to 'traditional' antimicrobials, including but not limited to small molecules, natural products, antibodies, vaccines, probiotics and faecal transplant therapy, bacteriophages, antimicrobial peptides, lysins, antitoxins and immune modulators • Drug quality (including fake or sub-standard drugs) and properties such as oral bioavailability, long half-life, etc that are secondary to activity but can be essential to market viability • Characterise a target for which some evidence of its usefulness is already available • Combining identification of target and other aspects such as screening/optimising of compounds
Preventives	Any product-specific R&D designed to prevent systemic disease (no symptoms, could be both sick and healthy subjects). This is sub-categorised into either 'Vaccines' or 'Other' and could include but is not limited to: <u>Preventives – Vaccines:</u> Defined as a product (usually a biological preparation or substance) that stimulates the adaptive immune system to develop long-lasting protective immunity against antigens from pathogens and is administered primarily to prevent disease. This is achieved through the generation of antigen-specific memory T and B cells (adaptive/acquired immune system). • Research that addresses challenges in developing vaccines, e.g. identification of protective antigens, defining correlates of protection, understanding most effective antigen delivery methods and stimulating long-term protective immune responses • Identification of vaccine candidate(s): Screening of potential natural or synthetic antigens and other vaccine components (e.g. adjuvants) in a pathogen/disease-specific context and may include e.g. protein/peptide/epitope libraries, antigen-expressing vectors, substances

	derived from pathogens, weakened pathogens or their toxins, serological activity (neutralising and non-neutralising) • Studies conducted to assess vaccine candidate for safety and efficacy (e.g. in tissue-culture or cell-culture and animal testing and clinical trials) <u>Preventives – Other:</u> Defined as a product (often a drug) that prevents disease through other means than vaccination and by itself does not generate an antigen-specific memory immune response. • Prophylactics – medication/treatment to prevent disease from occurring- e.g. administration of antimicrobial with appropriate therapeutic dose for limited and disease appropriate duration in healthy subjects at risk of specific infection or where infection/disease is likely to occur • Immune modulators – activate, boost or restore normal immune function independent on the pathogen causing infection (not antigen-specific); These include cytokines, lipopolysaccharides, short segments of bacterial DNA that also stimulate innate immune responses (i.e., CpGs), antibodies, and certain plant materials • Trait-selective breeding of animals/plants resistant to AMR infections, e.g. genome editing technologies for the generation of genome editing animals • Other disease prevention products, such as biofilm inhibitor (inhibition of surface adhesion, interference with quorum-sensing system, disruption)
Diagnostics ***includes detection, screening and diagnostics***	Any product-specific R&D aimed at the development or improvement of detection, screening or diagnosis. This could include but is not limited to: • Identification of causative agent (including distinguishing between viral and bacterial) and identification of resistance (including resistance profiles), including susceptibility testing • Development of diagnostic or prognostic tests and devices for clinical use, and use in the field (e.g. animal farm-settings) • Tests and screening tools for population-based, epidemiological studies and surveillance routines aiming at the identification of determinants that are involved in the cause, risk or development of AMR • Development of companion diagnostics – provide information for the safe and effective use of a corresponding drug or biological product • Development of tests or detection tools including machine learning predictions to identify infected individuals or status of infections with AMR-relevant agent(s) within a herd/flock) • Diagnostic tools in support of trait-selective breeding of animals/plants, e.g. genotyping technologies to improve disease resistance (e.g. SNPs)
Promotants	Any product-specific R&D designed to improve or maintain health/welfare and increase productivity and/or growth in the absence of disease/infection. They are usually provided as food/feed additives. This could include but is not limited to: • Non-medically important antimicrobials at sub- or non-therapeutic doses used for an on-going duration • Probiotics - live cultures of microorganisms (e.g., yeast, algae, fungi and bacteria) added to the diet to improve the balance of microbial communities in the gastrointestinal tract • Prebiotics - organic compounds such as certain sugars that, when added to the diet, are indigestible but are broken down by certain beneficial microorganisms in the gut, which selectively stimulates these and other microorganisms' growth • Antimicrobial peptides - short molecules with antibacterial properties that are toxic to certain bacteria • Phytochemicals - plant-derived compounds, such as essential oils or tannins that may have antibacterial and growth promoting effects • Organic acids, enzymes and other alternatives, such as heavy metals (zinc, copper) and clay minerals
Other products	Any product-specific R&D that does not fit under therapeutics, preventives, promotants or diagnostics. It does not include devices that are part of delivery systems for therapeutics, vaccines or diagnostics. This could include but is not limited to: • **Biocides:** used as antiseptics and disinfectants – chemicals and biological agents used for the expressed purpose to control, deter, inhibit or kill harmful microorganisms • **Biofilm**-related products (material, devices, particles, etc) that prevent, prohibit or interfere with biofilms

	• **Other products** like medical devices, wound healing products/dressing, anti-adhesions • Technologies to improve and monitor health, production and welfare in animals such as sensors/devices (via microbiome/weight gain, etc) at individual and herd/flock level (reduction of AMU)
Operational ***includes operational and implementation***	Operational and implementation research that aids in decision making and management strategies and could include but is not limited to: • **Infection prevention and control** (IPC): Management and interventions aimed at optimizing clinical, veterinary or farming practice related to: disinfection, sterilisation and disease management programmes (e.g. biosecurity, husbandry methods, use of vaccination, health management) and evidence-based guidelines/policies of IPC programmes • **Optimal use / Stewardship**: Research and studies to optimise the uptake and use of products (antimicrobials, diagnostics and vaccines and other technologies) with the aim of reducing the emergence or rate of development of resistance and/or the need to consume antibiotics, and normally does not impact product-specific label (see registration and implementation). Includes trials which compare agents against each other to inform clinical practice and guideline development • **Access and Availability**: Work that aims to improve the access and availability of AMR- and infection-reducing technologies • **Surveillance**: population-level analysis of disease surveillance or monitoring, antimicrobial consumption/usage and resistance trends/development/susceptibility; includes specific informatics tool for collection, management and analysis of AMR testing data • **Epidemiology:** Studies that analyse determinants of health and disease conditions in defined populations, specifically how, who, when, and where they occur. Major study areas include disease causation, transmission, outbreak investigation, disease surveillance, environmental epidemiology, occupational epidemiology, screening, biomonitoring, and comparisons of treatment effects such as in clinical trials • **Social Science:** Research to inform behavioural change among humans (individuals, groups such as farmers, organisations/companies,) or in relation to animals, economic analysis to inform and quantify challenges or costs-solutions. Impacts of external factors (such as assessments of the contribution of pollution or contamination); the environmental impact of new antimicrobials; digital products
Capacity building ***includes capacity building and infrastructure***	Efforts aiming to improve the human or infrastructural resource capacity to address the challenges of AMR. May include but is not be limited to: laboratory capacity, staff training, network formation (for knowledge sharing only), infrastructural or process improvements for example clinical trial conduct – that goes beyond a single product.
Policy	Research or investments that will inform the development of, review or revision of policies and regulations (national and international). This could include but is not limited to: • Relevant research, not listed above, with an objective of informing or proposing concrete changes to policy of influencing stakeholder-action in the field of AMR • Impact of care services such as research into how social factors, financing systems, structures and processes, technologies and behaviours affect access to care, the effectiveness of care, and development and evaluation of interventions to improve services • Economic impact, cost benefit analysis, economic models and incentives and market analysis • Health technology assessments • Supporting evidence of intervention into national health programmes (economic impact)

