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# Learning about the changing needs for prosthetics service provision from routinely collected digital centre management data: an exemplar study across three clinics in Cambodia

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**ABSTRACT:**

Prosthetic service development and delivery rely on context-specific data describing population needs. However, most existing data come from High-Income Countries or small geographic areas, which are not commonly comparable. In order to provide insights into characteristics of people accessing Cambodian prosthetic services, using digital patient records we investigated trends over three decades in birth year, sex, year and reason for limb absence, and prosthesis type. We extracted cross-sections in 2005 and 2019 indicating how the population accessing prosthetics services has changed.

Temporal trends aligned with Cambodia's socio-political history. The predominant historical reason for limb absence was weapon trauma during and following conflict, which changed to non-communicable disease and road accidents since 2000. Transtibial remained the most prevalent amputation level but transfemoral amputation had higher incidence for people with limb loss from road accidents, and people with limb loss due to disease were older. Both transfemoral and older-aged groups experience particular rehabilitation challenges.

The study shows how standardised, routinely collected data across multiple clinics within a country can be used to characterise prosthetics service user populations, over time. This indicates the need to track client characteristics and provides evidence for adapting services according to population dynamics and changes in patient need.

## INTRODUCTION:

Fifteen percent of the world's population has a disability, over a billion people, and 80% live in lower and middle income countries (LMICs) [1]. The Global Burden of Disease study 2019 indicates an international prevalence of amputation at 176 million, which has increased by over 50% since 1990 [2]. The prevalence of major upper- and lower-limb amputations is estimated to be between 50 and 65 million [2], [3]. Established barriers to accessing rehabilitation services for people with limb absence include a lack of policy, standards and governance, affordability, service delivery systems, availability and production of prosthetic devices, and trained professionals [4].

In many cases within LMICs, the high prevalence of amputation has been a direct result from conflict. In Cambodia, from 1979 to 2021, 19,779 people were killed and 45,144 people were injured by landmines, cluster munitions and other explosive remnants of war (ERW) following the Vietnam war, and subsequent civil conflict. This included 9,067 people with amputations [5]. Approximately 5% of the Cambodian population has a disability which affects their walking or mobility, and 84% of people with disabilities in Cambodia live in rural communities and thus face particular barriers to service access [6]. Challenges faced by rehabilitation service providers in Cambodia include withdrawal of international aid, poor retention of experienced clinicians, and a lack of continuity of care from acute healthcare facilities into rehabilitation.

Long-term economic growth and technological development interacts with changes in client needs and the ability to provide prosthetics services, often felt most acutely in LMICs. This may arise from gradual growth in non-communicable disease, or situations of conflict and natural disaster, where a sudden increase in need occurs alongside a drop in ability to provide care. The demography of people accessing prosthetics services is expected to change considerably, as landmines and ERW are cleared and urban environments grow rapidly with high incidence of road traffic accident injuries especially involving young people using motorcycles [7], [8]. Type 2 diabetes is also growing in prevalence [9], which elevates the risk of foot ulcers, infection and amputation [10]. This will likely necessitate a change in the specific requirements of prosthetics services, concerning prosthetic devices themselves, the provision and care pathway, and associated social support. For governments and non-governmental organisations (NGOs) to adapt the services they provide in response to these changes, they must be understood and predicted where possible, and this relies upon high quality data [11].

Prosthetics service need, access and delivery data are varied, and much of the existing data come from small geographic areas. The majority of available evidence on need has been generated through registry and health insurance data, which are concentrated in High Income Country (HIC) settings (e.g. USA [12], UK [13], [14] and Sweden [15]). Despite the high prevalence of disabilities and known barriers to access for rehabilitation services within LMICs, limited data are available to understand prosthetic services in these settings. The literature reports cross-sectional studies for low resourced settings, such as Sierra Leone in

2018 [16], Northern Uganda in 2019 [17] and Malawi in 2020 [18]. These set out to study social determinants of health amongst people with major limb loss, and identified barriers to access due to transport and healthcare service costs, and living in rural locations [18], as well as education and stigma [17] and a need for trained service provision staff and government support [16]. Other studies have taken a longitudinal approach, including two 1980s reports on a 24-year survey in Hong Kong [19] and a 15-year survey in Burma [20]. These studies identified trends in reasons for amputation and the numbers of people accessing prosthetic rehabilitation services as well as demographic disparities, most notably a considerably lower prevalence of women accessing prosthetic rehabilitation services than men.

Household surveys provide valuable population representative data, including those who do and do not access care, however these are often expensive and time consuming. An underutilised source of data within some LMICs are digital patient records, which are compiled for purposes other than research or without specific *a priori* research questions, and provide a valuable resource as real-world evidence, for example, to establish the varying needs within-country. The International Committee of the Red Cross (ICRC) established a standardised digital patient management system (PMS) which offers a valuable opportunity to identify context-specific needs for prosthetics services, with homogeneous client demographics and standardised clinical data, as well as outcome information. This dataset was used in a recent, large report of the demographics of people accessing physical rehabilitation services across 14 countries served by the ICRC (Barth et al., 2020). The gender imbalance was reinforced by further work on the same database for 5 countries considering demographics specifically of people with amputations, alongside observations of older age for non-traumatic than traumatic amputations, and a long delay between amputation and rehabilitation.(Barth et al., 2021)

The wider challenge in prosthetics service delivery is apparent at the systems level. Service providers aim to enable inclusive access, ensure and evidence quality, and provide continuity between health and rehabilitation services. In the context of growing non-communicable disease, the aim is early detection, intervention and prevention. This vision supports UN Sustainable Development Goals and WHO Rehab2030 strategy [23]. However, this can be complex from a health systems perspective when rehabilitation services are separate from health services, such as in Cambodia where prosthetic and orthotic rehabilitation services are governed by the Ministry of Social Affairs, Veterans and Youth Rehabilitation. Successful service design depends on understanding the needs of the population in context, therefore in the instance of LMICs we cannot rely solely upon evidence from high income countries in order to develop sustainable services and inform workforce planning. Facilitating service improvements therefore needs sustainable access to robust, routinely collected, accessible and meaningful data, that considers both functional outcomes and societal impacts, and is comparable across services and locations. In turn, this should support equitable service provision, part of the WHO's Universal Health Coverage agenda (UHC). However, to date, there has been limited utility of this data.

