

Cantonal Tuberculosis Activities in 2020

Data of the Tuberculosis Competence Centre of the Swiss Lung Association

Contracting authority	FOPH
Project responsibility	SLA Tuberculosis Competence Centre
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Version	final

List of changes

Date	Version	Author
05.08.2021	Draft produced with report 2019	SLA/NAG
06.08.2021	Draft adapted with new CI/CD	SLA/NAG
24.08.2021	Graphics from online survey adapted	SLA/NAG
21.09.2021	Online survey section adapted	SLA/NAG
22.11.2021	Fig. 1-3 adapted with updated data VD	SLA/NAG
24.11.2021	Insertion of all graphics	SLA/NAG
24.11.2021	Revision of texts	SLA/NAG
03.12.2021	Adaptations after internal proofreading, glossary	SLA/NAG
08.12.2021	Adaptations after feedback, Otto Schoch (OS)	SLA/NAG
23.12.2021	Adaptations after feedback, FOPH	SLA/NAG
02.03.2022	Translation to English	Frenzisgroup SLA/NAG

Glossary

Abbreviation/term	Meaning
FOPH	Federal Office of Public Health
FAC	Federal Asylum Centre
COVID-19	Disease caused by infection with Sars-CoV-2
DOT	Directly observed therapy
IGRA	Interferon Gamma Release Assay
IP	Index patient
KAZA	Cantonal medical office
CP	Contact person
SLA	Swiss Lung Association
LTBI	Latent tuberculosis infection
MDR-TB	Multidrug resistant tuberculosis
PDMS	Patient data management system
SEM	State Secretariat for Migration
TB	Tuberculosis
TST/TT	Mantoux tuberculin skin test
CI	Contact investigation

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1 Introduction

Tuberculosis is a transmissible bacterial disease, notifiable in Switzerland. As such, a case of tuberculosis not only involves the person who is sick (index patient or IP) but also the network of persons with whom the person has been in close contact. For this reason, a case of tuberculosis also has consequences for public health, which must be safeguarded by the Confederation.

When referring to contact persons (CPs) of an IP who have been infected with the tuberculosis bacterium, we are talking about a latent tuberculosis infection (LTBI). These persons are not actually ill, but only infected. The contact investigation (CI) resulting from this situation aims to identify the contact persons who are infected, and provide them with counselling and appropriate preventative treatment. In conducting a CI two different tests may be used to test CPs – the tuberculin skin test (TST) or the IGRA (interferon gamma release assay or, more commonly, blood test). These are described in more detail in chapter 4.

Due to their active tuberculosis, IPs receive treatment in accordance with the guidelines of the Manual of Tuberculosis. In some cases IPs are also prescribed directly observed therapy (DOT). This is examined in more detail in chapter 5.

In Switzerland, the cantons are responsible for these public health measures. All cantons, with the exception of Basel-Stadt and Bern (no longer since 2015 for the latter), delegate the relevant measures to the respective cantonal Lung Association. The key figures regarding the resources of the TB specialist services that have been agreed with the canton can be found in chapter 3.

The FOPH supports the Swiss Lung Association – mandated to run the Tuberculosis Competence Centre – in developing guidelines and coordinating the activities of the cantonal associations. The data on these activities of the cantonal TB specialist services can be found in this report. Delivery of the annual report on the activities of the TB specialist services is part of the mandate agreement between the FOPH and SLA. In addition, the data are presented to the cantonal associations under continuing training programmes organised throughout Switzerland and, in spring, to the annual symposium for tuberculosis, which is targeted to an international audience. However, the data are also designed to serve as instruments of orientation and guidance to the principal contracting authorities – the cantons.

Since January 1st 2016, the FOPH has requested that the cantonal medical officers provide the treatment results of tuberculosis patients upon concluding treatment. Since then, analysis of these data has been the responsibility of the FOPH and is therefore not included in this report.

2 Methodology

The data on tuberculosis cases (including information on the IPs, diagnostics, bacteriology and treatment) and on the contact investigations (information on contact persons, the place of contact and type of relationship to the tuberculosis case, as well as the results of testing) are generally recorded in the patient data management systems (PDMS). A pleasing new development was noted in 2020: contacts who have contracted TB can also be analyzed separately (see Table 4).

What data can be collected individually by the TB specialist services of the cantonal Lung Associations depends on the documents that are provided by the respective cantonal association (e.g. laboratory notifications and results) and on the mandate agreement between the cantonal offices of public health and the cantonal Lung Association governing the mandates (cf. chapter 2, Fig. 5).

The data from the RespiGO patient management system (concerning the cantons of UR, SO, BL, SG, AI, AR, AG, GR, GL, ZG, LU, SZ, NW, OW, VS, JU, TI) have been analysed via an Excel file (combination of various tables exported from RespiGO). For the IPs contained there, the current data structure did not permit a breakdown indicating whether the cantons of LU, SZ, ZG, OW, NW and BL had also tested contacts for other cantons (these data were provided only in a consolidated manner for the Lung Association of Central

Switzerland and the Lung Association of Aargau). This is to be taken into account in interpreting the data in Tables 1-3.

The data of the canton of Zurich (PulmoCare data management system) was extracted directly from the Business Intelligence tool.

The data of the cantons using a different PDMS (namely the cantons of NE, VD, TG, SH, FR, GE) are requested annually by means of an Excel spreadsheet and integrated manually in the overall evaluation incorporating all cantons. This also applies to the cantons of Basel-Stadt and Bern, where the work on combatting tuberculosis is not carried out by the cantonal Lung Associations.

Where necessary, incorrect or inconsistent data input is checked for plausibility and manually corrected (e.g. missing canton abbreviations in cases where the number of TB cases was clear and the canton was visible). According to the information in the system, some of the IPs could not be attributed to any canton or anywhere abroad and thus were not included in the analysis. Where possible, obligatory fields in the PDMSs ensured that data entry was controlled to allow as few input errors as possible. However, this is not the case with all PDMS.

All IPs (pulmonary or extrapulmonary) notified in Switzerland with at least one contact person tested are defined as IPs with the contact investigation having been carried out.

Depending on the respective chart, the analysis of the data refers to different groups of IPs – all the TB cases notified to the FOPH (371), TB cases notified to the TB specialist services (348), TB cases with a CI (197), or the subcategories pulmonary / extrapulmonary TB cases (246 and 99 respectively). The total n and the corresponding group of IPs are shown in the title of each chart.

The data presented below relate to the cases of tuberculosis between 2016 and 2020. As agreed by contract, the Swiss Lung Association supplies with the present report consolidated data to the FOPH on the results of the activities of the associations by canton [DOTs, CIs, treatments of latent tuberculosis infection (LTBI)], as well as further supplementary data on the work on combatting tuberculosis in Switzerland, which offer added value for readers of this report.

3 Key figures on the work of the tuberculosis specialist services in combatting tuberculosis

Every year an online survey is sent to all cantons to record additional data on the function and duties of the TB specialist services, which are not shown in the PDMS. Since the last survey in 2019, there have been no notable structural or procedural changes. According to information available as of November 2021, the discussion mentioned in the last report between the cantonal Lung Association of Geneva, the Hôpital Universitaire de Genève (HUG) and the cantonal medical service to redefine the responsibilities of all those involved in the work of combatting tuberculosis was to be completed by the end of 2021.

Three tuberculosis specialist services (TB specialist services) have concluded contracts with multiple cantonal medical offices. They are: the Lung Association of AG (also with BL), the Lung Association of SG (also with AR and AI), and the Lung Association of Central Switzerland (LU, OW, NW, SZ and ZG).

The financial indicators shown in Figures 1–4 were evaluated by the cantonal Lung Associations connected to the system (all except GE) via the financial data system. The TB specialist services (excluding the cantons of BS, BE and GE, for which no data are available for Fig. 1–4 for the reasons mentioned above) carried out approx. 9,945 hours of work in 2020. This corresponds to a work percentage of 538% or 5.4 FTEs (9,945/1,850 calculated as full-time).

In 2020, the full costs of all TB specialist services amounted to approx. CHF 1.4 million, of which approx. CHF 0.5 million accounted for direct personnel costs and CHF 0.1 million for the provision of services to third parties. The remaining CHF 0.8 million is distributed in infrastructure charges, material costs, overheads and other areas. The public sector (service contracts) covered around 78% of the total costs. The negative balance was covered by other service providers such as employers for screening persons at risk and funds of the cantonal

Lung Associations. However, the cost recovery ratio (shown here as DB4 [*Deckungsbeitrag 4*]) varies greatly from canton to canton (Fig. 1). Three TB specialist services show a positive DB4, namely the cantons of Fribourg, Neuchâtel and Thurgau. The cantons of Ticino and Uri show CHF 0 revenue this year, meaning the DB4 there is -100% because no expenses were covered by revenue. The remaining TB specialist services show a negative DB4 and a cost recovery ratio of -2% to -92%. The spread between the cantons is thus correspondingly high. It is interesting to note that the DB4 does not necessarily correlate with the number of TB cases or the size of the TB specialist service. The canton of ZH, a very large specialist service, has a marginally negative DB4, whilst for example the cantons of GL or GR, rather small specialist services, show a significantly larger negative figure.

