



Alliance4Life

Life Science Alliance: Closing Research and Innovation Divide in the EU

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1 Introduction

The *D2.1 Assessment Report* is the first public deliverable of the Alliance4Life project work package *WP2 Assessment & Benchmarking*. According to the Work Plan, the *D2.1 Assessment Report* falls under *Task 2.2 Assessment outputs collection, integration and benchmarking*.

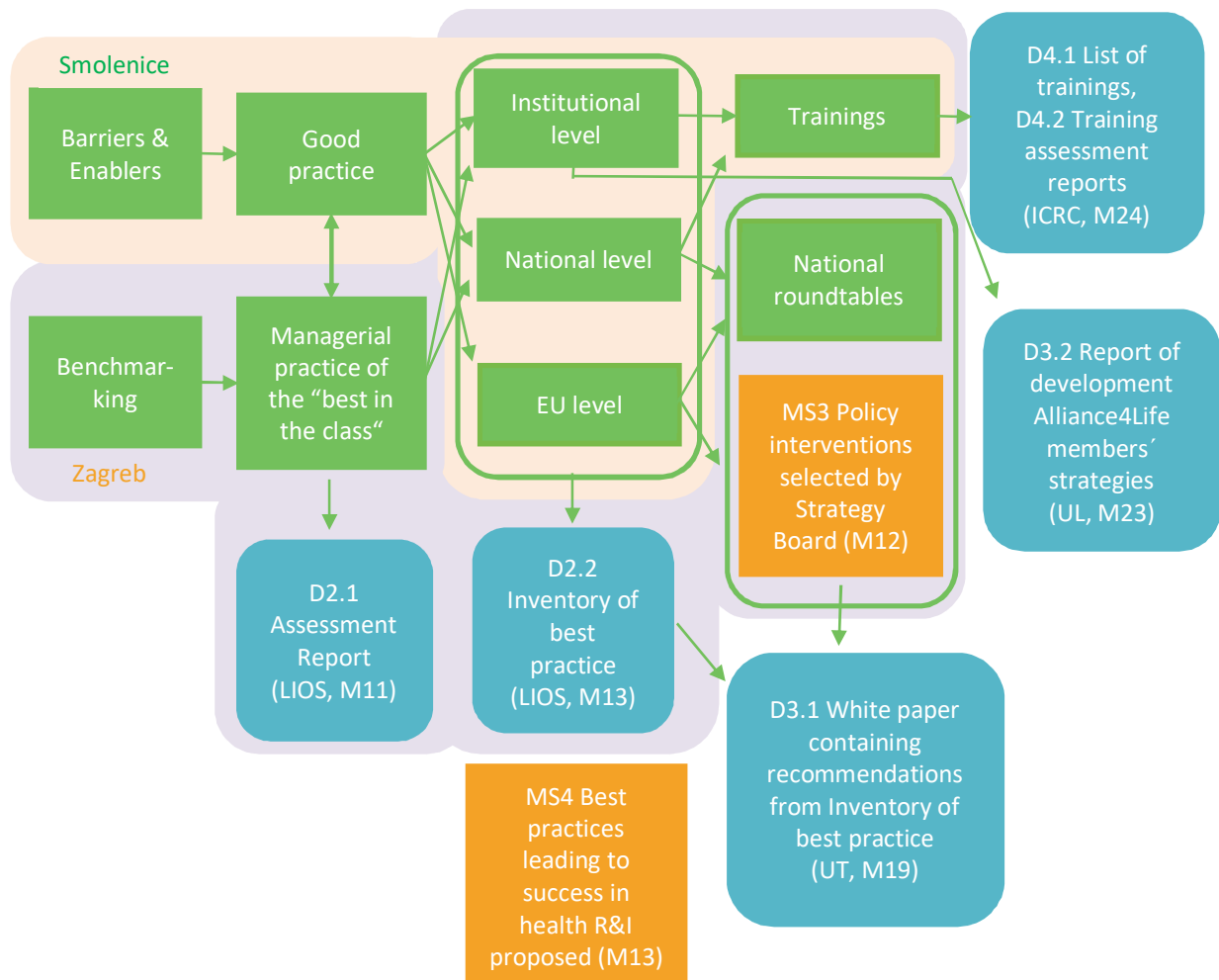
The objectives of *WP2 Assessment & Benchmarking* are as follows:

- To elaborate the criteria that will be used for identification and evaluation of typical constraints, challenges, needs, interests, and opportunities in partnering institutions with respect to the agenda of Focus Groups (FGs);
- To identify the main challenges and peculiarities of the health R&I faced by involved institutions and their researchers; and
- To sort out determinants of success in health R&I, especially “soft” underlying measures needed for (synergic) funding to result in excellent R&I performance.

The *D2.1 Assessment Report* is an essential part of the project Work Plan. Findings and conclusions of the report will be taken into account for the next tasks of WP2, as well as for the *WP3 Strategy & Policy*, and further elaborated in the next deliverables, namely *D2.2 Inventory of best practice* (due in M13 – January 2019), and *D3.1 White paper containing recommendations from Inventory of best practices* (due in M19 – July 2019). The main goal, however, is to use the managerial practice of benchmarking the best performing institutions as an inspiration for the Alliance4Life strategies.

See the interdependencies and flow of information within the Work Plan in the scheme below:

Fig. 1: Interdependencies of D2.1 within the Work Plan



It has to be pointed out that the benchmarking of R&I performance among Alliance4Life institutions (chapter 3), as well as with the EU advanced research institutions (chapter 4), cannot be seen as a precise comparison. Although all member institutions contributed a maximum effort to reach the best understanding of the definitions of benchmarking indicators, and to provide high quality data, there are differences between the individual institutions that influence the comparison. These **differences** especially concern **legal status and the institutional setting** (e.g., universities focused on both research and education, research institutions focused only on research, and hospitals carrying out research activities in addition to medical services), as well as **different systems of data monitoring** in the case of individual institutions.

Therefore, the main purpose of the benchmarking and of this report is to provide a **general overview of R&I performance** of Alliance4Life partnering institutions in order to **draw conclusions about managerial practices** that might be inspiring for others. These practices will be used for Alliance4Life recommendations at institutional, national, and EU levels, and for further development of Alliance4Life strategies, as shown in the scheme above.

2 Methodology and Indicators

The Alliance4Life consortium designed the list of benchmarking indicators in May and June 2018, based on the FGs' discussions, (see tables 1–5, which include definitions of indicators). The indicators were approved during the second consortium meeting held in Smolenice in June 2018 (M6), and then the final definitions of indicators were formulated. The following benchmarking domains have been considered by the consortium as relevant for the assessment of the R&I performance:

- Research excellence;
- Knowledge transfer;
- Funding, including grants and investments;
- Human resources; and
- Core Facilities.

The R&I indicator data were provided by all Alliance4Life members, and collected and analysed by the WP2 Leader, Latvian Institute of Organic Synthesis, in close collaboration with the Coordinator, CEITEC Masaryk University. After collecting the quantitative data, all members were asked to discuss institutional managerial practices in their respective domain of expertise, as well as provide a short analysis of outcomes that commented on the benchmarking results. Most of these managerial practices form the deliverable **D2.2 Inventory of Best Practice**.

For the **benchmarking with EU advanced research organisations**, two excellent European Life Science research institutes were selected: **European Molecular Biology Laboratory (EMBL)**, based in Heidelberg, Germany, and **Centre for Genomic Regulation (CRG)** based in Barcelona, Spain. Moreover, one excellent Life Science university, **Karolinska Institutet**, based in Stockholm, Sweden, was also selected.

The most important criteria for selecting these EU advanced institutions for the benchmarking are as follows:

- Their **mission** is similar to Alliance4Life’s mission – to focus on scientific research in Life Sciences;
- Their **excellence and reputation** as one of the top EU15 research institutions in Life Sciences (e.g., ranked by the Nature index); and
- The **availability of publicly accessible data** – using the InCites online research analytics tool for publication performance and their annual reports from 2016 - 2018. The institutions did not validate the publicly obtained available data.

EMBL covers six European sites. Therefore, it gives a representative overview of the critical mass of the whole spectrum of Molecular Biology research. **Karolinska Institutet** represents an excellent research university with a hospital, which is a similar setting to some of the Alliance4Life members. Finally, **CRG** is member of EU-LIFE, which is seen as a sister alliance to Alliance4Life, and has provided a lot of inspiration to the Alliance.

For the purpose of this public report, **the collected data were anonymised**. In **Chapters 3 and 4** of this report, which present the collected data, the names of the institutions involved in the benchmarking analysis were not specified.

The comprehensive table of indicators and collected data form **Annex II** of this report. The subchapters below (2.1–2.5) provide an **overview of indicators** used for the benchmarking, along with their **definitions**.

2.1. Research Excellence

Table 1. Benchmarking Indicators for the Research Excellence Domain

Domain	Indicator	Definition
Research excellence	Publications	Number of publications that are part of the Web of Science Core Collection; type of document (i.e., article, review, or letter), published 2015 - 2017 (cumulative total for the whole period)
	Publications Tier 5	Number of publications in Tier 5 (according to WoS)
	Publications Tier 10	Number of publications in Tier 10 (including T5, according to WoS)
	Publications Quartile 1	Number of publications in Q1 (including T10, according to WoS)
	Highly Cited Papers	Number of highly cited papers (according to WoS)
	External Collaboration	% of papers with external collaboration (i.e., at least one author has all different affiliations from the domestic benchmark institution)
	National Collaboration	% of papers with national collaboration
	Without Any Collaboration	% of publications without collaboration

	Indicator	Definition
	Cumulative Impact Factor	The sum of Impact Factors of all publications
	Average IF	The cumulative sum of IFs across all publications, divided by the total number of publications
	Cumulative Citations	The sum of citations of all publications (including self-citations)
	Average Citations	The sum of citations of all publications per item (including self-citations), divided by the total number of publications
	Number of Publications of Corresponding Author	The number of publications of the corresponding author with affiliation to the domestic benchmark institution
	Cumulative Citations of Corresponding Author	The sum of publication citations across all publications of the corresponding author with affiliation to the domestic benchmark institution (including self-citations)
	Average Citation of Corresponding Author	The sum of citations across all publications of the corresponding author with affiliation to the domestic benchmark institution per item (including self-citations), divided by the total number of publications
	ERC Grants	Number of ERC holders in 2017 (that were implemented in 2017, as beneficiary)
	MSCA-IF Grants	Number of MSCA Individual Fellowships holders 2017 (that were implemented in 2017, as beneficiary)

2.2. Knowledge Transfer

Table 2. Benchmarking Indicators for the Knowledge Transfer Domain

Domain	Indicator	Definition
Knowledge transfer	Patent Cooperation Treaty (PCT) Application	Number of PCT applications (cumulative total from 2015-2017)
	Licenses and Intellectual Property (IP) Assignments	Number of licenses and IP Assignments
	Spin-offs	Number of existing start-ups

2.3. Funding and Grants

Table 3. Benchmarking Indicators for the Funding and Grants Domain

Domain	Indicator	Definition
Funding & Grants	Total Cumulative Funding (EUR) Spent During 2015 - 2017	Total operational cost (including investments)
	Spent-International (competitive)	
	Spent-National - Institutional (non-competitive)	
	Spent-National (competitive)	
	Spent-ESIF	
	Spent-Private	
	Spent-Other	
	Spent-Investments	Long-term investments, as part of total cumulative funding, from all sources (e.g., construction, equipment, etc.)
	Total Awarded Funding During 2015-2017	Timing is based on institutional practice; the sum of all categories below = total awarded funding
	Core Funding-National (non-competitive)	Institutional funding
	Operating	
	Investment	
	National Grants (competitive)	
	Research	
	Infrastructure	
	CSA, Capacity-building, and Networking	
	ESIF funding	
	Research	
	Infrastructure	
	CSA, Capacity-building, and Networking	
International Grants	Awarded during 2015-2017 (includes all types of collaborative projects, as coordinator and partner(s)); EC contribution is only for the A4L institution	
H2020 ERC (number)	Includes only those who host the ERC (implementation matters)	
H2020 ERC (value, EUR)		
H2020 HEALTH (number)		
H2020 HEALTH (value, EUR)		
H2020 MSCA IF (number)	Includes only those who host the person (implementation matters)	
H2020 MSCA IF (value, EUR)		

Indicator	Definition
H2020 MSCA ITN (number)	
H2020 MSCA ITN (value, EUR)	
H2020 MSCA ETN (number)	
H2020 MSCA ETN (value, EUR)	
H2020 MSCA RISE (number)	
H2020 MSCA RISE (value, EUR)	
H2020 Teaming (number)	
H2020 Teaming (value, EUR)	
H2020 Twinning (number)	
H2020 Twinning (value, EUR)	
H2020 ERA-Chairs (number)	
H2020 ERA-Chairs (value, EUR)	
H2020 LEIT (number)	
H2020 LEIT (value, EUR)	
H2020 FET (number)	
H2020 FET (value, EUR)	
H2020 SC (except Health) (number)	
H2020 SC (except Health) (value, EUR)	
ERA-NETs (number)	
ERA-NETs (value, EUR)	
IMI (number)	
IMI (value, EUR)	
EUROSTARS (number)	
EUROSTARS (value, EUR)	
Other (number)	
Other (value, EUR)	
Private income	
Contract research	
Knowledge transfer	(e.g., from licences)
Other	(e.g., private donations, rental of premises, etc.)
Other sources	

2.4. Human Resources

Table 4. Benchmarking Indicators for the Human Resources Domain

Domain	Indicator	Definition
Human Resources	Total Staff FTE (all)	FTE=full-time equivalent: number of working hours that represent one full-time employee of the institute Include: total staff of the institute: research, supporting technical, and supporting administration Exclude: students without a working contract
	Total Staff FTE (female)	
	Total Staff FTE (international)	
	Total Staff HC (all)	Total staff HC (all): HC=headcounts: number of employees at the institute
	Total Staff HC (female)	
	Total Staff HC (international)	
	Research Staff FTE (all)	FTE=full-time equivalent: number of working hours that represent one full-time employee of the institute. To calculate FTE of research staff, encompass all working hours of research-affiliated staff, including those dedicated to their teaching or managerial duties. Research staff FTEs/HCs: include total research staff of the institute (researchers and facilities staff) Exclude: technical support, administrative, management, and students without a working contract
	Research Staff FTE (female)	
	Research Staff FTE (international)	
	Research Staff HC (all)	
	Research Staff HC (female)	
	Research Staff HC (international)	
	Supporting Technical Staff FTE (all)	Include: Core Facility staff
	Supporting Technical Staff FTE (female)	
	Supporting Technical Staff FTE (international)	
	Supporting Technical Staff HC (all)	
	Supporting Technical Staff HC (female)	
Supporting Technical Staff HC (international)		

	Indicator	Definition
	Supporting Administrative Staff FTE (all)	Include: administration and management
	Supporting Administrative Staff FTE (female)	
	Supporting Administrative Staff FTE (international)	
	Supporting Administrative Staff HC (all)	
	Supporting Administrative Staff HC (female)	
	Supporting Administrative Staff HC (international)	

2.5. Core Facilities

Table 5. Benchmarking Indicators for the Core Facilities Domain

Domain	Indicator	Definition
Core facilities	Number of Commercial Partners/Contracts + Volume of Contracts	Number of partners cooperating with the institute based on a commercial contractual research/service provision when the partner institution is the supplier in this relationship, and company is in the position of the customer (for 2017). Volume of such cooperation per 2017 excl. VAT in EUR. Add volume of such contracts.
	Coverage of the Running Costs from Core Facilities' Earnings (%) for 2018	Percentage of operational costs of Core Facilities covered by users' fees. Excluded for 2017, but it is extremely important to have the evidence for 2018.
	International Network Memberships (e.g., ESFRI roadmap membership)	Count each membership (not only leading position, but also the position of the partner). Include full membership only, not preparatory phase. Data for 2017. Provide the list of memberships in ESFRI.
	Users group	Percentage of the usage of Core Facilities by different users groups (to total 100%)
	Internal	
	External Academic	
	External Commercial	

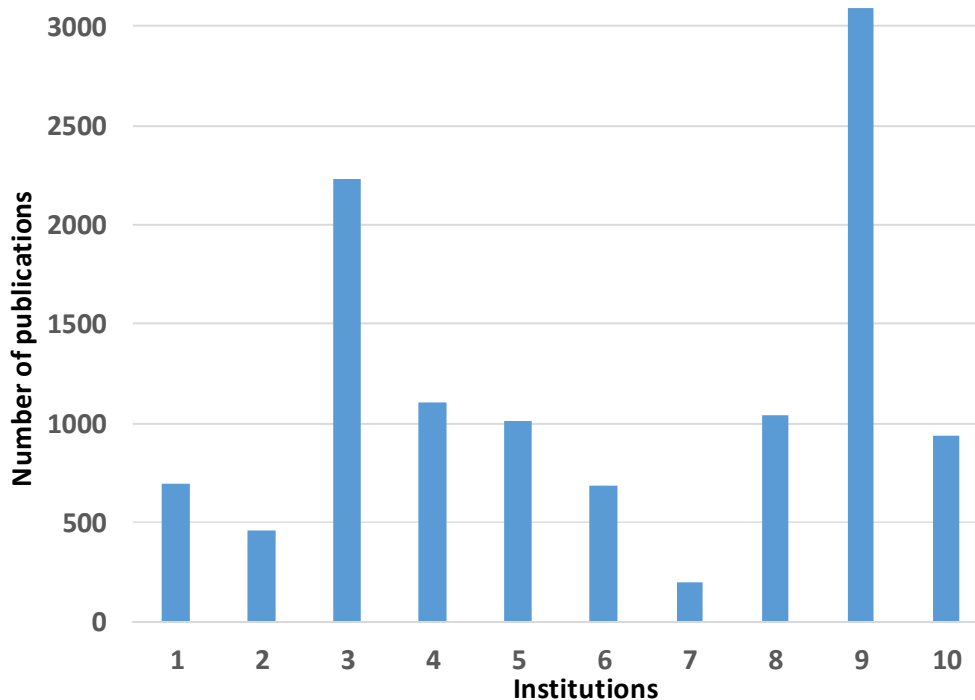
3 Benchmarking of Alliance4Life Member Institutions

3.1. Research Excellence

The most important indicators for the assessment of R&I performance in research institutions are those related to the production of scientific publications. Several types of presentations and comparisons are provided in the graphs below, which show the number of publications and, more importantly, their quality and citation impact.