In Cambodia, three of the eleven clinics providing P&O services across the country are run by NGO Exceed Worldwide, who have been collecting clinical data since 1998 as part of routine

care. Working with this service provider, this study aimed to provide novel insight into the important characteristics of those accessing prosthetic services in Cambodia and indicate their context-specific prosthetics service needs. Further, the study aims to show how Cambodian prosthetics service needs have changed over time and identify future service requirements.

## MATERIALS AND METHODS:

A retrospective longitudinal observational analysis was undertaken of people accessing prosthetics services between 1992 and 2019 provided alongside orthotics services by dual qualified staff at three Cambodian clinics run by charity Exceed Worldwide, in Phnom Penh, Kampong Som and Kampong Chhnang. Details were available on a variety of service delivery factors, but the present study's scope was limited to the demographics of those accessing the service. Approval was granted by national (230&311NECHR) and institutional ethics review boards (ERGO45577&51898). All records were collected in a standardised manner. Episodal statistics were extracted from their 'PMS-5' digital record (ICRC, Geneva, Switzerland) for all clients accessing Exceed's prosthetic clinics until 31st December 2019. Individuals were considered 'active' if they had at least one appointment in the last 7 years, on the Exceed Country Director's recommendation (SK). Each line of data described a single clinical contact such as an assessment, a prosthetic device provision, a replacement, or a repair. An individual could have multiple contacts for provision of prosthetic devices, and an individual device could have multiple repairs.

Analyses were undertaken to describe the demographics of clients accessing the prosthetics service and the devices they were prescribed, including the client's year of birth, gender, year of limb absence or amputation, reason/cause of limb absence/amputation, and type of prosthesis as a proxy for limb absence level. Descriptive statistics were extracted to assess the temporal trends in these demographics. The data analysis was performed in Stata version 16.

## RESULTS:

### *Part 1: Client Demographics:*

After removing duplicate appointments, the dataset contained 50,144 entries representing clinical contacts for 7,117 individuals. Some of these individuals only came to the service once for an assessment but received no device, while others have used the service over a prolonged period which included multiple contacts for delivery of devices and multiple repairs to each of these devices. The analysis focuses on 7,117 individuals, 2,820 of whom were classified as 'active' (having had at least one appointment in the last 7 years). The earliest clinical contact recorded within this data set was the 2nd December 1992 in Phnom Penh, 14th February 1993 in Kampong Som and 14th September 1995 in Kampong Chhnang. Records from before 1998, when the PMS was implemented, were input by the clinics from paper records for specific individuals whose care was ongoing.

Person characteristics for all and active patients, including reason for limb loss and type of prosthetic supplied are shown in Table 1. The majority of prostheses supplied were for lower limb absences, with transtibial and transfemoral devices supplied in a ratio of 5:1 for both all and active clients. Leaving out 'missing' data, the predominant reason for limb absence was amputation after weapon injuries (77%) (including landmines, enhanced radiation weapons, grenades or gunshots), followed by traffic accidents (6.9%) and a range of illness or disease-related causes (5.6%). Most clients had at least partial data recorded. 351 individuals (4.9%) did not have any data apart from the date of the initial assessment appointment.

*Table 1: Raw demographics of people accessing Exceed Worldwide services for prosthetic assessment, prosthetic device provision, repair, and replacement*

| | | **All Clients (%) N= 7117** | ***Count*** | **Active Clients (%) N= 2820** | ***Count*** |
|---|---|---|---|---|---|
| **Sex** | Female | 11.8 | *838* | 13.7 | *387* |
| | Male | 83.3 | *5,928* | 78.9 | *2,224* |
| | Missing | 4.9 | *351* | 7.4 | *209* |
| **Side** | Left | 45.2 | *3,215* | 44.0 | *1,242* |
| | Right | 45.7 | *3,253* | 43.7 | *1,233* |
| | Bilateral | 2.6 | *185* | 2.6 | *74* |
| | Missing | 6.5 | *464* | 9.6 | *271* |
| **Clinic** | Phnom Penh | 44.9 | *3,198* | 34.8 | *981* |
| | Kampong Chhnang | 25.5 | *1,814* | 36.1 | *1,017* |
| | Kampong Som | 29.6 | *2,105* | 29.2 | *822* |
| **Year of Birth (Age at end 2019, years)** | Before 1940 (>79) | 3.0 | *210* | 1.2 | *35* |
| | 1940-1959 (60-79) | 25.5 | *1,817* | 23.6 | *664* |
| | 1960-1969 (50-59) | 42.0 | *2,987* | 38.9 | *1,098* |
| | 1970-1979 (40-49) | 14.7 | *1,049* | 12.5 | *351* |
| | 1980-1989 (30-39) | 5.7 | *408* | 8.5 | *240* |
| | 1990 and later (≤29) | 4.2 | *295* | 7.9 | *223* |
| | Missing | 4.9 | *351* | 7.4 | *209* |
| **Age at first consultation (years)** | 0-19 | 5.8 | 413 | 7.9 | 224 |
| | 20-29 | 19.3 | 1,370 | 16.6 | 468 |
| | 30-39 | 34.5 | 2,455 | 29.0 | 817 |
| | 40-49 | 20.5 | 1,459 | 20.7 | 583 |
| | 50-59 | 9.7 | 689 | 12.6 | 354 |
| | 60+ | 5.3 | 380 | 5.9 | 165 |
| | Missing | 4.9 | 351 | 7.4 | 209 |
| **Reason for limb absence / Cause of Amputation** | Congenital | 2.9 | *203* | 3.9 | *110* |
| | Traffic Accident | 5.0 | *358* | 8.3 | *235* |
| | Weapon Injury | 56.7 | *4,033* | 55.1 | *1,554* |
| | Animal Bite | 0.7 | *46* | 1.2 | *33* |
| | Illness* | 4.1 | *293* | 5.1 | *145* |
| | Accident at Work | 2.1 | *149* | 2.5 | *70* |
| | Other | 1.9 | *135* | 3.0 | *84* |
| | Missing | 26.7 | *1,900* | 20.9 | *589* |
| **Type of prosthesis supplied,** as a proxy for level of limb absence or amputation | Partial Foot | 2.5 | *179* | 2.3 | *65* |
| | Transtibial (all) | 61.6 | *4,385* | 63.5 | *1,790* |
| | Knee Disarticulation | 1.0 | *68* | 1.2 | *34* |
| | Transfemoral | 22.0 | *1,564* | 19.5 | *549* |
| | Transradial | 4.8 | *343* | 3.4 | *97* |
| | Transhumeral | 1.5 | *105* | 1.3 | *37* |
| | Other | 1.7 | *122* | 1.4 | *39* |
| | Missing | 4.9 | *351* | 7.4 | *209* |

*Illness for all clients includes diabetes (17.1%), disease (41.6%), gangrene (5.1%), infection (35.5%). Illness for active clients includes diabetes (28.3%), disease (47.6%), gangrene (1.4%), infection (21.4%).