Fig. 1: Revenue and DB4 in % of total expenditure

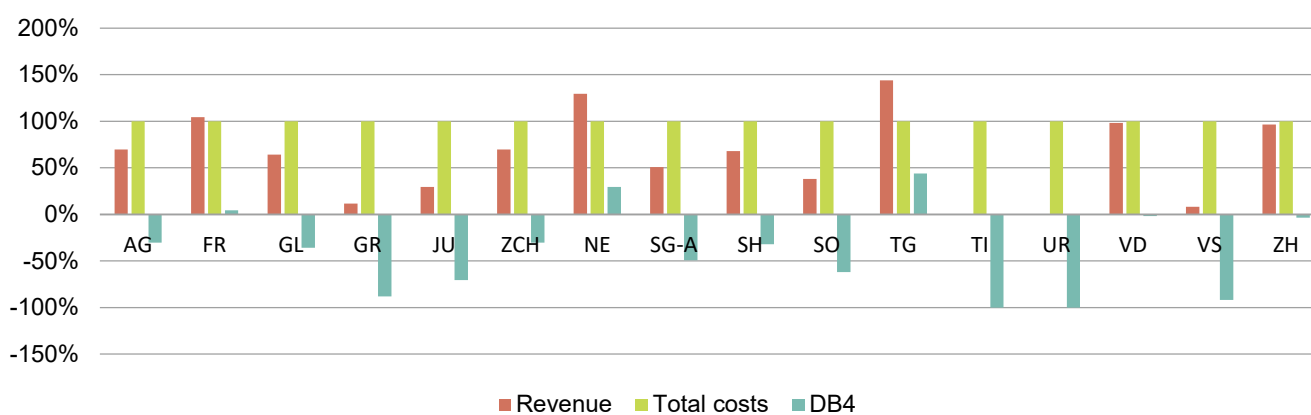
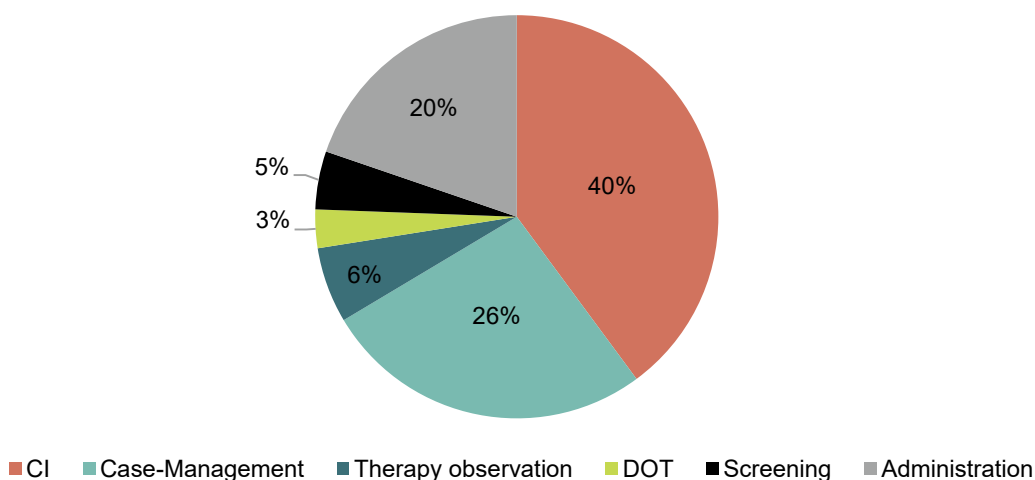


Figure 2 shows the percentage breakdown of time spent on different activities. The largest percentages are exhibited by the contact investigations (-4% compared to the previous year) and case management (-1%). The administrative activities have increased slightly compared to the previous year (+6%).

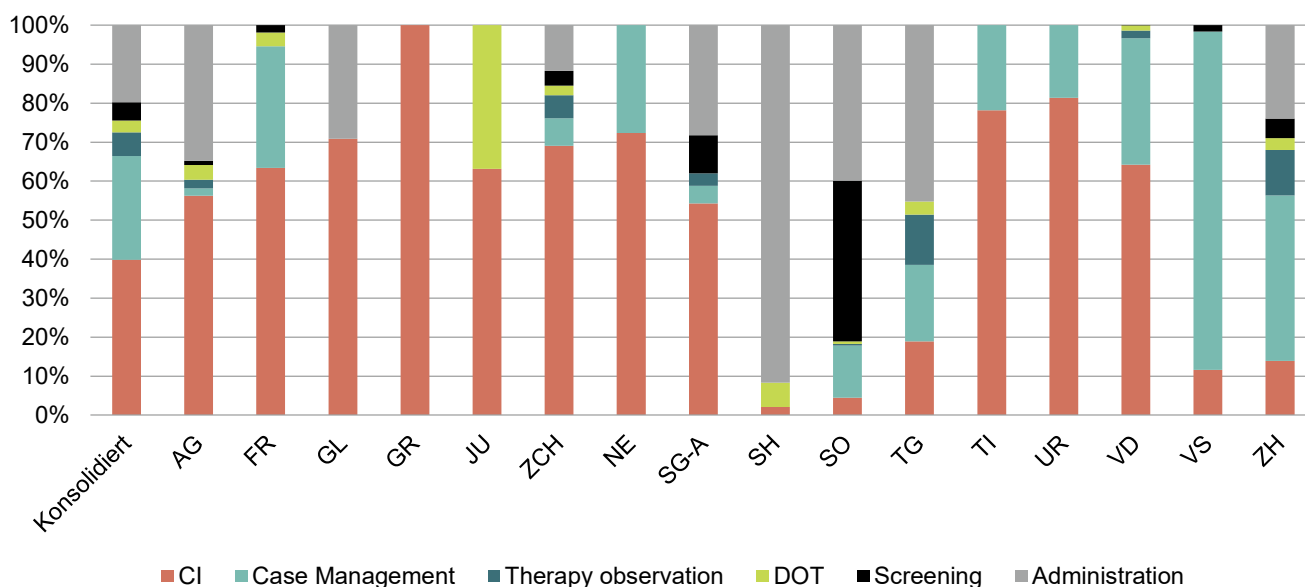
Fig. 2: Activities in % of total working time



The ratios vary from canton to canton, as Figure 3 shows. The services can be assumed to not have been recorded and/or carried out in the same way in each canton on account of the respective contract with the cantonal medical office and the services agreed in it. For example, activities relating to monitoring treatment may

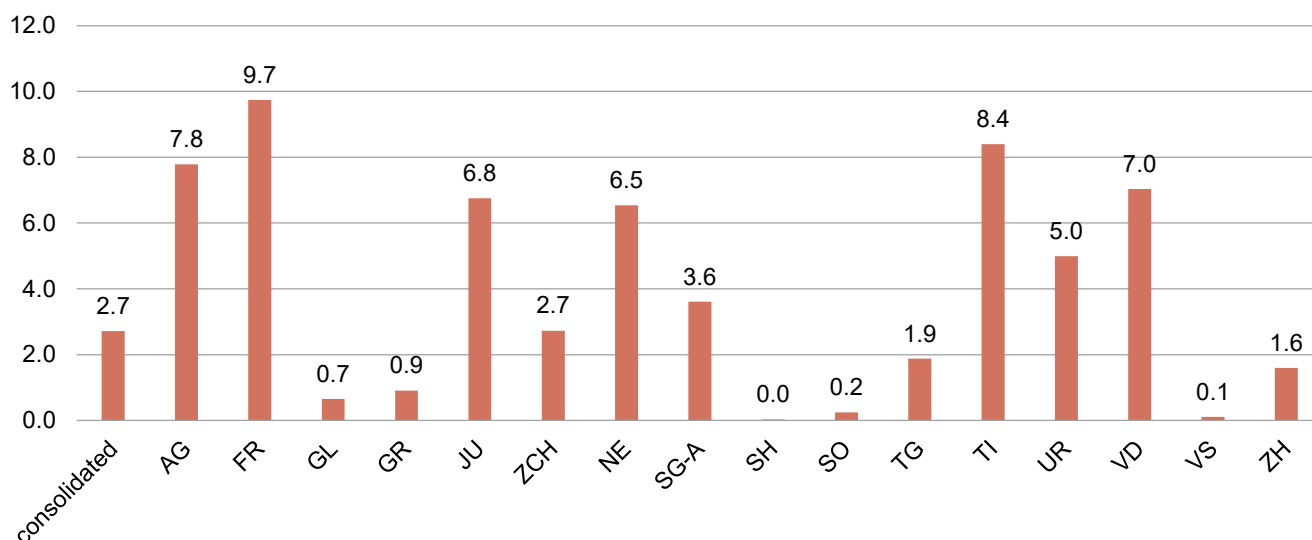
have been recorded under case management or CI. This also applies to the recording of administrative activities, which are shown separately by only eight TB specialist services (AG, GL, SH, SO, TG, ZCH, SG-A and ZH).