The total number of publications in absolute numbers (average value is not shown because the data is not normalized), produced by each institution during 2015-2017, is shown in Fig 2.

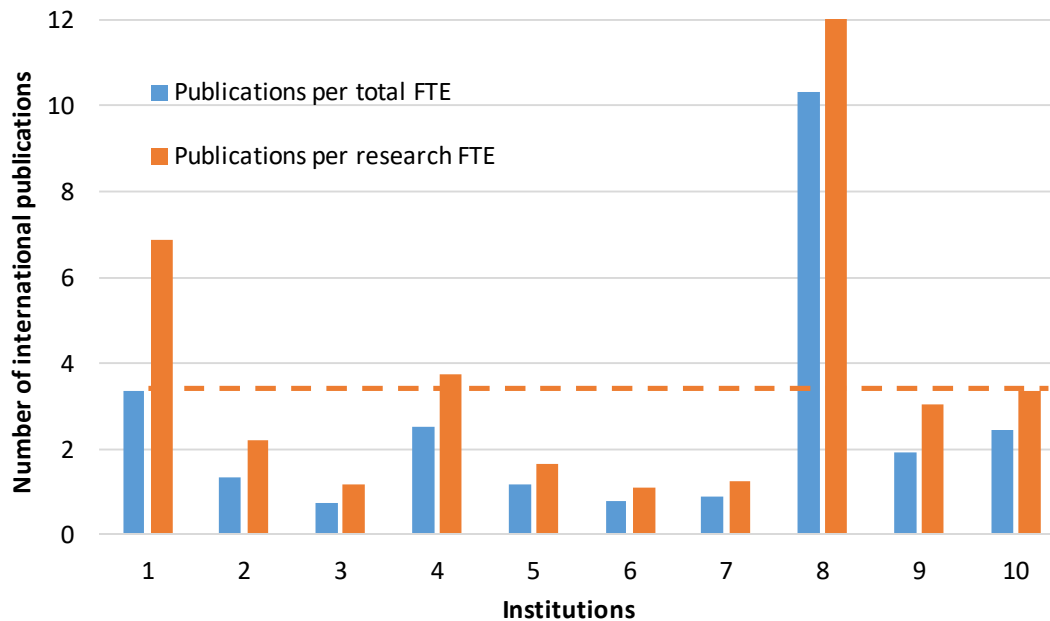
Fig. 2: Total Number of Publications, 2015-2017



Some institutions reported a negative impact on the output of publications because of institutional reorganisation. **Institution 2** underwent a change in legal status in 2016 (merging of the 4 institutions to create a larger centre) that was associated with moving to a new (building and resulted in an inability to perform experimental work for 7 months (due to requirements of new approvals for research using GMO and animals). **Institution 6** also reported similar structural rearrangements and an associated impact on the number of publications. In addition, several institutions mentioned that the availability of national calls for ESIF is an important source for research/research-related activity funding. The delays in this funding flow also negatively affected the publication outcomes. **Institution 7** has the smallest number of publications due to a large proportion of private income (30% from total funding, see Fig.14) and restrictions to publishing applied research results.

Fig. 3 shows the comparison between the number of publications in international journals per total staff FTE and the number of publications per research FTE at each institution. The dotted line shows the average value for the number of publications per research FTEs. The number of employees in the Alliance4Life institutions varies from 216 FTE (institution 7) to 2 922 FTE (institution 3).

Fig. 3: Number of Web of Science Publications per FTE, 2015-2017



On average, 1 publication in an international journal per research FTE per year is considered a sufficient outcome. Most of the institutions report an average of 1-3 publications per total/research FTE. **Institution 8** is the leader in the number of publications both per total FTE and per research FTE (10-12 publications per FTE). This institution indicates that the institutional system of monitoring FTE reports was funded by the research budget. However, some of the educational budget-funded staff also contributed to the publishing of papers. This partly explains why the ratio of publications/FTE is so high.

The second best performing **institution, 1**, (almost 7 publications per research FTE) has implemented changes in its 2015 strategy: from quantity of publications to quality. Before 2015, the measures of the major funding provider were strictly set to quantity, but the plan for period 2016-2020 follows managerial practice of internationally recognized institutions.

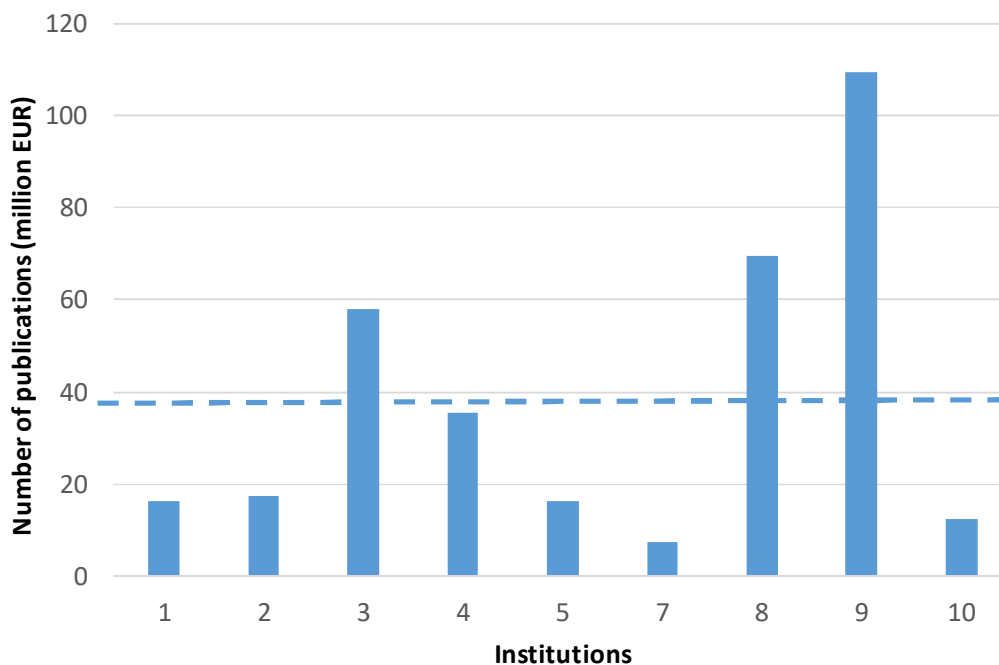
Several Alliance4Life institutions reported concerns about increasing the number of publications yet maintaining their quality, when **national systems of institutional evaluation** mostly consider the quantity of publications. **The number of publications**, however, should not be considered as the most important indicator for the excellence of research. Instead, the level (i.e., Tier 5, Tier 10, and Quartile 1) and fraction of **high impact publications** per total publication number and citations might be a more representative measure.

This recommendation, i.e. to **focus on high quality publications**, has recently been implemented by the **institution 2**. In the past period, this institution provided a monthly

bonus to an employee’s salary based on the contribution to publications during the preceding 5 years. The evaluation took into account the impact factor of the journal. By the beginning of this year, the institution 2 has adopted a strategy of evaluation based on Tier and Quartile in order to improve the fraction of high impact publications. This strategy includes annual bonus for the papers published in the actual year. **The bonus** will be provided **only for publications in Q1 and Q2 journals**, but not for Q3 and Q4, with exception of Q3 in-house edited international journals (in order to support their sustainability and improve their quality).

Fig. 4 shows the number of publications per operative funding in million EUR for 2015 – 2017. Due to reorganisation of the relevant units, **institution 6** was unable to provide precise data of operative funding spent during this period. Therefore, Fig.4 presents data only of nine of the ten institutions.

Fig. 4: Publications per Operative Funding in Million EUR, 2015-2017



Institutions 9 (109.5), **8** (69) and **3** (58) report relatively above-average numbers of publications per million EUR. It should be noted that **institution 8** indicates that due to different monitoring systems, it is not possible to combine the data from the research department and HR office. Regarding salaries, the extent of research funding is somewhat underestimated since the teaching staff (funded from the educational budget) spends part of their time doing research. Due to the particular system of monitoring at the HR office, it was not possible to calculate the correct proportion of funds that is dedicated to research within the educational budget.

The following two figures show the best publications. **Fig. 5** shows the absolute number of publications in Quartile 1 journals (Q1) and **Fig. 6** indicates the percentage of Q1 publications from the total number of publications.

Fig. 5: Number of Publications in Q1, 2015-2017

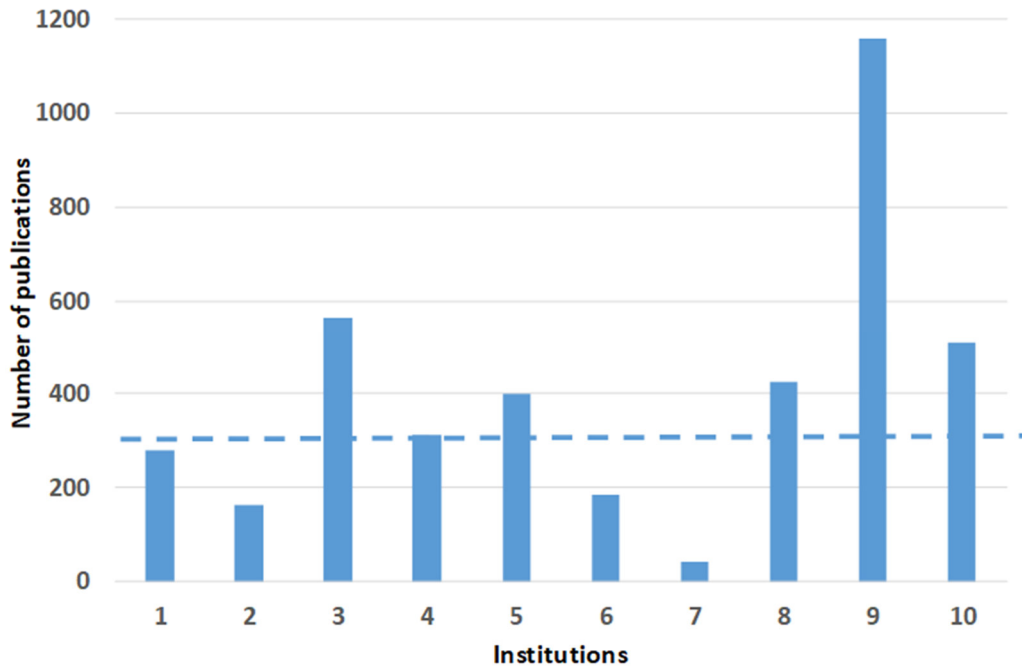
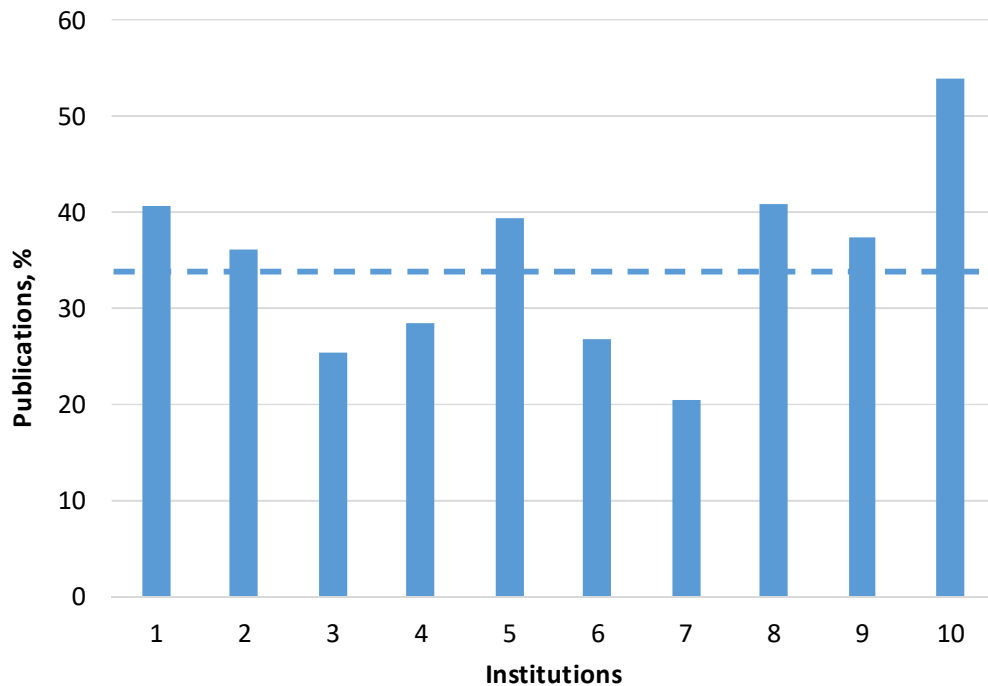


Fig. 6: Percentage of Quartile 1 Publications, 2015-2017

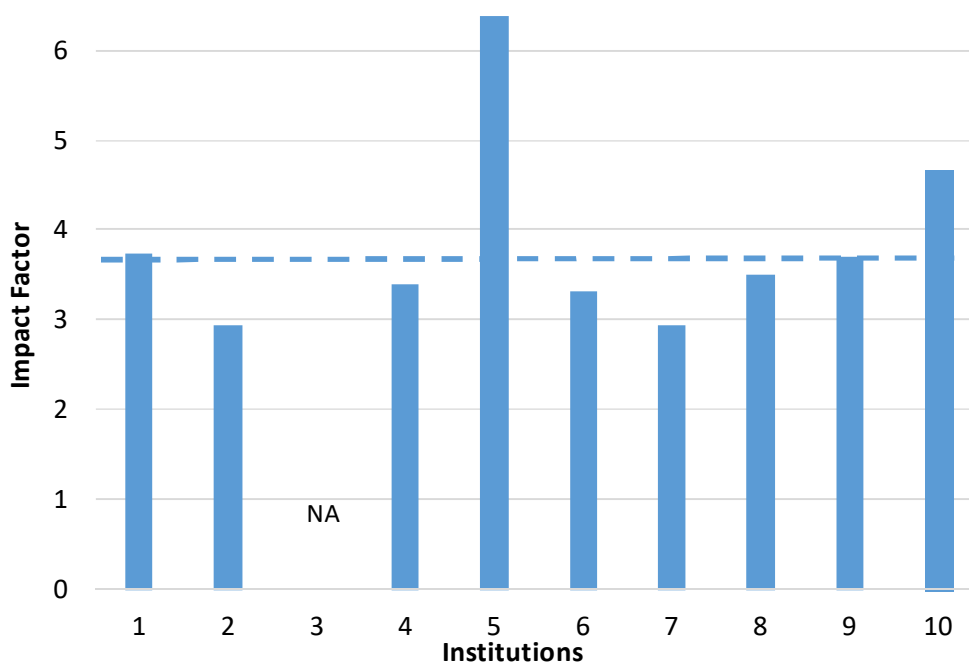


The results of the Alliance4Life institutions vary from 20.5% - 54%. About 40% of publications are published in Q1 journals. **Institution 10** is the leader in Q1 publications with 54%. This correlates to the fact that researchers frequently publish with external collaboration, and with corresponding authors from other institutions, and that the best publications have an above average citation per publication (see **Fig. 8**: 6 of 10 institutions have above average citations).