Table 15: Product-specific definitions

Discovery	The discovery and preclinical testing of innovative methods, processes, active ingredients, antigens, adjuvants, delivery vehicles/methods, diagnostics and corresponds to 'Technology Readiness Levels' 4-5. Several in vitro and in vivo methods are applied in order to assess biological activity, immunogenicity, efficacy and safety (toxicological studies) of potential candidates. The preclinical phase concludes with submission of an IND (Investigational New Drug) application with FDA-US or CTA (Clinical Trial Application) EMA-EU by submitting the IMPD (Investigational Medicinal Product Dossier). • For therapeutics and drug preventives this includes target validation, the hit discovery process (hit identification, hit to lead, lead identification and optimisation) • For preventative biologics such as vaccines this includes identification, selection and improvement/characterisation of vaccine components (antigen, adjuvant, carrier/delivery system, etc) that have the ability to induce immunogenicity (induction of cellular and humoral immune response/adaptive immune responses). This may include testing of serum in order to identify antigens/immunogens (samples from exposed individuals for testing immunogenicity), testing for ability to induce protective immune responses (e.g. by challenge with pathogen in animal or human models) • For diagnostics, this includes concept, feasibility, prototype development, and development of technical specifications • In Animal Health, includes market assessment to identify unmet animal health needs, preclinical/feasibility studies, including proof-of-concept safety and efficacy studies, and are usually conducted in target species
Development	The progression of selected candidates from discovery to commercialisation including investigating the efficacy and safety of the product in the field (e.g. clinical trials under GCP conditions), reformulation and repurposing and validation of manufacturing processes. This stage concludes with submission of an NDA (New Drug Application) or NADA (New Animal Drug Application) with the FDA/CVM or appropriate applications/dossiers with agencies in other countries and corresponds to 'Technology Readiness Levels' 6-8. • In Human Health, for therapeutics and preventives this includes clinical trial Phase 1 to Phase 3, and trials that will lead to an expansion of the product label (additional indications) • In Animal Health, Target Animal Safety Studies (TASS) and Target Animal Effectiveness Studies (TAES) are conducted and include dose-finding and field trials (designed to mimic its 'everyday' use) • For diagnostics this includes design lock, validation of manufacturing process, validation of accuracy and analytical performance in (clinical) trials, validation of performance and operational characteristics during uncontrolled routine use in programmatic settings
Approval and post-approval	Refers to the phase following first market authorisation (early-commercialisation) for a specific product and corresponds to 'Technology Readiness Levels' 9. This could include but is not limited to: • Filing in other, subsequent, legal jurisdictions (countries) • All subsequent research and monitoring that is a requirement by regulators (post-approval requirements or post-authorisation obligations), such as: paediatric investigation plans (PIPs), pharmacovigilance (phase 4) etc • Research into product optimisation (such as bioavailability, formulations) • Clinical studies which help inform how a product should be used in a clinical setting to inform among others product formulary inclusion, guideline incorporation, value-assessment and payor decisions

Funders/Investors

In general, **public funding** is sponsored by a government agency or other publicly-recognized organization, whereas **private funds** are donated mainly through private corporations or philanthropic efforts by a private organization or individual or are invested directly by the private legal entity.

Table 16: Definition of funders

Public – government	Public funding provided at any level of government. This also includes agencies if located within a ministry/department portfolio.
Public – other	• **Research councils:** separate legal entities and politically independent from government (they may still be answerable) • **Public universities:** state or government owned or receive significant public funds through government
Private – for profit	• **Pharmaceutical and Biotechnology companies, other relevant entities:** entities that research, develop, manufacture, market, distribute, import, offers for sale or sell pharmaceutical products or other products relevant to AMR. • **Small and medium-sized enterprises (SME):** non-subsidiary, independent firms with fewer than 250 employees and with annual turnover under EUR 50 million / US $ 55 million.
Private – not for profit	**Foundations:** independent legal entities set up for charitable purpose and are funded by an endowment, an individual, a family or business (corporation). They are often controlled by an independent Board.
Multilateral organisations	Refers to an alliance of multiple countries pursuing a common goal and deal with issues that are global priorities. Examples include the UN organisations such as WHO, FAO and UNEP and others such as OIE, World Bank, G20, EIB and GAVI.
Funding distributor	In the AMR field funders support organisations that in turn fund external projects or invest in own activities. Both the upstream grants and the downstream investments will be captured. To avoid double-counting, the notion of funding distributor has been introduced in the data-base. Projects/investments made by a funding distributor are referenced to said funding distributor. Examples of such funding distributors are CARB-X and GARDP. The former is a funding organisation, the latter invests mostly in its own projects. Funding arrangements, where different funders work together through a "virtual pool of funding" are not considered a funding distributor, as the individual funded projects are each recorded only once from the respective funders.

Type of Research Organisations

A research organisation is an entity, irrespective of its legal status (organised under public or private law) or way of financing, whose primary goal is to independently conduct fundamental or applied research (industrial research and experimental development).

Table 17: Definition of type of research organisations

Industry **SME**	Refers to a business entity with the aim of gaining profit. Belonging to industry but defined and recorded separately are 'small and medium-sized enterprises (SME)': non-subsidiary, independent firms with fewer than 250 employees and with annual turnover under EUR 50 million / US $ 55 million
Private research institution/facility	Refers to a privately owned building or facility whose primary mission is to pursue research in a specific area and which is not a university. Examples include Scripps Research, Broad Institute, Salk Institute, J. Craig Venter Institute, La Jolla Institute for Immunology, and Cold Spring Harbor Laboratory.
Public bodies	Refers to an organisation operated mainly by the government of one or multiple countries/territories, which is not a university or a public research institution/facility and includes international organisations. Examples include, Ministry, City, City Council, World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO) and World Organisation for Animal Health (OIE).

Public research institution/facility	Refers to a publicly owned building or facility whose primary mission is to pursue research in a specific area and which is not a university. Examples include, National Center for Global Health and Medicine, Max Planck Society (MPG).
University	Refers to a public or private educational institution where research takes place. Can grant degrees and includes faculties, departments and schools.
Other	Used in cases where none of the previously mentioned types are suitable, such as non-profit organisation (NGO) and Civil Society Organisations. Examples include Global Fund to Fight AIDS, Tuberculosis and Malaria, GAVI, Doctors Without Borders.

Diseases and Syndromes

Includes diseases and syndromes that affect humans and animal species.

Table 18: Definition of diseases or syndromes

Diseases or syndromes	Bloodstream infections: • The presence of viable bacteria or fungi in the bloodstream, demonstrated by positive blood culture(s). Bone and joint infections: • Any infection of the bone or joints noting there may be some cross over with skin and soft tissue infection. Gastrointestinal tract infections: • Any infection (or intoxication or inflammation caused by an infectious agent) of the gastrointestinal including the oesophagus, stomach, small and large intestine and rectum and the accessory organs of digestion, the liver, gallbladder and pancreas. Infections in pregnancy, during childbirth or in the puerperium period: • Includes both maternal and obstetric infections and infections during the first six weeks following birth. Nervous and sensory system infections: • Any infection of the nervous system (central and/or peripheral) or sensory organs such as ears, eyes and tongue. It excludes the skin (which is captured under skin and soft tissue infections) and the nose (which is captured under respiratory tract infection). Respiratory tract infections: • Any infection of the upper or lower respiratory tract including the nasal cavity, pharynx, larynx, trachea, and lungs. Sepsis (incl. Host response to infection): • An inflammatory immune response triggered by an infection and where host response to infection causes injury to tissues and organs. Sexually transmissible infections: • Infections that are passed from one person to another through sexual contact. Noting that there may be cross over with other areas including UTIs, skin and soft tissue infection, infections in pregnancy, during childbirth or in the puerperium period, and gastrointestinal tract infections. Skin and soft tissue infections: • An infection of the layers of the skin and underlying soft tissues including subcutaneous tissue, muscles, tendons, ligaments, fascia, and fibrous tissue. Urinary tract infections: • An infection in any part of the urinary system including kidneys, ureters, bladder and urethra. Lameness: • Can be caused by a group of infections (most common bacterial) specific to the feet and involves damage to the skin and epidermis due to injury or prolonged moisture. Mastitis: • Persistent, inflammatory reaction of the mammary gland and tissue (breast or udder) due to microorganism infection (most common bacterial).

Sub-Categories for Sector – Animal

The definitions below include any animal and animal-derived components such as milk, meat, eggs, fur, leather and wool. Within each animal group all ages and gender are include. Animal-derived products for human consumption (food) follow the same categorization and are tagged as 'Food' accordingly (visualization in the Dynamic Dashboard coming soon). Farmed animal groups include livestock, poultry, aquaculture and insects and non-farmed animal groups include companion animals and wildlife.