Fig. 3: Activities in % of total working time



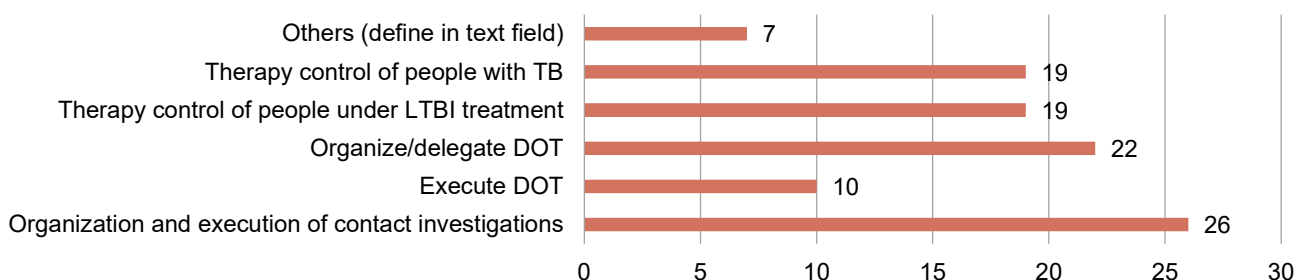
If the time invested per CI is considered, this varies between 1 and 128 hours. Of course, this depends on the scope of the CI: there are examples of CIs that were carried out with only one person tested and others with over 100 persons. In other words, the time invested per CI depends on the way that the respective canton records the working time per cost centre.

However, if the time invested per person tested is compared (Fig. 4), considerable differences emerge here as well. This might be due to the fact that certain TB specialist services carry out testing themselves whereas others have the contact persons tested by their general practitioner, or it might be due to whether they follow-up on LTBI treatment as well as how precisely they collect and record the results of treatment.

Fig. 4: CI – average hours spent per person tested

In July 2021, the Tuberculosis Competence Centre of the Swiss Lung Association collected information from all cantonal TB specialist services by means of an online survey for the purpose of completing the present report. Every canton and demicanton is counted as a TB specialist service because for every canton and demicanton there is a contractual agreement between the cantonal medical office and a TB specialist service (with the exception of the cantons of BE and BS).

Therefore, the cantonal offices of public health have assigned all TB specialist services (with the exception of the Lung Associations of Basel and Bern) the responsibility for carrying out CIs (Fig. 5) as an integral part of their public service mandate. In the canton of BS, the cantonal medical office provides the relevant services on its own. In the canton of BE, the Inselspital has taken charge of this responsibility. All 26 TB specialist services have indicated that they have been mandated to organize and conduct CIs. 22 organize or delegate DOT (directly observed therapy) for performance by an external partner, only 10 of the TB specialist services carry this out themselves. This is generally, although not exclusively, the case in the larger TB specialist services. "Other" refers mostly to screenings in large companies or schools that are additionally offered by some TB specialist services.

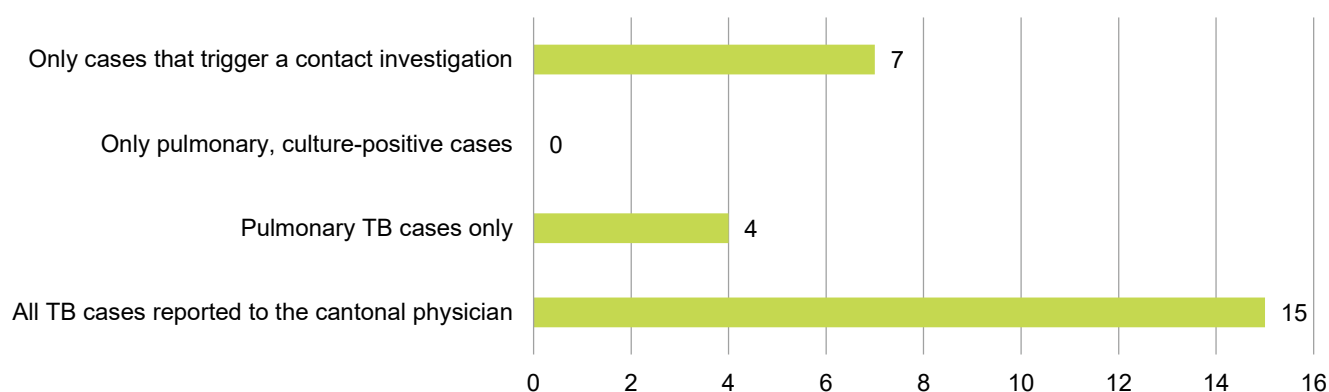
Fig. 5: Responsibilities of the TB specialist services on behalf of the cantonal medical offices

The responsibilities have changed in several areas compared with the 2019 survey. A new aspect is that three additional TB specialist services report carrying out DOT themselves compared with the previous year. Likewise, the number of TB specialist services that assume responsibility for monitoring LTBI treatment increased

by 3 to 19. The number of TB specialist services supporting patients with active TB remained the same compared with the previous year.

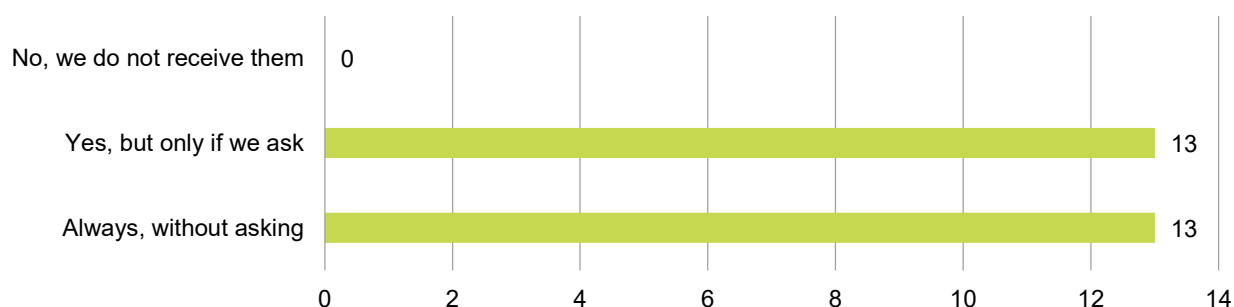
Figure 6 shows the TB cases of which the TB specialist services were notified by the cantonal medical offices. In seven cantons (in 2019: 9) only the TB cases that triggered a contact investigation were notified; a new aspect was that in four cantons (in 2019: 2) only the cases of pulmonary tuberculosis were notified. It is gratifying to see that in 15 cantons all TB cases known to the cantonal medical offices were also notified. This suggests efficient collaboration among the institutions and ensures a regular flow of information.

Fig. 6: Which TB cases are reported to you by the cantonal medical service?

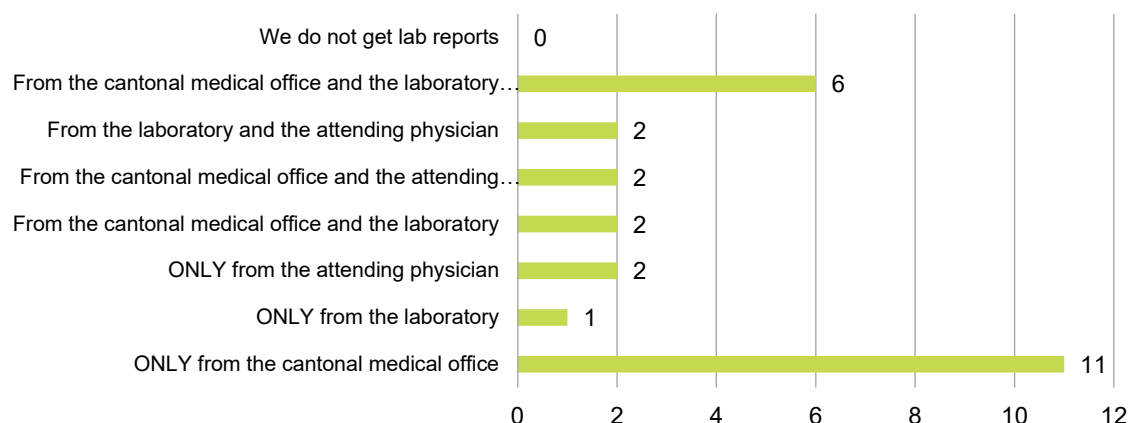


The TB specialist services receive, for the notified cases of TB, the laboratory notifications from the relevant laboratories or from the cantonal medical services (Fig. 7). 50% of all TB specialist services receive these without asking, the remainder only on request. This process can no doubt be optimised further in order to ensure that the laboratory notifications reach the TB specialist services by using as few resources as possible.

