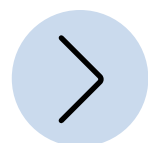




**ZKRD** Zentrales  
Knochenmarkspender-  
Register Deutschland

# ANNUAL REPORT 2020



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**2020 was a year of upheaval. In certain ways, this applies to everyone, of course, but to the ZKRD in particular: After almost 30 years as director and CEO of the ZKRD, Dr. Carlheinz Müller has gone into well-deserved retirement. Almost 30 years – meaning he was there from the very beginning.**

# 30 YEARS

**The ZKRD emerged in 1992 from the Ulm working group, with whom Dr. Müller – in the late 1980s – had already developed a program for managing search requests more efficiently that would revolutionize the process of finding stem cell donors.**

A lot has happened since then. On this foundation, the ZKRD has continued to develop and improve Germany's nationwide donor search system: **today, OptiMatch is one of the most efficient search engines that can be used worldwide for finding donors.** Many of the complex processes involved in a donor search have been automated. By networking with a variety of partners both nationally and internationally, the ZKRD has expanded its role as a center of excellence. Dr. Müller has not only been witness to all these activities, but has also placed a leading role in their development. **We therefore wish to thank him sincerely for his important work, which has for so long been pivotal to the tremendous success of the German registry, and wish him all the best for his retirement.**

In 2020, the ZKRD was faced not only with the challenges that come with a change in management but also – like everyone else – with the various obstacles presented by the COVID-19 pandemic. Upholding the ZKRD's motto of "Faster identification of the best donor worldwide" proved even tougher – especially when this extraordinary situation first arose. Changes in transport conditions due to pandemic-related flight cancellations and quarantine requirements were enormous hurdles to stem cell transplantation processes and international collaboration in the search for donors. In addition,

donor centers were unable to recruit as many new donors during the pandemic as they might otherwise have done. The ramifications will no doubt become evident in the years to come.

**Yet during these unprecedented times, we managed to overcome many of these challenges thanks to the outstanding efforts of all our partners. By pulling together, solutions could be found. Even under such difficult circumstances, we managed to complete all the collections and transport the donations to the patients. We wish to express our heartfelt thanks for this excellent teamwork and are already looking to the future with optimism.** However uncertain it may seem at the moment, we are confident that together, we can continuously optimize the complex donor search processes and, as always, find the best possible stem cell matches for patients worldwide.

Very special thanks also go, of course, to the millions of volunteers around the world who have registered their interest in donating stem cells or have already donated. Without them, our work would not be possible. Thank you very much – especially in this challenging year – for giving seriously ill patients the hope of life!

**PD Dr. Joannis Mytilineos**

**Dr. Peter Mein**



## 2.0 Introducing Dr. Joannis Mytilineos

**In July 2020, after more than 28 years with the ZKRD, former medical director Dr. Carlheinz Müller went into well-deserved retirement. His successor is Dr. Joannis Mytilineos, who as a renowned transplant immunologist is well equipped for the task.**

Dr. Mytilineos was born in Athens, Greece. After graduating from the Medical Faculty of the University of Heidelberg in 1986, he completed his PhD and his adjunct professorship, in the field of immunology (1986–2004). After heading the HLA laboratory at the Heidelberg University Hospital for 15 years,

he joined the Institute of Clinical Transfusion Medicine and Immunogenetics (IKT) in Ulm as Director of the Department of Transplant Immunology (2004–2020). In July 2020, he succeeded Dr. Carlheinz Müller as Medical Director of the German National Bone Marrow Donor Registry (ZKRD).

“During my time as a transplant immunology director, I was in charge of Germany’s largest search facility and a medium-sized donor center, where I learned a lot about the various aspects of stem cell donation and transplantation in Germany. Therefore, I am absolutely familiar with all respective procedures and processes. In my role as director of the ZKRD, it is very important to me that we continually look at everything from the viewpoint of our customers and partners.”

As an active member of several national and international scientific societies, Dr. Mytilineos has served on a number of their committees – quite often taking a leading role. In 2004, he was appointed as a Board Member of the International Histocompatibility Working Group (IHWG).

Dr. Mytilineos has also been elected to the boards of directors of various scientific and clinical societies, such as the American Society for Histocompatibility and Immunogenetics (ASHI), the German Society for Immunogenetics (DGI), the Eurotransplant International Foundation, the German Registry for Stem Cell Transplantation (DRST) and, lastly, the European Federation for Immunogenetics (EFI) – where he ultimately held the position of president from May 2019 to April 2021.

Dr. Mytilineos has been chair of several national and international conferences, most recently the 2016 EFI Conference in Kos, Greece. In 2004, after working for 15 years in solid organ transplantation, Dr. Mytilineos began focusing his clinical interests increasingly on hematopoietic stem cell transplantation. His list of publications currently includes over 100 peer-reviewed articles which he (co-)authored. Dr. Mytilineos is married and has two adult children.

“As the new medical director, I will be delighted if, in the next five to ten years, I can manage to consolidate the ZKRD’s position as a major regulator and partner on the national and international stage while introducing further technological developments which would benefit as many patients as possible both in Germany and abroad.”





### 3.0 An attempted tribute *tentative*

Writing a tribute to Dr. Carlheinz Müller is a reminder of the many seemingly hopeless and challenging tasks he himself tackled and successfully completed at a formidable rate and with aplomb during his time at the ZKRD. **The first triad of this tribute would be composed of the following:**

**Courage, energy and creative drive**

The solid foundations he laid are characterized by incredible longevity and an inherent force. Upon these foundations, he has built a well-connected, stable, and open house in which everyone finds their place: our patients and donors, we employees, and his partners across the globe. Guests from near and far were always welcome in his house and were unfailingly showered with attention – like good friends, which many of them also continue to be. **The second triad is:**

**Hospitality, warmth and discretion**



Why can this tribute only be tentative? According to Müller's logic, a conference program, for example, is always tentative up to the last minute before the start – or even until the end of the event – because things can change at any time. Hence, this tribute should also be regarded as tentative. **Who knows which seeds he has sown with foresight will yet all sprout?**

**Humor, perspective and flexibility**

For those of us who have had the honor and pleasure of crossing any of his paths, whether longer or shorter, up close or further away, more or less often, **the final triad (for now) is this:**

**Gratitude, good wishes for the future, and the desire for us to stay in touch!**



## Blood stem cell transport during the COVID-19 pandemic

**As in many areas of everyday life, the measures to contain the coronavirus also turned the customary processes for transporting stem cell donations completely on their head.**

Border closures, entry restrictions, quarantine and testing regulations were announced at such short notice that rapid responses were required at every turn to ensure that patients would continue to receive the necessary donations. The situation was made more difficult by the massive reduction in the number of available commercial passenger flights.

Thanks to the ZKRD's solid international network and the large number of donations mediated abroad, but also to ensure that German patients would continue to receive donations from abroad, creative and individual solutions were sought and identified. To this end, the ZKRD remained in permanent contact with its national partners, other international registries, various ministries and courier companies. One basis for using alternative transport routes was that Frankfurt/Main Airport is a very popular international cargo hub.

Particularly during the first wave of the pandemic, a veritable relay race was created for European donations. To overcome the restrictions mentioned above, shipments were passed from one courier to the next at border crossings or airports.

**Undoubtedly, one of the most ingenious solutions was to use cargo flights as an alternative transport route.**

Because air cargo traffic, unlike passenger flights, remained very stable despite the pandemic, cargo pilots were asked in many instances to supervise the stem cell shipments. Compared with the standard procedure, this newly devised process required three couriers: one to transport the shipment from the collection center to the airport and hand it over to the pilot; the pilot himself; and another courier who then collects the product from the pilot in the destination country



and delivers it to the transplant center. A lot of planning and coordination is required to manage this process. Many shipments, moreover, were transferred from the air to road or rail. Unfortunately, the procedures described do not suit all destinations. For countries such as Australia or New Zealand where transportation takes longer, an alternative had to be found.

**In these cases, the donated stem cells are frozen before shipment. The ZKRD handles the entire coordination and planning process as well as transportation of the frozen stem cells until they reach the recipient.**

Due to the technical expertise of Transport and Product Services in customs clearance, the team also manages declarations for other European registries.

**None of these solutions would have been possible without the partners with whom we work so closely. We are therefore very grateful to all those involved for their support, even during these challenging months, in delivering each donation to the respective patient. Many thanks!**



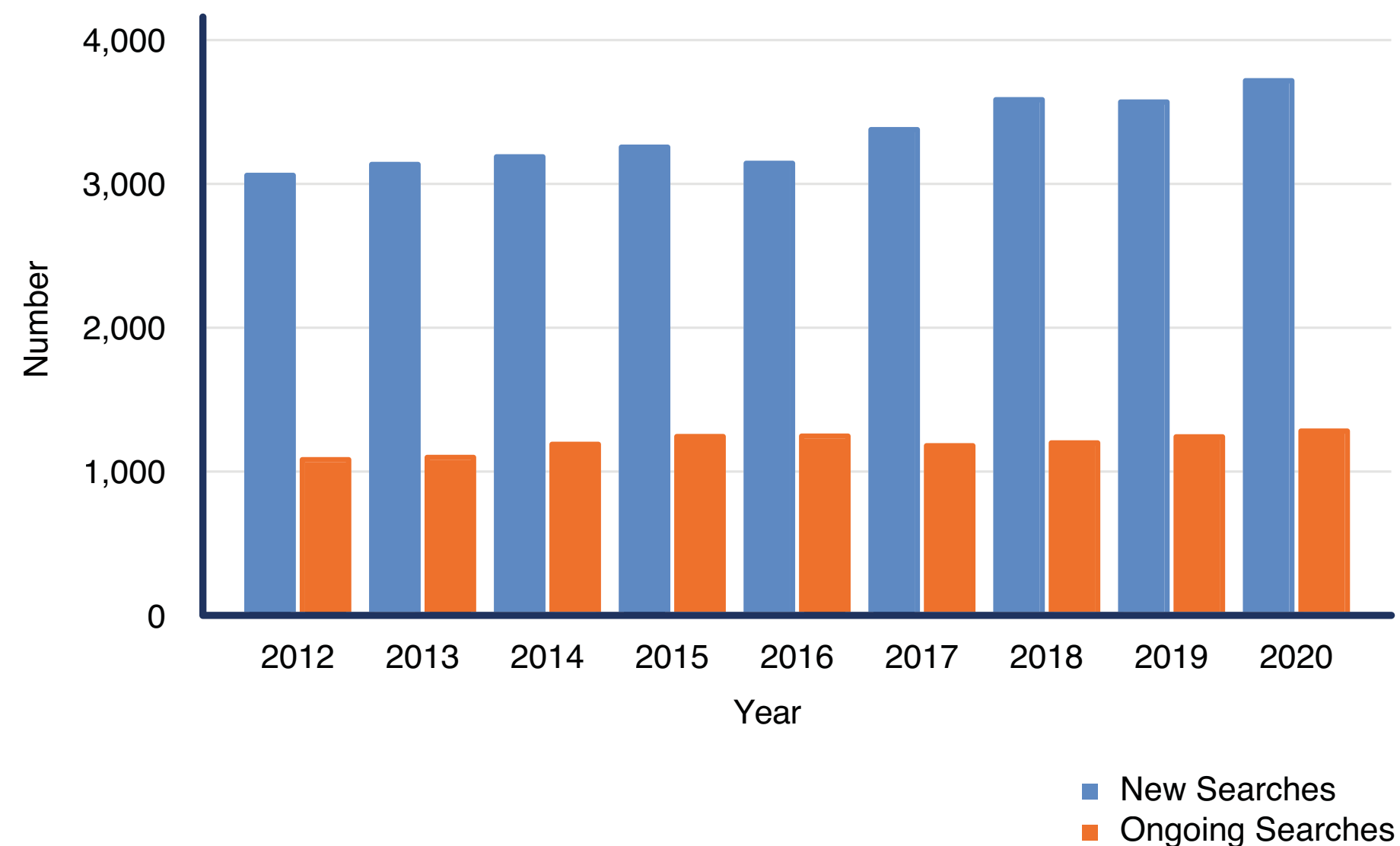


## 5.0 Donor search at the ZKRD

**When the ZKRD was founded almost 30 years ago, we had no inkling that one day it would become one of the most successful registries in the world.**

As a central body in Germany, the ZKRD is responsible for coordinating donor searches for German patients in accordance with Section 65f of Social Code Book V (SGB V). In recent years, the ZKRD has thus coordinated searches for an average of approx. 3,500 German patients a year.

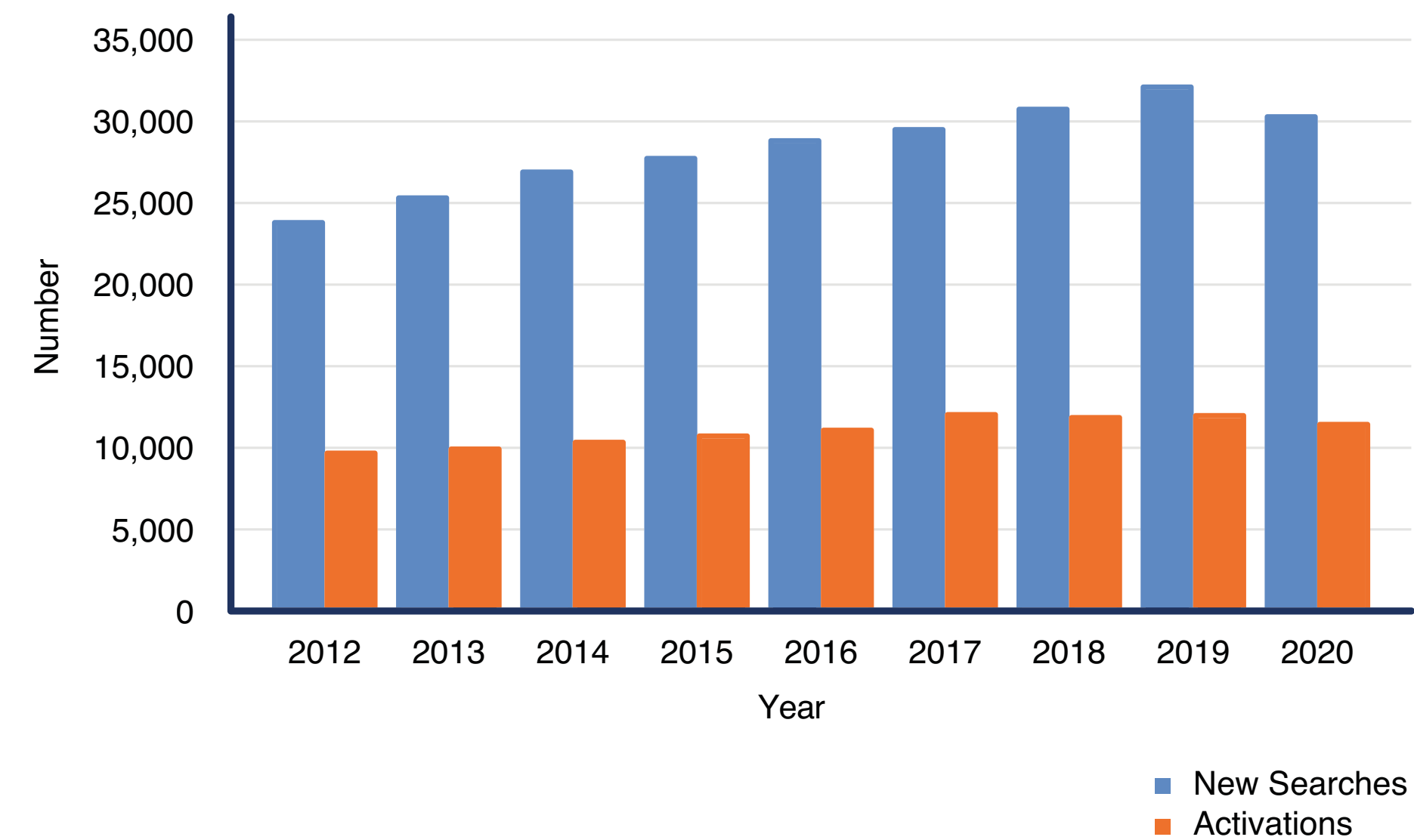
### 1. Donor Searches for German Patients



Many requests for German stem cell donors – around 30,000 every year – also come from abroad. Whereas the number of requests on behalf of patients in Germany increased slightly in the past year, requests from abroad decreased by almost 6 %. The challenges of the COVID-19 pandemic are very likely the main reason for this development.