Table 19: Definition of sub-categories for sector animal

Animal		no information regarding the animal group, name or species provided
Farmed-not specified		refers to domesticated or farmed animals and without further information regarding the animal group, name or species
Livestock		refers to any breed or population of animals kept by humans for a useful, commercial purpose and includes animals raised in an agriculture setting to produce labour and commodities such as meat, milk, fur, leather and wool
	Cattle	refers to any cattle (dairy, beef and meat), including cows, bulls, oxen or calves
	Small ruminants	refers to sheep (Ovis spp) and goats (Capra spp)
	Pig	refers to domesticated pigs (genus Sus), including terms e.g. swine, porcine, hogs, pork
	Livestock-Other Food	includes all other domesticated, farmed or captive wild animals (terrestrial) such as bovine (buffalo, bison, yak), camelidae (camels, llamas, alpacas), equidae (horses, donkey, mules/hinnies), lagomorphs (hares and rabbits), cervids
	Livestock-Other Non-Food	refers to all domesticated, farmed or captive wild animals (terrestrial) kept for fur and skin
	Not specified	refers to term 'livestock' without additional information regarding the animal group, name or species
Poultry		Domesticated or farmed birds, including backyard poultry, kept by humans for their eggs, meat or feathers
	Chicken	refers to chicken (Gallus domesticus), including hen, rooster/cock, chicks and terms such as broiler
	Other	includes e.g. turkey, quail, ostrich, pigeons, ducks, geese
	Not specified	refers to term 'poultry' without additional information regarding the animal group, name or species
Aquaculture		refers to farming of aquatic animals and implies some form of intervention in the rearing process to enhance production (e.g. feeding, regular stocking, protection from predators).
	Fish	refers to any fresh or saltwater species, most common farmed fish are in order carp, salmon, tilapia and catfish
	Other	includes species within e.g. crustaceans, mollusca and amphibia and terms such as shellfish
	Not specified	refers to term 'aquaculture' without additional information regarding the animal group, name or species
Insects		refers to small hexapod invertebrates within the arthropod phylum
	Bees	refers to domesticated honeybees (genus Apis)
	Other	includes e.g. silkworm
	Not specified	refers to term 'insects' without additional information regarding the animal group, name or species
Companion Animals		refers to animals kept as pets, but can also be in a laboratory and medical/educational set-up
	Mammals	includes e.g. cats, dogs, ferrets, rodents
	Other	can includes e.g. birds, reptiles (except if captured above)
	Not specified	refers to term 'companion animal' without additional information regarding the animal group, name or species
Wildlife		refers to any feral animal, captive wild animal or wild animal (non-domesticated and non-farmed) that has a phenotype unaffected by human selection and lives independent of direct human supervision or control (exception zoo animals)

Technology readiness level (TRL)

TRL 1 – basic principles observed
TRL 2 – technology concept formulated
TRL 3 – experimental proof of concept
TRL 4 – technology validated in lab
TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 7 – system prototype demonstration in operational environment
TRL 8 – system complete and qualified
TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

List of infectious agents with a relevant AMR issue

Section A: Categories applicable to all sectors

Bacteria / gram-variable

This category includes the bacteria that are considered:

- Gram-variable, meaning they may stain either negative or positive
- Atypical, meaning they do not colour with Gram staining but rather remain colourless, or it is difficult to see the Gram reaction
- Acid fast

Bacteria / Other gram-negative

The category includes any gram-negative bacteria considered to have a drug resistance issue that are not listed individually (see section B and C). This will also include projects that are specifically conducting R&D on gram-negative bacteria without specifying which bacterium.

Bacteria / Other gram-positive

The category includes any gram-positive bacteria considered to have a drug resistance issue that are not listed individually (see section B and C). This will also include projects that are specifically conducting R&D on gram-positive bacteria without specifying which bacterium.

Bacteria / Not specified

Includes projects conducting R&D relevant to AMR that do not specify which bacterium or Gram reaction.

Section B: Human Bacterial Pathogens

Categorization and inclusion methodology for human bacterial pathogens

The World Health Organization's (WHO) Global Priority List of Antibiotic-Resistant Bacteria [1], the United States of America's Centers for Disease Control and Prevention (CDC) Antibiotic Resistant Threats in the United States 2019 [2] and the bacteria included in the European *Centre* for Disease Prevention and Control's (ECDC) European Antimicrobial Resistance Surveillance Network (EARS-Net) [3] were used to develop a combined list of priority bacteria with a drug-resistance issue the Global AMR R&D Hub's priority list. It was considered that all research into these bacteria, irrespective of the drug-resistance profile, would be relevant to advance efforts to address antimicrobial resistance.

The priority list is separated into critical, high and medium priority and also includes a watch list. The critical priority bacteria are: *Acinetobacter* spp., *Clostridioides* spp., and *Enterobacteriaceae.* The high priority bacteria are: *Campylobacter* spp., *Enterococcus* spp., *Helicobacter* spp., *Mycobacterium* spp., *Neisseria* spp., *Salmonella* spp. and *Staphylococcus* spp. The medium priority bacteria are: *Streptococcus* spp., *Haemophilus* spp. and *Shigella* spp. There is currently only *Bordetella* spp. included on the watch list.

For the categorization process, only the bacterial genus level (noting the family *Enterobacteriaceae* was also included) was used and will be displayed. Table 20 list the genus included in categorization and the rules applied for inclusion based on the aforementioned priority lists.

When projects included bacteria other than those listed in Table 20 an individual assessment was performed by the Secretariat to determine if there is a known drug-resistance issue. This assessment included searching the literature and reaching a consensus within the Secretariat if the bacteria has a known drug- resistance issue or not. Where consensus was not reached or there was ambiguity in the literature bacteria were parked and further investigation was conducted.

The list of additional bacteria and the outcomes from the assessment are provided in Table 21 and Table 22. Please note that these lists will be continually updated.

Table 20: Genus of priority bacteria and inclusion criteria for the Dynamic Dashboard

Priority^	Bacterial genus	Inclusion criteria for the Dynamic Dashboard
Critical	*Acinetobacter*	All *Acinetobacter* included.
	Clostridioides	*Clostridioides* (or *Clostridium*) *difficile* was included. Any other *Clostridioides* and *Clostridium* were individually assessed for inclusion.
	Enterobacter	All *Enterobacter* included.
	Enterobacteriaceae	*Enterobacter* spp., *Escherichia coli, Klebsiella pneumonia, Proteus* spp. *Providencia* spp. and *Serratia* spp. were included. In addition, projects that just mentioned *Enterobacteriaceae,* without further specification, were included. Any other bacteria in the *Enterobacteriaceae* family were individually assessed for inclusion.
	Escherichia	*Escherichia coli* was included. Any other *Escherichia* were individually assessed for inclusion.
	Klebsiella	*Klebsiella pneumonia* was included. Any other *Klebsiella* were individually assessed for inclusion.
	Morganella	All *Morganella* included.
	Proteus	All *Proteus* included.
	Providencia	All *Providencia* included.
	Pseudomonas	*Pseudomonas aeruginosa* was included. Any other *Pseudomonas* were individually assessed for inclusion.
	Serratia	All *Serratia* included.
High	*Campylobacter*	All *Campylobacter* included.
	Enterococcus	*Enterococcus faecium* and *Enterococcus faecalis* were included. Any other *Enterococcus* were individually assessed for inclusion.
	Helicobacter	*Helicobacter pylori* was included. Any other *Helicobacter* were individually assessed for inclusion.
	Mycobacterium	*Mycobacterium tuberculosis* was included. Any other *Mycobacterium* were individually assessed for inclusion.
	Neisseria	*Neisseria gonorrhoeae* was included. Any other *Neisseria* were individually assessed for inclusion.
	Salmonella	All *Salmonella* included.
	Staphylococcus	*Staphylococcus aureus* was included. Any other *Staphylococcus* were individually assessed for inclusion.
Medium	*Streptococcus*	*Streptococcus pneumoniae,* group A *Streptococcus* (*S. pyogenes* and group B *Streptococcus* (*S. agalactiae*) were included. Any other *Streptococcus* were individually assessed for inclusion.
	Haemophilus	*Haemophilus influenzae* was included. Any other *Haemophilus* were individually assessed for inclusion.
	Shigella	All *Shigella* included.
Watch	*Bordetella*	*Bordetella pertussis* was included. All other *Bordetella* were checked to see if there was a published resistance issue

^°Priority level used for visualisations on the Dynamic Dashboard

Table 21: Other bacteria with a drug resistance issue included in the Dynamic Dashboard

Genus	Species	Key reference
Actinomycetes	*Actinomycetes* spp.	[4]
Burkholderia	*B. cenocepacia*	[5]
	B. cepacia	[5]
	B. mallei	[5]
	B. multivorans	[5]
	B. pseudomallei	[5]
	B. vietnamiensis	[5]
Chlamydia	*C. trachomatis*	[6, 7]
Clostridium	*C. botulinum*	[8, 9]
	C. perfringens	[10, 11]
Coxiella	*C. burnetti*	[12]
Chronobacter	*Cronobacter* spp., formerly *Enterobacter sakazakii*	[13]
Corynebacterium	*C. diphtheriae*	[14]
Enterococcus	*E. hirae*	[15]
Helicobacter	H. cinaedi	[16]
Listeria	*L. monocytogenes*	[17]
Moraxella	*M. catarrhalis*	[18, 19]
Mycobacterium	Non tuberculosis mycobacterium (NTM) as a group	[20]
	M. abscessus	[21]
	M. africanum	[22]
	M. avium	[20]
	M. kyorinense	[23]
	M. leprae	[24]
	M. ulcerans	[25]
Mycoplasma	*M. genitalium*	[26]
	M. pneumoniae	[27]
Porphyromonas	*P. gingivalis*	[28]
Staphylococcus	*S. epidermidis*	[29]
Streptococcus	*S. mitis*	[30]
Treponema	*T. pallidum*	[31, 32]
Ureaplasma	*Ureaplasma* spp.	[33]
Vibrio	*V. alginolyticus*	[34]
	V. cholerae	[35]
	V. vulnificus	[36]

Table 22: Bacteria with low drug resistance excluded from the Dynamic Dashboard

Genus	Species	Key reference
Francisella	*F. tularensis*	[37]
Neisseria	*N. meningitidis*	[38]

Section C: List of Infectious Agents relevant for AMR R&D in Animals

A pathogen list relevant to AMR R&D for animals was created based on OIEs guidance documents resulting from consultation of two ad hoc Groups on 'Prioritization of Disease for which Vaccines could reduce Antimicrobial Use in Animals'.