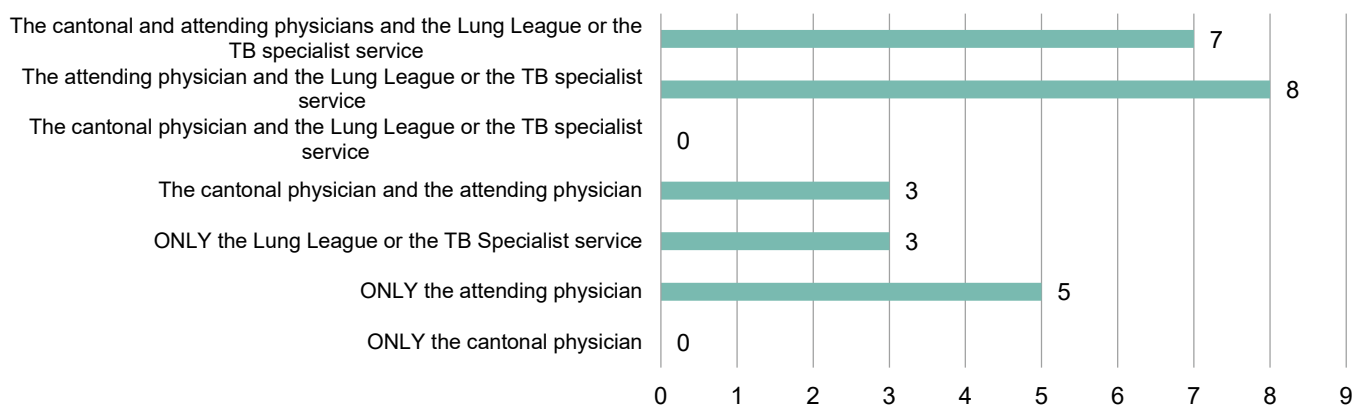
Fig. 7: Do you have the laboratory reports for the TB cases reported to you by the cantonal medical service?



Compared with the previous surveys, the source of the laboratory notifications received by the TB specialist services was considered in a more differentiated manner (Fig. 8). The majority of the specialist services receive laboratory notifications directly from the cantonal medical office responsible. Six receive laboratory notifications from all three possible partners. One positive aspect is that no TB specialist service reported not receiving any laboratory notifications.

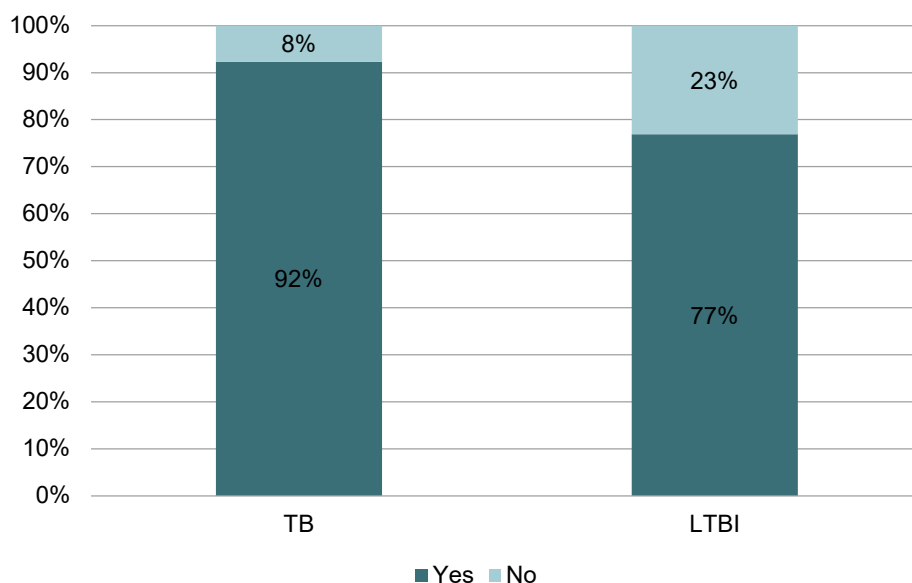
Fig. 8: Source of TB laboratory results

When it comes to the decision to carry out DOT, it is of interest who is involved / who takes the decision. As shown in Figure 5, 22 TB specialist services are authorised by the cantonal medical officer to organise and carry out DOT. The vast majority of decisions are taken by the attending physician in concert with the TB specialist service (8) or by all three parties together (7). It is notable that the decision is taken solely by the TB specialist service in three cantons.

Fig. 9: Who decides to initiate DOT

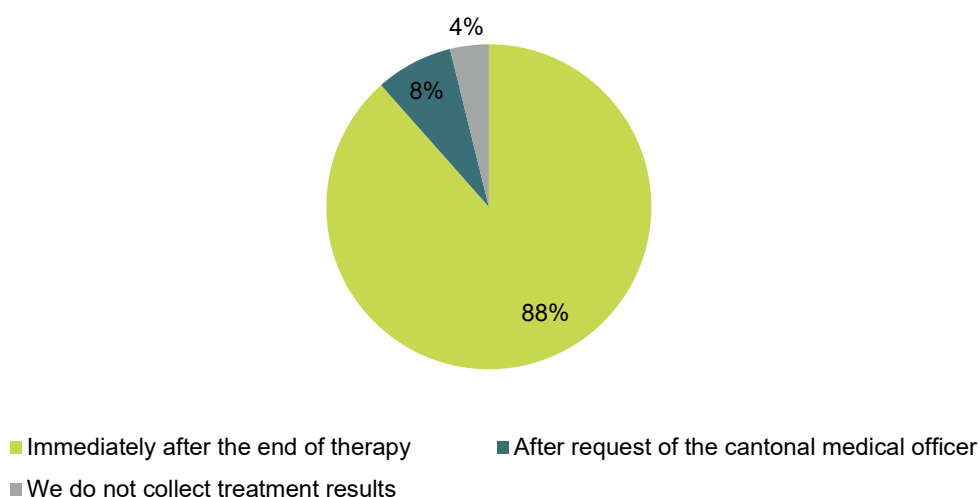
For the first time the online survey also collected data on the outcome of LTBI treatment and TB treatment. All TB treatments must be notified to the FOPH. Receiving the results of TB treatment through the cantonal medical offices, the FOPH is tasked with analysing them. The results of LTBI treatment need not be notified and there are no analyses available in this respect. In some cantons the collection of the treatment results obtained by the treating physician is delegated to the TB specialist services. In 2020, 92% of all TB specialist services collected the TB treatment results, only 8% reported that they did not do this. As to the results of LTBI treatment, 77% of the TB specialist services collected the results in each case compared to 23% that did not.

Fig.10: Results of TB/LTBI treatment obtained



It was also recorded when the TB specialist services collected the treatment results (for TB and LTBI treatment). In more than ¾ of all cases, this took place directly upon the conclusion of treatment. This is reasonable since a case cannot be closed in the PDMS until all laboratory results and the results of treatment are available.