National research evaluation systems still consider the number of Web of Science (WOS) publications as an important parameter, but **the situation is slowly shifting** to the **evaluation of quality**, according to Q1-Q4 journal rankings. Several Alliance4Life institutions have implemented bonus systems to promote publishing in high impact journals. For example, **institution 10** decided to apply a **bonus system** that financially supports researchers **who publish in Q1 and Q2 journals**. This system was both the result of a requirement of the EU project and a result of institution 10's aim to encourage researchers to improve their performance.

Fig. 7. shows the average Impact Factor (IF) of publications, which is also an important indicator for the evaluation of R&I excellence.

Fig. 7: Average Impact Factor (IF), 2015-2017



Relatively above-average impact factors are reported for publications produced by **institutions 5** (6.38) and **10** (4.66). As already mentioned, **institution 10** has introduced the bonus system for high quality publications. **Institution 5** commented that all PhD students and researchers make an effort to publish their results in international journals with the highest IF possible. This is not an obligation, but rather something that every researcher (in the interest of their career), knows. For other institutions, the average IFs of publications are in the range of 2.93 – 3.73. **Institution 3** could not provide these data because of technical issues.

Average citations per publication and citations of publications by corresponding author from the respective Alliance4Life institutions are presented in **Fig. 8** and **Fig. 8a**, respectively).

Fig. 8: Average Citations per Publication, 2015-2017

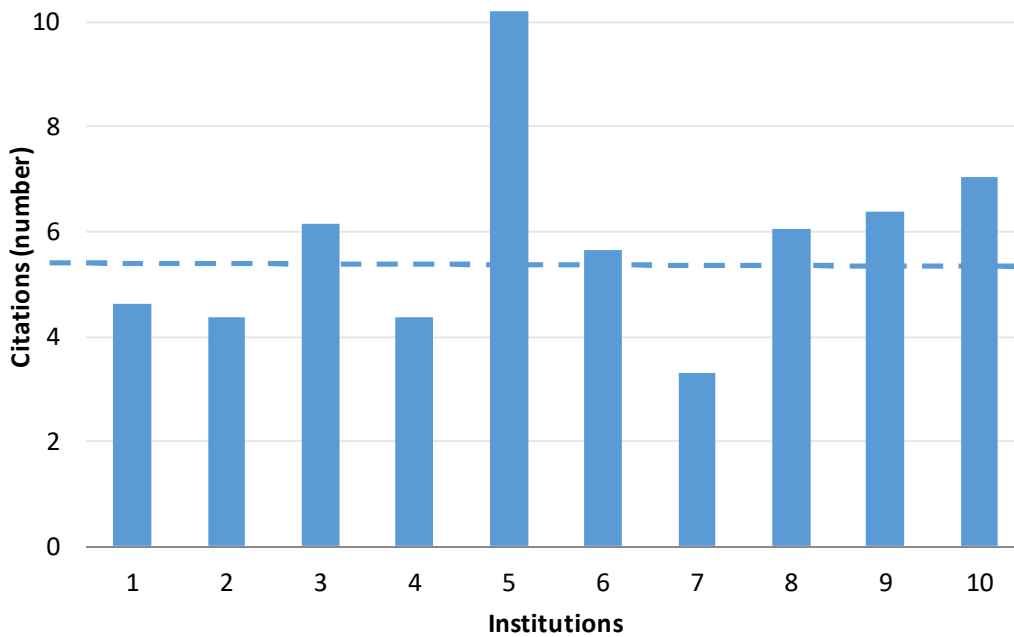
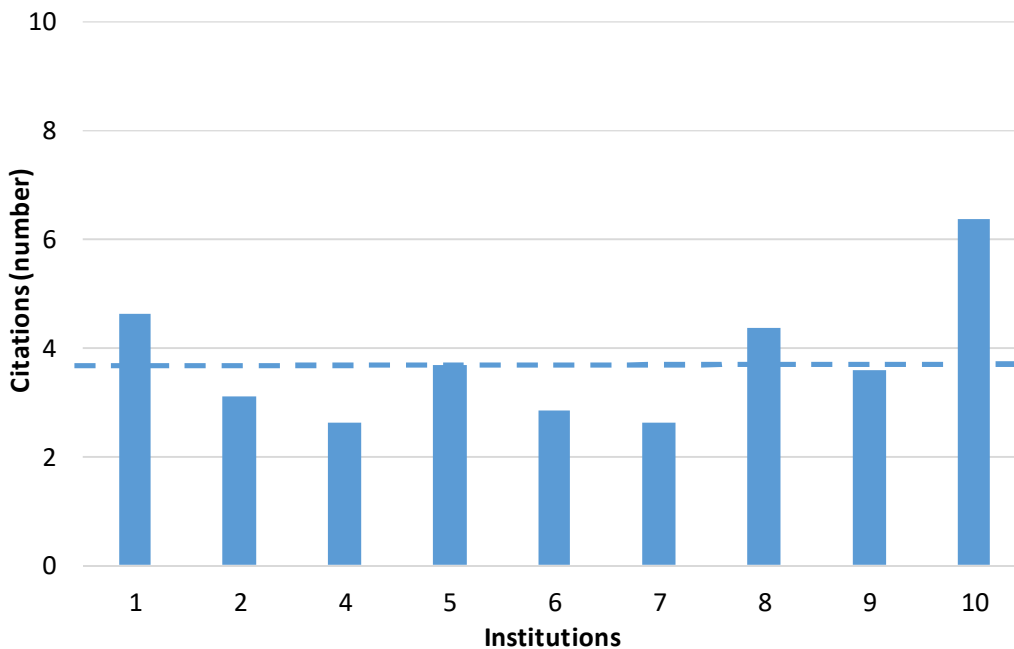


Fig. 8a: Average Citations of Corresponding Author, 2015-2017

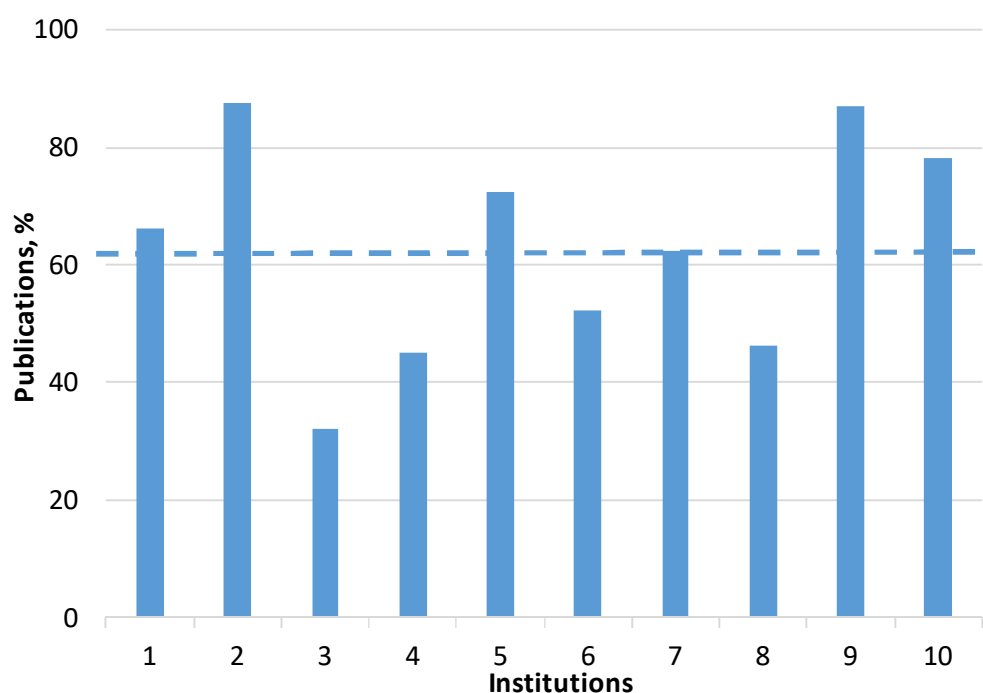


In Fig. 8, institution 5 has the highest average number of citations per publication. The most cited publications of corresponding authors are from **institutions 1, 8, and 10 (Fig. 8a)**. Lower than average citation per all publications value (**Fig. 8**) than average citations for publications with corresponding authors from respective institution provides evidence

for importance and benefits of external collaborations. The average citation of corresponding authors is fairly average (5 of 10 institutions are below average).

Fig. 9 below shows the percentage of publications resulting from international collaborations.

Fig. 9: Percentage of Publications with External Collaboration, 2015-2017



The average share of publications with external collaboration in Alliance4Life partner institutions is $\approx 63\%$.

In connection with the results from Fig. 9, it is interesting to analyse the **participation in the Horizon 2020 programme (Table 1)**. Especially the numbers of individual grants under the **Excellent Science pillar** (i.e., **ERC** and **MSCA** funding schemes) give an important evidence of scientific excellence of research institutions and universities in Europe.

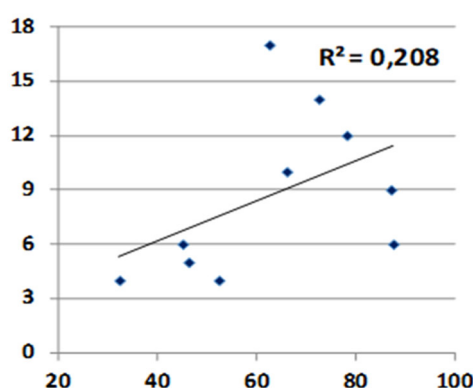
Table 6. Participation in Horizon 2020 and other international projects, 2015-2017.

Projects	Total	1	2	3	4	5	6	7	8	9	10
ERC	4					1	1			1	1
MSCA-IF	2						2				
MCSA ITN	10	1		1		1		3	1	1	2
MSCA RISE	6	2						1		1	2
Teaming	9	1		1		1	1	1	1	1	2
Twinning	7					4					3
ERA-Chair	2					2					
Health	24	4	2	2	6	3		1	2	3	1
LEIT	1	1									
FET	2	1		1							

Projects	Total	1	2	3	4	5	6	7	8	9	10
IMI	5							1	1	2	1
ERA-Nets	15		4			2		9			
Eurostars	1							1			
TOTAL PROJECTS		10	6	5	6	14	4	17	5	9	12

Table 1. shows that all institutions have experience in Horizon 2020 projects. The most successful institutions are **1, 5, 7, and 10**. The **institutions 5, 6, 9, and 10** have demonstrated their trend towards scientific excellence by being awarded several ERC and/or MSCA-IF projects. In total, partners have 24 project participations in the Societal Challenge *Health, demographic change, and wellbeing* projects, indicating how important this area is for the Alliance4Life consortium. The most successful Alliance4Life partners in calls under this Societal Challenge are institutions **1, 4, 5 and 9**. Almost all institutions are involved in successful Horizon 2020 projects in the area of *Spreading excellence and widening participation*. Three institutions are partners in ERA-NET projects. The success of institutions **2, 5, and 7** in ERA-NET calls is related to the policy of their respective countries, which support participation in the ERA-NETs in the health area.

Fig. 10: Correlation between Publications with External Collaboration and number of international projects, 2015-2017



As seen from **Fig. 10**, the correlation between the two criteria: publications with external collaboration (%) and the total number of H2020 and other **international projects** is not very strong

The success in H2020 is also connected with the **grant support practice**. The grant support in **institution 1** is divided between 2 departments (pre-award and post-award). The incentives for the researchers have not been implemented yet, except for the ERC support scheme. The institutional motivation for researchers is based on the rule to deliver at least 50% of the team budget via international/private funding (including contractual research). The **pre-award support team** provides very good support (e.g., go or no go decision-making help, and support in proposal preparation). Thus, the overall success rate of H2020 proposals has increased to 27% (so far unfortunately only as a partner in the consortia). There is still a challenge in obtaining major grants (i.e., the coordination of H2020 and ERC). Institute 1 recently announced a **new support scheme for ERC applicants** to motivate candidates that have been pre-selected by the top management of

the institute. They are given a 6 thousand EUR budget for proposal preparation (to hire a consultancy company), and there is an additional bonus for success in the ERC competition. This scheme is being offered to foreign candidates as well, so this means it is an incentive for talent attraction. Based on Alliance4Life Grants Focus Group meetings between partners, the plan is to soon announce an internal yearly competition for the best not funded proposals that will **acknowledge excellent results that were just below approval**. The success of institution 1 in attracting international funding is mostly based on former contacts of researchers. However, the challenge remains to coordinate competitive projects. The success of the grant support is related to long-term “education” of research teams, as networking is very important in gaining initial experience in H2020. Other interesting projects are popping up, and the role of the institution (and the budget) involved with new proposals is growing (i.e., becoming WP leaders in important WPs, etc.).

Institution 6 noted that individual grants are mostly written by individual researchers. As the country has considerably improved its research infrastructure, some researchers decided to return to their home country and continue their scientific careers there. Certain schemes on the national level have been helpful and have had an effect on future results, such as **travel grants to brokerage events** or partner meetings, and **bonuses for submitted H2020 projects**. 2018 was the first year when **synergy grants** were introduced (MSCA IF fellows with a mark higher than 70 that were not funded, and ERC grantees with a mark A that were not funded could re-submit their applications to be funded from ESIF). **Internal consultation services** were improved, and a system of quite intensive reminders about possible international calls was put in place to inform researchers about grant application opportunities. An agreement has been signed with **external consultants** to evaluate their impact on proposal success (currently working with Twinning proposal in Life Sciences). Their costs can also be partially compensated through national schemes.

Institution 4 indicated that their successful project applications are thanks to a “champion” professor who performs top quality research and has succeeded in coordinating two RIA actions (one in FP7 and one in H2020). In addition, institution 4 has developed a **support unit for proposal writing**.

Institution 5 has offered favourable conditions for applying to R&I projects: the Office of Research and Development provides support services in project coordination, management and information exchange, and all members of the institution have access to various R&D-related background informational sources on how to finance applications, make management decisions, etc. In the beginning of 2011, institution 5 implemented Regulations for Processing Development Projects that stipulate the basis and procedure for processing various projects, including R&I projects. A **database of funding opportunities** has been created to make finding information easier. Different funding opportunities are also disseminated via the grants mailing list. In 2013, a series of informational seminars was launched to disseminate information on, among others, topics related to R&I (e.g., the creation of spin-offs, promotion of research, etc.). In finding funding opportunities, internal support is provided primarily by the Office of Research and Development and the Office of Academic Affairs, but also by the International Cooperation Unit of the Rector’s Strategy Office and the Foundation of institution 5. In addition to support units, project managers in academic units are also involved with R&I support services (the positions have been created by academic units according to their needs and possibilities). In 2018, institution 5 restructured the research support services

and created a new Grant Office to expand **pre-award services in order to increase grant capture capabilities**.