Requests from Germany increased by almost **4%** in 2020

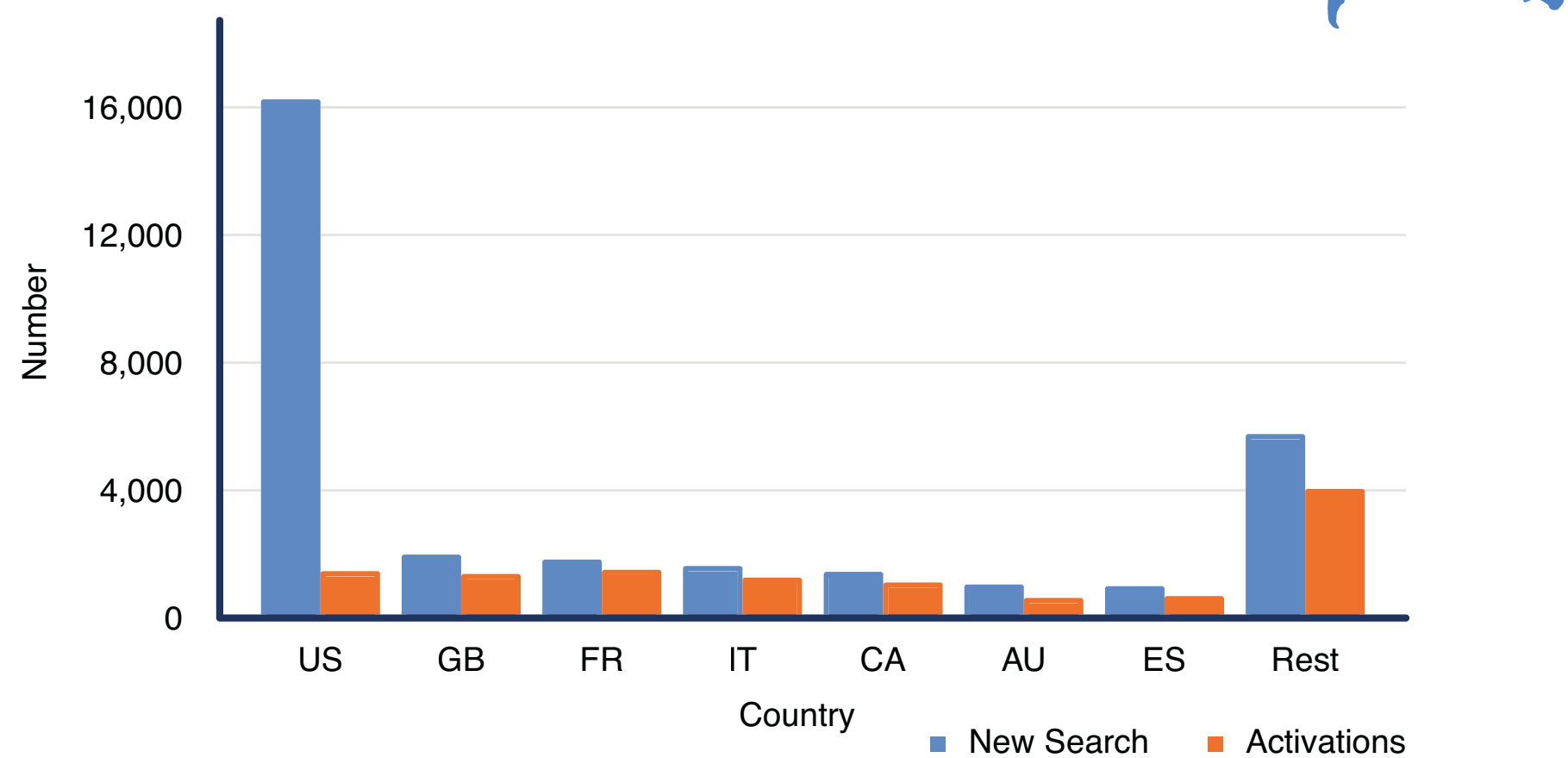
### 2. Donor Searches for International Patients



## 5.0 Donor search at the ZKRD

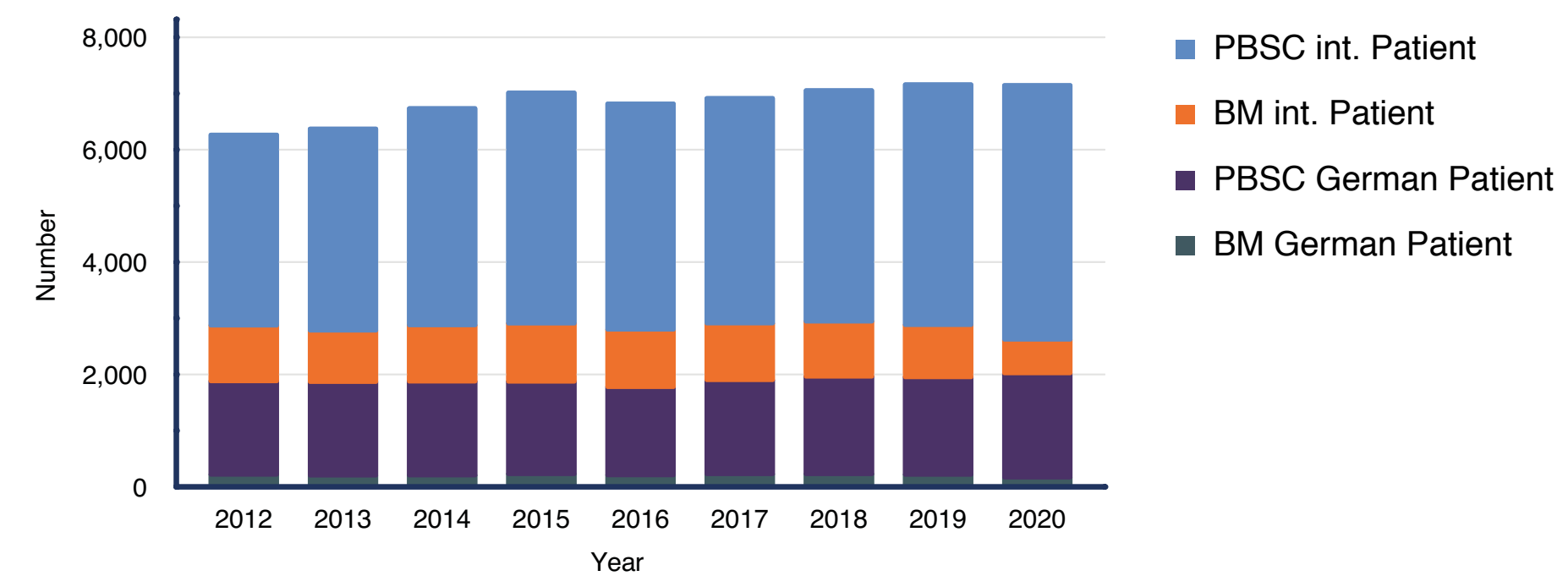
Most search requests from abroad come from the USA, followed by Great Britain, France, and Italy. However, the number of requests far exceeds the actual number of orders from these countries.

### 3. Origin of Searches for German donors in 2020

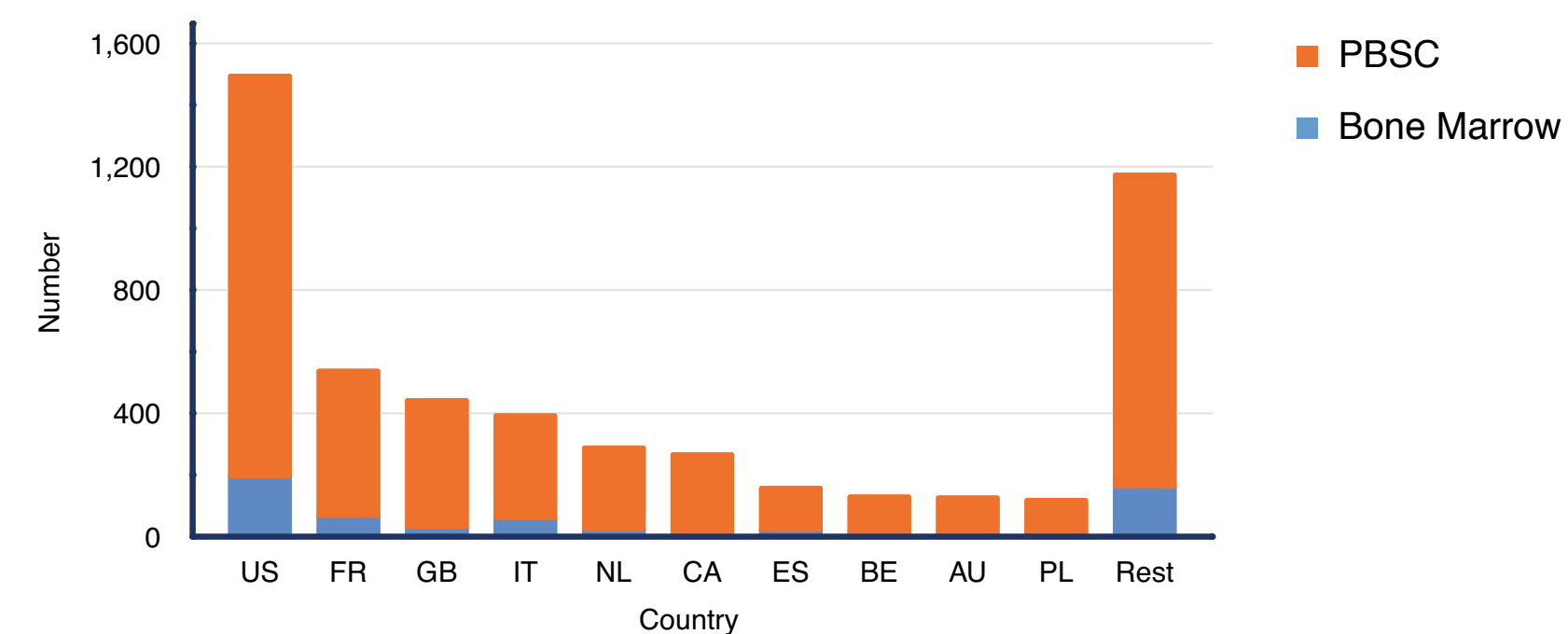


**The total number of blood stem cell collections in 2020, at 7,150, remained at the same high level.** Combined with the fact that, despite the pandemic, almost 37 % of the stem cell donations made worldwide by unrelated adult donors came from Germany, this demonstrates the enormous importance of German donors to national and international patient care.

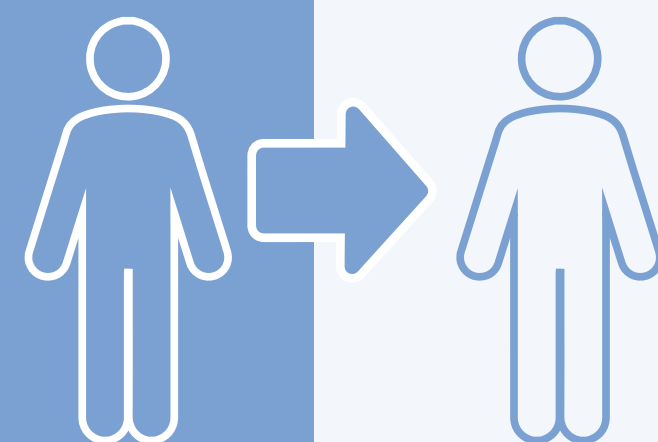
### 4. Blood Stem Cell Donations from German Donors



### 5. Distribution of Donations from German Donors for International Patients in 2020



Since its foundation, the ZKRD has identified suitable donors in Germany for a total of approx. 30,000 patients at home and more than 70,000 patients abroad.



As with the search requests, most of the stem cells donated for patients abroad are destined for the USA. Yet France, Great Britain and Italy also frequently requests for donations from Germany.

**As a central point of contact, the ZKRD offers its partners support across the board – from searching for an unrelated stem cell donor through coordinating the work-up and shipment, to customs clearance and billing.**



## 5.1 Transfer of DKMS donor data

To date, doctors and patients abroad have also benefited from the ZKRD being the central partner for donor searches, since all the search-relevant data of registered donors in Germany could be supplied by the ZKRD. Consequently, to search the German pool of over 9 million donors for a suitable match, submission of a single search request to the ZKRD was sufficient. The transfer of the DKMS donor data from the UK, Poland and Germany to the international DKMS registry has now resulted in some fundamental changes, however.