Fig. 11: Time at which results of treatment were obtained



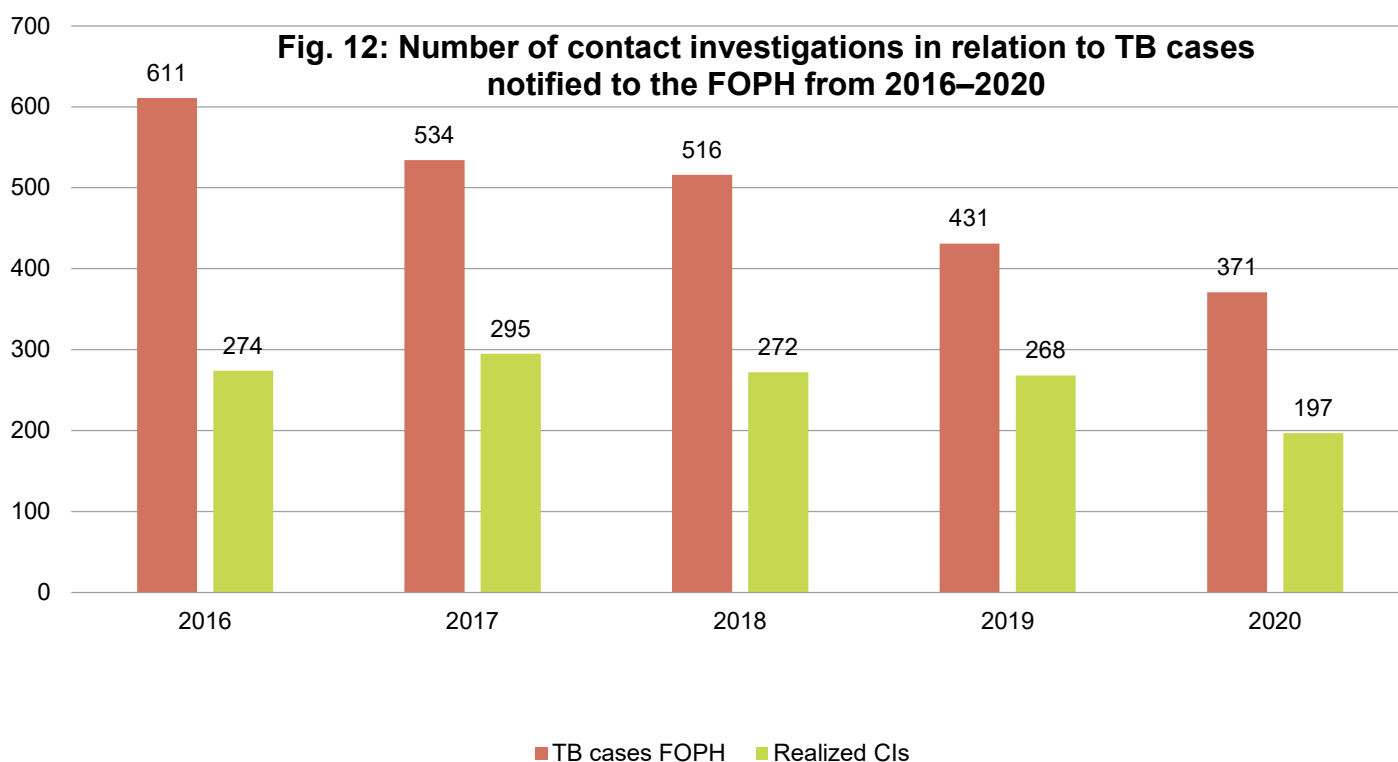
In conclusion, the information from the online survey show that the collaboration between the cantonal TB specialist services, the cantonal medical offices and the attending physicians functions well. Responsibilities are clearly defined and treatments, as well as CIs and DOT, are jointly coordinated and carried out. The Manual of Tuberculosis, published online, is updated annually: it conforms with the processes and guidelines of the WHO and the FOPH for the optimal support and treatment of TB patients and their contacts. The response rate of 100% to the online survey is also gratifying. This shows that the Tuberculosis Competence Centre likewise demonstrates a good level of collaboration with the cantonal TB specialist services and that the flow of information is ensured.

4 Results and analysis of contact investigations

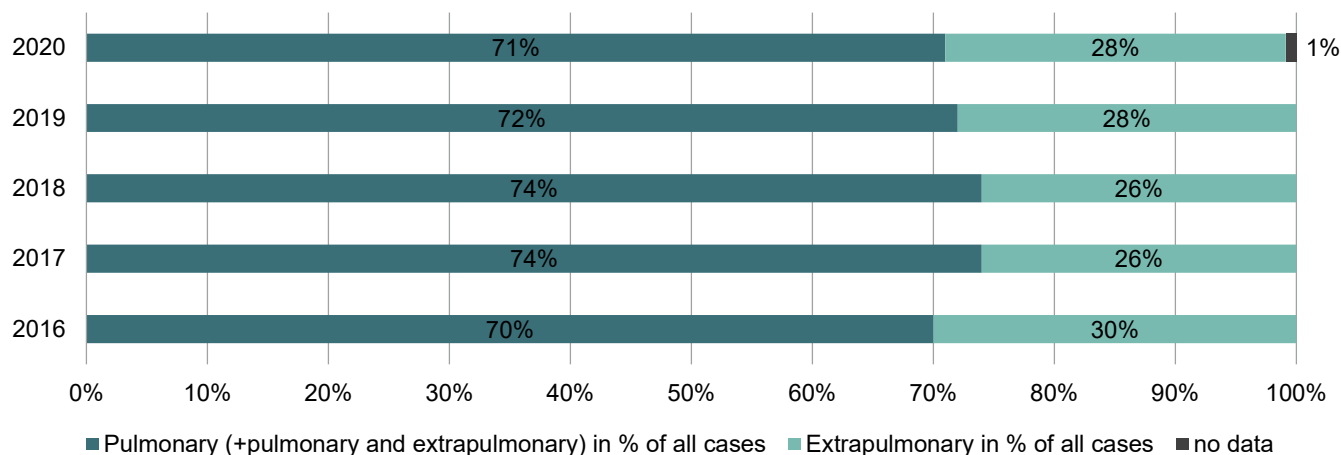
As already mentioned in chapters 1 and 3 above, in Switzerland a contact investigation (CI) is carried out in cases of infectious tuberculosis, conforming to the guidelines of the Manual of Tuberculosis. A contact investigation is defined as at least one contact person of an IP having been tested and recorded in the PDMS. The contact investigation as such includes all the resources that a TB specialist service provides for a specific case of TB (administrative duties, tests, counselling of contacts and index patients, other services).

4.1 Tuberculosis cases that resulted in a contact investigation (CI)

Of a total of 371 TB cases notified to the FOPH in 2020 in Switzerland (excluding the cases in the Principality of Liechtenstein or non-classified cases, as of 8 December 2021), the TB specialist services were mandated to carry out a contact investigation for 197 (53.1%) of them [previous year: 62.2%] (Fig. 12). A contact investigation was counted as such if at least one contact had been tested and this test was recorded in the system. From 2016 to 2020, the percentage varied between 43.4% (in 2015) and 62.2% (in 2019).

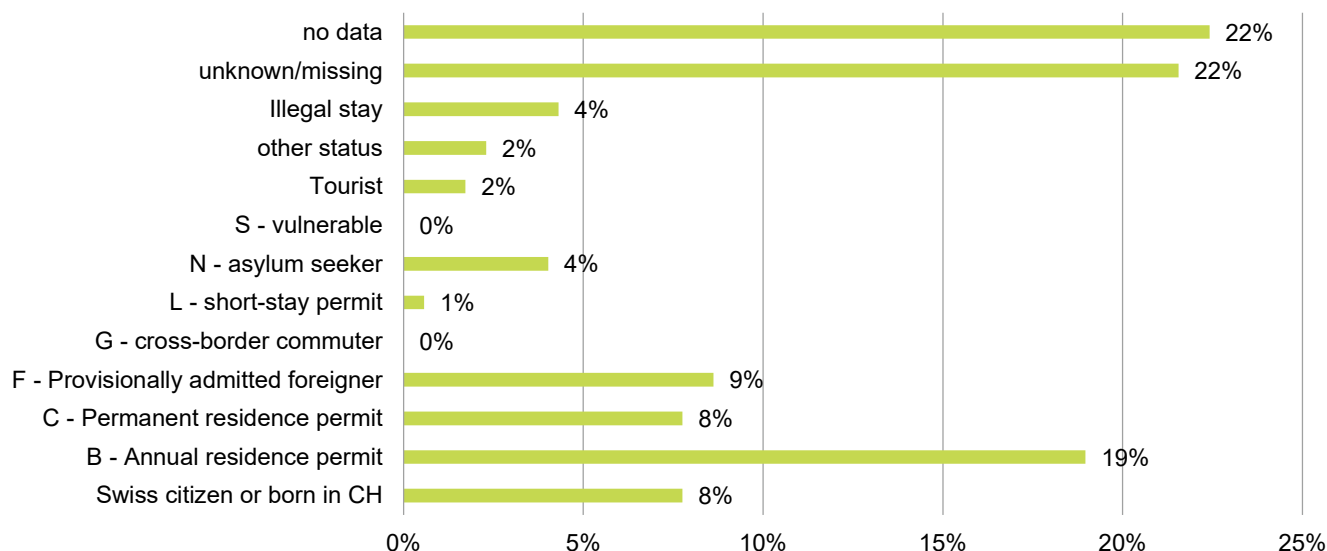


Pulmonary cases are all cases of pulmonary tuberculosis that are recorded as “pulmonary” or “pulmonary + extrapulmonary”. Cases of purely extrapulmonary TB are not included in this group. TB cases generally result in a CI because only they are classed as potentially contagious. In Figure 13 the percentages refer to all TB cases known to the TB specialist services (n=348) and not to all TB cases notified to the FOPH (n=371) or cases with a CI (n=197). Thus, in 2020, 71% of the TB cases notified to the TB specialist services were recorded as “pulmonary” (or “pulmonary + extrapulmonary”), of which 28% as purely “extrapulmonary”. In three cases (1%) no classification into these two categories was made in the system. These cases are shown separately in the chart for 2020.