Weapon injury was the most common reason for limb absence at all levels (Table 2). Noteworthy proportions of transfemoral amputations were linked to traffic accident, partial foot amputation or absence for congenital reasons, and upper limb absence for congenital and

accidents at work (Figure 1). The most common absence level was transtibial for all reasons except for traffic accidents, for which transfemoral devices were most common (Figure 1, Table 2). Upper limb devices were considerably more common for people with limb loss following accident at work (30%) versus other reasons for absence. Partial foot absence represented 16% of people with congenital limb absence and 11% of people with amputation following animal bite.

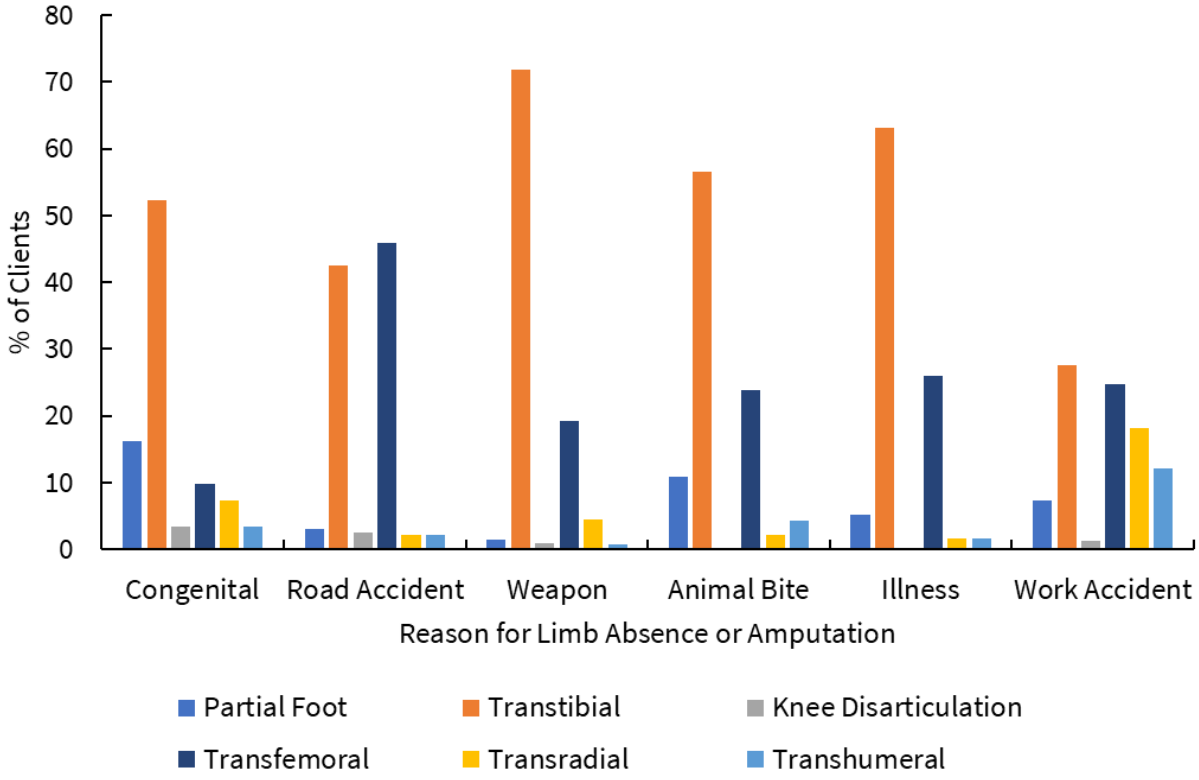


*Figure 1: Percentage of types of prosthetic device supplied, as a proxy for level of limb absence or amputation, for each reason for limb absence or amputation, for all clients, omitting 'other' and 'missing' categories (n=5082).*

Considering the links between age and reason for limb absence or amputation (Figure 2, Table 3) people with limb absence due to congenital problems were very young. The traffic accident, weapon injury and accident at work reasons for amputation were all highest for the 20–29-year age group. A notable difference was amputation due to illness, which showed a markedly increasing trend across age groups.