Since the beginning of FP7, **institution 7** has implemented a strategy to promote participation in FP calls. Researchers actively attend **info days and brokerage events** organised by the EC and the National Contact Points. The potential partners for joint proposals are being identified among the existing collaborative partners. Institution 7 has established an internal bonus system to stimulate the research performance of scientific staff. It includes **the bonus for the attracted research funding** (i.e., H2020, ERA-NET-funded projects and proposals evaluated above thresholds).

Institution 10 has developed an **ERC support scheme** in 2012, providing the service of experienced consultants to all applicants (covered from centralized costs), organizing mock interviews to those who have passed step 1 of the evaluation. After delivering significant results to the institution 10 (2 ERCs in 2012-2014), the support scheme was adopted at the level of university and contributed to the awarding of another 2 ERC grants. Also, the respective university supports the relocation of ERC holders from abroad with the **Award in Science and Humanities**, an internal grant worth 2 mil. EUR, and encourages internal researchers with the potential for ERC granting with smaller internal grants (100 thousand EUR in 3 years) for high-risk, high-gain research. It is necessary to note that the success of institution 10 in ERCs is also largely determined by its **progressive career and HR policies**.

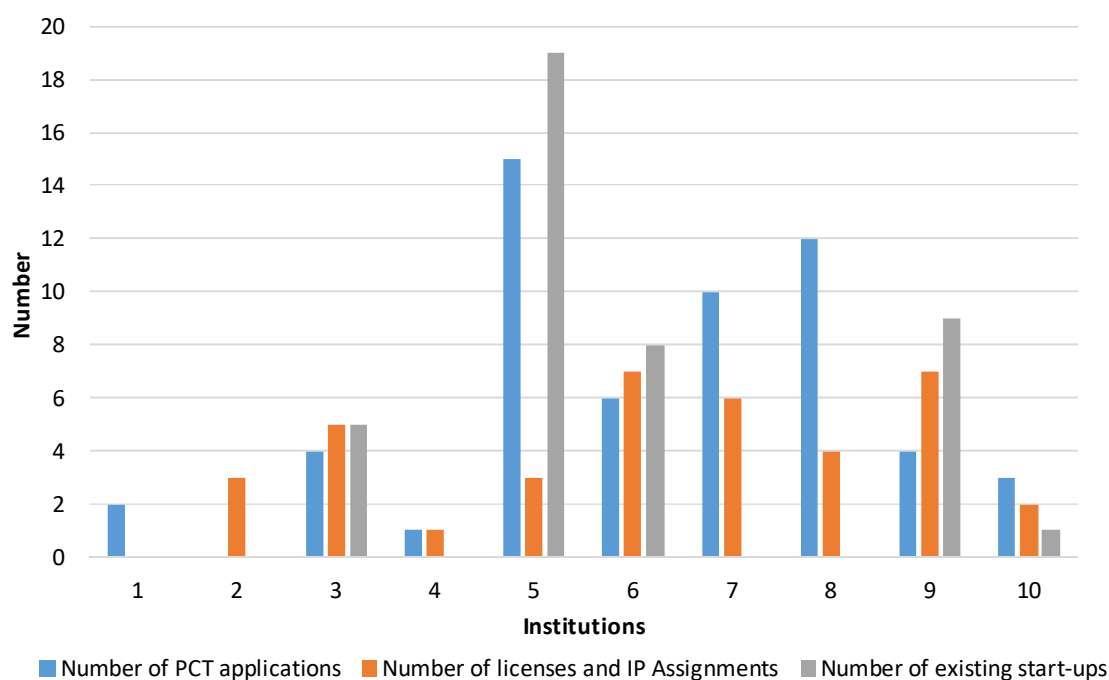
Based on the discussions of Alliance4Life Focus Groups, the following factors listed in **Table 2** below were identified as the main enabling and supporting factors for reaching research excellence:

Table 7. Enablers of Success in Research Excellence

Enablers of success in Research excellence in Alliance4Life institutions:
<ul style="list-style-type: none"> • Travel grants for participation in brokerage events and information days • Bonus system for high-impact publications • Bonus system for attracted competitive funding • Support scheme for ERC applicants • Progressive career and HR policies • Funding opportunities disseminated via the grants mailing list • Pre-award services to increase grant capture capabilities

3.2. Knowledge Transfer

All Alliance4Life partners have experience and accomplishments in the field of Knowledge and Technology Transfer as shown in **Fig. 11** below.

Fig. 11: Number of patents, licences and start-ups, 2015-2017

Five institutions have succeeded in establishing start-ups (**institutions 3, 5, 6, 9, and 10**). The most successful institution is **5**, which possesses 15 PCT applications and 19 start-ups.

Institution 5 has addressed the need for spin-off support and active commercialization of research results through licensing since 1996, which brought up the subject for the first time to the institution's internal legislation (**royalty sharing with inventors**). The first **spin-off support program** that offered several services to university staff starting spin-off companies was initiated in 1999. These activities have been in constant development, and spin-off support activities have been extended to students through different initiatives. For example, external consultants have been consulting institution's 5 technology transfer team, providing support in professional development.

Institution 6 is a comprehensive higher education and research organisation. The overall strategy of tech-transfer encompasses dual possibilities. First, the technology transfer strategy focuses on **enhancing research commercialization potential**. Therefore, a range of knowledge and technology transfer services are offered for the academic community (e.g., selecting the appropriate IP protection strategy, evaluating market opportunities, ensuring help in contract and/or collaborative research, and offering training sessions on IP management issues). Second, the technology transfer strategy includes the **development of entrepreneurship**, and fostering **science and business collaborations**. This allows for institution 6 researchers and/or students opening up the market intake possibilities.

Institution 9 has implemented an institutional technology transfer and innovation strategy with a goal of becoming a **regional innovation centre** (i.e., reference institution, multiplier role). The strategy includes:

- Coordinating development of physical, virtual, enterprise, and intellectual infrastructure that fosters innovation;

- Strengthening new types of relationships, utilising synergies (between research and the business sphere, at various levels, and in both the private and public sectors);
- Integrating launched R&I projects into the national and international scientific world;
- Improving conditions surrounding research and innovation in Health and Life Sciences; and
- Strengthening institutional competitiveness in the international scientific environment.

Similarly as in the previous domain, for Knowledge Transfer the following enablers can be summarized:

Table 8. Enablers of Success in Knowledge Transfer

Enablers of success in Knowledge transfer in Alliance4Life institutions
<ul style="list-style-type: none"> • Central funds for IP protection and IP protection policy • Refinanced expenses on patenting processes and establishing spin-offs • Support program for institutional staff starting spin-off companies • Internal inventors are favoured ahead of potential external licensees to develop the invention into commercial products • Development of entrepreneurship (e.g., courses, external consultants) • Fostering science and business collaborations • Royalties to inventors

3.3. Funding

Funding is considered as one of the decisive factors for achieving a good performance in R&I. The Alliance4Life institutions have reported the following amounts of awarded funding during the period 2015-2017, both as absolute numbers (Fig 12) and for the comparison divided by the full time equivalent (FTE) of staff (Fig. 13).

Fig. 12: Total Awarded Funding, Million EUR, 2015-2017

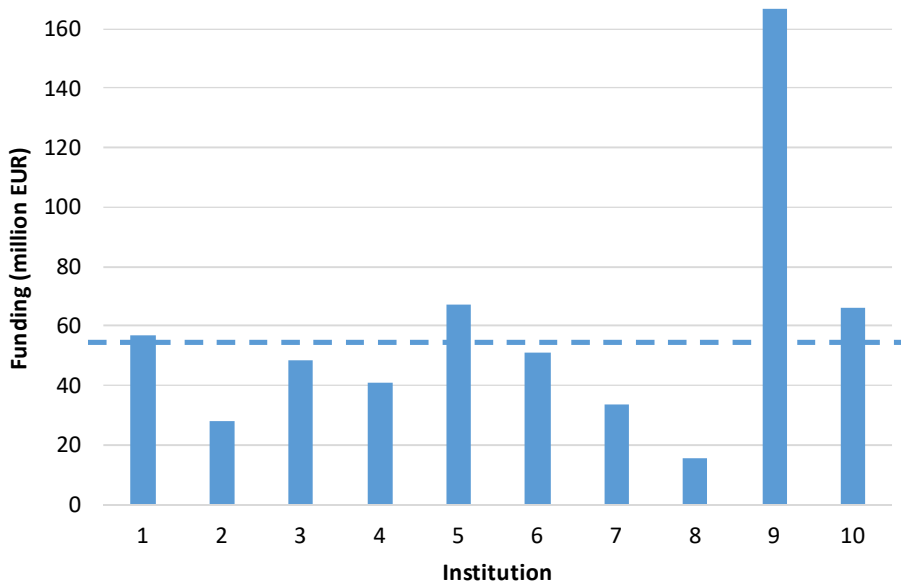
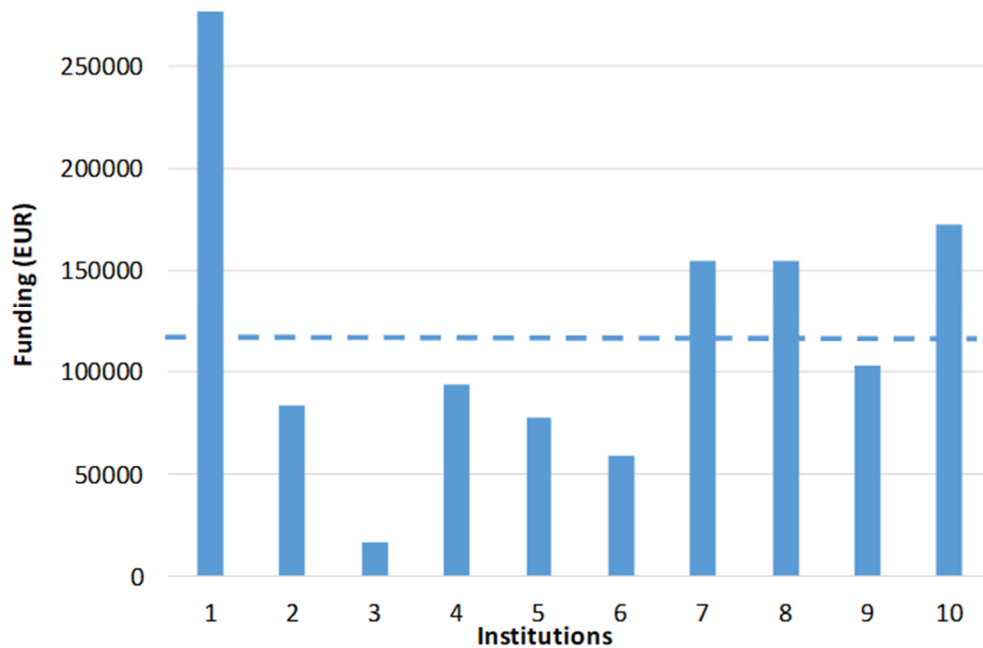


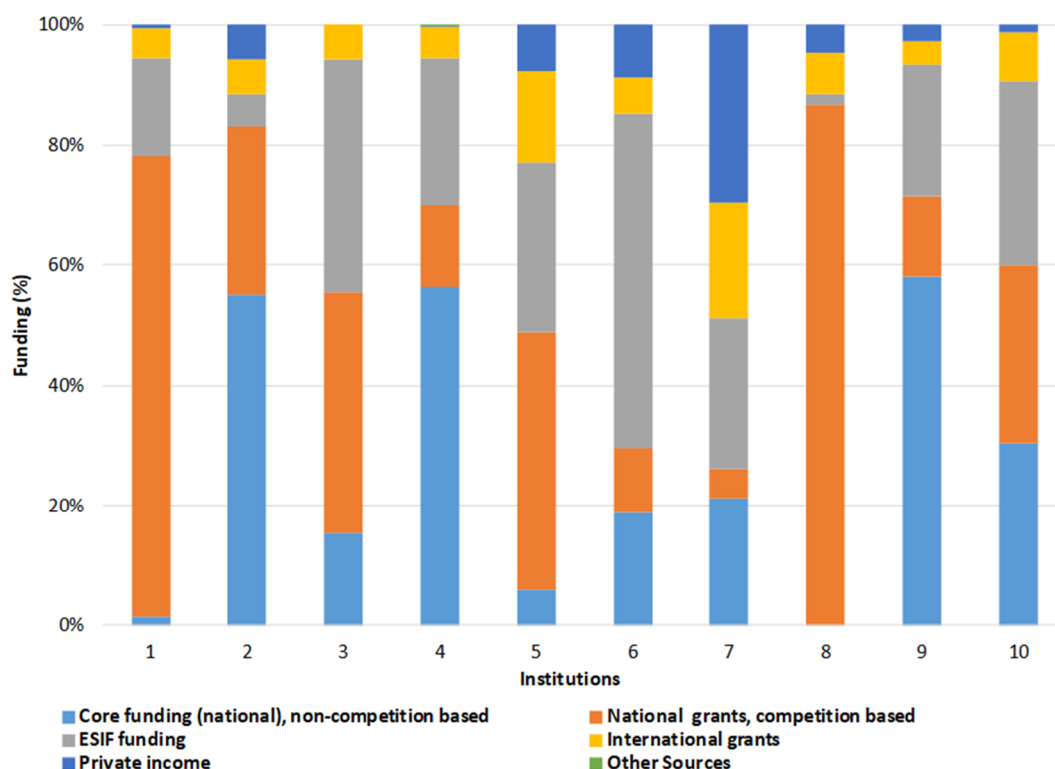
Fig. 13: Awarded Funding per total FTE, EUR, 2015-2017

If the awarded funding is reported per FTE of employees (Fig.13), it ranges from the 16,618 EUR/FTE (institution 3) to 276,344 EUR/FTE (institution 1).

Institution 1 is relatively small in terms of FTEs but highest performing in this benchmarking criterion. It has become very productive in attracting funding recently. The probable reason is that in 2015, institution 1 changed its funding structure. Research groups became responsible for their own incomes, and each group was advised to raise approximately **50% of its budget from competitive international/private resources**.

Institution 3 reports high involvement of less paid technical staff and PhD students in research work, resulting in less funding per FTE.

Institution 4 is an **educational institution**; therefore, it is difficult to calculate the accurate number of FTEs dedicated to research. This is especially true for the administrative and technical personnel. The responsible Ministry in charge of national universities' funding derives the funding from the number of students, rather than from scientific outputs. Therefore, scientific outputs are achieved based on low national funding, and rather by some enthusiastic scientists attracting international competitive project funding.

Fig. 14: Percentage of Types of Awarded Funding, 2015-2017

The **main funding sources** of income for all institutions are national core funding, competition-based national grants, ESIF funding, international grants, and private income. The ratio of different funding types is reflected in **Fig. 14**.

The percentage of national funding depends on the research policy and on the percentage of GDP allocated for research in each country. The largest **influence of ESIF** funds is evident for **institutions 3** (39 %) and **6** (56 %). Very low impact of ESIF funds is observed in the funding of **institutions 8** (2%) and **2** (5%). The proportion of ESIF funds in the budget of other partner institutions is in the range of **16-30%**.

The **ratio of funding sources** varies between Alliance4Life partner institutions. The largest national funding (national grants) was awarded to **institutions 1** (77%) and **8** (87%), but the least funding was awarded to **institutions 6** (11%) and **7** (5%). The largest core funding was awarded to **institutions 9** (58%), **4** (56%), and **2** (55%) and the least funding was awarded to **institutions 1** (2%) and **5** (6%). Core funding was not available for institution **8**.

During the reporting period, **institution 1** implemented a **major sustainability grant**, so the average national grant share was higher than in general.

Institution 2 included basic salaries in the core funding (76,6% of the core funding in 2017 was spent on basic personnel costs), and had a very **minor contribution of grants** to salaries because resources for salaries from grants are very low (generally no funding for new positions). This does not allow the generation of an attractive system of incentives. In addition, the majority of working contracts before 2015 were permanent. These contracts protected low-performing researchers and hindered the selection of excellent researchers.