- Pigs, poultry and fish (April 2015) AHG_AMUR_Vaccines_2015 [44]and
- Cattle, sheep and goats (May 2018) AHG_AMUR_Vaccines_Ruminants_2018[45]

In addition, relevant animal pathogens with an unmet need for AMR were included per input from the experts consulted by the Secretariat for the development of the animal-specific categorization fields of the Dynamic Dashboard.

For the categorization process, only pathogen genus or family level were used and are displayed in the Dynamic Dashboard. All species within the listed genus or family were included and some representative species are listed in the tables. When projects included species that are not listed in the tables below and with a relevance for AMR, they were categorized as virus-other, fungus-other and parasite-other, respectively. In the case of bacterial infections, they were categorized as other and according to gram staining (other-gram-positive, other-gram-negative and other-gram-variable).

Table 23: Animal Bacterial Pathogens

Bacterial Genus	Species include, but not limited to
Actinobacillus	*Actinobacillus pleuropneumoniae*
Aeromonas	*Aeromonas hydrophila*
Anaplasma	*Anaplasma marginale*
Bacillus	*Bacillus anthracis*
Bibersteinia	*Bibersteinia trehalosi*
Bordetella*	*Bordetella bronchiseptica*
Brachyspira	All *Brachyspira* included
Brucella	*Brucella suis, Brucella abortus, Brucella ovis, Brucella melitensis*
Campylobacter*	All *Campylobacter* included
Chlamydiaceae	All *Chlamydia* included
Clostridioides*	*Clostridium perfringens*
Corynebacterium	All *Corynebacterium* included
Dermatophilus	*Dermatophilus congolensis*
Dichelobacter	*Dichelobacter nodosus*
Edwardsiella	*Edwardsiella ictaluri*
Ehrlichia	*Ehrlichia ruminantium*
Escherichia*	All *Escherichia* included
Flavobacterium	*Flavobacterium columnare*
Fusobacterium	*Fusobacterium necrophorum*

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https://www.oie.int/fileadmin/SST/adhocreports/Diseases%20for%20which%20Vaccines%20could%20reduce%20Antimicrobial%20Use/AN/AHG_AMUR_Vaccines_Apr2015.pdf

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https://www.oie.int/fileadmin/SST/adhocreports/Diseases%20for%20which%20Vaccines%20could%20reduce%20Antimicrobial%20Use/AN/AHG_AMUR_Vaccines_ruminants_May2018.pdf

Haemophilus*	*Haemophilus parasuis*
Histophilus	*Histophilus somni*
Lawsonia	*Lawsonia intracellularis*
Leptospira	All *Leptospira* included
Mannheimia	*Mannheimia capricolum, Manheimia haemolytica*
Mycobacterium*	*Mycobacterium bovis, Mycobacterium avium* (paratuberculosis)
Mycoplasma	*Mycoplasma agalactiae, Mycoplasma hyopneumoniae*
Pasteurella	*Pasteurella multocida*
Photobacterium	All *Photobacterium* included
Piscirickettsia	*Piscirickettsia salmonis*
Pseudomonas*	All *Pseudomonas* included
Salmonella*	All *Salmonella* included
Staphylococcus*	*Staphylococcus aureus, Staphylococcus hyicus, Staphylococcus aureus mastitis, Staphylococcus pseudintermedius*
Streptococcus*	*Streptococcus agalactiae, Streptococcus suis, Streptococcus uberis*
Trueperella	*Trueperella pyogenes*
Vibrio	All *Vibrio* included
Yersinia	*Yersinia rukerii*

*Any bacteria with relevance for AMR but not included in bacteria genus names highlighted in bold indicate a human priority pathogen as described above.

Table 24: Animal viral pathogens

Virus Family	
Arteriviridae	Porcine Reproductive and Respiratory Syndrome virus (PPRS)
Birnaviridae	Infectious Bursal Disease virus (IBDV)
Coronaviridae	Bovine coronavirus (BCoV), Avian coronavirus/Infectious bronchitis virus (IBV)
Orthomyxoviridae	All influenza viruses included
Paramyxoviridae	Peste des petits ruminants virus (PPRV), Bovine Respiratory Syncytial Virus (BRSV)
Pestivirus	Bovine Virus Diarrhoea Virus (BVDV)
Poxviridae	Goatpox Virus, Sheeppox Virus
Reoviridae	Bluetongue virus, Rotavirus

Table 25: Animal fungal pathogens

Fungus Genus	
Aspergillus	All *Aspergillus* included
Candida	All *Candida* included
Cryptococcus	All *Cryptococcus* included
Mucorales	All *Mucorales* included

For the categorization process, parasites were grouped into protozoa, helminths and ectoparasites.

Table 26: Animal parasitic pathogens

Parasites	
Protozoa-*Babesia*	All *Babesia* included
Protozoa-*Cryptosporidium*	*Cryptosporidium parvum*
Protozoa-*Eimeria*	All *Eimeria* included
Protozoa-*Theileria*	Theileria annulata, Theileria parva
Protozoa-*Trypanosoma*	All *Trypanosoma* included
Helminths-*Nematodes*	Mostly families: *Trichostrongylidae*, *Molineidae*, *Ancylostomatidae, Chabertiidae*
Helminths-Other	For example trematoda such as *Fasciola hepatica*
Ectoparasites	All ectoparasites are included

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Appendix 2 – List of funders and investments since 2017

Table 27: Investments and project numbers by start year

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
AR	National Scientific and Technical Research Council					3	79,200	3	79,200
AT	FWF Austrian Science Fund	1	206,489	3	1,301,446	6	2,318,631	10	3,826,566
AU	Australia and Pacific Science Foundation	1	34,650					1	34,650
AU	Australian Research Council	7	2,879,087	15	5,789,893	9	3,163,125	31	11,832,104
AU	Department of Industry, Innovation and Science			3	3,347,662	1	508,635	4	3,856,296
AU	Medical Research Future Fund			3	3,601,615			3	3,601,615
AU	National Health and Medical Research Council	45	22,036,274	65	35,259,635	46	25,139,134	156	82,435,044

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
BE	Agentschap voor Innovatie door Wetenschap en Technologie	1	786,668					1	786,668
BE	Research Foundation - Flanders	5	1,194,032					5	1,194,032
BR	National Council for Scientific and Technological Development			6	300,000			6	300,000
BR	São Paulo Research Foundation	1	342,409	3	875,776			4	1,218,185
CA	Canadian Institutes of Health Research	76	32,110,424	58	12,422,313	55	8,835,197	189	53,367,934
CA	Global Affairs Canada	4	436,171	1	255,308			5	691,479
CA	Infectious Diseases Research Collaboration	4	312,609	1	182,984	11	6,393,169	16	6,888,762
CH	INNOSUISSE	1	357,626			2	1,138,116	3	1,495,741
CH	Médecins Sans Frontières	1	645,600					1	645,600

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
CH	Swiss National Science Foundation	59	24,353,842	39	25,881,306	32	17,276,797	130	67,511,945
CN	Ministry of Science and Technology					14	11,826,518	14	11,826,518
CN	University Grants Committee	3	341,411	6	571,527	6	568,379	15	1,481,318
CZ	Czech Science Foundation	6	1,371,201	6	1,846,865	4	3,318,744	16	6,536,810
CZ	Ministry of Education Youth and Sports	2	272,744	2	1,135,689	4	360,815	8	1,769,248
CZ	Ministry of Health	6	2,292,849	2	927,360	4	1,509,257	12	4,729,466
CZ	Ministry of Industry and Trade	1	1,029,572	1	609,825			2	1,639,397
CZ	Technology Agency of the Czech Republic	2	955,935	2	522,311	2	1,960,200	6	3,438,446
DE	Deutsche Forschungs-gemeinschaft			1	471,960			1	471,960