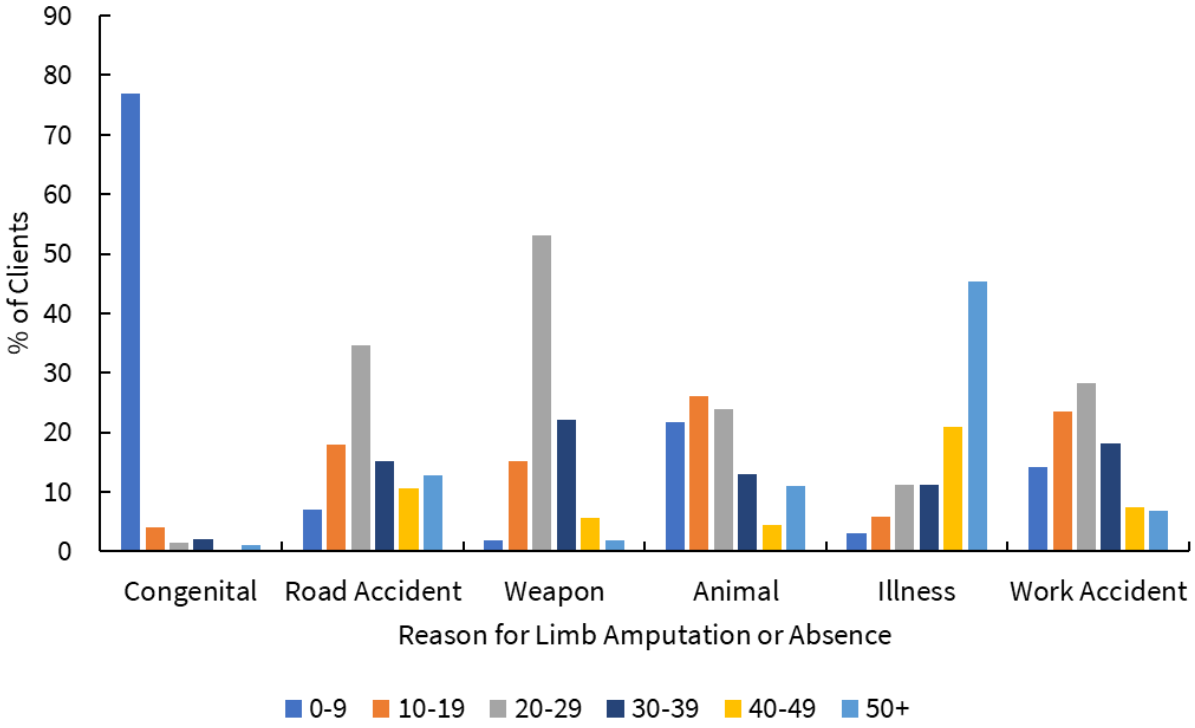


*Figure 2: Percentage of clients grouped by age at amputation or limb absence, for each reason for limb absence, for all clients, omitting 'other' and 'missing' categories (n=5082).*

***Part 2: Temporal Trends:***

Figure 3 and Table 4 show the change of supply in seven different prosthetic devices, as a proxy for level of limb absence, by the year of absence or amputation, over more than six decades. The main trend is a proportional decline in people with transtibial absences from a peak in the 1980-89 decade, and a rise in transfemoral, with all other levels remaining stable below 12.5%.

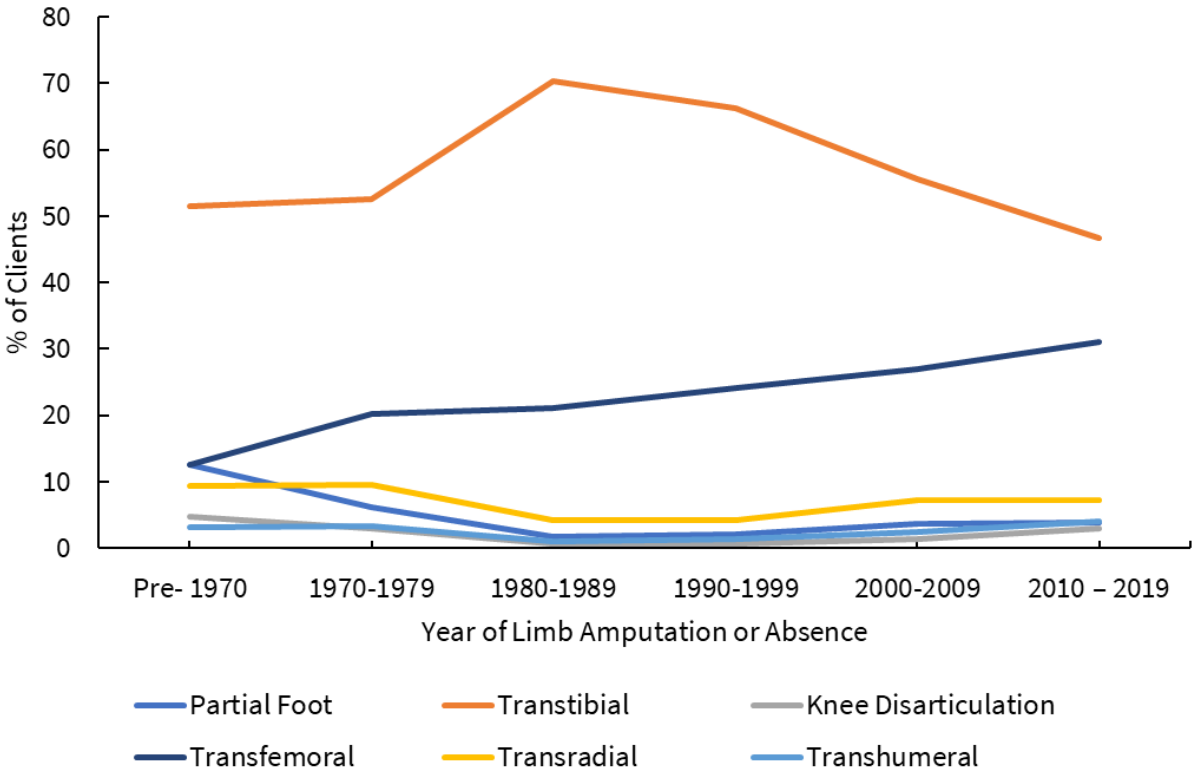


*Figure 3: Percentage of level of limb absence for the clients' year of amputation or absence grouped by decades, for all clients, omitting 'other' and 'missing' categories (n=6644).*

Figure 4 and Table 5 show the temporal trends in frequency of reason for limb absence over six decades between <1970 and 2019 for all clients. Notably the proportion of people experiencing amputation following weapon injury peaked in the 1980-89 decade, and since 2000 traffic accident and trauma have become the most common causes of limb absence.