Fig. 13: Percentage of pulmonary/extrapulmonary cases

4.2 Residence status of index cases

Among the IPs that were notified to the TB specialist services in 2020, the residence status is unknown or outstanding in the system for 43% of them. The remaining cases are divided as shown in Figure 14. In Switzerland, the residence status is recorded on a voluntary basis.

Fig. 14: Residence status of index cases (n=348)

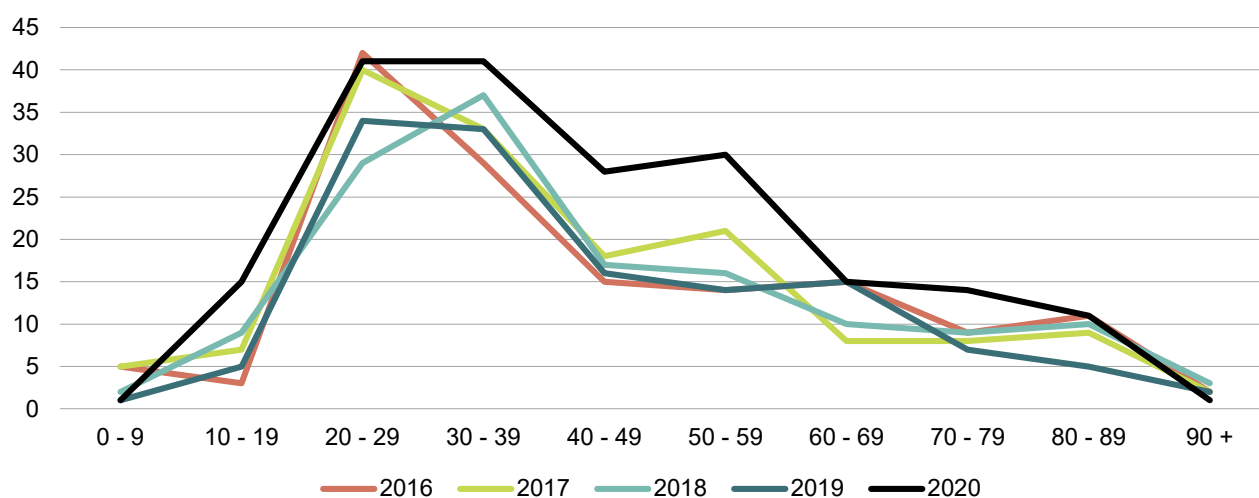
Note on Figure 14:

The category "no data" includes all IPs for whom no information on their Aliens Police status was recorded in the PDMS. The category "unknown/missing" contains all index patients for whom their Aliens Police status is not known by the TB specialist services. Based on current recording practice, it may be assumed that no information is frequently recorded in the system for IPs of Swiss origin. This explains the shift of data compared to 2019 (2019: "Swiss and born in Switzerland" category: 27%).

As shown in Figure 14, the topic of tuberculosis in Switzerland predominantly concerns people with a migrant background or people living in federal asylum centres (FAC). Consequently, coordination and collaboration with the State Secretariat for Migration (SEM) is of central importance in order to be able to quickly identify and treat cases of tuberculosis in the asylum system. Until 2019, staff members at federal asylum centres were regularly provided with onsite training by the Tuberculosis Competence Centre on identifying and treating tuberculosis. From 2022, a new eLearning programme will be made available free of charge to all FAC staff and replace the previous in-person events.

4.3 Age distribution of index cases with CIs

Fig. 15: Age distribution of index cases with CIs per year and category (n=197)



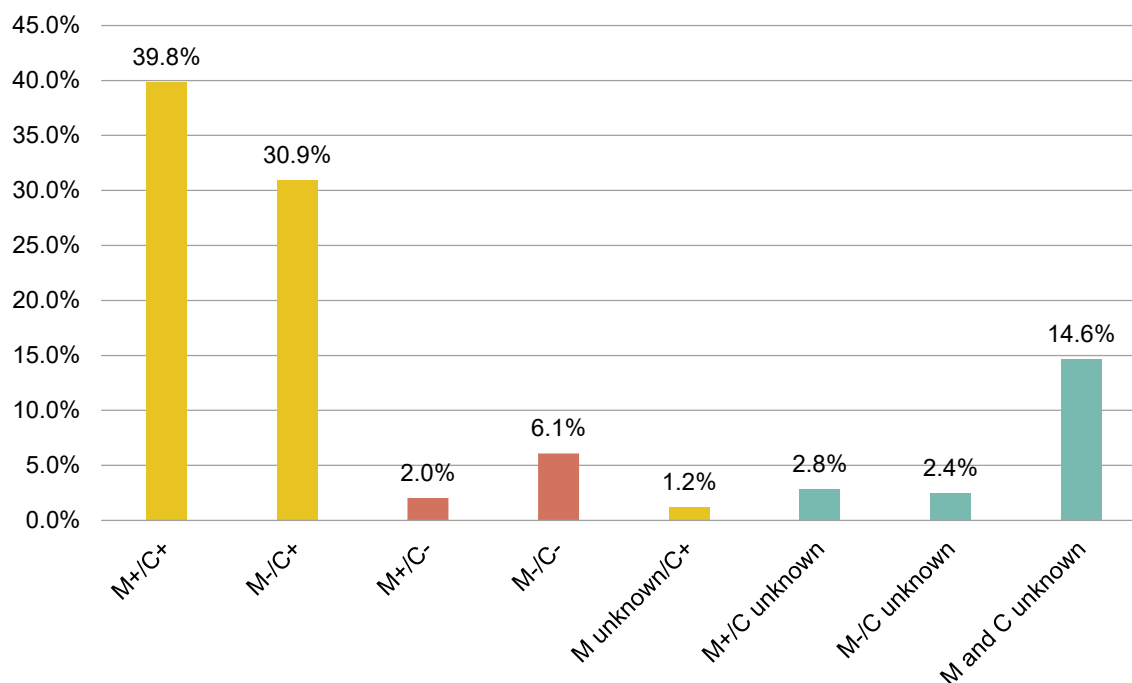
The age distribution of cases that triggered a contact investigation and were recorded in the PDMS shows, as in the 2019 report, a majority of young adults aged between 20 and 50 (Fig. 15). For 2020, data were available for more cantons than in previous years, explaining the increased number of cases in the chart. However, the age distribution remains unchanged compared with previous years. The majority of cases of tuberculosis in Switzerland – as in other western countries – occur in young people on account of tuberculosis tending to be a disease of young adulthood and because of the over-representation of this age group in the migrant population from countries with an increased prevalence of tuberculosis. The proportion of tuberculosis cases in older persons is correspondingly smaller.

However, cases may be discovered very late at any adult age and be contagious for contact persons during a longer period. Children under the age of ten rarely have a contagious form of tuberculosis. If children below age ten constitute index cases in a contact investigation or have contracted tuberculosis, a (generally adult) source of spread is usually sought among contacts (centripetal contact investigation). It is notable that the curve of TB cases flattens at age 80 and older. The underlying hypothesis for this is that these individuals (born in the 1940s) were not so frequently infected in childhood and developed tuberculosis in old age, as was still the case one generation earlier (year of birth: 1910-1940).

4.4 Bacteriological status of pulmonary cases

In 2020, the TB specialist services recorded a total of 246 cases of pulmonary tuberculosis (both pulmonary and extrapulmonary). The bacteriology results of these cases break down as follows:

Fig. 16: Bacteriology results in % of all notified pulmonary TB cases in 2020 (n=246)



Legend

M+ and *M-*: microscopy positive/negative from a respiratory specimen

C+ and *C-*: culture positive/negative from respiratory or other material

Yellow: culture-positive cases

Red: culture-negative cases

Turquoise: cases with unknown culture result

Note on Figure 16: the category “M unknown/C+” does not exist in the PDMS currently used by several cantons (RespiGO) for analysis. The cases with this bacteriology were assigned to the categories “M and C unknown”.

71.9% (2019: 71.1%) of pulmonary cases were confirmed in the culture (177 cases). 19.8% (2018: 23.2%) had an unknown culture result. 14.6% (2019: 8.5%) had an unknown result for microscopy and culture.