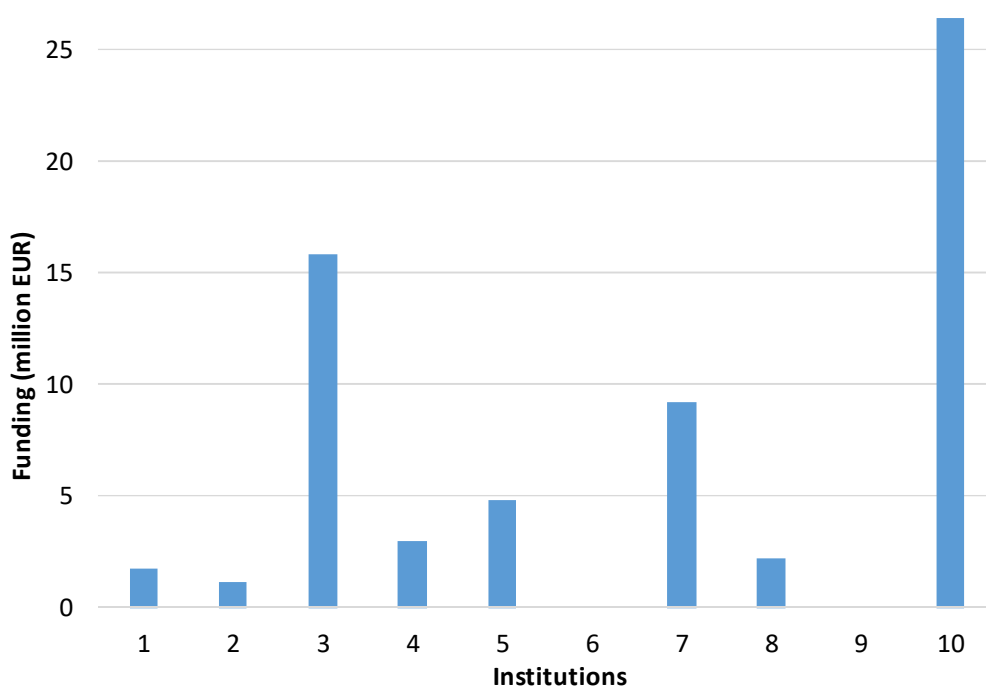
Major funding for **institution 4** came from **teaching**, and it has not been clearly defined which part was dedicated to science.

Private funding in Alliance4Life institutions made up 1% - 9% of the total funding. The largest private funding share of ~30% was achieved by **institution 7**. This institution has historically established **long-term collaborative contacts with the pharmaceutical industry**. This has resulted in the full understanding of research needs of the industry, as well as in general, acceptance of the research work culture required by industrial partners in contract research: confidentiality, discipline, target-oriented research, multi-disciplinary, and flexible research groups.

Institution 3 does not possess private income because in the reporting period, the amount was negligible. In some years, there was an occasional contract for research activity performed in collaboration with domestic and foreign business entities, private persons or other entities.

Participation in the international projects (mainly in Horizon 2020) is very important for all Alliance4Life partners, not only as a source of funding, but mostly as a possibility to increase their capacity by networking with other European leading research institutions. The input of competitive international project funding reached 19% in the budget of **institution 7**, and 15 % in the budget of **institution 5**. For other institutions, this source of funding was only in the range of 4-8 %.

Fig. 15: Institutional Investment Spent, Million EUR, 2015-2017



Eight institutions out of ten have reported they spent investments during 2015-2017. Institutions **3**, **7**, and **10** have been the most successful in this respect.

In the case of **institution 2**, national grant schemes did not provide any investment funds. The same was true during 2015-2017, in which the small investments came from international grants and research contracts with commercial partners.

Institution 3 had a few large projects regarding the construction of new facilities and renovation of the existing infrastructure.

For **institution 4**, investments during the reporting period were mostly represented by their own institutional funding, and some project funding. The ESIF investments were awarded, but were not spent in the period of 2015 -2017.

Institution 6 did not receive investments from the government as core funding, at least not in Life Sciences (the main investments for infrastructure (i.e., buildings and equipment) come from ESIF). Similarly, for **institution 9**, investment funds have not been available.

The highest investment, in the case of **institution 10**, has been attributed to the construction of new buildings and to the centralization of new state-of-the art infrastructures needed for top-level research. It also reflects a very low investment into the infrastructure during the previous period.

All of **institution 6's** investments funding for infrastructure (i.e., buildings and equipment) required the creation of Open Access Centres because of investment projects. These were centres that provided access to infrastructure for internal and external users, which paid for usage of the infrastructure (access was only provided during certain hours, or with input from scientific researchers). Such centres were formalised with a certain form of reporting. Recently, there were some changes made in the approach and the legislation, in which a flexible view of the open access principle was introduced.

Obviously, there is a time lag of at least several years for the infrastructure investments to positively impact publication output. Within the next stages of Alliance4Life, it will be useful to analyse the **dynamics of research excellence during 2018 – 2020** in the context of research investments and compare that to the investment data. Another factor affecting the correlation between investments and publication output is the composition of research infrastructure targeted towards fundamental and/or applied research.

It has to be noted, however, that the distribution of investment levels across countries depicted in Fig. 15 is largely the result of **national policies**. For instance, the governmental policy on **ESIF securing availability of funding for the research infrastructure** is one of the reasons behind the heavy upgrade of the research infrastructure for **institution 7**.

3.4. Human Resources

Human resources, especially support of **equal opportunities, diversity** (incl. **internationalization**), and **mobility**, is the key to the successful R&I performance of scientific institutions. Within the assessment of Human resources Alliance4Life looked at proportion and categories of staff (FTEs and HC), gender dimension including leaky pipeline, and internationalization.

Information about full time equivalents (FTE) of all institutions is presented in **Fig. 16** below, which shows different sizes of the Alliance4Life partners.

Fig. 16: Total FTE of Staff, 2017

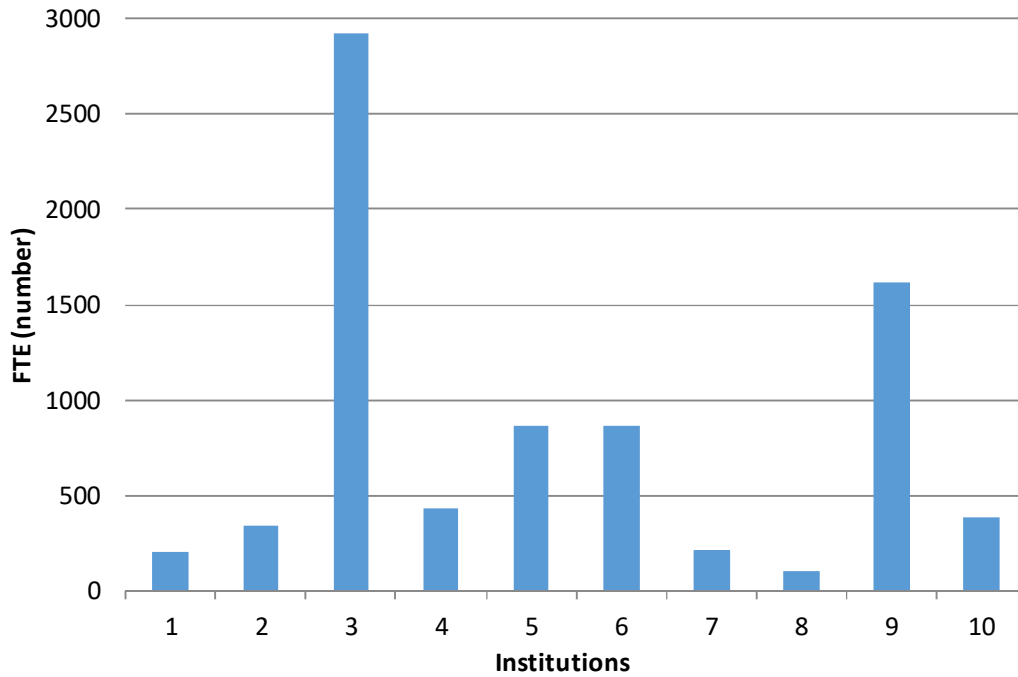


Fig. 17 provides information about the proportion of total staff full-time equivalents (FTE) versus head counts (HC). It can be seen that for most of the institutions, this criterion is >50% (except of **institutions 1, 4, and 8**).

Fig. 17: Staff FTE/HC in %, 2017

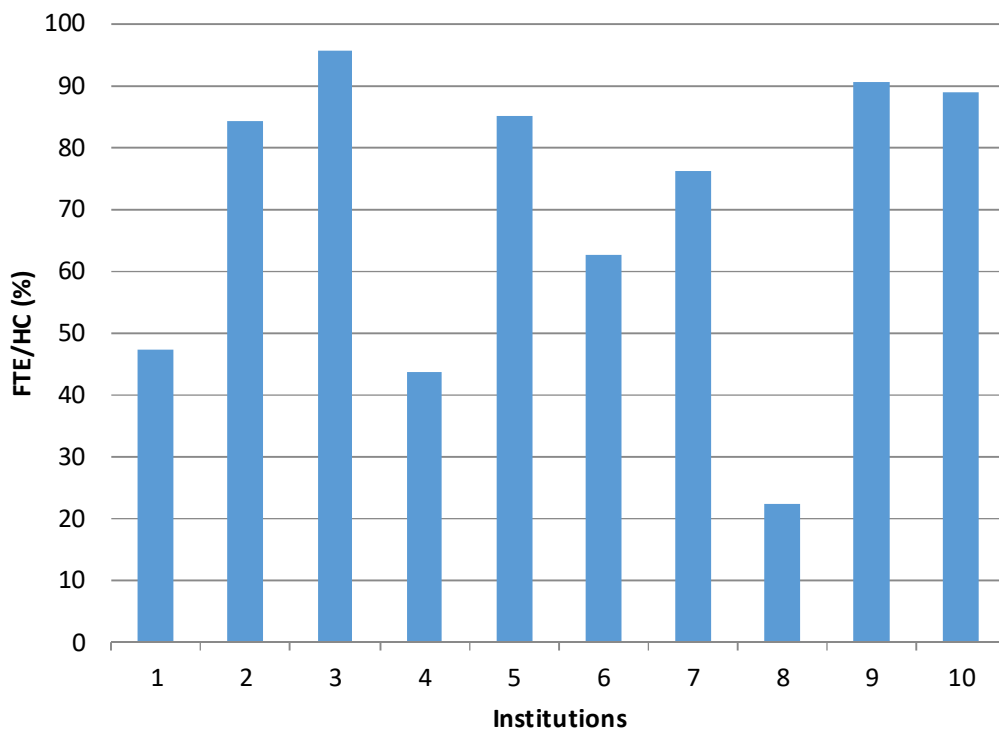
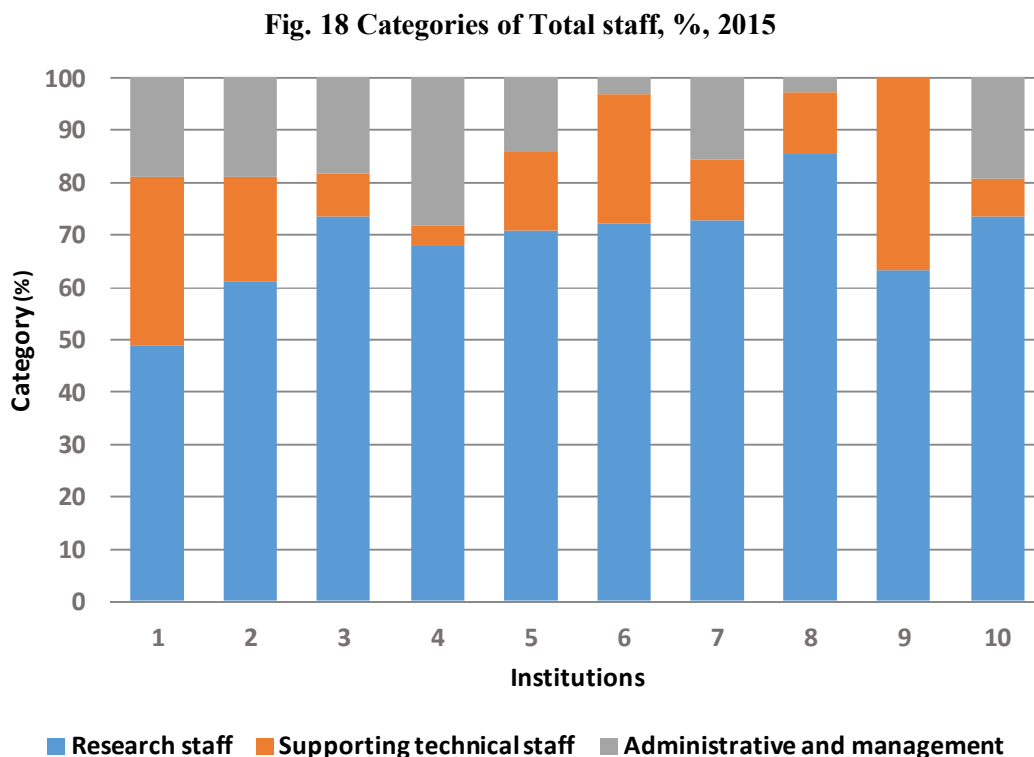


Fig. 18 below shows the percentage of research staff, supporting technical staff, and administrative staff at each institute.



It should be noted that **differences in data** are partially caused by the different career systems of the institutes, which use different categorizations of employees for research, supporting technical, and administrative positions.

The largest proportion of research staff is in **institution 8** (85.6 %), and the smallest in **institution 1** (49%). For other institutions, research staff is in the range of 61 %-73 % of total employees. The institutions carrying out part of their **research work in their hospitals** have a greater amount of supporting technical staff (32.1 % for **institution 1** and 36.8 % for **institution 9**). Other institutions have supporting technical staff in the range from 3.9 % to 24.7 %. The largest percentage of administrative and management staff is in **institution 4** (28 %).

In **institution 2**, supporting staff is mainly responsible for building operations and services, and for the care of animal facilities.

Institution 4 calculated administrative staff as 50%, but are aware that the percentage dedicated to research is probably much lower.

Institution 8 has 3 % administrative/managerial staff, but most of the other institutions have a range of 14%-19% of the total number of employees.

Institution 9 did not report the number of administrative staff. It has a centralized administrative body which covers the needs (e.g., economic, HR, legal, etc.) of all facilities/clinics, which means that the same administrative staff is also responsible for supporting research, education, and healthcare. Since the above FTE percentage and HC numbers represent the staff working in research, institution 9's numbers **are not comparable** to the FTE/HC of the administrative staff of the other institutions.

The next **Fig. 19** reflects the **gender proportion** in human resources of the assessed Life Science institutions. It shows a balanced distribution between genders in all institutions (the share of women varies from 53 % to 72 %). However, when looking at the share of women in different positions, the **leaky pipeline is present in all institutes**. This is evident in **Fig. 19a**. In research staff, the range of female employees is from 42%-69 %, but among principle investigators, this range is lower (24% to 58%).