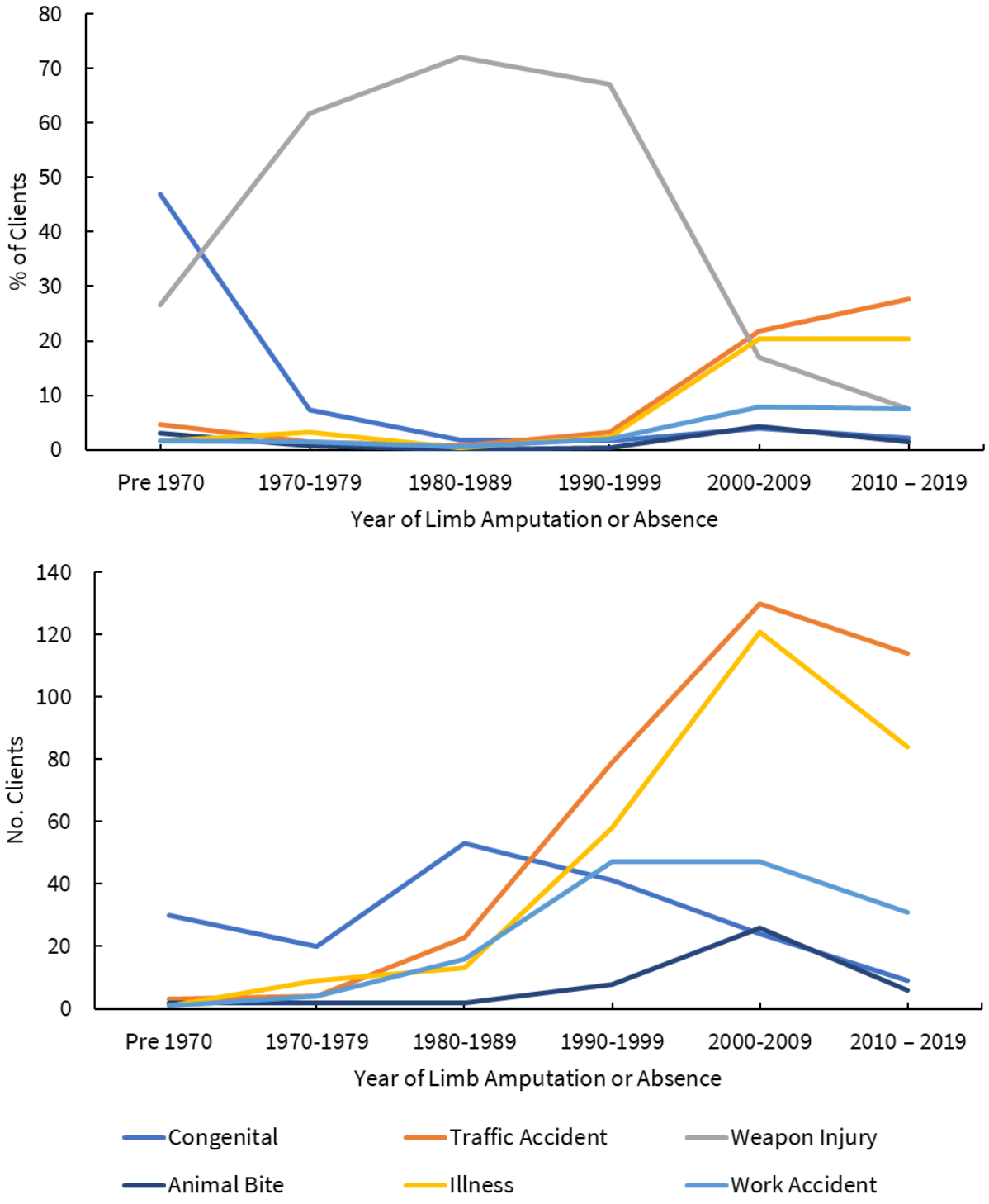


*Figure 4: Top: Percentage of reason for limb amputation or absence for the clients' year of amputation or absence grouped by decades, for all clients, omitting 'other' and 'missing' categories (n=5082). Bottom: the number of clients with each reason for limb amputation or absence per decade, omitting 'weapon injury'.*

Figure 5 and Table 6 show how the age distribution and level of limb absence or amputation (%) differ with age for clients who were classified as active in 2019, and in 2005. The existing, active population accessing this service has become older (Figure 5 top), and while the overall

distribution of absence levels has changed little (Figure 5 middle), inspecting subgroups shows differences such as a proportional decrease in the transtibial level in the 10-49-year-old age groups (example in Figure 5 bottom).

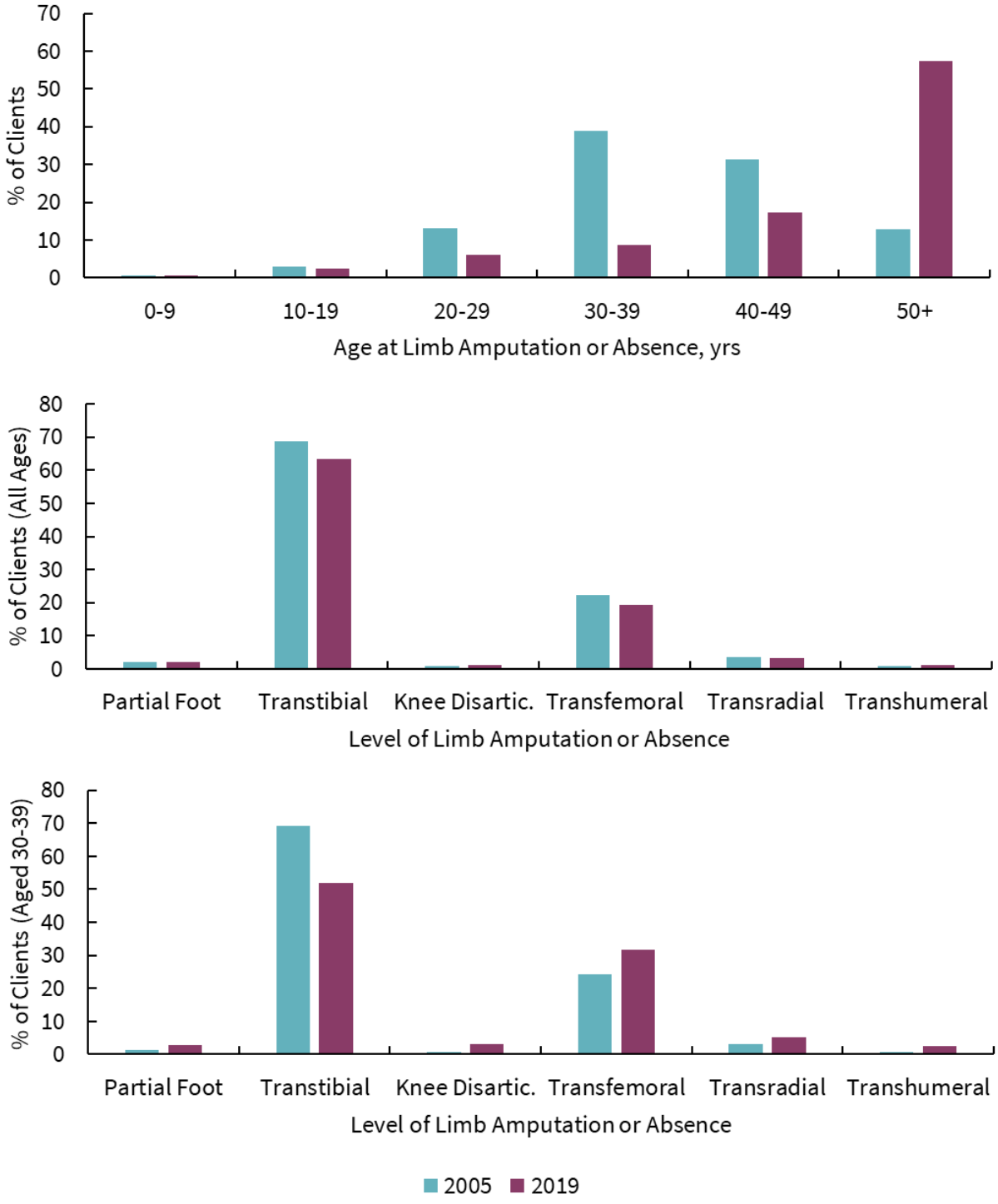


*Figure 5: Age distribution of clients actively accessing the service in 2005 and 2019 (top), and of these clients, the distribution of levels of limb absence or amputation omitting 'other' and 'missing' categories, for all clients (middle. 2005: n=5170; 2019: n=2820), and for those in the exemplar 30–39-year-old age group (bottom. 2005: n=2015; 2019: n=247).*