6.1% (2019: 4.2%) are M-/C- (15 cases). These are in part cases in which a CI had been started but was discontinued after obtaining negative culture results. Other (non-classifiable) cases and those with an unknown bacteriology increased compared with the reporting years 2018 and 2019. Even if the TB specialist services are supposed to have the laboratory notifications at their disposal, as per their contracts, they commonly do not receive them (giving up after repeated enquiries) or are not able to receive them because the patient has left the canton (moved abroad, asylum seekers transferred or disappeared), which makes follow-up difficult.

The TB specialist services are well aware of this problem, but – because of limited human resources – focus their priorities on the correct implementation of CIs and case management (cf. Fig. 2 and 3).

4.5 Scope of contact investigations

In 2020, 197 contact investigations were notified by the TB specialist services in Switzerland. These varied in size depending on the number of contact persons (CPs) tested in them. The distribution by category size is similar to that in previous years. No very large CIs (over 50 persons) were recorded in 2020. A CP is part of a CI if they were registered in the system and underwent either Mantoux testing (also called “tuberculin skin test” or TST) or an IGRA. Contact persons who were not tested (because they had not been indexed or because they did not appear for the test) are not recorded as part of the CI in the charts below.

Fig. 17: Scope of CIs (n=197)

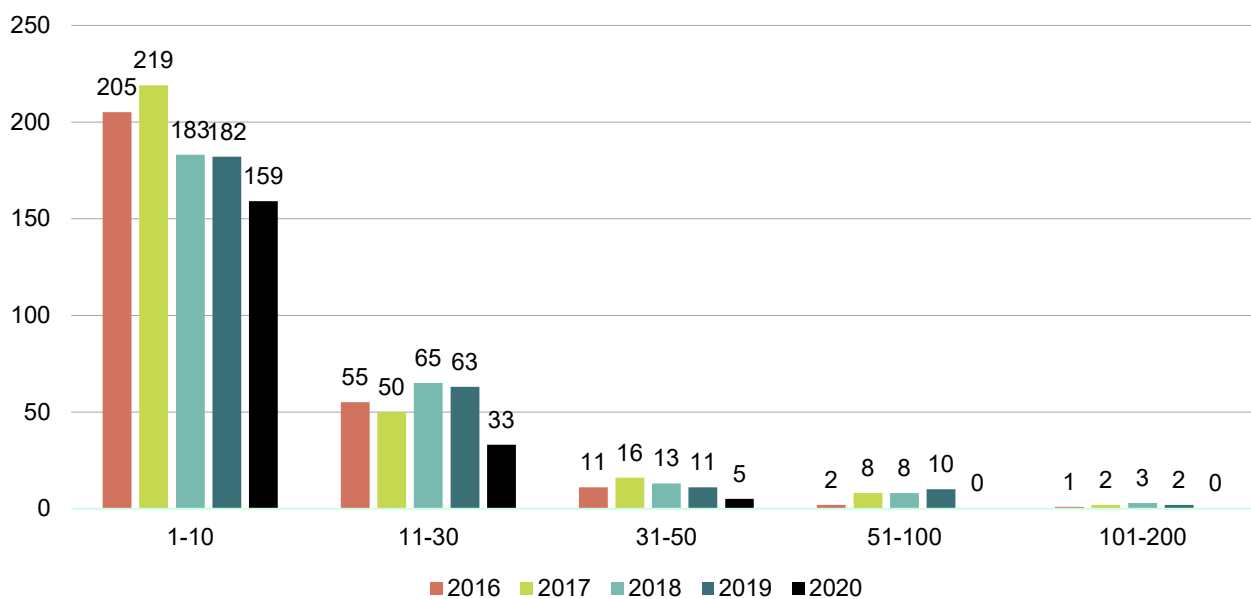
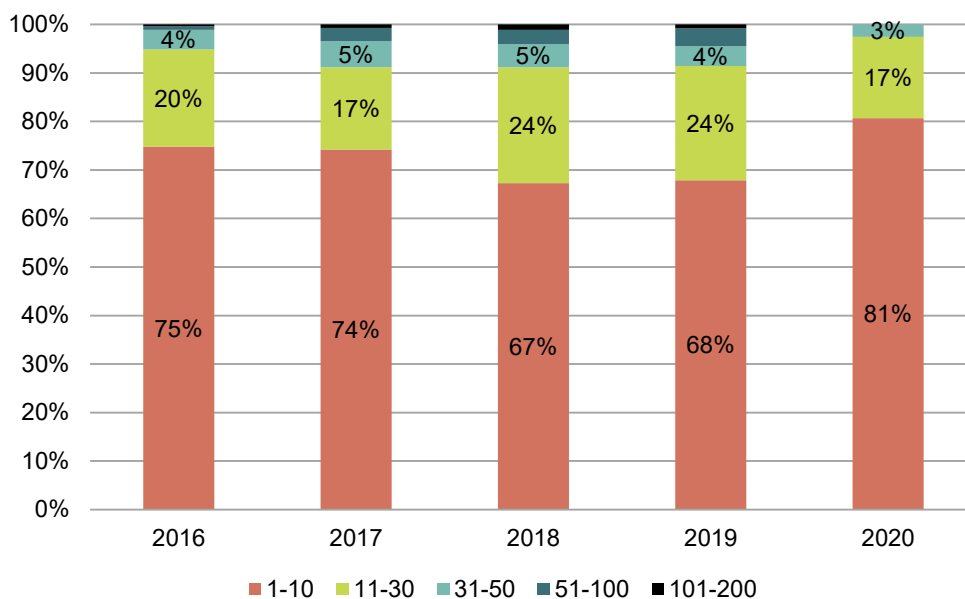


Fig. 18: Scope of CIs in % of all CIs carried out (n=197)



The number of CIs carried out with 1-10 people tested per CI stabilised during the period of 2016-2020 to around 70% of all CIs carried out. In 2020, 81% actually fell into this category (Fig. 18). This might be explained by measures related to COVID-19 and a general reduction of contact in public, and by a partly more restrictive strategy of the TB specialist services pertaining to the inclusion of contact persons in CIs. As an example, this may be due to the requirement to wear a mask in many places in the current pandemic situation.

4.6 Comparison of contact investigations at the cantonal level

The CI figures vary – depending on the canton and from year to year. The variations between cantons may be explained by the different ways in which CIs are carried out (in particular the indications for CIs and their scope). However, with small numbers random fluctuations are also to be expected.

Notes on the interpretation of the data

- The number of CIs compared to the total number of notified cases can provide information as to how more or less restrictively the indications for a CI are given. This relationship should be considered separately for centrifugal CIs (search for infected persons) and centripetal (search for the source of spread) CIs. As an approach, this relationship could be considered separately for pulmonary (mostly centrifugal) and extrapulmonary (mostly centripetal) cases. Table 1 shows the figures together, summarised for all cases.
- The average number of tested persons per CI can help to ascertain whether the indications for testing exposed persons are more or less restrictive. The higher the number of persons tested increases, the smaller the group of persons recorded who are exposed (on average), tendentially rendering the use of resources less worthwhile.

Comparison between the cantons should be based on multiple years in order to be able to identify exceptional years. One canton can thus make cross-comparisons with other cantons and, if necessary, control CI practice at different levels (indications, size, resources). This is shown in tables 1-3 below.

Table 1: Number of CIs carried out by year and canton, TB cases notified to the FOPH and CIs in % of the TB cases notified to the FOPH

Table 1	Number of CIs			TB cases notified to FOPH*	CIs in % of notified cases
	2018	2019	2020	2020	2020
German Switzerland					
AG	28	21	9	22	40.9%
AR	0	0	0	0	n/a
AI	0	2	0	1	0.0%
BE	22	15	23	33	69.7%
BL	10	1	3	5	60.0%
BS	9	9	5	9	55.6%
GL	0	2	0	0	n/a
GR	1	5	2	7	28.6%
LU	11	10	11	17	64.7%
NW	2	2	2	2	100.0%
OW	1	0	1	2	50.0%
SG	6	12	9	17	52.9%
SH	2	5	2	3	66.7%
SO	6	7	6	10	60.0%
SZ	3	1	4	7	57.1%
TG	4	6	4	11	36.4%
UR	0	0	0	1	0.0%
ZG	1	3	6	10	60.0%
ZH	59	56	40	70	57.1%
TOTAL, GERMAN SWITZERLAND	165	157	127	227	55.9%
Latin Switzerland					
GE	21	50	29	56	89.3%
FR	13	4	3	9	44.4%
JU	5	6	1	1	100.0%
NE	4	5	4	11	45.5%
TI	7	3	3	10	30.0%
VD	48	34	27	41	82.9%
VS	9	9	3	16	56.3%
TOTAL, LATIN SWITZERLAND	107	111	70	144	48.6%
TOTAL	272	268	197	371	53.1%

*In 2020 a total of 374 TB cases were notified to the FOPH. One case from Liechtenstein and two cases that could not be attributed have not been included in this table (N = 371).