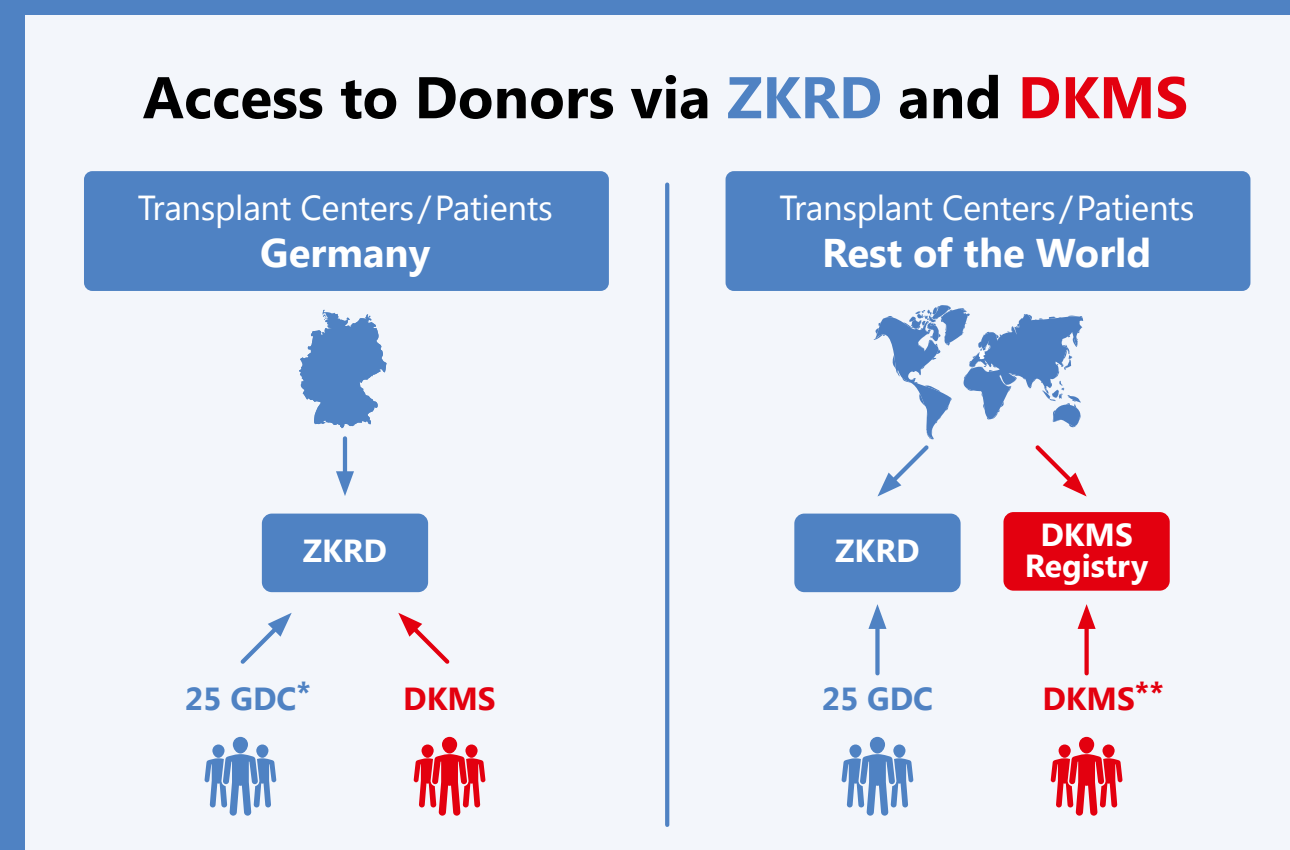
In the summer of 2020, the DKMS initiated a project whereby its donors in the UK, Poland and Germany could be made available to patients abroad via the new DKMS Registry. To adapt the structures and processes developed over a number of decades to suit the new conditions, various procedures at the ZKRD had to be addressed and software, interfaces and database structures remodeled. Working closely with the DKMS, virtual workshops were organized for this purpose and important information shared, respectively, with all the partners and institutions involved.

The first step was carried out in October 2020, when the data of the UK DKMS donors was transferred to the DKMS Registry. Once complete, the DKMS donor data from Poland and Germany was added in April 2021. This transfer of several million donor data sets was relatively smooth thanks to the close collaboration of all teams involved.

This means that **international partners** now need to submit requests to two registries if they wish to find potential donors in Germany for their patients. Since the two registries together hold data on over 9.5 million

German donors, many of whom have also undergone high-resolution typing, only a search in both registries guarantees that the most suitable donor can be identified for the patient in question.

In terms of meeting the requirements for **patients in Germany**, i.e., national requests, the switch has not resulted in any changes, since the ZKRD is a national registry appointed exclusively to coordinate the search and selection of donors for patients in Germany as defined by Section 65f SGB V.



\* GDC: all other German donor centers

\*\* DKMS: including DKMS Donors from Germany, Poland, UK, Chile and DKMS BMST India





## 5.2 ZKRD donor pool for international patients

**Donor centers in Germany are not only responsible for the recruitment, registration and typing of potential donors: they also remain in regular contact with their donors to ensure that the database is as up to date as possible. They transmit the search-relevant data of their donors to the ZKRD, where they are then available to all patients worldwide. Consequently, the ZKRD can currently access the data of several million German donors across 25 donor centers in response to international search requests.**

The donors registered with these donor centers display tremendous enthusiasm and commitment combined with a high level of availability. For patients, this means that valuable time is saved, as it seldom takes much time at all to determine whether the requested donor is available and ready to donate.

### Availability



To guarantee donor availability, the German standards for unrelated blood stem cell donations recommend that the donor centers contact their registered donors once a year. They can therefore check whether the contact details are still correct and the donor is still willing to donate. In times of rapidly changing telephone numbers, this is often difficult, but in urgent cases, a donor's contact details can be obtained from the local residents' registration office. On their respective websites, moreover, the donor centers also offer donors the possibility to update their personal details themselves. In addition to contacting donors every year, the donor centers use other channels, such as newsletters, to sustain donor loyalty.

As well as reachability, trust plays a major role in successful stem cell donation. The regular provision of information increases the motivation of donors to actually donate if a potential match is found.

### Quality



Many of the 25 donor centers have set up recruitment programs aimed specifically at recruiting young donors. As a result, almost 50% of the donors newly recruited to these donor centers are under 25 years of age. Furthermore, 5-loci high-resolution HLA typing has been performed in about 40% of all donors of the 25 donor centers. In responding to international search requests, the ZKRD thus has access not only to the data of many young donors, but also a large number of donors who have undergone high-resolution HLA typing. Most of these donor centers, moreover, have many decades of experience in donor management. They can therefore offer a very flexible response to individual situations, which is highly advantageous to both donors and patients.

### Powerful search algorithm



Donor searches are performed using OptiMatch, the search engine developed by the ZKRD which has also been used for many years by other countries, such as Canada and Australia, as well as by the World Marrow Donor Association (WMDA), and since last year, moreover, by Spain. The program generates a list of the most suitable donors within only a few seconds and additionally indicates the probability of a match with these donors. This is particularly useful if full high-resolution HLA typing results are not available for the donors. By considering the probability with which a donor and patient may be compatible, fewer donors generally need to be re-tested and costs can thus be saved. The probabilities are calculated based on specific HLA frequencies. Highly selective donor lists are therefore generated, ultimately permitting rapid identification of the ideal donor.



## 5.3 Transparent search costs

2020 was a year that brought many internal and external changes at the ZKRD. As always, offering as many patients as possible access to an optimal donor search process and, in turn, blood stem cell donations of a high quality, is very important to us, helping us to stay true to our mission: “Faster identification of the most

suitable donor for any patient – worldwide!” A precondition in this respect is that the selection of a donor can be made as independently as possible from criteria such as search costs, donor origin, transport routes, etc.

### This means that at the ZKRD ...

- free pre-screening is offered in the form of a preliminary donor list.
- there is no search activation fee.
- **transparency in our pricing and billing is guaranteed by ...**
  - invoicing only those services that have actually been requested for a patient,
  - charging separate fees for the search and the work-up,
  - keeping the rates for collections equal for all national partners,
  - charging all international partners the same rates.
- any charges resulting from further requests are billed later on to ensure that no time is lost. Hence, this is one of the quickest ways to get initial feedback on potential donors for a patient.
- our rates for collecting blood stem cells – whether from bone marrow or peripheral blood – are always moderated.
- parallel CT and work-up can also be requested in especially urgent cases.

Transplant hospitals with a small number of cases, in particular, benefit from the case-based method of billing. Hence, they are not expected to assume prorated costs (pay-as-you-go financing) for other transplant hospitals that have a high number of requests or a large demand for donors.

Direct billing of each request also means that only those donors are requested who indeed appear to be most suitable.

**This results in better donor protection, a cause that is of utmost importance to the ZKRD and its partners.**

The ZKRD's billing system helps, moreover, to maintain the required diversity of players involved as expected by the global community, since financing of the individual partners is secured due to the direct billing.



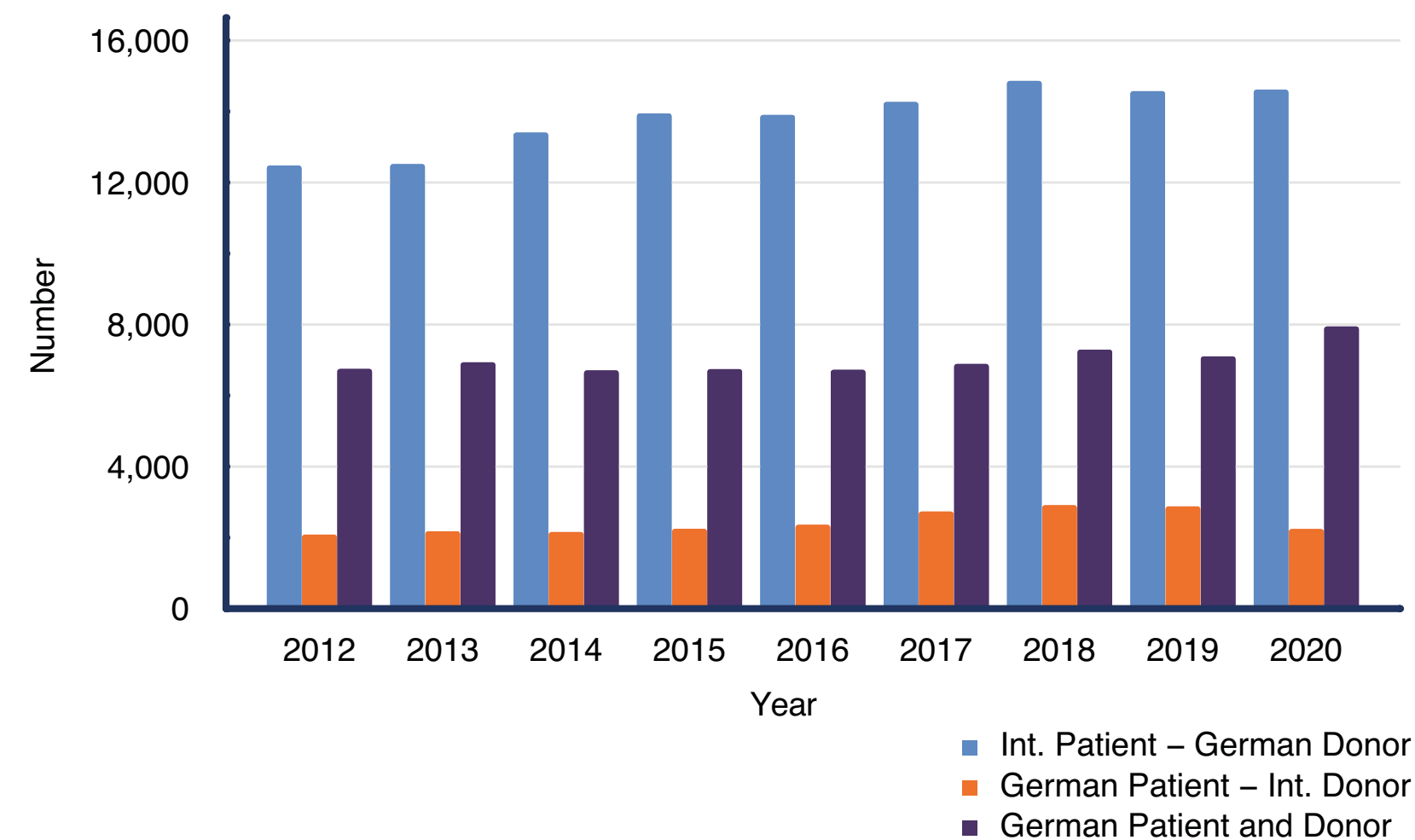


## 6.0 Introduction of the health and availability check (HAC)

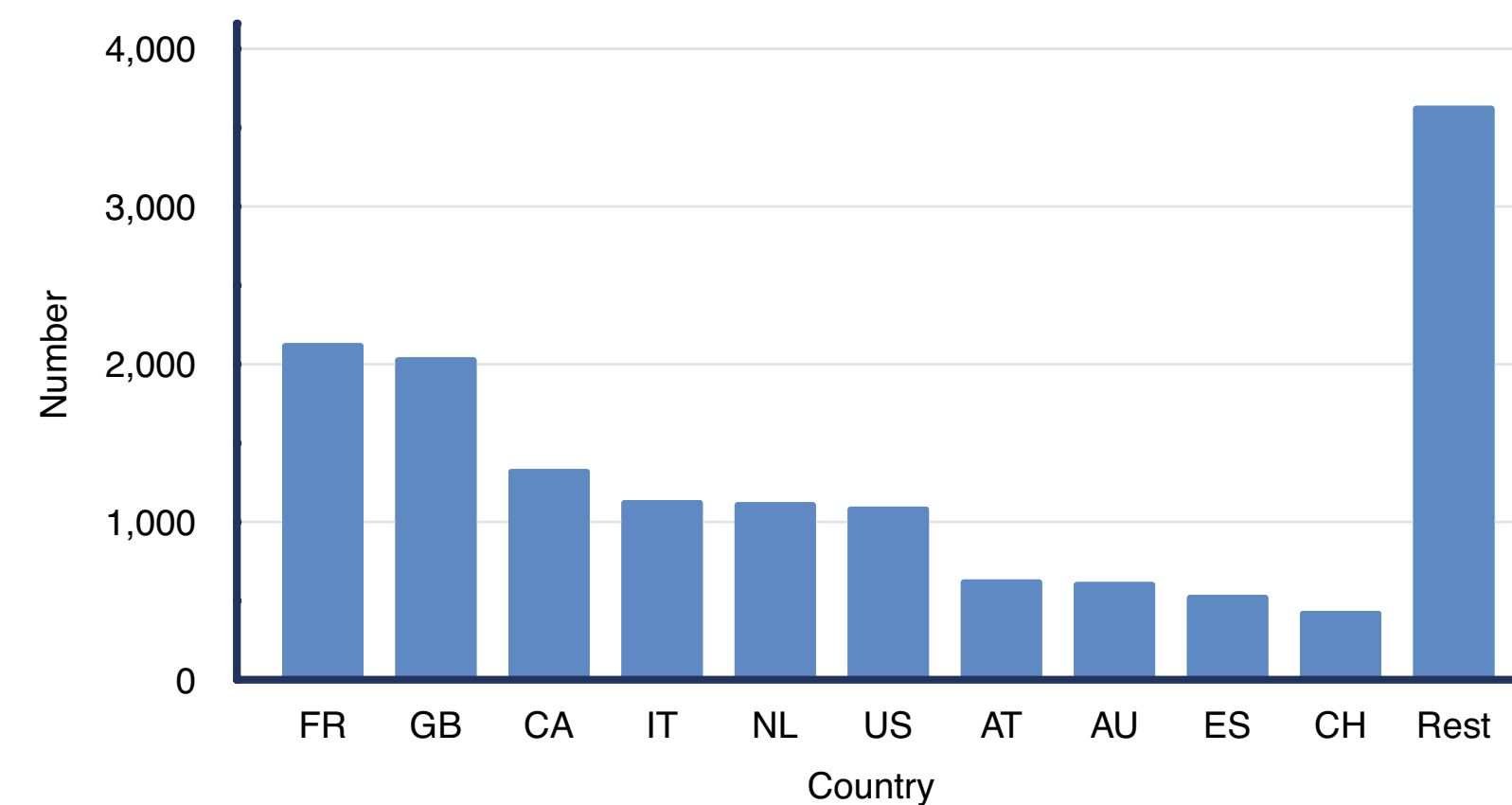
When selecting donors, the HLA characteristics of a donor must again be determined from an independent sample by the laboratory where the patient's HLA characteristics were also determined. For this purpose, a blood sample is required from the donor.