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
DE	Federal Ministry of Education and Research	83	45,523,967	28	67,930,080	66	26,480,168	177	139,934,215
DE	Gemeinsamer Bundesaus-schuss/ Innovations-ausschuss (G-BA)	2	22,196,700			1	2,912,000	3	25,108,700
DE	German Center for Infection Research	1	544,263					1	544,263
DE	Ministry of Food, Agriculture, and Consumer Protection, Lower Saxony					1	558,354	1	558,354
DE	MWIDE	1	1,307,437					1	1,307,437
DK	Impact Fund			4	22,345,000	2	10,250,000	6	32,595,000
EE	Ministry of Rural Affairs Estonia	1	52,650					1	52,650
EE	Estonian Research Council	1	171,534			1	97,140	2	268,674
ES	Instituto de Salud Carlos III	4	354,208	5	580,921	2	343,545	11	1,278,674

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
EU	European & Developing Countries Clinical Trials Partnership	6	37,206,103					6	37,206,103
EU	European Commission	41	123,722,387	49	76,066,216	62	76,850,586	152	276,639,189
EU	European Research Council	22	36,528,719	16	31,421,849	17	23,120,059	55	91,070,628
EU	Innovative Medicines Initiative	1	2,689,211			9	65,936,452	10	68,625,663
FI	Academy of Finland	9	3,581,773	9	2,960,563	18	5,654,208	36	12,196,545
FR	Agence Nationale de la Recherche	22	11,279,906	15	7,287,396	12	4,611,126	49	23,178,429
HU	National Research, Development and Innovation Office	2	252,793					2	252,793
IE	Health Research Board	1	1,548,272	1	227,230	2	56,000	4	1,831,502
IL	Israel Ministry of Health	1	122,235			2	340,140	3	462,375
IL	Israel Science Foundation	2	587,910	2	674,040	2	1,258,782	6	2,520,732

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
IN	Department of Biotechnology	12	2,065,479	13	1,280,640	9	1,839,059	34	5,185,178
IN	Wellcome Trust/DBT India Alliance	3	1,368,995	4	1,935,800	3	813,793	10	4,118,588
IT	Ministero della Salute	1	155,844	1	300,250			2	456,094
JP	Japan Agency for Medical Research and Development	4	1,171,513	1	452,520			5	1,624,033
JP	Japan Society for the Promotion of Science	200	11,139,679	97	4,185,270	107	4,728,259	404	20,053,207
RU	MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FED.	1	384,000			1	630,000	2	1,014,000
KR	Animal and Plant Quarantine Agency	5	1,340,007					5	1,340,007
KR	Korea Health Industry Development Institute	1	12,314					1	12,314

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
KR	National Research Foundation of Korea	1	879,231					1	879,231
LU	Grand Duchy of Luxembourg	1	118,600					1	118,600
NL	Dutch Research Council	1	799,500					1	799,500
NL	Ministry of Health Welfare and Sport	1	8,572,500					1	8,572,500
NL	Netherlands Organisation for Health Research and Development	25	10,944,292	12	5,869,077	3	812,047	40	17,625,415
NL	NWO & Dutch Ministry for Health			8	6,590,668			8	6,590,668
NO	The Research Council of Norway	10	3,943,288	24	17,047,237	15	12,184,113	49	33,174,638
NO	TMS - Trond Mohn Foundation					3	4,255,616	3	4,255,616

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
NO	Western Norway Regional Health Authority	1						1	
NZ	HRC	3	1,827,241	4	1,915,833	7	3,614,507	14	7,357,582
NZ	Royal Society of New Zealand	4	1,699,402	3	2,003,760	2	838,565	9	4,541,727
PT	Fundação para a Ciência e Tecnologia	2	2,862,367	52	14,164,050	1	144,736	55	17,171,153
RU	MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION	1	384,000			1	630,000	2	1,014,000
RU	Russian Science Foundation	8	1,672,000	14	2,949,375	10	2,150,500	32	6,771,875
SE	Bank of Sweden Tercentenary Foundation	1	23,600	1	797,880			2	821,480
Sweden	Swedish Energy Agency			1	218,000			1	218,000

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
Sweden	Swedish Heart-Lung Foundation					8	1,195,040	8	1,195,040
Sweden	Swedish Research Council	34	10,024,630	28	16,004,860	31	10,490,020	93	36,519,510
SE	Swedish Research Council for Environment Agricultural Sciences and Spatial Planning	3	995,500	3	1,082,140	7	3,642,080	13	5,719,720
SE	The Foundation to Prevent Antibiotic Resistance					3	291,200	3	291,200
SE	VINNOVA	8	2,504,188	15	6,112,313	6	2,151,370	29	10,767,871
UK	Academy of Medical Sciences	7	613,660	11	397,559	7	436,054	25	1,447,273
UK	Action on Hearing Loss	1	6,475					1	6,475
UK	Arts and Humanities Research Council	5	1,331,396	1	288,316	1	250,340	7	1,870,052

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
UK	Biotechnology and Biological Sciences Research Council	40	30,194,889	55	29,467,526	48	46,797,423	143	106,459,839
UK	Chief Scientist Office	1	206,761					1	206,761
UK	Dunhill Medical Trust					2	564,799	2	564,799
UK	Economic and Social Research Council	19	15,221,827	3	3,914,299	1	119,917	23	19,256,043
UK	Engineering and Physical Sciences Research Council	10	8,844,746	9	6,794,576	7	5,548,216	26	21,187,538
UK	GAMRIF			3	14,720,818	42	29,228,324	45	43,949,142
UK	Innovate UK	39	15,936,810	27	14,558,172	22	14,743,653	88	45,238,635
UK	Medical Research Council	62	41,510,797	31	48,442,157	38	42,414,006	131	132,366,960
UK	Medical Research Foundation					1	4,860,000	1	4,860,000

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
UK	National Centre for the Replacement Refinement and Reduction of Animals in Research	1	98,440	3	358,650	3	320,086	7	777,176
UK	Natural Environment Research Council	1	188,474					1	188,474
UK	NIHR	14	11,634,765	14	18,926,283	13	21,393,916	41	51,954,964
UK	UK Research and Innovation					4	5,157,547	4	5,157,547
UK	Versus Arthritis	1	377,985			1	189,238	2	567,224
UK	Wellcome Trust	88	40,671,274	63	54,270,339	48	55,474,210	199	150,415,823
USA	Agency for Healthcare Research and Quality	9	5,050,962	5	1,894,003	3	649,524	17	7,594,489
USA	Bill & Melinda Gates Foundation	34	30,084,490	65	63,640,494			99	93,724,984
USA	Biomedical Advanced Research and Development Authority	2	64,800,000	1	15,700,000	1	20,700,000	4	101,200,000

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
USA	CARB-X	23	63,358,000	15	34,520,000	22	66,325,000	60	164,203,000
USA	Congressionally Directed Medical Research Programs	6	3,791,363	30	21,178,858	28	39,349,410	64	64,319,631
USA	Cystic Fibrosis Foundation					1	5,100,000	1	5,100,000
USA	Leo Model Foundation			1	100,000			1	100,000
USA	National Institute on Disability, Independent Living, and Rehabilitation Research			1	99,827			1	99,827
USA	National Institutes of Health	212	216,025,671	283	232,492,143	270	198,049,388	765	646,567,203
USA	National Science Foundation	16	3,818,511	28	8,302,140			44	12,120,651
USA	North Carolina Biotechnology Center	1	500,000					1	500,000
USA	United States Department of Agriculture	7	24,252,981	2	6,100,000	1	1,237,500	10	31,590,481

Country Funder	Funder*	2017 projects	2017 budget (USD)	2018 projects	2018 budget (USD)	2019 projects	2019 budget (USD)	Total projects	Total budget (USD)
USA	United States Food and Drug Administration	6	1,422,197	18	2,241,050	2	138,260	26	3,801,507
USA	US CDC	6	5,238,382	6	2,472,368			12	7,710,750
ZA	NRF SA	3	77,513					3	77,513
ZA	South African Medical Research Council	1	760,000					1	760,000
Total		1371	1,030,152,201	1304	968,831,620	1180	912,134,995	3855	2,911,118,816

*Only the project information from 108 funders are listed. For 33 out of the 141 funders, we do have only information on projects started before 2017 and the more recent project data are missing.

Appendix 3 – Analysis by individual bacteria on the priority list

This appendix presents the analysis of the information contained in the Dynamic Dashboard, as at 8 September 2020, on the individual bacteria included in the Global AMR R&D Hub's priority list. More information on the bacteria in scope both for the priority list and the Dynamic Dashboard as a whole can be found in the **List of infectious agents with a relevant AMR issue**, available at[46].

Critical priority level bacteria

The bacteria genus identified as a critical priority on the Global AMR R&D Hub's list are: *Acinetobacter* spp., *Clostridioides* spp., *Enterobacteriaceae,* and *Pseudomonas* spp.

Acinetobacter spp.

As at 8 September 2020, only *A. baumannii* is included.

The total investment captured in the Dynamic Dashboard researching *Acinetobacter* spp. is 86 million USD. Of this investment 43% is funding research into therapeutics, 43% is funding basic research and 10% is invested into operational and implementation research.