Fig. 19 Gender proportion of female, %, 2015

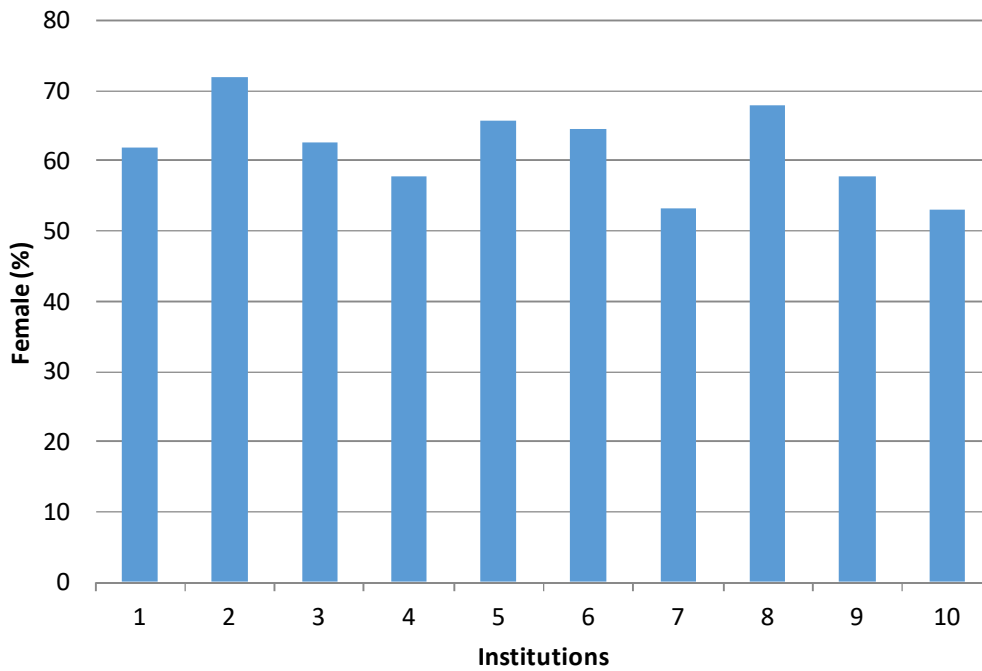
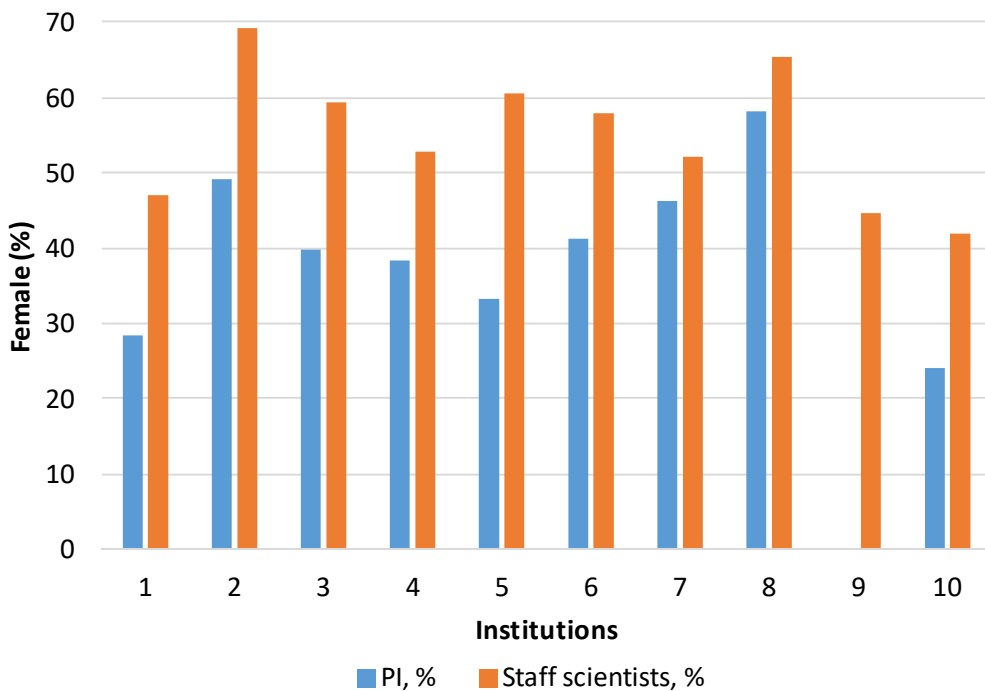


Fig 19a Leaky pipeline of female PIs, %, 2015



The next two figures show the situation with mobility and internationalization of staff.

Fig. 20: International Research Staff, FTE, 2017

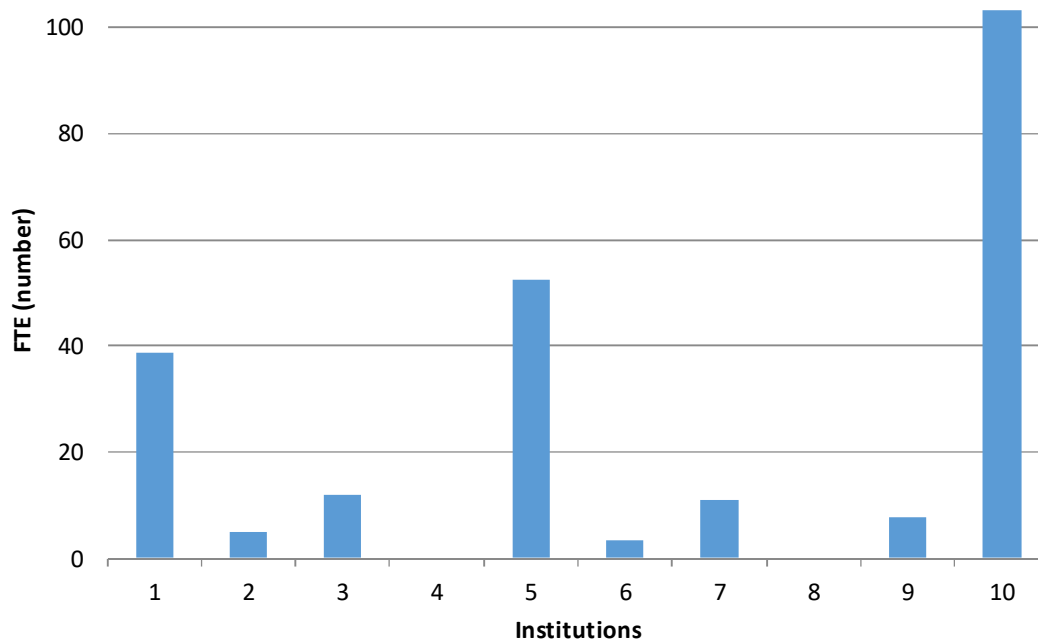
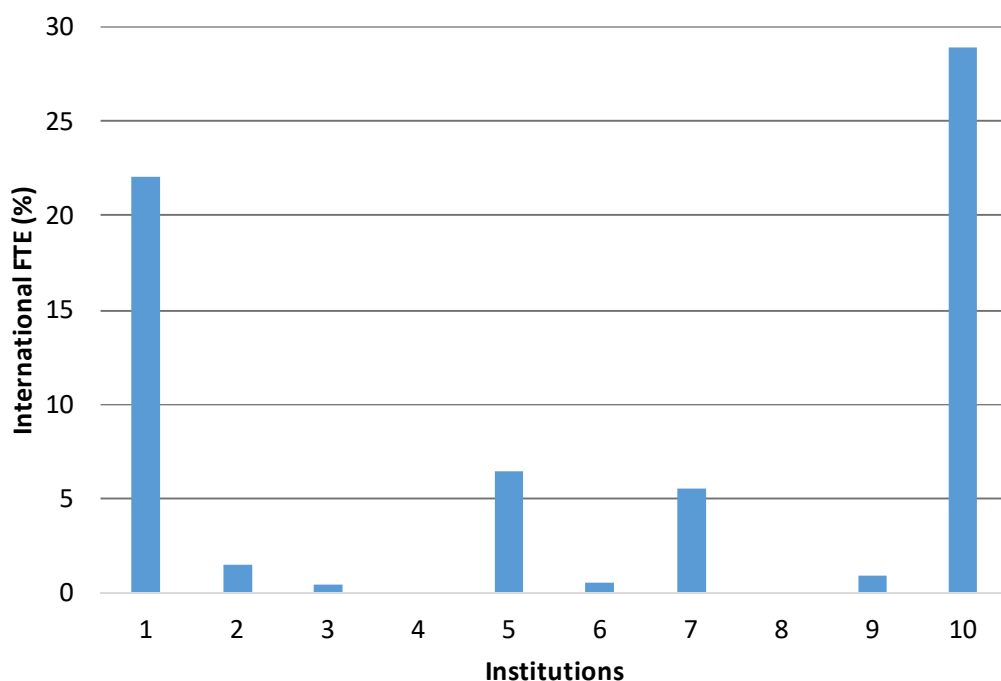


Fig. 20a: Proportion of International Research Staff, %, 2017



The mobility of researchers and the proportion of international staff (Fig. 20 and 20a) are crucial for the development of a competitive, excellent research. **Institutions 10, 5, and 1** employ the largest number of international staff, while the other institutions have considerably less international staff. It is a **challenge for further development** of

Alliance4Life institutions in promoting and supporting the mobility of incoming and outgoing researchers.

For **institution 1**, the major change happened in 2013 when a new and international Chair was hired, as well as the implementation of the FP7 REGPOT project (2013-2017). Before 2013, there were no international staff among Principal Investigators and the management. There was only about 5% international staff in total. The new Chair, together with the REGPOT funding, increased the percentage of international staff to 20% of Principal Investigators, 28% of top management and approximately 20% of all staff.

In **institution 2**, the inability to attract more international staff is related to i) to a **very low salary** rate when compared to other EU countries (and no funding for salaries from grants during 2015-2017) and ii) a very complicated entry process for foreigners applying for working contracts.

Institution 4 does not employ international staff, the most of international researchers being visiting professors, and **institution 8** does not monitor this indicator. **Institution 4** was awarded the **Human Resources Excellence in Research** logo.

Institution 5 always publishes open vacancies internationally. The competition is open and not limited to local researchers. Moreover, it is sometimes a goal to employ foreign staff and to invite already established researchers to teach and do research in institution 5, and thus increase its research capacity. In that regard, the best hires are the people who are invited to the institution through personal contacts. The Post-doc positions are also advertised internationally, but once again, the most successful candidates come from personal invitations or advertisements through supervisors' contacts. Additionally, people who are happy with working at institution 5 often advertise open positions at their previous institutions and among their professional contacts. Quite often, post-docs in institution 5 continue in their research careers. Institutes and Grants Offices support researchers in their bids for research funding to ensure continuity of research. Institution 5 offers a long-term **programme of social events for its foreign staff** to make sure they have every opportunity to socialise and not feel lonely. **Intercultural competences and knowledge of national culture and history** are addressed in several **courses and social events** in order to minimise the potential of conflicts due to a multicultural faculty and/or foreign environment. In addition, institution 5 provides **language courses (both national and English)** to all faculty members and to their families, to facilitate a smooth transition to working in an international setting and living in a national-language environment.

During its establishment in 2011, **institution 10** formulated a goal to attract international researchers and support the diversity of research teams. To attract researchers from abroad, the **HR strategy** was formulated, setting an obligation to use **open international recruitment** procedures (which are also internationally promoted). The establishment of the **“English speaking” working environment** for foreign employees was essential at the beginning. In 2012, a **Welcome Office** was established (the first in the country). Since 2014, there has been 1.0 FTE (one person) dedicated to the welcome services' agenda at the institution. As a part of the HR Department, the Welcome Office Manager assists new and current foreign employees, with the mission to minimize the bureaucratic burden and enable researchers to focus on their research projects. The first contact is initiated before arrival (i.e., helping with residence permits), and the service continues after arrival, and throughout the stay at the institution. The service also extends to family members. Recently, **institution 10** has been awarded the **Human Resources Excellence in Research** logo.

Table 9: Enablers of Success in Internationalization of Human Resources

Enablers of success in HR Internationalization in Alliance4Life institutions	
•	Open vacancies published internationally
•	Welcome Office
•	“English speaking” working environment
•	Already established researchers invited to do research and teaching
•	Programme of social events for international staff
•	Courses and social events to increase intercultural competences and knowledge of national culture and history
•	Language courses (both national and English)

3.5. Core Facilities

Indicators characterizing core facilities in the Alliance4Life institutions are summarized in **Table 10**.

Table 10: Core facilities

Institutes		1	2	3	4	5	6	7	8	9	10
Core facilities	Number of commercial partners/contracts	4	5	1	0	23		50	n.a.	n.a.	14
	Volume of contracts, EUR		785 825			393 966	685 230	4 000 000			244 350
	Coverage of the running costs from Core Facilities earning (%) for 2018	n.a.	n.a.	44	0	n.a.	n.a.	30	n.a.	n.a.	30
	International network memberships (e.g.ESFRI roadmap membership)	3	4 Eur.Virus Archive iPAAC OECD IAEA	0	0	3 BBMRI EATRIS ELIXIR	0	1 EU-OPEN SCREEN	n.a.	n.a.	6
	User group										
	Internal (%)	85	85	88	0	75	90	58	n.a.	n.a.	90
	External academic (%)	10	5	12	0	8	3	35	n.a.	n.a.	9
	External commercial (%)	5	10	0	0	17	7	7	n.a.	n.a.	1

Most of the partnering institutions established their core facilities within their organisational structure. For those partners who did not, filling out the indicators is impossible.

Monitoring the presented data is not only a benefit, but a necessity. There are two critical reasons why it is important to monitor usage statistics. The first is to recognize the economic balance to be able **to analyse the financial sustainability of the facilities**. The second is related **to Public Aid Issue** and **Open Access**, which need to be monitored, and user statistics need to be reported. However, what is most important at the institutional level is that each institution knows how much the core facilities cost, as well as the amount of money they are able to earn. At the national and EU levels, international network memberships can significantly help when applying for grants and finding strong partners for collaboration. Having an overview of users, broken down by user groups, is the basis for each core facility, no matter what tool (e.g., booking system, online calendar, logbook, etc.) is used for this purpose.

In the case of **institutions 4, 8, 9**, core facilities are not formally established in the organisational structures of the institutions. **Institution 4** does not have any core facilities established as administrative entities, and cannot monitor them independently. However, they possess facilities that act as CFs, but do not have separate units or budgets.

In **institution 6**, all investments/funding for infrastructure (required the creation of Open Access Centres because of investment projects. These were centres that provided access to infrastructure for internal and external users, which paid for usage of the infrastructure (access was only provided during certain hours, or with input from scientific researchers). Such centres were formalised with a certain form of reporting. Recently, there were some changes made in the approach and the legislation, in which a flexible view of the open access principle was introduced.

Institution 10 is the only one having a dedicated person in the position of **Core Facilities Manager**, who coordinates financial resources and project-related issues. Institution 10 developed also guidelines of CF operation and quality management that were already shared with FG members as a good managerial practice.

Only two partners have established **internal evaluation procedures** of CF, and this is very important for quality management and improvement of core facilities' performances.

It should be highlighted that the **concept of Core Facilities differs** from institution to institution. It also differs between countries, and even within the same country. For instance, not all core facilities have governmental financial support for covering running costs or supporting Open Access. This inconsistent environment fosters disparities in managerial practices because they affect competitiveness. In general, it is difficult to define anything that can be universally recommended. The key evaluating principles can be shared as a good practice, but without details related e.g. to the mechanisms that can depend on the way of funding.

Big data were identified as the first topic for training. Each institution has their own way of dealing with (regular) data storage and computations, but for big data, there is limited knowledge, and this needs to be expanded.

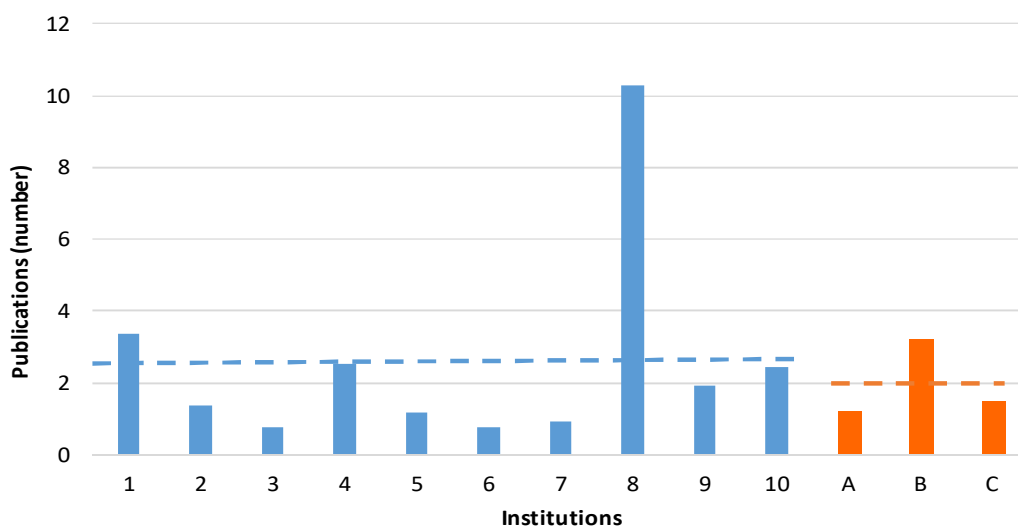
4 Benchmarking with EU Advanced Institutions

The collection of benchmarking data from EU advanced research organisations was based on publicly available information, which provided comparable data for the publication performance (source: InCites analytical tool). However, it was not comparable data for other indicators, where the definitions were not in place (source: annual reports). For a number of indicators, data was not available at all (e.g., funding structure, andr the headcount of research staff). Although institutions with the best possible datasets available were selected, this selection cannot be considered as representative for the Health and Life Science community of the whole EU15.