### 6. Confirmatory Typing Requests



### 7. Origin of Health and Availability Check Requests for German donors 2020



Over the years, an increasing number of donors have been repeatedly asked to undergo such blood testing for various patients – especially for search requests from abroad.



## 6.0 Introduction of the health and availability check (HAC)

To spare the donors multiple blood tests in the future, we began introducing the health and availability check (HAC) back in the fall of 2019. Due to the COVID-19 pandemic and the associated restrictions on blood sample shipments, this process was accelerated. Since July 2020, the HAC has also been available through the ZKRD system.

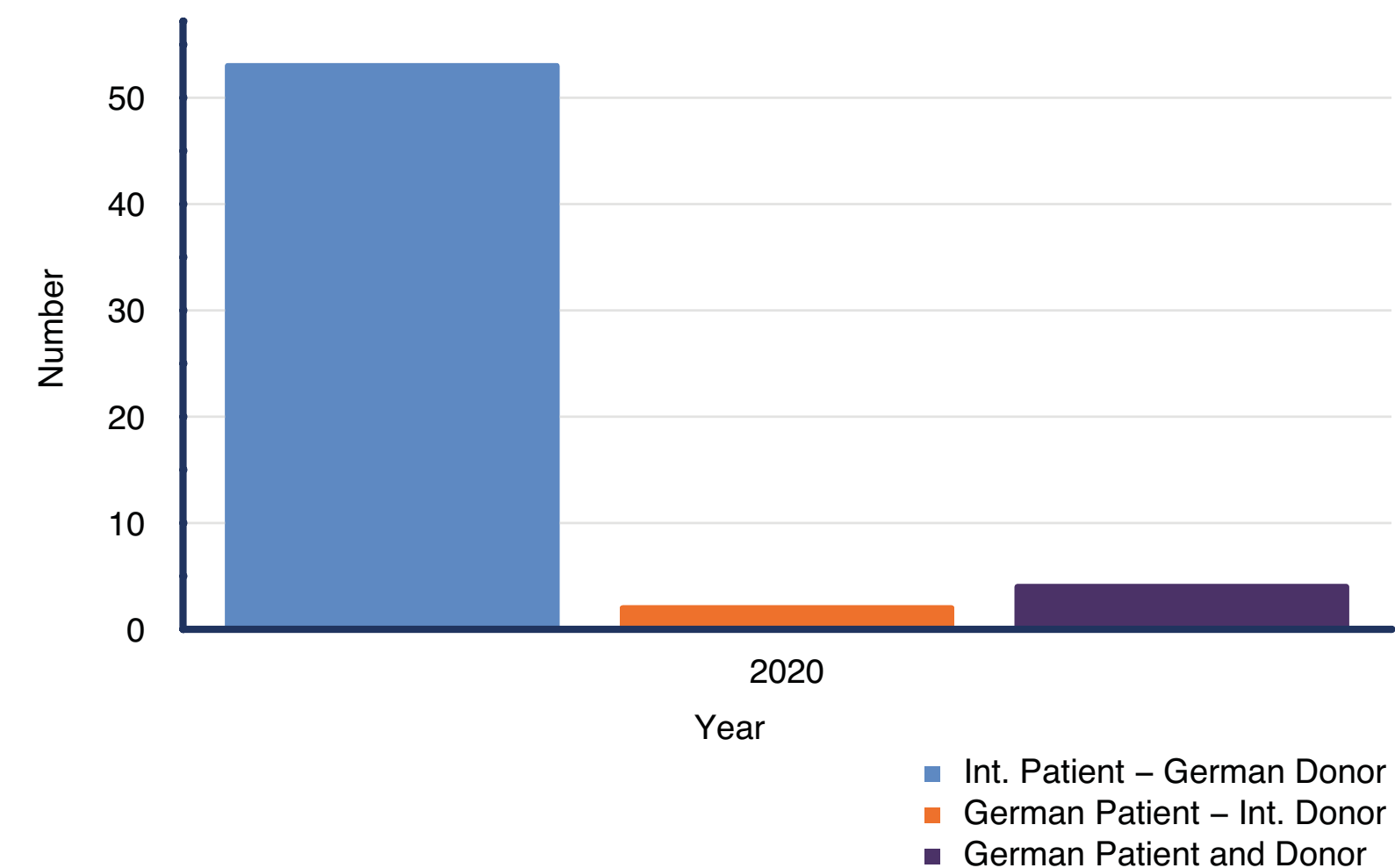
To conduct a health and availability check, a briefing meeting must be held with the donor. Furthermore, as with the confirmatory testing, a health questionnaire is used to check the donor's medical eligibility and obtain consent. The availability of the donor is also examined. If the health questionnaire reveals any unusual findings, these must be evaluated by a doctor. The donor center reports the anticipated suitability and availability of the donor to the ZKRD as soon as the donor briefing has taken place. Lastly, the results are sent to the ZKRD along with any additional transplant-relevant information.

If the donor is available for a donation and the findings of the health and availability check are unremarkable, the donor may be requested for work-up. During the work-up process, confirmatory typing is performed on the pre-collection blood samples.

The requirements for requesting an HAC is 5-loci high-resolution HLA typing of the donor and prior confirmatory typing (CT) performed at least once to confirm HLA-A, B, C and DRB1 as a minimum. [The German standards \(for unrelated blood stem cell donation\)](#) provide more details (Paragraph 3.5, Health and Availability Check). The HAC can be requested for all German donors.

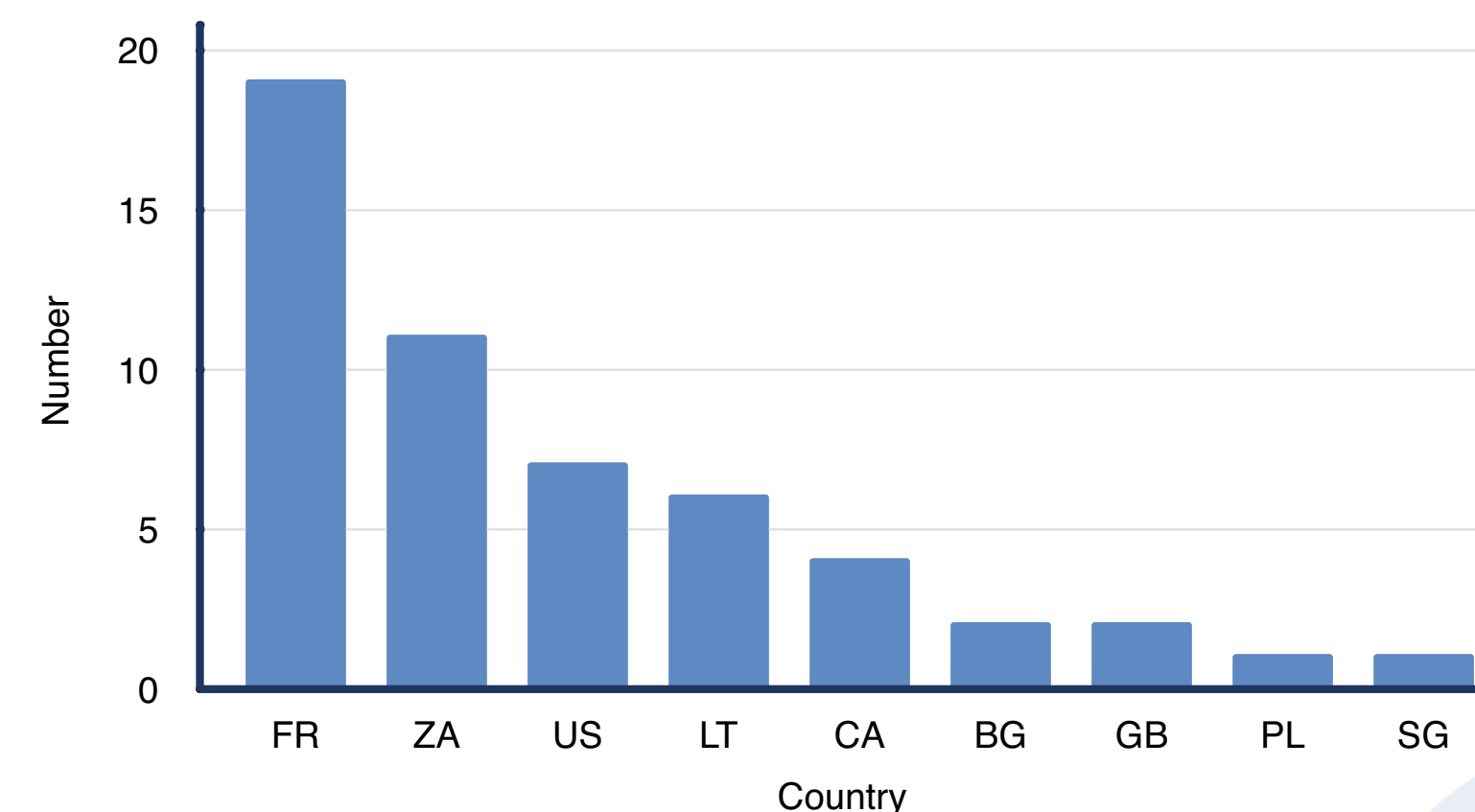
**The HAC has proved to be an effective and fast method for checking the availability of potential donors, especially during the COVID-19 pandemic, and is now established as an additional, useful method for rapidly requesting a donor.**

## 8. Health and Availability Check from 7/2020



**In the interests of protecting donors, the HAC should be the preferred route in the case of national donors for whom consistent CT results from 5-loci high-resolution typing have already (repeatedly) been obtained.**

## 9. Origin of Health and Availability Check Requests for German donors 2020



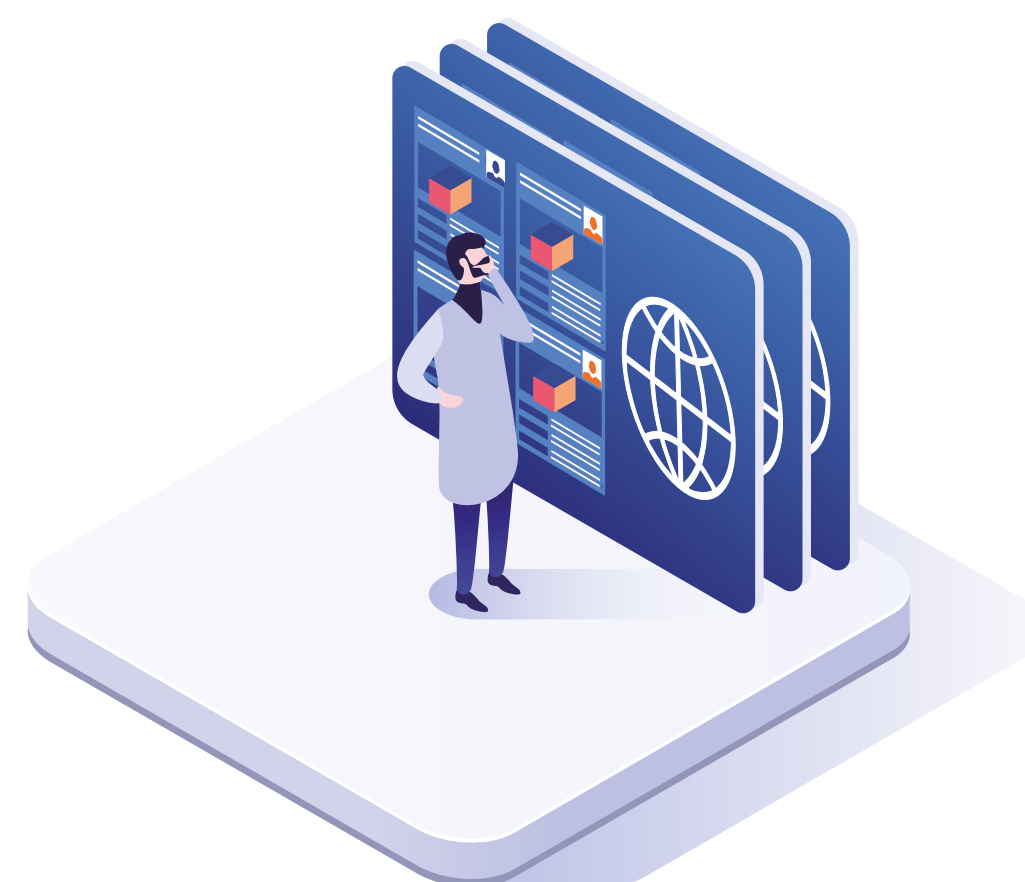


## 7.1 OptiMaS now helping Spanish patients, too!

Back in 2019, the Spanish registry (REDMO) approached the ZKRD to inquire whether OptiMaS could be included in the planned upgrade of its registry system. The team at REDMO envisaged an overall modernization of its system and looked to fill the gap in terms of the matching algorithm.

Implementing a proprietary matching engine does not always make sense as it can prove complex to develop.