## DISCUSSION:

Using routinely collected data this study provides insight into the clinical and demographic characteristics of people who have experienced limb absence or loss in Cambodia over more than six decades. By presenting temporal trends in patient characteristics and prosthetic device types, this study has shown how the Cambodian prosthetics service needs have changed over time, based on reasons for limb absence and the patients' demographics. Routinely collected clinical data are regularly used in high income countries, but less in LMICs, partly because data are not so easily available, and partly due to the dearth of professionals to analyse them [24]. This project revealed insightful temporal trends in the demographics of people undergoing amputation which correspond to known historical events, and the devices prescribed to them. In Cambodia the prevalence of landmine and ERW injuries is understood anecdotally, but researchers report a mismatch between in-country data and published literature [25]. The design and delivery of prosthetic services would benefit from understanding key patient descriptors of age, level and reason for limb absence, allowing the adjustment of resource allocation, service planning and delivery, to maintain and improve care and to target investment in services where it is most needed. The present study facilitated an overall description of the prosthetics service access in Cambodia (Table 1-3). Temporal information was obtained by combining groupwise analyses with their changes over more than three decades, including the proportion of clients accessing the service for different prosthetic devices (Table 4 and Figure 3), and for different causes of limb absence (Table 5, Figure 4).

The dataset shows an overall decline in incidence of limb amputation or absence since a peak in the 1980s, dominated by the trend in weapon injuries. However, there was an underlying rise in the absolute number of amputations linked to traffic accidents, illness, and accidents at work throughout the period to a peak in 2000-09. For the small group of clients experiencing limb absence or amputation pre-1970 (n=64), congenital defects predominated, believed to be linked to the defoliant Agent Orange used during the Vietnam War (1961-71) [26]. The dataset shows a declining number of clients with limb absence or amputation for congenital reasons since the 1980s. A dominant factor was the rise in weapon injuries from pre-1970s until a gradual decline in 1990s (Table 5, Figure 4). This trend corresponds with the end of the Vietnam War (1961-71), the Cambodian Civil War (1968-75) and the Khmer Rouge regime (1975-89) and subsequent Cambodian-Vietnamese War (1979-89), with peace and political stability generally considered to have been reached in 1999. The predominance of weapon injury as the reason for amputation reduced markedly from 2000-2009 onwards and was replaced with a wider variety of causes including traffic accident and illness (primarily listed as diabetes, infection, or gangrene).

The transtibial absence level clearly had the highest incidence in all decades (Table 4), although there is a gradual increase in the proportion of transfemoral absences. Possible explanations may be found in the changing reasons for limb absence, most notably the increasing incidence of amputation following traffic accidents. Traumatic injury in traffic accidents has a historic burden and is a growing cause of lower extremity loss in many LMICs [27]. The growth in

vehicle numbers, insufficient law enforcement, lack of road safety education, speed increases and inadequacy of health services have led to a rapid rise in road fatalities and injuries [28], and 7/10 injuries and deaths in 2014 were attributed to road accidents [6]. The increasing prevalence of transfemoral amputation may correspond with the different form of traumatic injury sustained in a road accident, especially for motorcyclists and passengers in side-on collisions with cars. Individuals with transfemoral absence are known to have more complex rehabilitative needs and poorer outcomes [29], and require more complex devices that take longer to manufacture and are more challenging to maintain.

Therefore, information generated in this study provides direction for future areas of device research and development, and indicators for forthcoming service delivery needs. These temporal trends in the data were filtered for active clients to create cross-sections at the end of 2005 (i.e., clients who were active in the 7 years since the digital record began) and at the end of 2019, to allow comparison of the demands upon service providers at particular timepoints (Table 6). The total number of clients has reduced, though their age profile has increased (Figure 5 top). The ageing of existing clients, and entry of older new clients with amputations most commonly due to illness, appears to be outweighing the entry of new young clients into the service. This will impact the complexity of patient management and the ability of the government and NGOs to deliver the same interventions within existing time frames. This may indicate a need for more holistic management as needs become more complex. Looking at the whole group there has been little apparent change in the distribution of clients' level of limb absence (Figure 5 middle), although in younger age groups (10-49yrs) the decline in the proportion of transtibial and increase in transfemoral absence is noticeable (Figure 5 bottom). Interestingly there was relatively little change in the limb absence level for people aged 50 and above between the 2005 and 2019 cross sections. Illness was a common cause of amputation in this age group (Figure 2), so a partial explanation may be the rising prevalence of non-communicable disease (NCD) and associated comorbidities such as diabetes, which is rising fastest in LMICs [9]. Diabetes is a known risk factor for lower limb amputations and presents an associated societal burden [10]. Mortality studies in high resourced settings [30] indicate median life expectancy of 20 months following major lower limb amputation for vascular or infection-related reasons, and 77% mortality at 5 years. In this dataset only 17.1% of amputations due to illness were linked specifically to diabetes, and a further 35.5% to infection, 5.1% to gangrene and 41.6% to unspecified disease. The high proportion of unspecified disease may indicate different conventions of reporting and could indicate an under-estimate of the true level of diabetic causes. The impact of any associated comorbidities will further accentuate these figures, and this may give an insight into future challenges with rising rates of amputation due to NCD in low resourced settings.