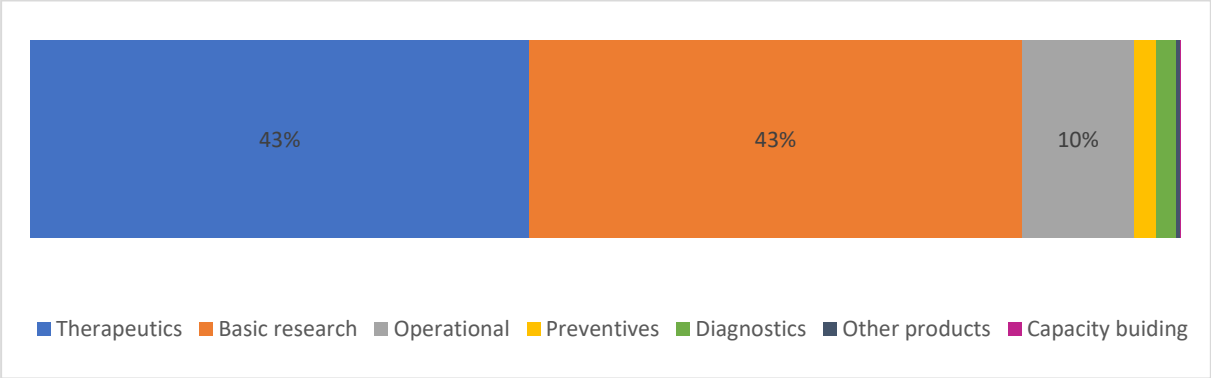

Figure 46: What research is happening into Acinetobacter spp. presented as % of investment by research area

Clostridioides spp.

As at 8 September 2020, only *C. difficile* is included.

The total investment captured in the Dynamic Dashboard researching *Clostridioides* spp. is 156 million USD. Of this investment 58% is funding therapeutics, 18% is invested into operational and implementation research, and 18% is funding basic research.

[46] https://globalamrhub.org/dynamic-dashboard/library/infectious-agent-in-scope/

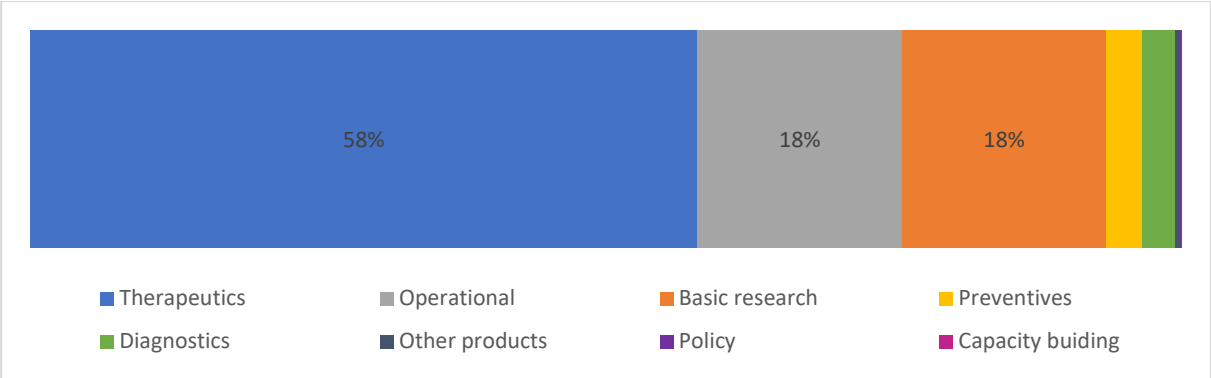

Figure 47: What research is happening into Clostridioides difficile, presented as % of investment by research area

Enterobacteriaceae

As at 8 September 2020, the bacteria included in the *Enterobacteriaceae* are *Escherichia coli,* all *Enterobacter* spp. *Klebsiella pneumonia*., all *Proteus* spp., all *Providencia* spp., all *Serratia* spp, and any *Enterobacteriaceae* with no further specification. No investments towards *Morganella* spp. have been captured in the Dynamic Dashboard.

The total investment captured in the Dynamic Dashboard researching *Enterobacteriaceae* is 276 million USD. Of this investment 37% is funding therapeutics, 35% is funding basic research and 12% is invested into operational and implementation research.

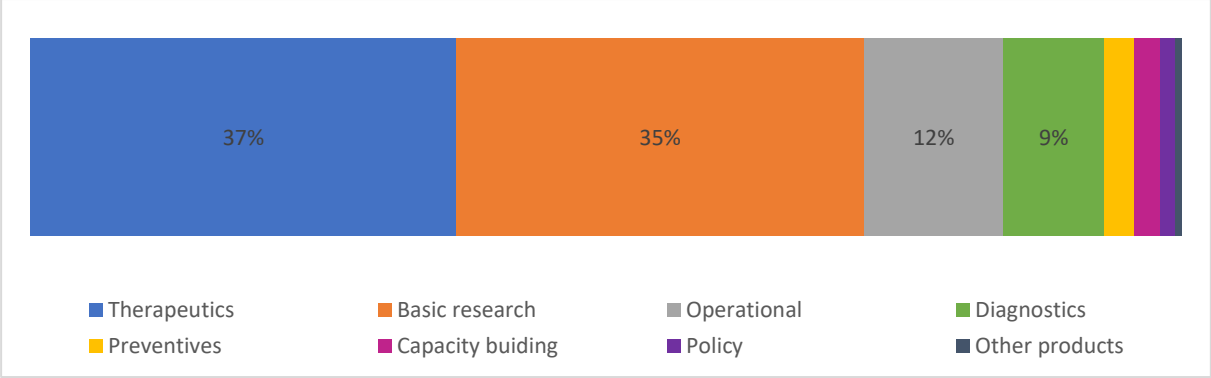

Figure 48: What research is happening into Enterobacteriaceae presented as % of investment by research area

When looking at the bacteria that comprise the *Enterobacteriaceae* family, the top funded (above 10%) research areas are:

- *Enterobacteriaceae* (no further identification), therapeutics (43%), operational and implementation research (22%), diagnostics (15%), and basic research (14%)
- *Escherichia* spp. basic research (57%), therapeutics (24%)
- *Enterobacter* spp. therapeutics (56%), basic research (25%), diagnostics (17%)
- *Klebsiella* spp. therapeutics (43%), basic research (41%)

Pseudomonas spp.

As at 8 September 2020, only *P. aeruginosa* is included.

The total investment captured in the Dynamic Dashboard researching *Pseudomonas* spp. is 223 million USD. Of this investment 43% is funding therapeutics, 40% is funding basic research and 7% is invested into capacity building.

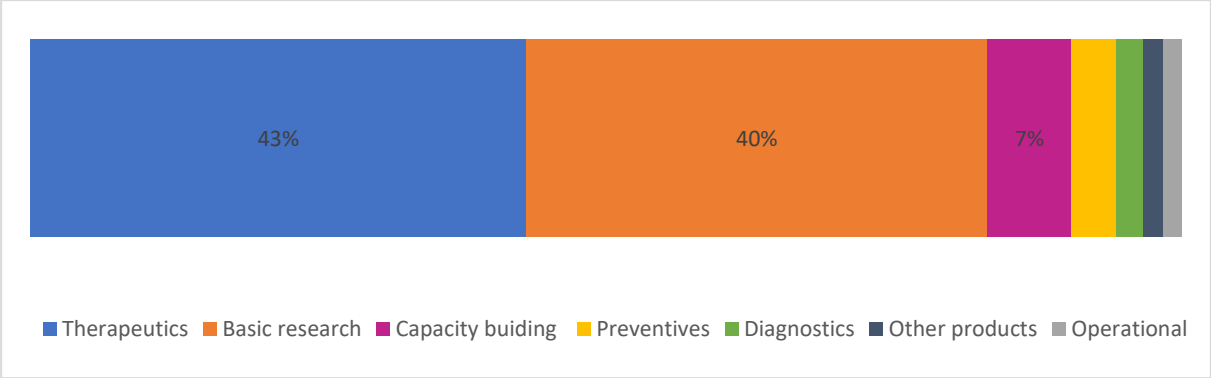

Figure 49: What research is happening into Pseudomonas spp. presented as % of investment by research area

High priority level bacteria

The bacteria genus identified as high priority on the Global AMR R&D Hub's list are: *Campylobacter* spp., *Enterococcus* spp., *Helicobacter* spp., *Mycobacterium* spp., *Neisseria* spp., *Salmonella* spp. and *Staphylococcus* spp.

Campylobacter spp.

All *Campylobacter* spp. are included.