The ZKRD, on the other hand, already had a system in place: OptiMaS is a “match box” that can be hosted on a single server, where it can be “fed” with patient and donor data to create search reports using the ZKRD’s OptiMatch algorithm. The OptiMaS server is relatively simple to run and maintain and allows developers to easily access data via a web service interface.



OptiMaS software has already been being used by the Canadian registry since 2012 and by the Australian registry since 2013. Additionally, the WMDA uses a slightly different version of OptiMaS for its “Search & Match” service.

With that in mind, various discussions took place between the ZKRD and REDMO on how to proceed. The fall meeting of EMDIS in Prague in 2019 gave the ZKRD the opportunity to meet in person and, ultimately, a joint project was agreed upon. The timeline seemed to be suitable as REDMO planned to go live with its new solution exactly one year later in fall 2020.

Not long afterwards, the Spanish team started to test against its requirements by accessing a ZKRD-hosted testing environment. At the time of testing, two use cases were identified that OptiMaS could not fulfill. Both features were then implemented by the ZKRD in March 2020.

During the main implementation phase in 2020, progress at both ends was discussed in bi-weekly calls. Key staff from both registries have known each other for many years, mostly due to their involvement in the EMDIS community. Discussing open issues and finding pragmatic solutions was always a pleasure for the main participants, namely Cristina Fusté, Mario Gran, Hans-Peter Eberhard and Daniel Freund.



As progress was made, it was soon time to prepare to go live. Despite the pandemic, the project progressed well and remained on schedule. It was ultimately agreed upon to run OptiMaS here at the ZKRD in Ulm, Germany and provide REDMO with the required access over the internet. This model makes it even easier for the ZKRD’s system engineers to maintain and run OptiMaS and to focus on the integration of the API web service at REDMO.

**The system went live at REDMO on November 2, 2020, after a very pleasant and successful one-year project.**



Hans-Peter Eberhard



Daniel Freund



## 7.2 Interview with Christina Fusté from REDMO – Spain

**“I started working at the Josep Carreras Foundation/REDMO 21 years ago. At the beginning, I was in charge of donor searches and the coordination of transplants for Spanish patients. Since 2009, I have been the technical coordinator of the registry, being responsible for data analysis, user experience project management and quality management.”**

Cristina Fusté – technical coordinator



**How would you describe the situation at your registry before you started to initiate the change process and why did your registry need to replace its matching system?**

“At Josep Carreras Foundation/REDMO we were aware that the algorithm we had developed needed updating and had become obsolete both for donor searches (inclusion of ambiguous allele combinations in some of its aspects) and for cord blood searches (search determinants vs DNA).

This caused many delays and a reduction in the productivity of our coordinators since they had to compensate for the work not being managed by the algorithm. The changes to the immunological parameters would have been difficult for our technical team to implement given that we are a small registry and the volume of improvements needed was significant.”

UNSTOPPABLE  
AGAINST  
LEUKAEMIA

**Why did you decide to contact ZKRD and to use their matching system?**

Having implemented the WMDA's Search and Match (S&M), in which the OptiMaS algorithm is applied, the shortcomings of our system became more evident. We therefore decided to outsource this process.

We examined several algorithms, but the opinion of other registries and the fact that our coordinators were familiar and comfortable with using S&M was a major starting point. Furthermore, the needs it covered and the way the ZKRD approached the change, by providing manuals and very fluid communication with the team (thank you Daniel and Hans-Peter), convinced us to opt for their service. It took nine months to integrate the algorithm into our database, with both technical teams working smoothly and hand in hand.

**How does the new OptiMaS system benefit your daily work?**

“Now that OptiMaS has been integrated into our database, many aspects of our daily work are much easier: first and foremost, good categorization of donors in search results is a must for all registries, but there are many more improvements, for example:

- **the detection of HLA typing errors**, which was an important gap to be filled at REDMO.
- **facilitating the analysis of data from open requests** concerning our patients and donors and thus improving our search strategies and the information we provide to our transplant centers.
- **the probability analysis** and information linked to the patient-donor typing pairings facilitate the daily work of our search coordinators when selecting the best donors for our patients and optimize the search time, which is our main objective as a registry.

OptiMaS is one more tool that makes us, as we say in the Josep Carreras Foundation:

**‘Unstoppable against Leukaemia’.**”



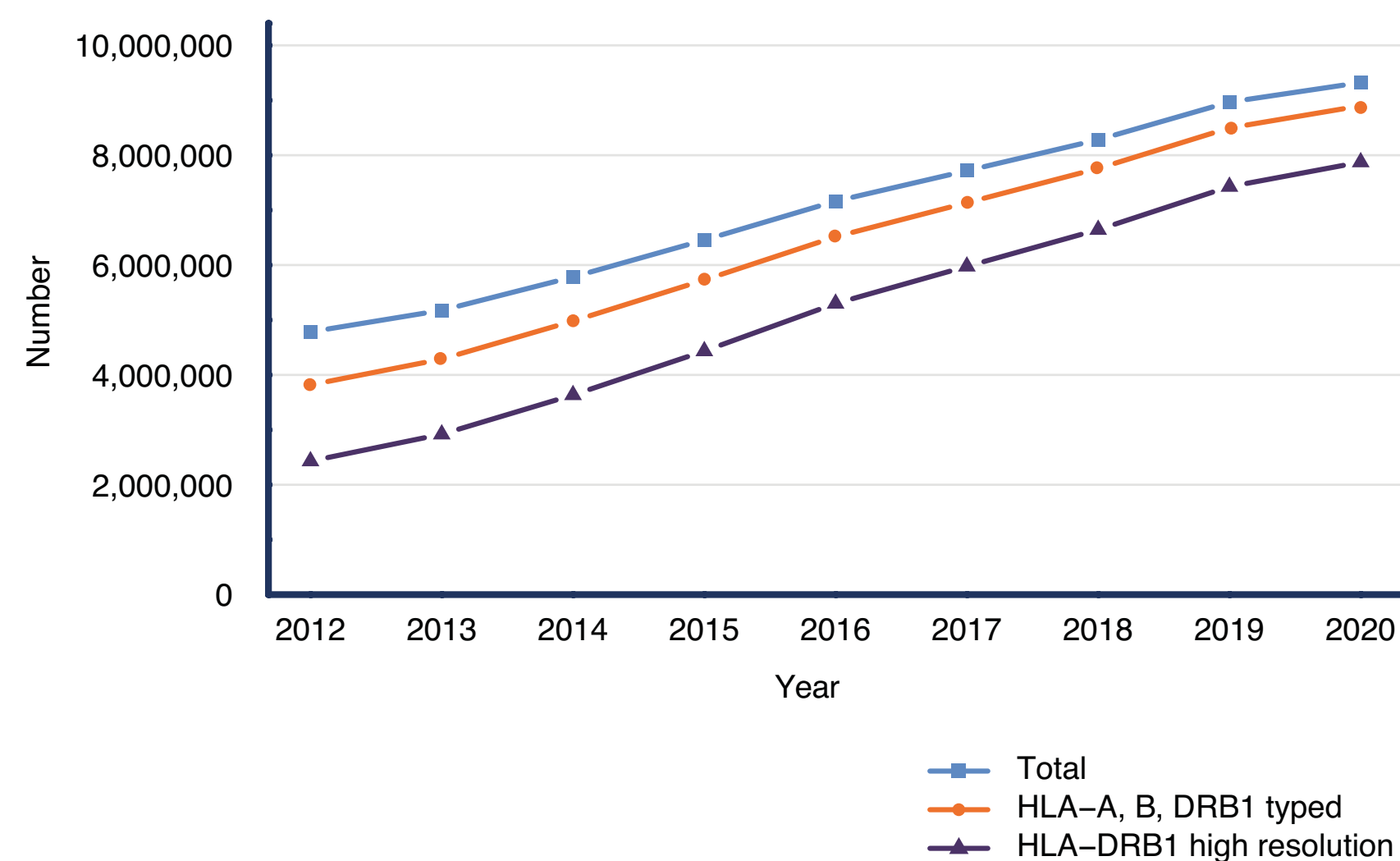
## 8.0 The ZKRD 2020 in figures

“Reliable information is hard to come by. Doing something with it is even harder.” (freely adapted from Sir Arthur Conan Doyle, 1859–1930).  
The 2020 statistics provide comprehensive insights into the ZKRD’s activities, which should enable you to draw precise conclusions for your needs.

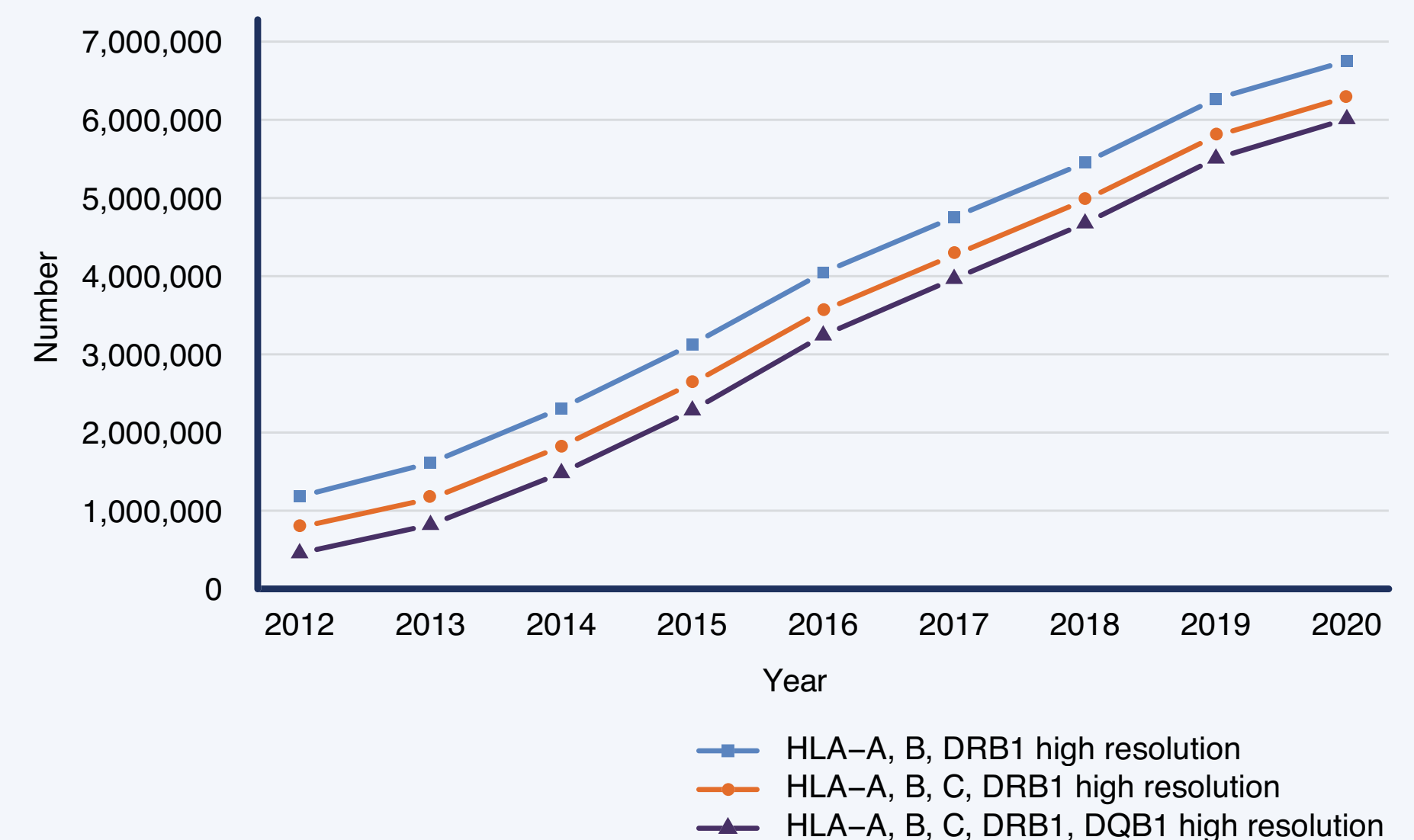
2020 was a different and exceptional year – not only in the area of blood stem cell donation. In January, we were proud to announce Germany’s 9 millionth donor. The impact of the COVID-19 pandemic then became perceptible, creating a challenge out of the success of the previous few years in terms of new donor registrations. Nevertheless, the German donor centers achieved a growth of more than 355,000 to reach 9,340,000 donors in total.