This study is limited by reliance on secondary analysis of clinical data sets, which do not represent complete coverage. Its accuracy was dependent on reporting practices and is influenced by any differences in data input regimes between the three centres, and some data were missing. The study also provides no information on people in need who do not access physical rehabilitation services, and no reason for why people stop appearing in the dataset. This may be due to death, people moving and accessing a different prosthetics service, or

ceasing to use their prosthesis. Some people may have accessed more than one centre, which could only be accounted for if the dataset noted a national identification record. Future work might investigate the declining number of people accessing prosthetics services in the last decade, and whether this is due to the existing population reaching their life expectancy, standardised prosthetic devices lasting longer or no longer meeting the needs of an emerging middle class who may then choose to access services elsewhere, or people experiencing more difficulty in accessing services due to reducing financial support. Further consideration of dimensions including sex should be made, noting that female clients are in a clear minority in this and similar datasets. Findings might enhance our recommendations for improving the equity and diversity of the service.

This first longitudinal study of people accessing prosthetics clinics in Cambodia emphasises the benefits of using routinely-collected clinical data across multiple prosthetic clinics and highlights the importance of having standardised data on aetiology, management and outcomes. It supports the International Society for Prosthetics & Orthotics (ISPO)'s work to identify the core requirements for a global registry, and ATscale whose 2020 *Product Narrative report for Prostheses* proposed that "defining the core dataset of amputee data and outcome measures will underpin the efforts of countries to implement registries" and "Creation of a global platform and governance for aggregation of country-level data will enable consolidated insights" [11]. This study presents an exemplar dynamic analysis which could be implemented by any centre or country using the ICRC's PMS, the most widely used digital record in low-resourced settings. It provides a call-to-arms for comparable studies across other contexts, for example to extend the general physical rehabilitation service research on ICRC data (Barth et al., 2020). These findings show the potential for registry data to identify the essential value delivered by prosthetics services and provide evidence to help service providers share best practice and adapt to a changing population and dynamic patient needs, and may be extended to other causes of disabling conditions.

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**DECLARATION OF INTERESTS:**

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## APPENDICES:

*Table 2: Data behind Figure 1: percentage of reason for limb absence for each type of prosthetic device supplied, as a proxy for level of limb absence, for all clients (n=3451). Percentages are calculated in column categories.*

| | **Partial Foot** | **Transtib** | **Knee Disartic** | **Transfem** | **Transrad** | **Transhum** | **Other** | **Missing** | **Count** |
|---|---|---|---|---|---|---|---|---|---|
| Congenital | 18.4 | 2.4 | 10.3 | 1.3 | 4.4 | 6.7 | 12.3 | 0.0 | 203 |
| Traffic Accident | 6.2 | 3.5 | 13.2 | 10.5 | 2.3 | 7.6 | 4.9 | 0.0 | 358 |
| Weapon Injury | 34.1 | 66.1 | 55.9 | 49.7 | 51.9 | 30.5 | 38.5 | 0.0 | 4033 |
| Animal Bite | 2.8 | 0.6 | 0.0 | 0.7 | 0.3 | 1.9 | 0.8 | 0.0 | 46 |
| Illness | 8.4 | 4.2 | 0.0 | 4.9 | 1.5 | 4.8 | 5.7 | 0.0 | 293 |
| Accident at Work | 6.2 | 0.9 | 2.9 | 2.4 | 7.9 | 17.1 | 10.7 | 0.0 | 149 |
| Other | 0.6 | 1.3 | 4.4 | 1.8 | 7.6 | 7.6 | 10.7 | 0.0 | 135 |
| Missing | 23.5 | 21.0 | 13.2 | 28.8 | 24.2 | 23.8 | 16.4 | 100.0 | 1900 |
| *Count* | *179* | *4,385* | *68* | *1,564* | *343* | *105* | *122* | *351* | *7,117* |

| | **Congenital** | **Traffic Accident** | **Weapon Injury** | **Animal Bite** | **Illness** | **Accident at Work** | **Other** | **Missing** | **Count** |
|---|---|---|---|---|---|---|---|---|---|
| Partial Foot | 16.3 | 3.1 | 1.5 | 10.9 | 5.1 | 7.4 | 0.7 | 2.2 | *179* |
| Transtibial | 52.2 | 42.5 | 71.9 | 56.5 | 63.1 | 27.5 | 41.5 | 48.4 | *4385* |
| Knee Disarticulation | 3.5 | 2.5 | 0.9 | 0.0 | 0.0 | 1.3 | 2.2 | 0.5 | *68* |
| Transfemoral | 9.9 | 45.8 | 19.3 | 23.9 | 25.9 | 24.8 | 20.7 | 23.7 | *1564* |
| Transradial | 7.4 | 2.2 | 4.4 | 2.2 | 1.7 | 18.1 | 19.3 | 4.4 | *343* |
| Transhumeral | 3.5 | 2.2 | 0.8 | 4.4 | 1.7 | 12.1 | 5.9 | 1.3 | *105* |
| Other | 7.4 | 1.7 | 1.2 | 2.2 | 2.4 | 8.7 | 9.6 | 1.1 | *122* |
| Missing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 18.5 | *351* |
| *Count* | *203* | *358* | *4,033* | *46* | *293* | *149* | *135* | *1,900* | *7,117* |

*Table 3: Data behind Figure 2: percentage of clients grouped by age at amputation or limb absence, for each reason for limb absence, for all clients (n=3541). Percentages are calculated in column categories.*

| Cause | Congenital | Traffic | Weapon | Animal | Illness | Accident at Work | Other | Missing | Count |
|---|---|---|---|---|---|---|---|---|---|
| 0-9 | 76.9 | 7.0 | 1.9 | 21.7 | 3.1 | 14.1 | 6.7 | 2.3 | 349 |
| 10-19 | 3.9 | 17.9 | 15.2 | 26.1 | 5.8 | 23.5 | 17.8 | 11.3 | 986 |
| 20-29 | 1.5 | 34.6 | 53.0 | 23.9 | 11.3 | 28.2 | 26.7 | 38.7 | 3123 |
| 30-39 | 2.0 | 15.1 | 22.0 | 13.0 | 11.3 | 18.1 | 8.2 | 15.4 | 1317 |
| 40-49 | 0.0 | 10.6 | 5.6 | 4.4 | 20.8 | 7.4 | 12.6 | 5.2 | 451 |
| 50+ | 1.0 | 12.9 | 1.9 | 10.9 | 45.4 | 6.7 | 12.6 | 6.2 | 406 |
| Missing | 14.8 | 2.0 | 0.5 | 0.0 | 2.4 | 2.0 | 15.6 | 21.0 | 485 |
| *Count* | *203* | *358* | *4,033* | *46* | *293* | *149* | *135* | *1,900* | *7,117* |