Total investment for *Campylobacter* spp. captured in the Dynamic Dashboard was 13 million USD over 49 projects. Of this investment 47% is funding basic research, 20% is funding operational and implementation research and 14% is researching therapeutics.

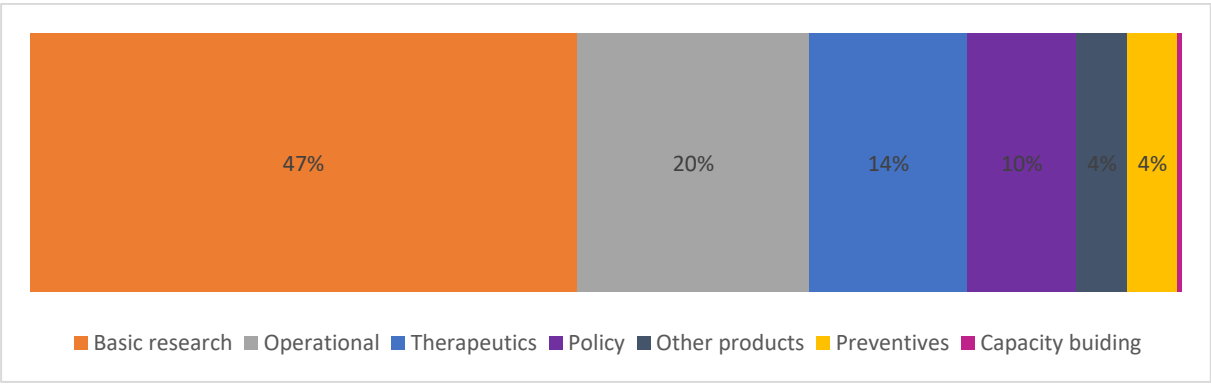

Figure 50: What research is happening into Campylobacter spp. presented as % of investment by research area

Enterococcus spp.

As at 8 September 2020, *E. faecium, E. faecalis* and *E. hirae* are included

Total investment for *Enterococcus* spp. captured in the Dynamic Dashboard was 53 million USD over 134 projects. Of this investment 61% is funding basic research, 27% is funding therapeutics and 9% is invested into operational and implementation research.

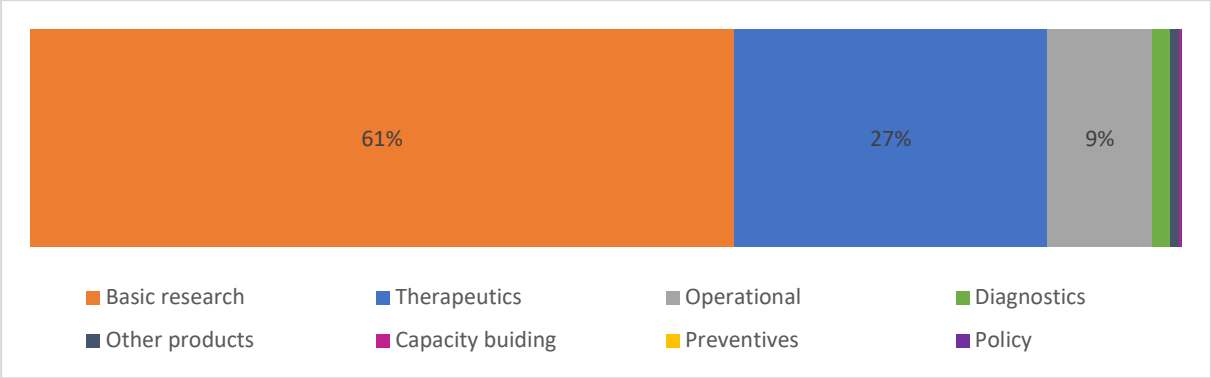

Figure 51: What research is happening into Enterococcus spp. presented as % of investment by research area

Helicobacter spp.

As at 8 September 2020, *H. pylori* and *H. cinaedi* are included.

Total investment for *Helicobacter* spp. captured in the Dynamic Dashboard was 15 million USD over 111 projects. Of this investment 57% is funding basic research, 21% is invested into operational and implementation research and 9% is funding diagnostics.

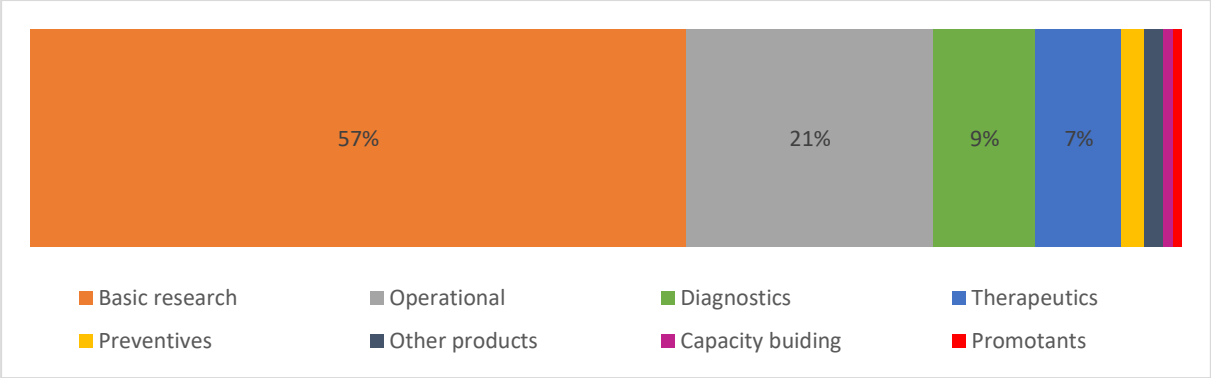

Figure 52: What research is happening into Helicobacter spp. presented as % of investment by research area

Mycobacterium spp.

The data is presented in the main section of the report, where R&D investment addressing high priority level bacteria is discussed.

Neisseria spp.

As at 8 September 2020, only *N. gonorrhoeae* is included.

Total investment for *Neisseria* spp. was 105 million USD over 115 projects. Of this investment 33% is funding research into therapeutics, 18% is funding basic research and 16% is invested into capacity building (of which 99% is a single investment provided to GARDP).

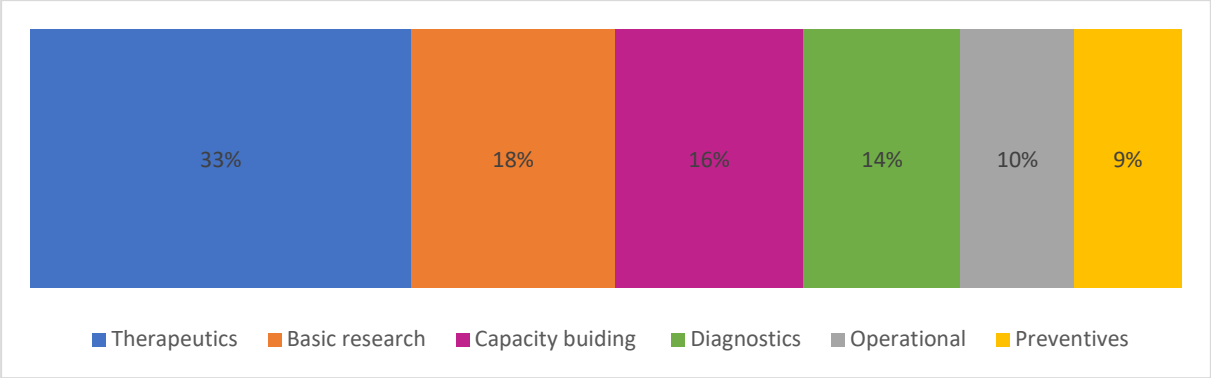

Figure 53: What research is happening into Neisseria spp. presented as % of investment by research area

Salmonella spp.

All *Salmonella* spp. are included.

Total investment for *Salmonella* spp. was 110 million USD over 185 projects. Of this investment 54% is funding basic research, 28% is funding research into preventives (all directed towards vaccines), and 11% is invested into operational and implementation research.