### 10. German Donor Numbers



### 11. Donors in Germany Typed at High Resolution



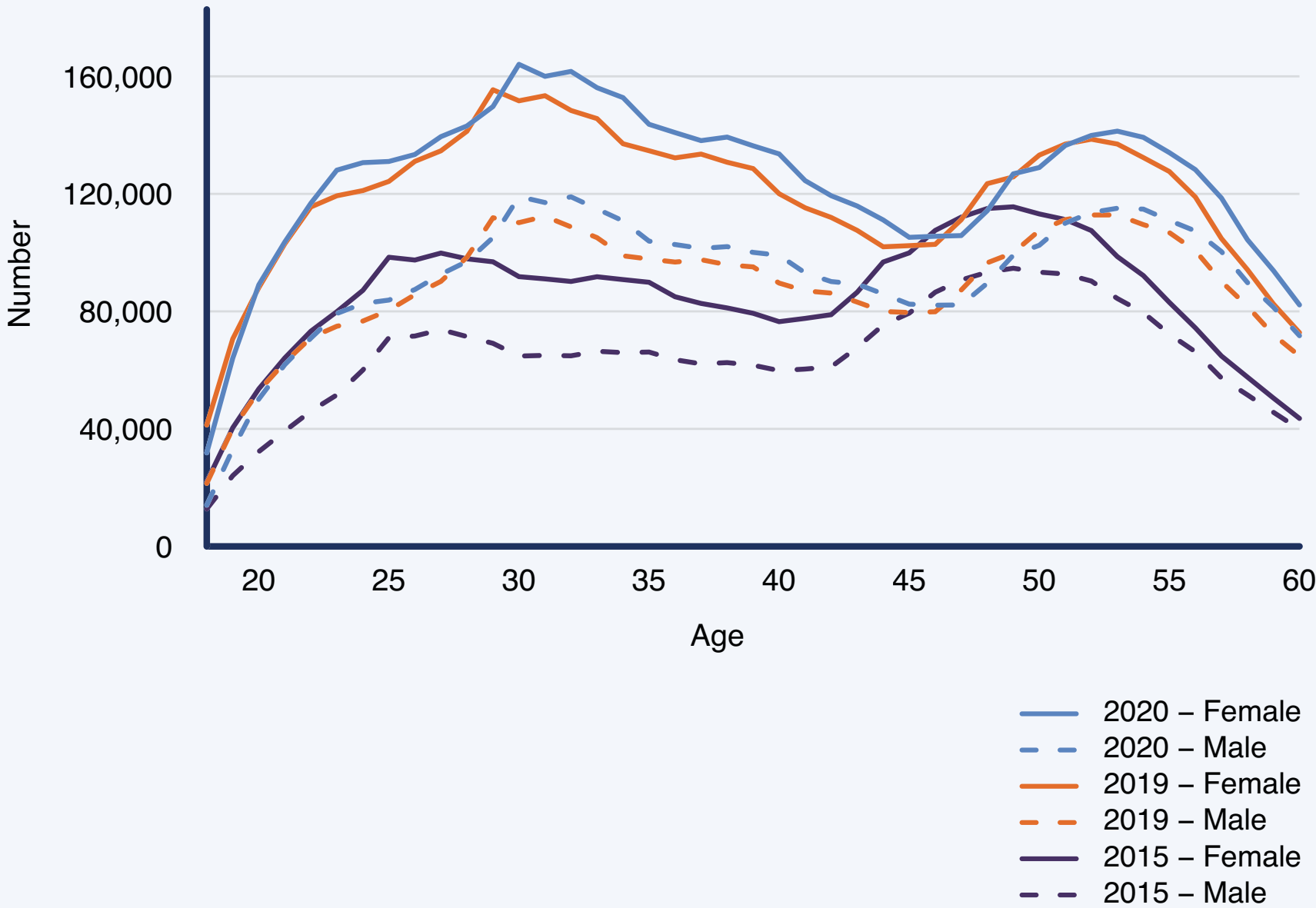


8.0 The ZKRD 2020 in figures

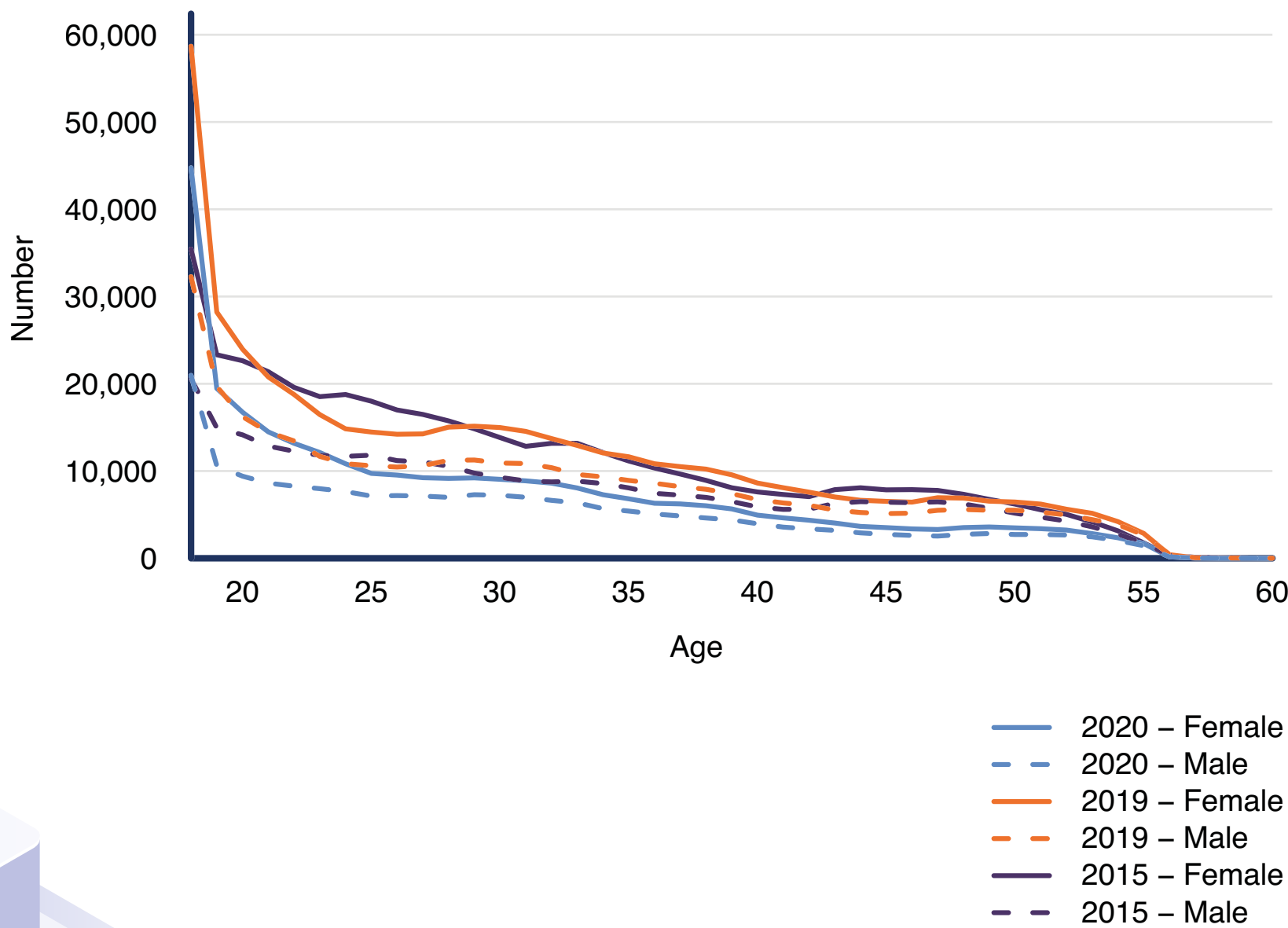
Overall, the growth in donor numbers was lower last year than in the years before; however, given the challenges faced by the donor centers, it still exceeded expectations. Among the newly recruited donors, young volunteers make up the lion's share.



12. Age Distribution of German Donors



13. Age Distribution of Newly Recruited Donors

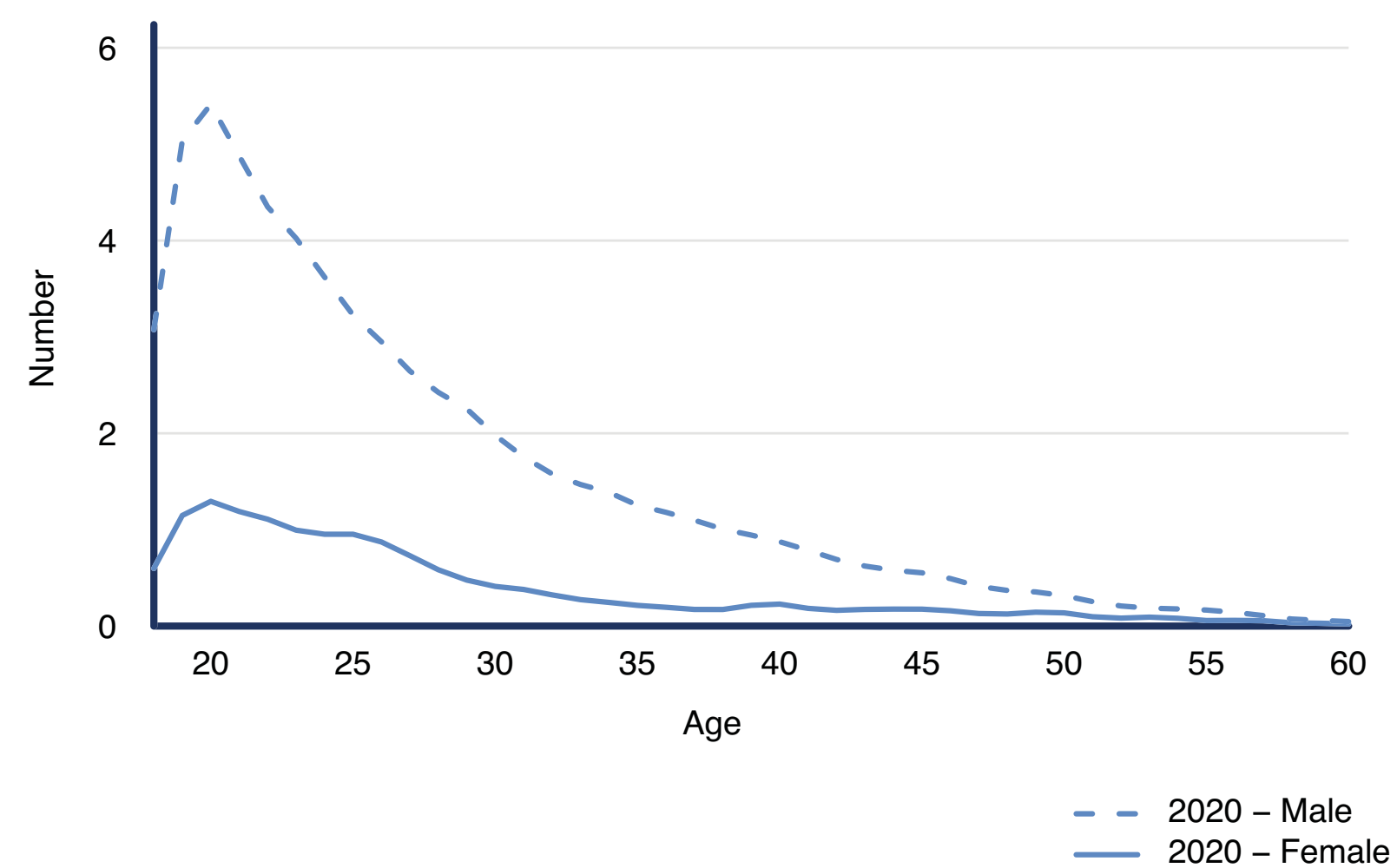




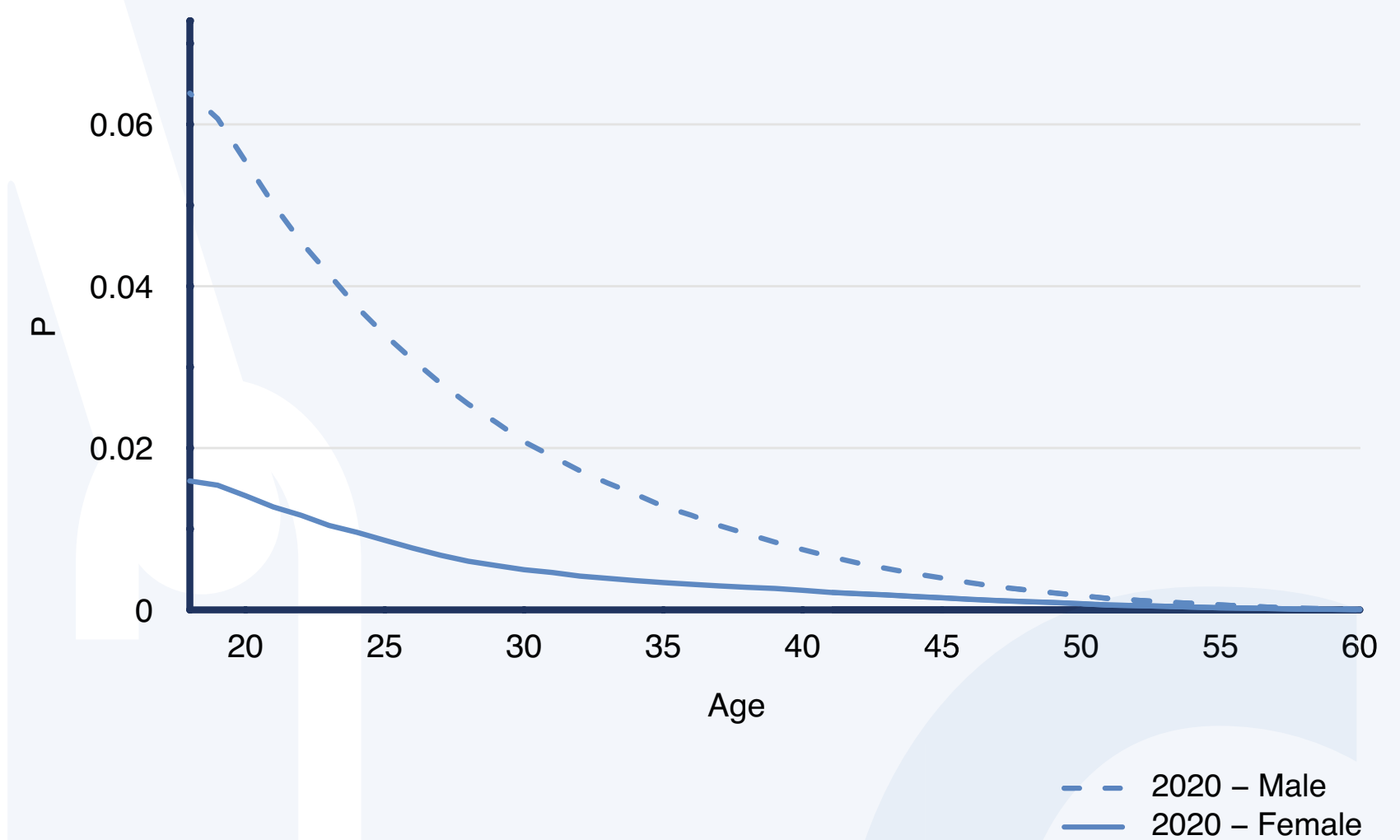
## 8.0 The ZKRD 2020 in figures

Considering the chances of being selected as a donor at a specific age, the following graphs demonstrate that the probability of a stem cell collection decreases with increasing age and that in most cases, young men are selected to donate.