As shown below in Figures 21 – 25, the benchmarking between Alliance4Life member institutions (institutions 1-10) and selected EU advanced research institutions (**titled A, B, and C**) revealed differences in research output results.

Fig. 21 provides the comparison of the number of publications normalized to total staff (FTE).

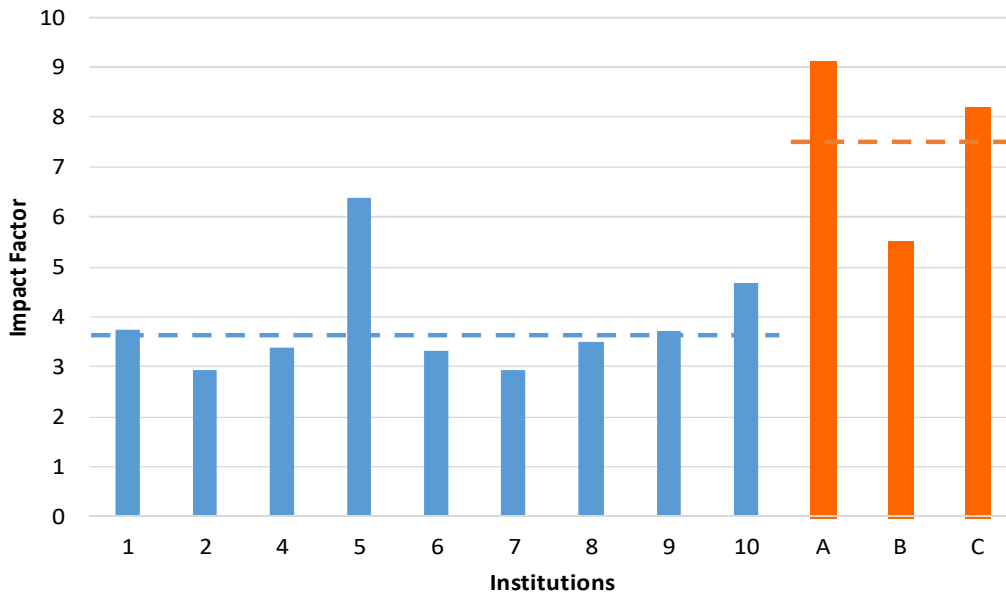
Fig. 21: Publications per Total Staff FTE, 2015-2017



The total number of publications normalized to total staff (FTE) is in general comparable among all benchmarked institutions. The seemingly outlying result of Alliance4Life institution 8 has already been explained in Chapter 3.1 (Fig. 3).

The next **Fig. 22** provides an overview of qualitative data based on the average Impact Factor (IF).

Fig. 22: Average Impact Factor, 2015-2017



The average IF of journals where Alliance4Life member institutions publish their research is, in general, significantly lower in comparison to that of selected EU advanced research organisations. However, the bars of the two best performing institutions of Alliance4Life in this indicator (i.e., **institutions 5 and 10**), provide evidence of their very good publication performance, which is already comparable with **institution B**.

The following two charts, **Fig. 23** and **Fig. 24**, show the comparison of publications in the best scientific journals, which provide evidence of the publication quality.

Fig. 23: Percentage of Q1 Publications, 2015-2017

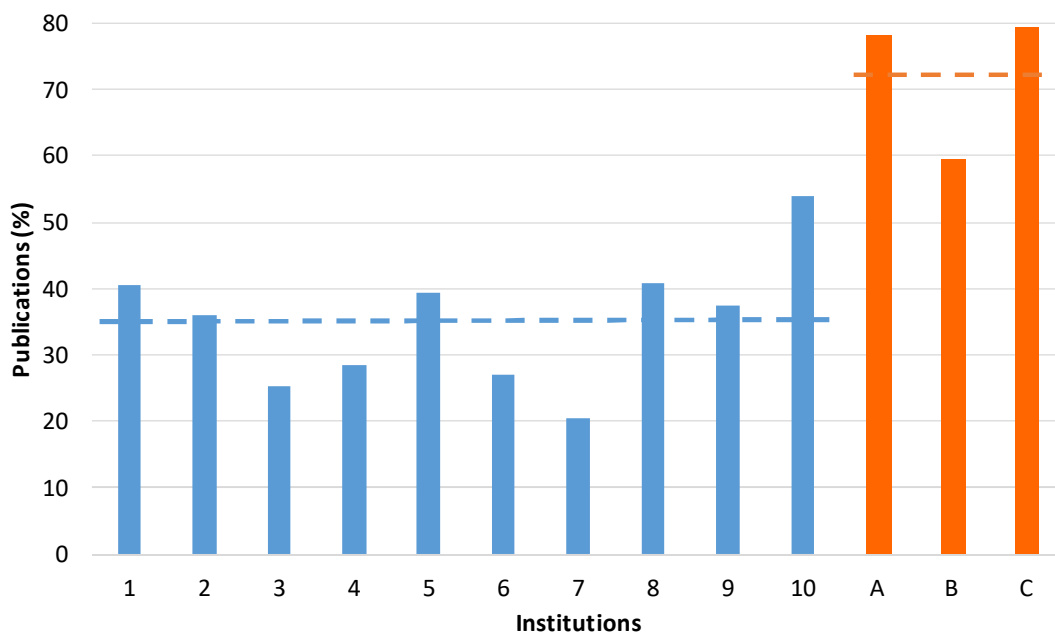
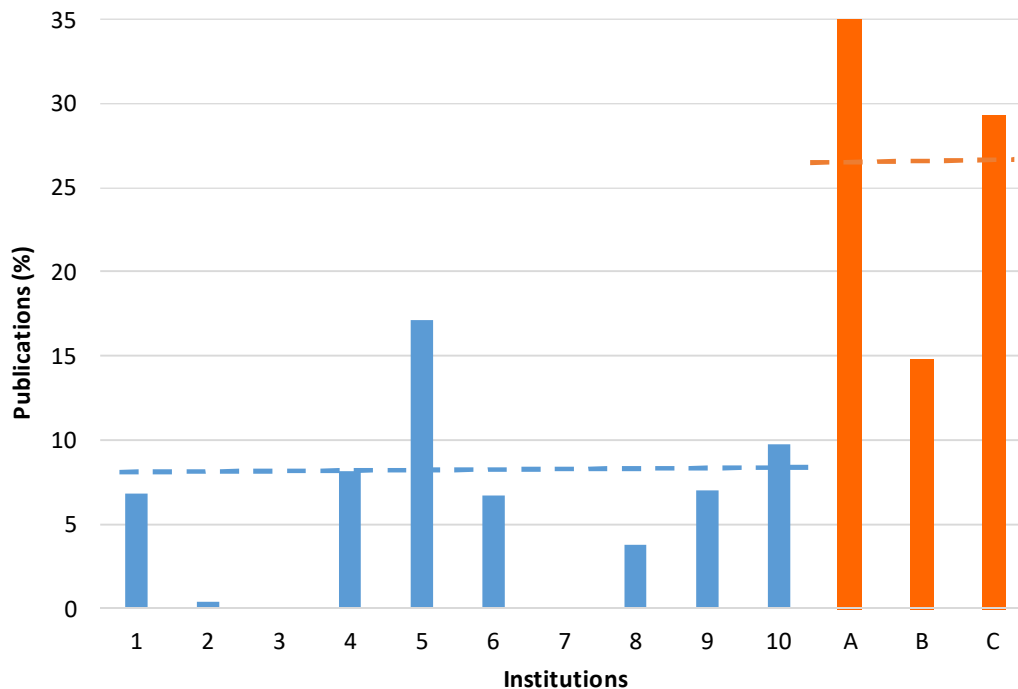


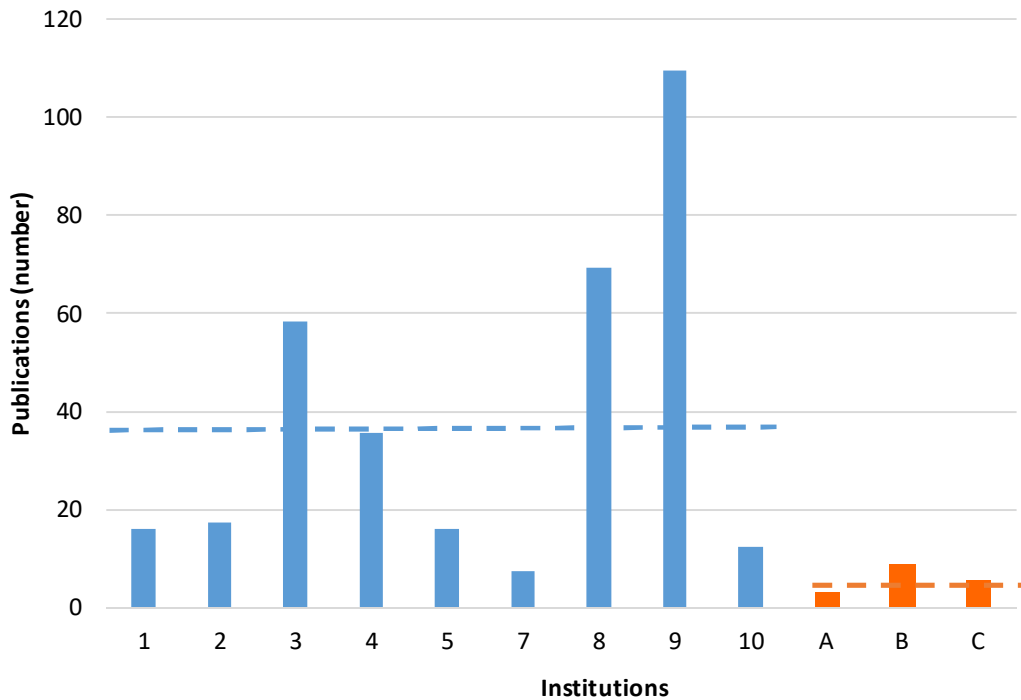
Fig. 24: Percentage of Publications in Tier 5, 2015-2017

The percentage of publications in Q1 journals and Tier 5 journals is, in general, higher for the selected EU advanced research institutions. This indicates that the scientific quality of research output generated by selected EU advanced research institutions is higher than that of Alliance4Life partner institutions. Similarly, as in the case of the average IF, some of the Alliance4Life members show a very good quality performance. This is true especially for **institution 10** (Q1 publications) and **institution 5** (Tier 5 publications).

It should be pointed out, however, that also between selected EU advanced research institutions, differences exist. An analysis of the publication output of a larger number of institutions would provide more reliable conclusions.

Fig. 25 below presents the comparison of publication output normalized to total spent operational funding.

Fig. 25: Publications per Total Spent Operational Funding, Million EUR, 2015-2017



The number of publications generated per each mil. EUR of operational funding is significantly higher in Alliance4Life partner institutions than in the selected EU advanced research institutions. Although this could be an indication that the production of high quality research output requires larger investments of research funding, it should be pointed out that different accounting systems in research institutions (see Chapter 3.1) do not allow the assignment of research funding to research output unambiguously. Thus, the aforementioned conclusion and statistical significance of the observed differences are not fully reliable.

5 Conclusions

5.1 Benchmarking of Alliance4Life Member Institutions

To the best of our knowledge, there are no similar assessment reports based on benchmarking performed at the institutional level among such a large number of research organisations from different countries. Thus, our report is the **first attempt to analyse research output normalized to funding and human resources**. Similarly, analyses of knowledge transfer including patenting, licensing and establishing start-ups have not been performed to such an extent.

The main objective of the benchmarking among Alliance4Life institutions was to provide the **baseline overview** about their scientific performance, as well as other domains that are considered important for **further development and strategies**. During the phase of selecting and defining indicators, the Alliance4Life consortium realized that this task was very difficult due to the **heterogeneous approach of each institution**. The key finding was that substantial differences exist in monitored data at each institution, in their information systems, as well as accounting systems. This is due to traditional practice at each institution, as well as national evaluations systems and legislation. In spite of these differences and the heterogeneity of Alliance4Life, the best effort was made to collect data that are useful for having a baseline for **monitoring further progress**.

Our experience clearly shows the **need for the development of harmonized performance indicator sets**, which is essential for any inter-institutional benchmarking of health R&I performance in the EU. The table below represents a set of performance indicators that were successfully collected from Alliance4Life, along with the average values gathered for the whole Alliance4Life.

Table 11: Alliance4Life benchmarking average values

Indicator	Alliance4Life average	Min-max interval
Average yearly publications (per research staff FTE)	1.2	0.4 - 4.0
Publications per operational funding (million EUR)	38.0	7.3 - 109
Q1 publications (% of total number of publications)	35.0	20.5 - 54.0
Average Impact Factor	3.8	2.9 - 6.4
Publications with external collaboration (%)	62.9	32.2 - 87.5
Average yearly awarded funding (thousand EUR per FTE)	39.7	5.5 - 92.1
Females from total FTE (%)	61.7	53.0 - 72.0

As these indicators represent research excellence of the institutions under study, their monitoring would allow for comparison of normalised and harmonised data among different Health and Life Science research institutions in the EU. Therefore, **the main conclusion of the Assessment Report is that the Alliance4Life proposes to establish and promote indicators presented in Table 11 as a basis for the development of standardized performance monitoring and benchmarking in the EU.**

5.2 Benchmarking with the EU Advanced Research Institutions

The main goal of **benchmarking with the selected advanced EU research institutions** was to have an overview of whether there is the gap in performance, and determine how big the gap is, and if some Alliance4Life members are about to close the gap for some of the indicators.

Although performance differences between Alliance4Life and selected EU advanced research organisations were observed, these **differences cannot be generalized**. The Alliance4Life does not represent the whole Health and Life Science community of the EU13, and the current selection of EU advanced research institutions does not represent the whole Health and Life Science community of the EU15. However, the Assessment Report shows that **in the Excellent Science domain, the gap exists between**

Alliance4Life and the three selected EU advanced institutions, especially for the quality of publications. The observed trends in research output results are summarised below:

- The **number of publications normalized to total staff FTE** in Alliance4Life partner institutions and selected EU advanced research organisations is comparable (see Fig 21);
- The **quality of the publications** (e.g., average IF value (Fig. 22), percentage of Q1 publications (Fig. 23) and percentage of publications in Tier 5 (Fig. 24)) is higher in selected EU advanced research institutions; and
- The **number of publications normalized to operational funding** is higher in Alliance4Life partner institutions (Fig. 25).

The biggest challenge faced during the benchmarking exercise with the EU advanced research institutions was the **availability of publicly accessible data**, especially for the funding structure and headcount of research staff. Therefore, the experience clearly shows that the **introduction of harmonized performance indicator sets** with clear definitions that would be shared and monitored among the EU research institutions are needed. Accepting such a recommendation would also help other European alliances and networks in monitoring their performance and progress.

5.3 Next Steps

The presented benchmarking results and the first description of related managerial practices will be used for the following next steps, according to the Alliance4Life Work Plan:

- **Description of best practices** (*D2.2 Inventory of best practice*);
- **Discussions** with relevant stakeholders and research and innovation policymakers **in all Alliance4Life countries** (*D5.5: Round table reports*);
- Formulation of **policy recommendations** (*D3.1 White paper containing recommendations from Inventory of best practices*); and
- Formulation of **Alliance4Life strategy** (*D3.2 Report of development Alliance4Life members' strategies*).