*Table 4: Data behind Figure 3: percentage of types of prosthetic device supplied, as a proxy for level of limb absence, for the clients' year of amputation or absence grouped by decades, for all clients. Percentages are calculated in column categories.*

| | **Pre-1970** | **1970-1979** | **1980-1989** | **1990-1999** | **2000-2009** | **2010 – 2019** | **Missing** | **Count** |
|---|---|---|---|---|---|---|---|---|
| Partial Foot | 12.5 | 6.3 | 1.7 | 2.1 | 3.7 | 3.9 | 3.6 | 179 |
| Transtibial | 51.6 | 52.6 | 70.3 | 66.3 | 55.5 | 46.7 | 12.3 | 4385 |
| Knee Disarticulation | 4.7 | 2.9 | 0.7 | 0.7 | 1.3 | 2.9 | 0.2 | 68 |
| Transfemoral | 12.5 | 20.2 | 21.2 | 24.1 | 27.0 | 31.0 | 4.6 | 1564 |
| Transradial | 9.4 | 9.6 | 4.2 | 4.2 | 7.2 | 7.3 | 3.1 | 343 |
| Transhumeral | 3.1 | 3.3 | 0.9 | 1.3 | 2.5 | 4.1 | 0.6 | 105 |
| Other | 6.3 | 5.2 | 1.1 | 1.3 | 2.7 | 4.1 | 2.1 | 122 |
| Missing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 73.4 | 351 |
| *Count* | *64* | *272* | *2,904* | *2,390* | *596* | *413* | *478* | *7,117* |

*Table 5: Data behind Figure 4:percentage of reason for limb amputation or absence for the clients' year of amputation or absence grouped by decades, for all clients. Percentages are calculated in column categories.*

| | **Pre 1970** | **1970-1979** | **1980-1989** | **1990-1999** | **2000-2009** | **2010 – 2019** | **Missing** | **Count** |
|---|---|---|---|---|---|---|---|---|
| **Congenital** | 46.9 | 7.4 | 1.8 | 1.7 | 4.0 | 2.2 | 5.4 | 203 |
| **Traffic Accident** | 4.7 | 1.5 | 0.8 | 3.3 | 21.8 | 27.6 | 1.1 | 358 |
| **Weapon Injury** | 26.6 | 61.7 | 72.1 | 67.2 | 17.0 | 7.5 | 3.8 | 4033 |
| **Animal Bite** | 3.1 | 0.7 | 0.07 | 0.3 | 4.4 | 1.5 | 0.0 | 46 |
| **Illness** | 1.6 | 3.3 | 0.5 | 2.4 | 20.3 | 20.3 | 1.5 | 293 |
| **Accident at Work** | 1.6 | 1.5 | 0.6 | 2.0 | 7.9 | 7.5 | 0.6 | 149 |
| **Other** | 3.1 | 1.1 | 0.2 | 1.0 | 6.4 | 9.9 | 4.4 | 135 |
| **Missing** | 12.5 | 22.8 | 24 | 22.1 | 18.3 | 23.5 | 83.3 | 1900 |
| ***Count*** | *64* | *272* | *2,904* | *2,390* | *596* | *413* | *478* | *7,117* |

*Table 6: Data behind Figure 5: percentage of the type of prosthetic device supplied, as a proxy for level of limb absence, for the clients' current age grouped by decades, for clients who were active at the end of 2019 and at the end of 2005. Percentages are calculated in column categories.*

| **End of 2019:** | **0-9** | **10-19** | **20-29** | **30-39** | **40-49** | **50+** | **Missing** | **Overall** | **Count** |
|---|---|---|---|---|---|---|---|---|---|
| Partial Foot | 17.7 | 7.1 | 6.9 | 2.8 | 0.4 | 2.0 | 0.0 | 2.2 | 62 |
| Transtibial | 35.3 | 40.0 | 34.7 | 51.8 | 70.4 | 75.7 | 0.0 | 63.5 | 1,791 |
| Knee Disarticulation | 5.9 | 2.9 | 3.5 | 3.2 | 1.2 | 0.9 | 0.0 | 1.3 | 36 |
| Transfemoral | 5.9 | 22.9 | 33.0 | 31.6 | 22.9 | 17.5 | 0.0 | 19.4 | 547 |
| Transradial | 17.7 | 8.6 | 11.6 | 5.3 | 3.1 | 2.1 | 0.0 | 3.2 | 89 |
| Transhumeral | 11.8 | 4.3 | 5.8 | 2.4 | 1.2 | 0.6 | 0.0 | 1.3 | 36 |
| Other | 5.9 | 14.3 | 4.6 | 2.8 | 0.8 | 1.2 | 0.0 | 1.7 | 49 |
| Missing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 7.5 | 210 |
| *Count* | *17* | *70* | *173* | *247* | *489* | *1,615* | *209* | .. | *2,820* |

| **End of 2005:** | **0-9** | **10-19** | **20-29** | **30-39** | **40-49** | **50+** | **Missing** | **Overall** | **Count** |
|---|---|---|---|---|---|---|---|---|---|
| Partial Foot | 17.2 | 8.1 | 1.6 | 1.4 | 2.2 | 2.4 | 0.0 | 2.1 | 108 |
| Transtibial | 58.6 | 48.3 | 60.6 | 69.3 | 72.2 | 71.7 | 0.0 | 68.6 | 3,546 |
| Knee Disarticulation | 0.0 | 2.0 | 1.0 | 0.8 | 0.8 | 0.9 | 0.0 | 0.9 | 46 |
| Transfemoral | 10.3 | 18.1 | 28.6 | 24.2 | 19.6 | 19.1 | 0.0 | 22.4 | 1,157 |
| Transradial | 6.9 | 11.4 | 5.3 | 3.0 | 3.1 | 3.3 | 0.0 | 3.6 | 188 |
| Transhumeral | 6.9 | 6.7 | 1.3 | 0.7 | 0.6 | 0.9 | 0.0 | 1.0 | 52 |
| Other | 0.0 | 5.4 | 1.5 | 0.5 | 1.4 | 1.5 | 0.0 | 1.2 | 60 |
| Missing | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 100.0 | 0.3 | 13 |
| *Count* | *29* | *149* | *678* | *2,015* | *1,623* | *665* | *11* | .. | *5,170* |