### 14. Collections per 1,000 Donors



### 15. Probability of Donating by the Age of 60

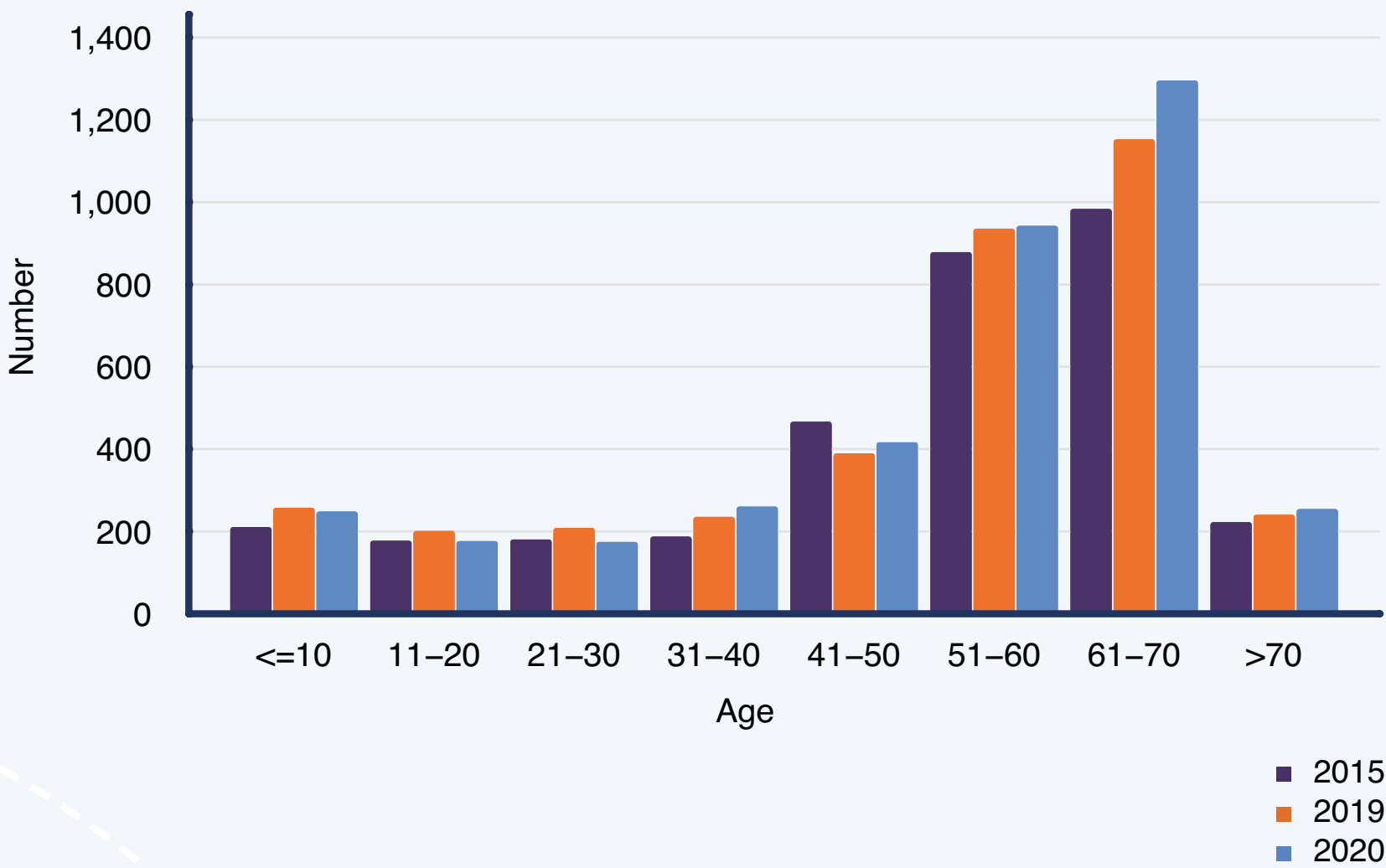




8.0 The ZKRD 2020 in figures

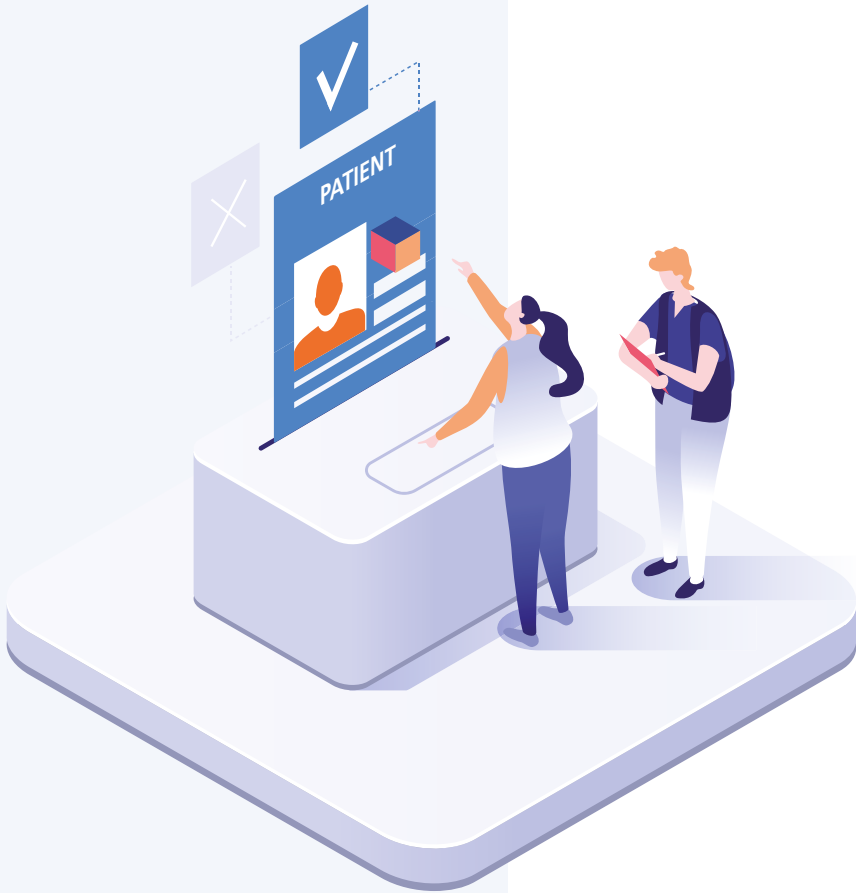
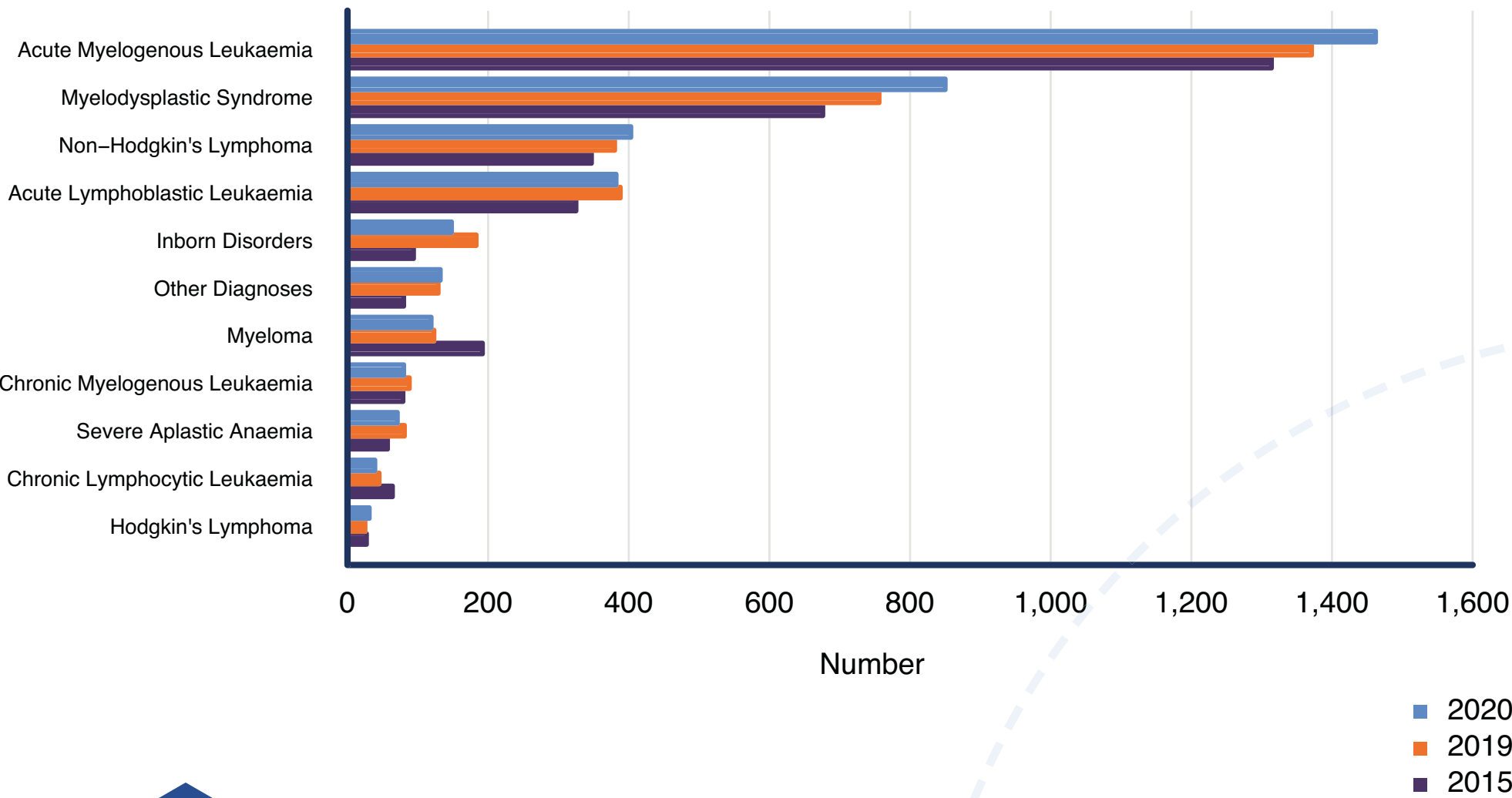
A glance at the development among patients for whom an unrelated donor has been requested reveals that growth has been greatest in the group of 61–70-year-olds.

16. Distribution of German Patients by Age



This is reflected in the increased number of AML and MDS diagnoses, both of which are age-related conditions:

17. Distribution of Diagnoses of German Patients



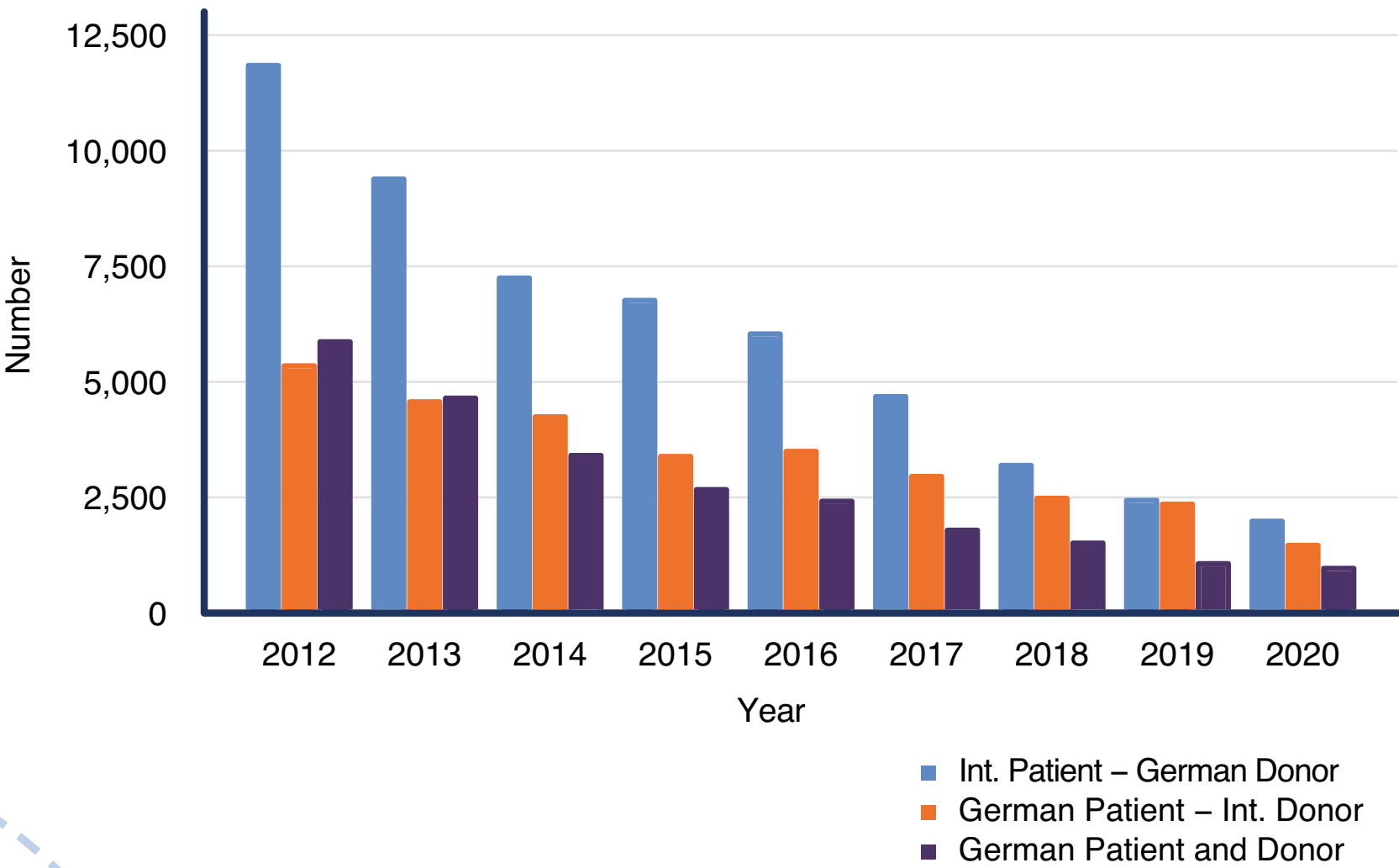


## 8.0 The ZKRD 2020 in figures

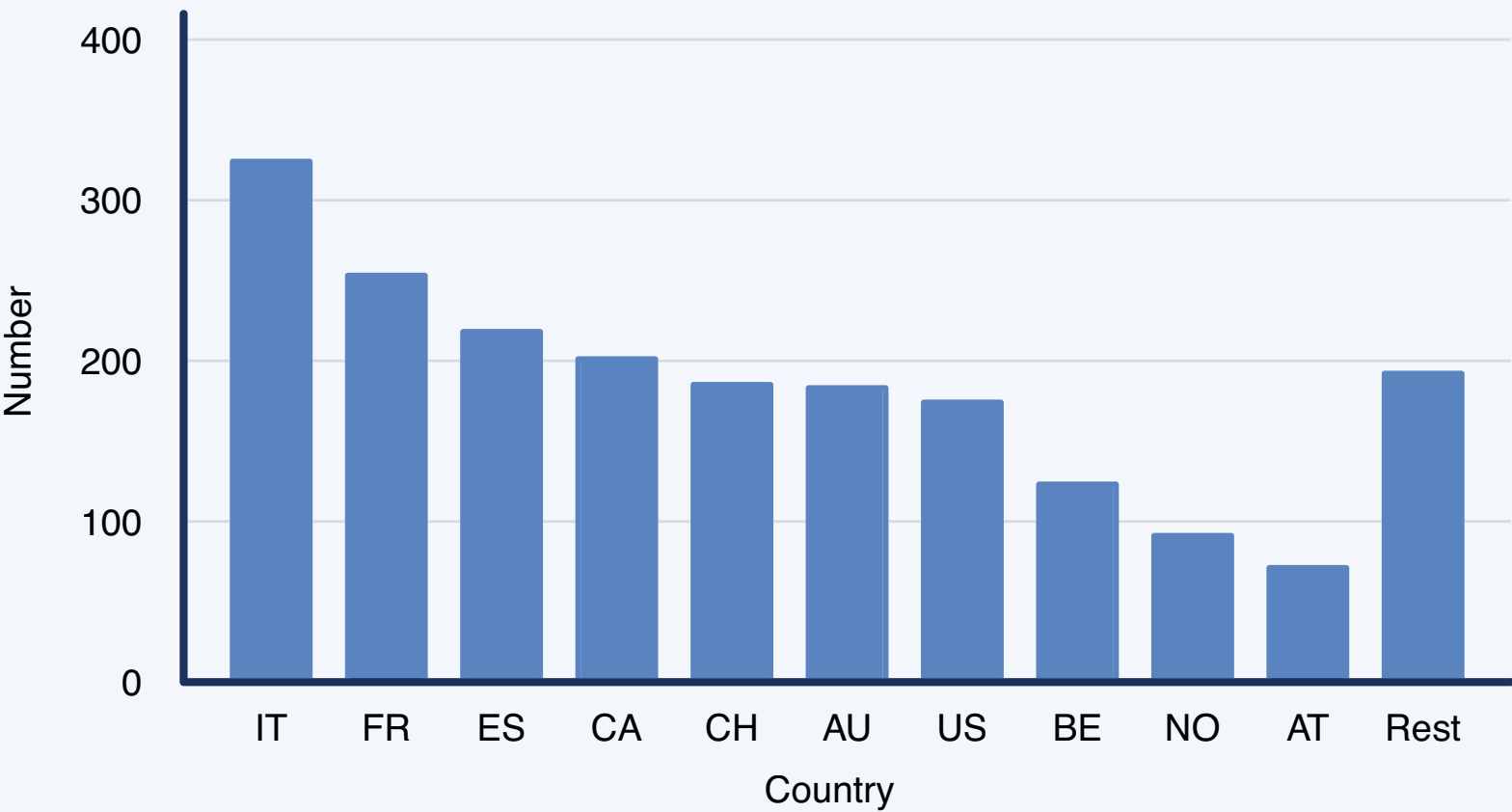
If a potentially suitable donor is identified for a patient but comprehensive high-resolution typing has not been undertaken, additional HLA typing can confirm that the compatibility initially calculated still actually applies and the suspected perfect match has thus been found.



### 18. HLA Typing Requests



### 19. Origin of HLA Typing Requests for German donors in 2020



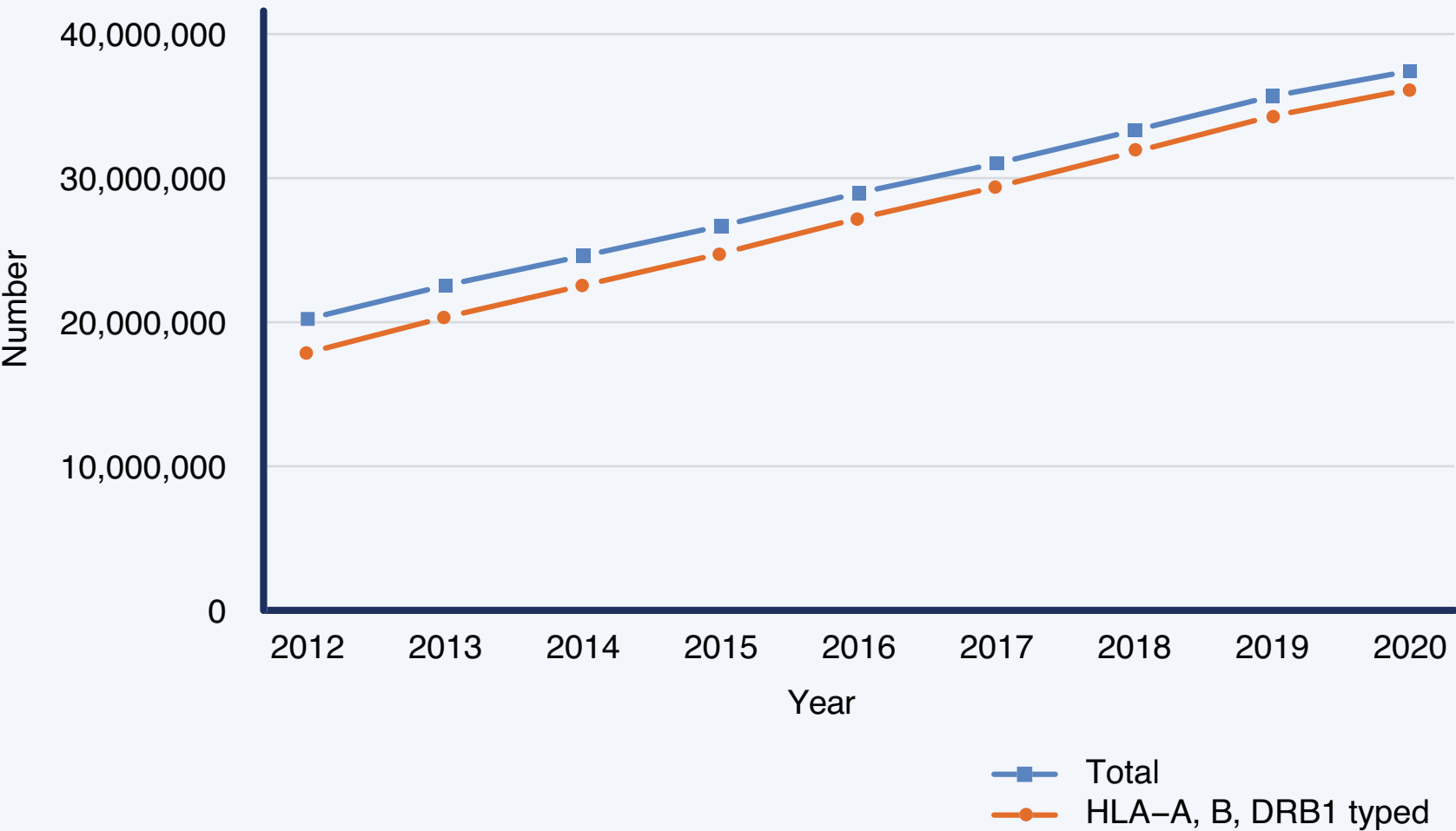


8.0 The ZKRD 2020 in figures

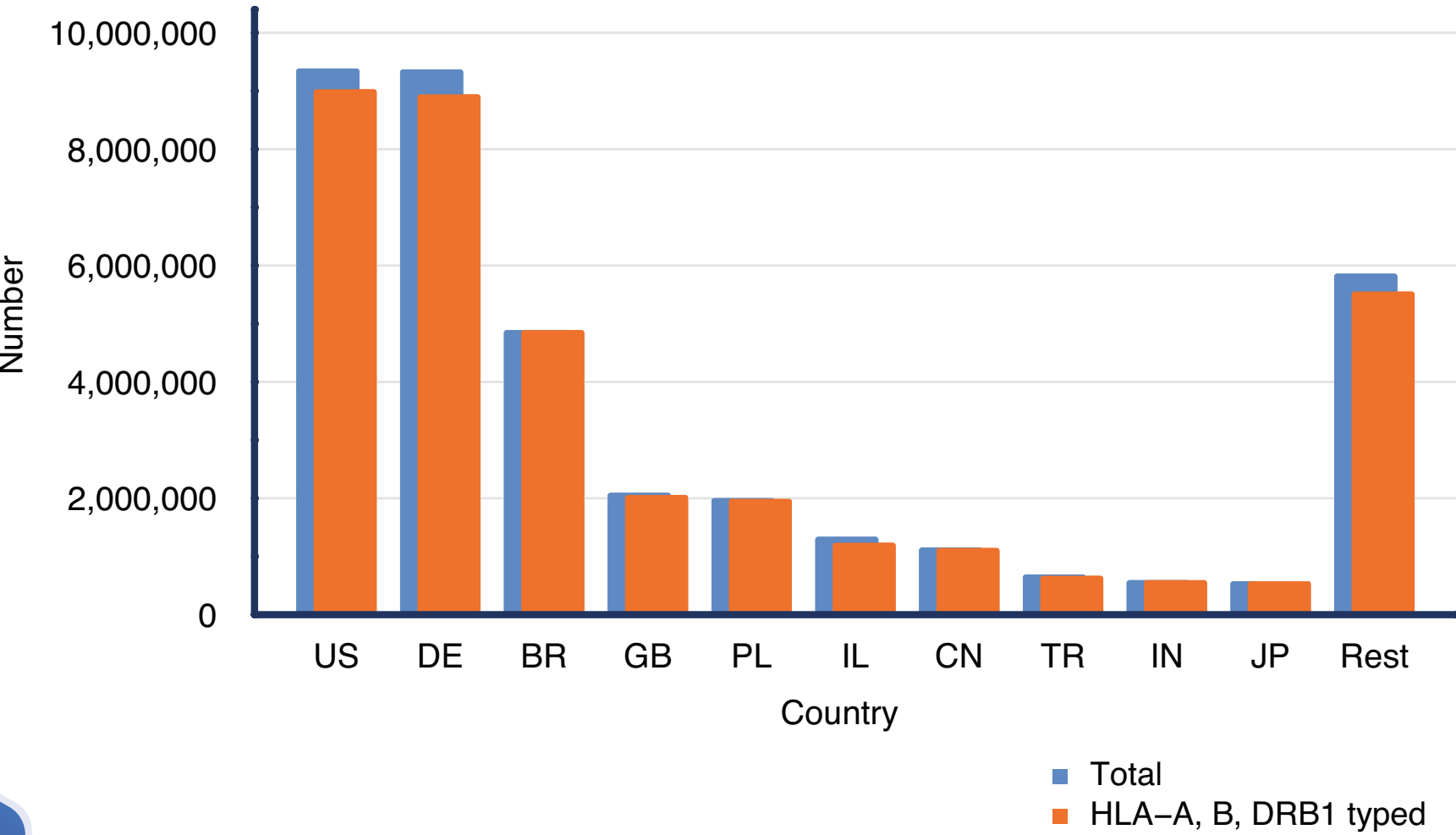
Looking at the international donor numbers, the challenges of the COVID-19 pandemic become apparent here as well, leaving a small dent in the growth of donor numbers which otherwise show a linear increase.



20. Donor Numbers Worldwide (according to WMDA)



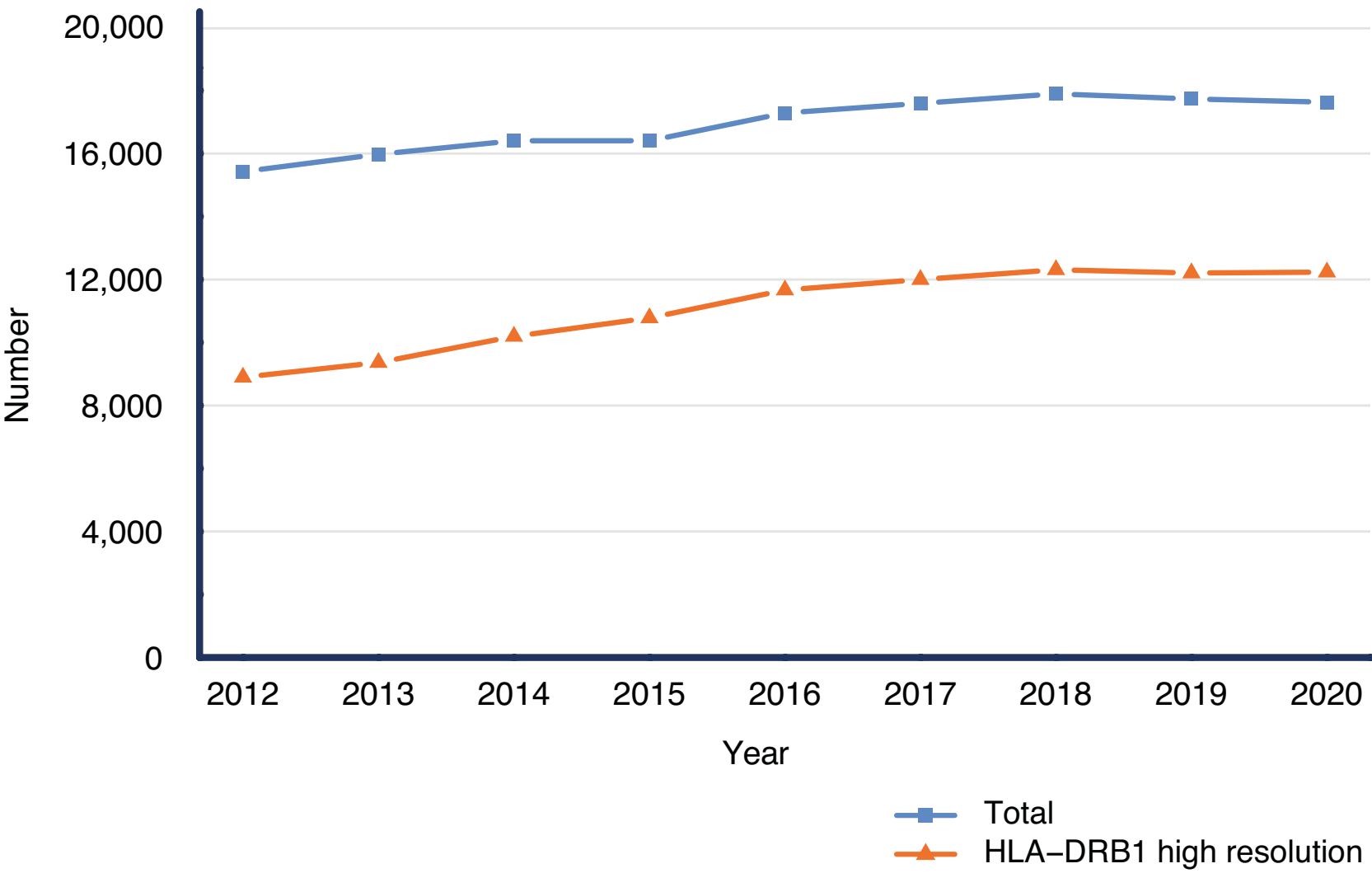
21. Distribution of Donors Worldwide (according to WMDA) in 2020



## 8.0 The ZKRD 2020 in figures

As well as the search-relevant data from blood stem cell donors, cord blood units are also listed at the ZKRD for donor searches. Despite a slight drop in 2020, the ZKRD can access almost 18,000 pseudonymized cord blood donations, some of which have undergone high-resolution typing.

### 22. Number of ZKRD Cord Blood Units



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