The *D2.1 Assessment Report* is the analysis of the current situation in ten Alliance4Life institutions. In terms of monitoring the progress of Alliance4Life, the Alliance plans to **repeat the assessment** by collecting and comparing the data in 2-3 years (in connection with the implementation of the Alliance4Life strategy and research policy changes in relevant countries), and to further benchmark the situation with the leading European research institutions in the area of health R&I.

6 ANNEX I – Abbreviations

CF – Core Facilities;
CRG – Centre for Genomic Regulation;
CSA – Coordination and Support Actions;
D – Deliverable;
EMBL – European Molecular Biology Laboratory;
ERA – European Research Area;;
ERA-NET – ERA scheme for NETworking and opening of transnational research programmes;
ERC – European Research Council;
ESIF – European Structural and Investment Funds;
EU – European Union,
FET – Future and Emerging Technologies;
FG – Focus Group;
FP – Framework Programme;
FTE – Full-Time Equivalent;
GDP – Gross Domestic Product;
H2020 – Horizon 2020;
HC – Head Counts;
HR – Human Resources;
ICRC – International Clinical Research Center of St. Anne's University Hospital Brno;
IF – Impact Factor;
IMI – Innovative Medicines Initiative;
IP – Intellectual Property;
LIOS – Latvian Institute of Organic Synthesis;
LEIT – Leadership in Enabling and Industrial Technologies;
M – Month;
MS – Milestone;
MSCA – Marie Skłodowska-Curie Actions;
MSCA-ETN – MSCA European Training Network;
MSCA-IF – MSCA Individual Fellowship;
MSCA-ITN – MSCA Innovative Training Network;
MSCA-RISE – MSCA Research and Innovation Staff Exchange;
PCT – Patent Cooperation Treaty;
Q – Quartile;
R&D – Research and Development;
R&I – Research and Innovation;
T5 – Tier 5;
T10 – Tier 10;
UL – University of Ljubljana;
UT – University of Tartu;
VAT – Value-Added Tax;
WoS – Web of Science; and
WP – Work Package.

7 Annex II - Collected data tables

Modul	Indicator	Institutions									
		1	2	3	4	5	6	7	8	9	10
Research excellence	Publications	689	455	2 233	1 103	1014	684	200	1041	3094	940
	Publications Tier 5	47	2	n.a.	89	173	46	0	40	217	93
	Publications Tier 10	105	12	n.a.	166	250	91	12	114	384	210
	Publication Quartile 1	280	164	565	314	400	184	41	426	1157	508
	Highly cited papers	3	3	51	9	49	11	0	90	72	12
	External collaboration	66	87,47%	32,24	45	72,49%	52,30%	62,50%	46,20%	87	78,1%
	National collaboration	34,11	44,84%	n.a.	24	27,51%	55,0%	38%	51,80%	44,5	48,25%
	Without any collaboration	10,60 (incl. MU)	12,53%	n.a.	31	0	16,70%	37,50%	2%	13	11,91%
	Cumulative Imact Factor	2480,43	1335,19	n.a.	3 042	6311,05	2261,77	585,7	3640,16	11439,3	4379,8
	Average IF	3,73	2,93	n.a.	3,39	6,38	3,307	2,93	3,5	3,7	4,7
	Cumulative citations	3182	1988	13 713	4 809	10343	3864	667	6031	19671	6630
	Average Citations	4,62	4,37	6,14	4,36	10,2	5,65	3,3	6,04	6,4	7,1
	Number of publications of correspondence author	315	243	n.a.	412	481	378	142	440	1075	452
	Cumulative Citations of correspondence author	1357	759	n.a.	1 089	1784	1081	373	322	3852	2875
	Average Citation of correspondence author	4,3	3,12	n.a.	2,64	3,7	2,86	2,63	4,38	3,6	6,4
ERC grants	0	0	0	0	1	1	0	0		2	
MSCA-IF grants	0	0	0	0	0	2	0	0		0	
Modul	Indicator	Institutions									
		1	2	3	4	5	6	7	8	9	10
Knowledge transfer	PCT application (Patent Cooperation Treaty)	2	0	4	1	15	6	10	12	4	3
	Licenses and IP Assignments	0	3	5	1	3	7	6	4	7	2
	Spin-offs	0	0	5	0	19	8	0	0	9	1
Modul	Indicator	Institutions									
		1	2	3	4	5	6	7	8	9	10
Funding	Total funding 2015 - 2017 spent total	42 728 867	27 057 966	38 386 973	30 507 586	62 626 653	n.a.	277 339 137	15 484 030	28 257 566	82 297 276
	spent -international competitive	3 391 373	833 593	118 624	2 730 766	10 080 956	n.a.	7 859 805	652 578	4 217 137	7 009 036
	spent - national - institutional (non competitive)	12 107 617	15 130 006	7 484 808	2 129 296	3 580 976	n.a.	6 161 766	0	n.a.	20 065 757
	spent - national competitive	24 799 694	7 876 882	11 885 753	4 433 605	29 661 284	n.a.	2 211 471	13 920 356	12 215 793	20 899 840
	spent - ESIF	2 040 462	650 785	18 897 788	202 703	13 775 093	n.a.	3 075 211	311 871	11 824 628	33 297 602
	spent - private	389 722	1 351 186	0	45 000	5 548 344	n.a.	8 030 884	465 535	n.a.	748 871
	spent - other	0	139 037	0	87 838		n.a.	0	133 691	n.a.	99 248
	spent - investments	1 682 769	1 076 477	15 759 218	3 000 000	4 795 996	n.a.	9 273 669	2 226 500	n.a.	26 392 308
	Total funding 2015 - 2017 awarded	56 664 306	27 989 572	48 563 034	40 839 384	67 235 711	51 408 021	33 447 165	15 657 490	166 866 660	65 977 806
	Core funding (national), non-competition based	865 304	15 380 802	7 484 808	23 007 674	4 001 364	8 871 398	7 095 341	n.a.	99 514 045	20 065 757
	operating	865 384	15 130 006	7 484 808	913 079	4 001 364	8 871 398	7 095 341	n.a.	99 514 045	20 065 757
	investment	0	250 796	n.a.	1 216 216		0	0	n.a.	0	0
	National grants, competition based	43 475 538	7 876 882	19 403 006	5 616 710	28 874 662	5 004 408	1 662 123	13 567 784	23 280 611	19 451 131
	research	41 576 885	7 876 882	11 885 753	5 536 710	28 874 662	4 063 128	1 662 123	11 895 541	n.a.	19 451 131
	infrastructure	1 803 846	0	7 517 253	80 000	n.a.	0	0	1 634 599	n.a.	0
CSA, capacity building, networking	94 808	0	n.a.		n.a.	941 280	0	37 645	n.a.	0	
ESIF funding	9 214 154	1 476 466	18 897 788	10 000 000	19 003 998	26 210 818	8 370 185	298 474	37 602 979	20 312 113	
research	6 999 231	204 073	1 623 457	5 000 000	10 418 923	610 925	3 281 645	0	n.a.	638 558	
infrastructure	1 310 846	825 681	15 759 218	5 000 000	8 585 075	25 599 893	4 095 361	0	n.a.	19 673 555	
CSA, capacity building, networking	904 077	446 712	1 515 113		n/a	0	992 179	0	n.a.	0	

Modul	Indicator	Institutions									
		1	2	3	4	5	6	7	8	9	10
	International grants	2 809 231	1 629 313	2 777 432	2 090 006	10 171 892	2 790 872	6 439 088	1 075 019	6 469 025	5 399 935
	H2020 ERC (number)	0	0	0	0	1	1	0	0	1	1
	H2020 ERC (value, EUR)	0	0	0	0	865 626	2 499 875	0	0	44 146	1 499 990
	H2020 HEALTH (number)	4	2	2	6	3	0	1	2	3	1
	H2020 HEALTH (value, EUR)	365 577	890 484	529 500	1 900 000	164 483	0	239 775	202 704	317 164	199 902
	H2020 MSCA IF (number)	0	0	0	0	0	2	0	0	0	0
	H2020 MSCA IF (value, EUR)	0	0	0	0	0	261 559	0	0	0	0
	H2020 MSCA ITN (number)	1	0	1	0	1	0	3	1	1	2
	H2020 MSCA ITN (value, EUR)	242 308	0	215137	0	500 497	0	177 801	164159,82	0	473 844
	H2020 MSCA ETN (number)	0	0	0	0	0	0	3	0	1	2
	H2020 MSCA ETN (value, EUR)	0	0	0	0	0	0	177 801	0	0	473 844
	H2020 MSCA RISE (number)	2	0	0	0	0	0	1	0	1	2
	H2020 MSCA RISE (value, EUR)	203 000	0	0	0	0	0	62 100	0	54 861	378 000
	H2020 Teaming (number)	1	0	1	0	1	1	1	1	1	2
	H2020 Teaming (value, EUR)	35 500	0	10095	0	297 994	77 495	42 000	486897	143 535	296 049
	H2020 Twinning (number)	0	0	0	0	4	0	0	0	0	3
	H2020 Twinning (value, EUR)	0	0	0	0	1 399 829	0	0	0	0	1 724 025
	H2020 ERA-Chairs (number)	0	0	0	0	2	0	0	0	0	0
	H2020 ERA-Chairs (value, EUR)	0	0	0	0	1 806 637	0	0	0	0	0
	H2020 LEIT (number)	1	0	0	0	0	0	0	0	0	0
	H2020 LEIT (value, EUR)	623 077	0	0	0	0	0	0	0	0	0
	H2020 FET (number)	1	0	1	0	0	0	0	0	0	0
	H2020 FET (value, EUR)	106 154	0	0	0	0	0	0	0	0	0
	H2020 SC (except Health) (number)	0	0	0	0	2	4	0	0	1	0
	H2020 SC (except Health) (value, EUR)	0	0	0	0	299 792	1 081 058	0	0	0	0
	ERA-NETs (number)	0	4	0	0	2	0	9	0	0	0
	ERA-NETs (value, EUR)	0	197 500	0	0	79 738	0	482 849	0	0	0
	IMI (number)	0	0	0	0	0	0	1	1	2	1
	IMI (value, EUR)	0	0	0	0	0	0	2 214 335	39582,08	306 724	100 000
	EUROSTARS (number)	0	0	0	0	0	0	1	0	0	0
	EUROSTARS (value, EUR)	0	0	0	0	0	0	122 028	0,00	0	0
	other (EUR)	792 269	545 329 (FP7, bilateral, found-ations)	2 022 695	190 000	4 757 296	1 108 760	3 098 200	181 676	742 124	728 125
	Private income	299 999	1 626 109			5 183 795	4 112 704	9 880 429	0	0	748 871
	contract research	288 461	1 547 293	0	30 000	4 935 240	-	9 778 199	0	4 860 461	748 871
	knowledge transfer	0	0	0	0	226 405	-	102 230	0	0	0
	other	11 538	78 816	0		22 150	-	0	716 208	0	0
	Other Sources	0	0	0	95 000		0	0	0		0

Modul	Indicator	Institutions										
		1	2	3	4	5	6	7	8	9	10	
HR	Total staff (all) FTE	205,05	335,89	2922,37	435,2	863,975	863,82	216	101,1	1614,7	382,04	
	Total staff (female) FTE	126,81	241,48	1832,26	252,1	567,925	558,16	115	68,711	933,5	202,77	
	Total staff (international) FTE	45,24	5	13	0	56,2	4,93	12	0%	15,6	110,41	
	Total staff (all) HC	433	399	3060	993	1015	1379	284	450	1784	430	
	Total staff (female) HC	233	276	1907	454	663	879	149	305	1032	238	
	Total staff (international) HC	87	5	15	0	64	7	12	0%	16	137	
	Research staff (all) FTE	100,45	204,91	2152,12	295,2	612,575	624,02	157	86,5	1020,3	281,03	
	Research staff (female) FTE	47,33	141,9	1276,85	181,5	370,525	365,04	82	56,4542	455,5	117,87	
	Research staff (international) FTE	38,64	5	12	0	52,45	3,43	11	0%	7,8	103,34	
	Research staff (all) HC	265	241	2251	713	683	1089	197	279	1155	321	
	Research staff (female) HC	111	161	1328	262	407	653	103	168	526	146	
	Research staff (international) HC	75	5	14	0	58	5	11	0%	8	128	
	Supporting technical staff (all) FTE	65,82	67,5	235,94	17	130,4	213,3	25	11,6	594,4	27	
	Supporting technical staff (female) FTE	52,33	59,86	185,1	14	94,05	179,37	17	9,2568	478	24,7	
	Supporting technical staff (international) FTE	5,6	0	1	0	0,85	1,5	1	0%	7,8	2,73	
	Supporting technical staff (all) HC	127	84	256	34	165	264	51	168	629	32	
	Supporting technical staff (female) HC	94	68	197	28	117	212	27	134	506	29	
	Supporting technical staff (international) HC	11	0	1	0	2	2	1	0%	8	4	
Supporting administrative staff (all) FTE	38,78	63,48	534,31	123	121	26,5	34	3	0	74,01		
Supporting administrative staff (female) FTE	27,15	39,72	370,31	82	103,35	13,75	16	3	0	60,2		
Supporting administrative staff (international) FTE	1	0	0	0	2,9	0	0	0%	0	4,34		
Supporting administrative staff (all) HC	41	74	553	246	167	26	36	3	0	77		
Supporting administrative staff (female) HC	28	47	382	164	139	14	19	3	0	63		
Supporting administrative staff (international) HC	1	0	0	0	4	0	0	0%	0	5		
Modul	Indicator	Institutions										
		1	2	3	4	5	6	7	8	9	10	
Core facilities	Number of commercial partners/contracts + Volume of contracts	4	5 (785 825 EUR)	1	0	23 commercial partners/ 393 966 EUR	685 230	50/4 mill EUR	Not monitored/not available.	n.a.	14/ 244350 EUR	
	Coverage of the running costs from Core Facilities earnings (%) for 2018	N.A.	N.A.	44%	0%	n.a.	n.a.	30%	Not monitored/not available	n.a.	9%	
	International network memberships (e.g. ESFRI roadmap membership)	3 (ELIXIR, EATRIS, CZECRIN)	4 (European Virus Archive, iPAAC, OEI, IAEA)	0	0	3 (BBMRI ERIC; EATRIS ERIC; ELIXIR)	0	EU-OPENSREEN	Not monitored/not available	n.a.	6	
	Users group				0					Not monitored/not available		
	internal	85%	85%	88%	0%	75%	90%	58%	Not monitored/not available	n.a.	90%	
	external academic	10%	5%	12%	0%	8%	3%	35%	Not monitored/not available	n.a.	9%	
	external commercial	5%	10%	0%	0%	17%	7%	7%	Not monitored/not available	n.a.	1%	

Modul	Indicator	Description	Institution		
			A	B	C
Research excellence	Publications	Number of publications which are a part of Web of Science Core Collection, type of document: Article, Review, Letter, published 2015 - 2017 (together for the whole period)	2108	17254	704
	Publications Tier 5	Number of publications in Tier 5 (according to WoS)	742	2562	206
	Publications Tier 10	Number of publications in Tier 10 (including T5, according to WoS)	1018	3359	194
	Publication Quartile 1	Number of publications in Q1 (including T10, according to WoS)	1648	10251	560
	Highly cited papers	Number of Highly cited papers (according to WoS)	180	571	25
	Cumulative Impact Factor	The sum of Impact Factor's of all publications	19190,46	94659,48	5798,16
	Average IF	The sum of IFs over all publications divided by the number of publications	9,10	5,49	8,24
	Cumulative citations	The sum of citations of all publications (including self-citations)	60000	186409	11075
	Average Citations	The sum of citations of all publications per item (including self-citations) divided by the number of publications	28,46	10,80	15,73
Funding	Total funding 2015 - 2017 spent total	Overall funding (mil. EUR) together for whole period 2015-2017 total operational cost, will be used for paper cost/budget including investments	689,244	1,929	131,7
	Total funding 2015 - 2017 awarded	timing is based on institutional practice sum of all below = all AWARDED	706	1,955	70,8
HR	Total staff (all) FTE	FTE – full-time equivalent: Number of working hours that represents one full-time employee of the institute Include total staff of the institute: research, supporting technical and supporting administrative EXCLUDE: students without a working contract.	1734	5405	482