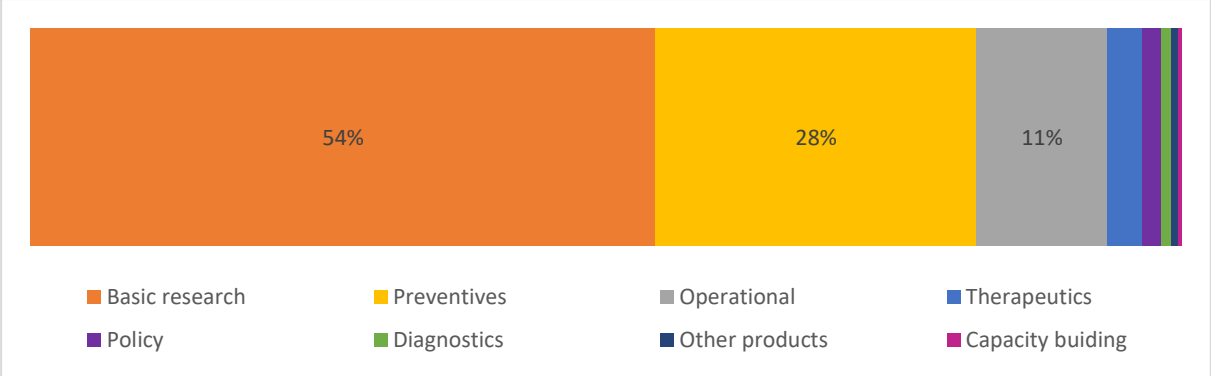

Figure 54: What research is happening into Salmonella spp. presented as % of investment by research area

Staphylococcus spp.

As at 8 September 2020, *S. aureus* and *S. epidermidis* are included.

Total investment for *Staphylococcus* spp. captured in the Dynamic Dashboard was 387 million USD over 687 projects. Of this investment 40% is funding research into therapeutics, 37% is funding basic research and 12% is invested into operational and implementation research.

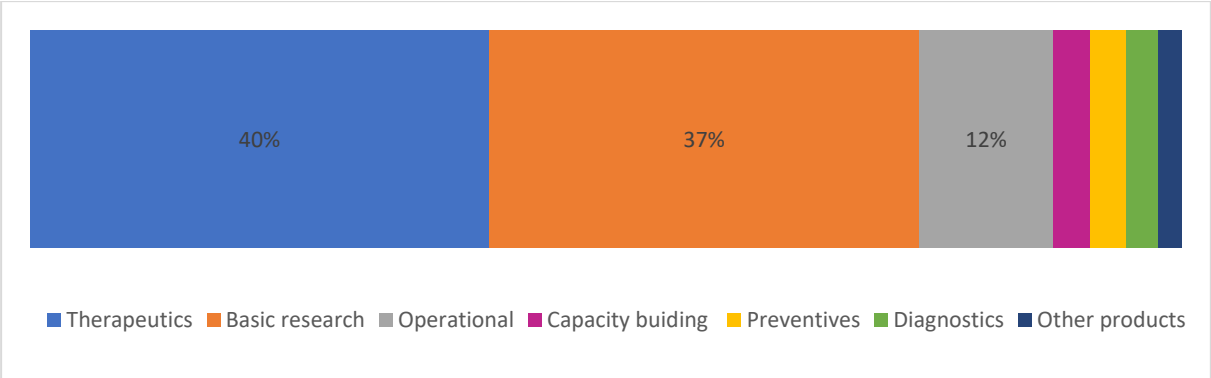

Figure 55: What research is happening into Staphylococcus spp. presented as % of investment by research area

Medium priority level bacteria

The bacteria genus identified as medium priority on the Global AMR R&D Hub's list are: *Haemophilus* spp., *Shigella* spp., and *Streptococcus* spp.

Haemophilus spp.

As at 8 September 2020, only *H. influenzae* is included.

Total investment for *Haemophilus* spp. captured in the Dynamic Dashboard was 6 million USD over 32 projects. Of this investment 63% is funding basic research, 27% is invested into operational and implementation research, and 9% is funding research into preventives.

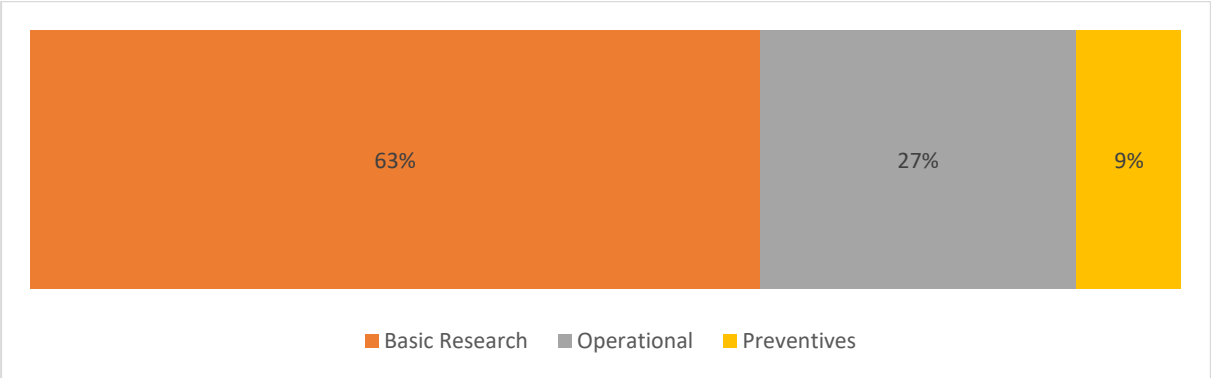

Figure 56: What research is happening into Haemophilus presented as % of investment by research area

Shigella spp.

All *Shigella* spp. are included.

Total investment for *Shigella* spp. captured in the Dynamic Dashboard was 62 million USD over 62 projects. Of this investment 69% is funding research into preventives, 23% is funding basic research, and 5% is funding research into therapeutics.

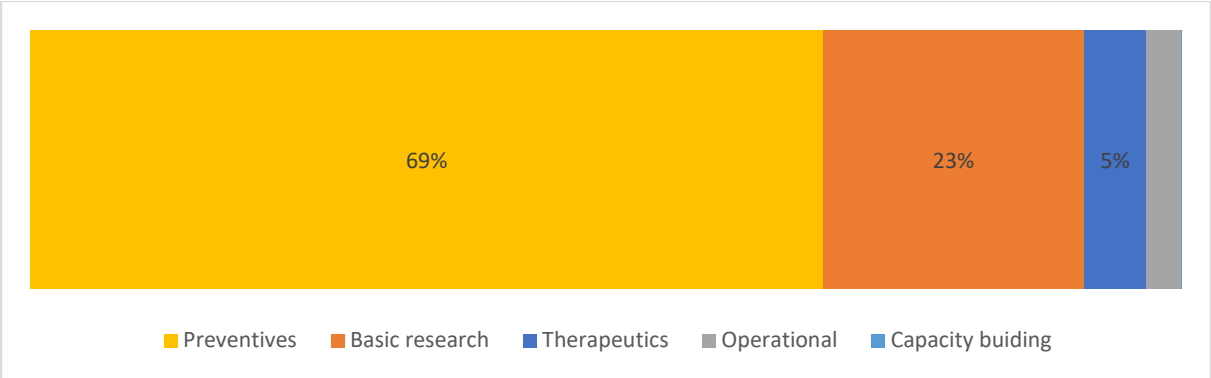

Figure 57: What research is happening into Shigella presented as % of investment by research area

Streptococcus spp.

As at 8 September 2020, *St. pneumoniae, St. pyogenes* (group A *Streptococcus*), *S. agalactiae* (group B Streptococcus) and *St. mitis* are included.

Total investment for *Streptococcus* spp. captured in the Dynamic Dashboard was 197 million USD over 430 projects. Of this investment 40% is funding basic research, 29% is invested into operational and implementation research, and 22% is funding research into preventives.

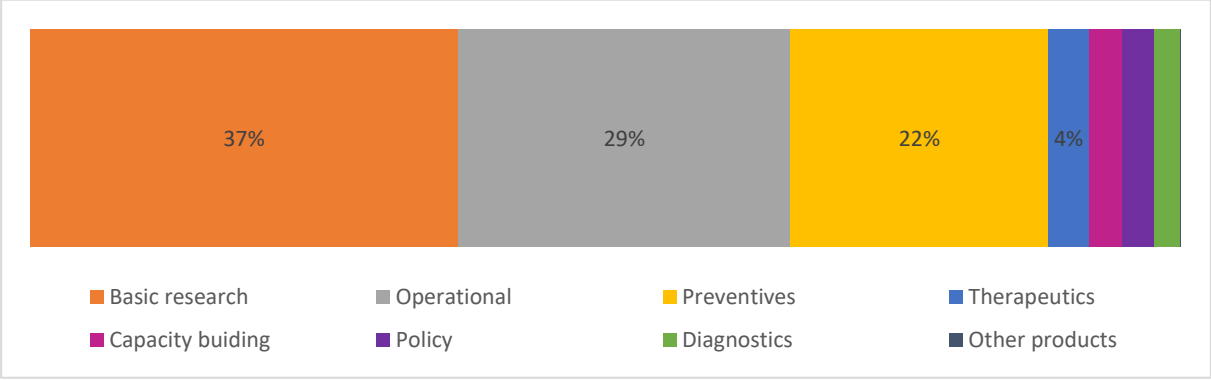

Figure 58: What research is happening into Streptococcus presented as % of investment by research area