Table 2: Number of usable tests/persons tested in CIs in individual cantons, tests carried out/persons tested by other cantons in CIs, and sum total of all usable tests/persons tested in CIs for the canton concerned (per canton and per year).

Table 2	Number of usable tests/persons tested in CIs in the individual cantons			Number of usable tests/persons tested by other cantons in CIs			Total usable tests/persons tested in CIs for the respective canton		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
German Switzerland									
AG	308	437	29	32	12	10	340	449	39
AR	0	0	0	1	2	0	1	2	0
AI	0	3	0	0	1	0	0	4	0
BE	190	221	169	8	18	5	198	239	174
BL	57	20	11	1	0	0	58	20	11
BS	64	47	23	4	3	2	68	50	25
GL	0	16	0	11	1	0	11	17	0
GR	1	10	9	4	0	0	5	10	9
LU	64	123	84	30	8	3	94	131	87
NW	2	24	13	0	0	0	2	24	13
OW	1	0	32	0	0	0	1	0	32
SG	33	89	45	21	16	6	54	105	51
SH	23	8	28	1	7	4	24	15	32
SO	20	82	61	26	5	19	46	87	80
SZ	62	6	18	7	1	3	69	7	21
TG	71	26	40	23	21	6	94	47	46
UR	0	0	0	1	0	0	1	0	0
ZG	6	10	19	11	4	8	17	14	27
ZH	554	596	290	74	41	14	628	637	304
TOTAL, GERMAN SWITZERLAND	1456	1718	871	255	140	80	1711	1858	951
Latin Switzerland									
GE	130	262	107	0	10	1	130	272	108
FR	57	29	17	1	9	0	58	38	17
JU	27	38	9	1	5	0	28	43	9
NE	42	25	3	4	0	0	46	25	3
TI	11	6	14	1	0	0	12	6	14
VD	644	339	196	0	13	6	644	352	202
VS	70	150	49	8	0	0	78	150	49
TOTAL, LATIN SWITZERLAND	981	849	395	15	37	7	996	886	402
TOTAL	2,437	2,567	1,266	270	177	87	2,707	2,744	1,353

Table 3: Average of usable tests/persons tested per CI and canton, number of usable tests/persons tested in CIs for other cantons, and total of usable tests/persons tested by the canton in CIs.

Table 3	Average of usable tests/persons tested per CI and per canton			Number of usable tests/persons tested for other cantons in CIs, including contacts who could not be attributed to a canton			Total of usable tests carried out/persons tested by the canton in CIs		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
German Switzerland									
AG	12	21	4	54	33	48	362	470	77
AR	0	0	n/a	0	0	0	0	0	0
AI	0	2	n/a	0	0	0	0	3	0
BE	9	16	8	57	21	13	247	242	182
BL	6	20	4	0	0	0	57	20	11
BS	8	6	5	6	3	0	70	50	23
GL	0	9	n/a	0	6	2	0	22	2
GR	5	2	5	39	7	1	40	17	10
LU	9	13	8	2	0	0	66	123	84
NW	0	12	7	0	0	0	2	24	13
OW	1	0	32	0	0	0	1	0	32
SG	9	9	6	31	20	45	64	109	90
SH	12	3	16	2	0	0	25	8	28
SO	8	12	13	1	4	22	21	86	83
SZ	23	7	5	17	0	0	79	6	18
TG	24	8	12	10	6	11	81	32	51
UR	0	0	n/a	0	0	2	0	0	2
ZG	17	5	5	0	0	0	6	10	19
ZH	11	11	8	89	74	13	643	670	303
TOTAL, GERMAN SWITZERLAND	10	12	7	308	174	157	1764	1892	1028
Latin Switzerland									
GE	6	5	4	0	7	0	130	269	107
FR	4	10	6	0	13	1	57	42	18
JU	6	7	9	0	2	10	27	40	19
NE	12	5	1	2	0	3	44	25	6
TI	2	2	5	3	0	0	14	6	14
VD	13	10	7	16	46	3	660	385	199
VS	9	17	16	10	12	15	80	162	64
TOTAL, LATIN SWITZERLAND	9	8	6	31	80	32	1012	929	427
TOTAL	10	10	7	339	254	189	2,776	2,821	1,455

Notes on Tables 1-3

For 2020, only the number of persons tested could be analysed. For 2018 and 2019, the usable tests are presented in the same table. There may be differences between these two data items because contacts may also be tested several times. However, these differences do not play a substantial role for the overall picture or comparison between the cantons for 2020.

All in all, around 53% (2019: 64%) of the cases notified to the FOPH resulted in a CI. In contrast to the previous year, fewer contact investigations were carried out in Latin [non-German-speaking] Switzerland (49%, in 2019: 74%) in relation to the total number of cases compared to German-speaking Switzerland (55.9%, in 2019: 58.3%).

However, the number of CIs in relation to the number of TB cases varies considerably from canton to canton:

- If only the cantons with at least 10 TB cases are compared (13 cantons), the percentage varies greatly. In 2020 this ranges from 36.4% in the canton of Thurgau to 89.3% in the canton of GE. These figures may not be regarded as absolute because TB specialist services included for 2020 the TB cases that may have already been counted by the FOPH in 2019 or will not be included until 2021.
- If we compare the four cantons with more than 30 TB cases (BE, GE, VD, ZH), the proportion also varies there from 57.1% (ZH) to 89.3% (GE).
- The average number of contact persons tested per CI in 2020 in Latin Switzerland (6) is comparable to German-speaking Switzerland (7) (see Table 2). It is slightly lower compared with the two previous years. As mentioned above, this might be a consequence of the general contact restrictions due to the pandemic.
- Differences between cantons in the number of persons tested may depend on specific circumstances in individual years (e.g. CI in a school or in other specific institutions may result in a larger number of tests than a CI involving a group of private persons). There are also instances in which a CI/a test is carried out for psychological reasons in order to reassure persons who have been in contact with a case.

It should also be borne in mind at this point that TB cases that are discovered in asylum seekers in the weeks following their application for asylum often do not result in a CI or, if so, in a more restrictive CI (often limited to the family, fellow travellers, even particularly exposed roommates). The identification and tracing of contacts are likewise often difficult. Practice varies depending on the location of the asylum centre. Furthermore, the current COVID-19 situation has also influenced worldwide migration, which in 2020 was lower than in previous years (according to the number of asylum seekers indicated in the statistics published by the SEM).

Table 3 provides information on how many tests a canton carried out for its own CIs and how many tests it carried out on behalf of other TB specialist services, or how many persons it tested. The sum total of tests carried out is higher than those shown in Table 2 because not all tests carried out by a canton could be attributed to a commissioning canton. Whether and how many contacts a canton tests for another canton heavily depends on the type of CIs that takes place in a given year and how many persons they include, as well as whether the index patient was mobile and had contacts in different cantons. In general, it can be established here that inter-cantonal collaboration functions well and the correct implementation of CIs in accordance with the Manual of Tuberculosis is thus ensured.

4.7 Results of persons tested in contact investigations during 2016–2020

Table 4: Details of test results of CIs

Year	2016	2017	2018	2019	2020
Number of contact investigations	274	295	272	268	197
Infected persons					
Recorded contact persons	2579	3535	3150	3148	n/a
*Missing results	163	297	391	384	n/a
Less undetermined IGRAs	38	31	42	20	2
Number of persons tested	2378	3207	2717	2744	1353
Persons TST-tested	497	353	355	231	158
TST in % of total persons tested	20.9%	11.0%	13.1%	8.4%	11.7%
of which TST+	82	71	37	37	24
TST+ in % of persons TST-tested	16.5%	20.1%	10.4%	16.0%	15.2%
of which IGRA for confirmation	59	68	23	14	13
Considered to be infected: confirmed TST+ with IGRA	32	20	14	1	9
TST+	82	74	37	37	24
Less those persons subsequently tested with IGRA	59	50	23	14	13
Persons subsequently tested with IGRA in % of TST+	72.0%	67.6%	62.2%	37.8%	54.2%
Considered to be infected: total TST+ without IGRA confirmation	23	24	14	23	11
Persons only IGRA-tested	1919	2885	2394	2533	1195
IGRA in % of persons tested	80.7%	90.0%	88.1%	92.3%	88.3%
IGRA+: considered to be infected	331	399	297	250	151
Total considered to be infected	386	443	325	274	171
Infected persons in % of persons tested	16.2%	13.8%	12.0%	10.0%	12.6%
Non-infected persons					
Number of persons tested	2378	3207	2717	2744	1353
Less those considered to be infected	386	443	325	274	171
Total considered to be non-infected	1992	2764	2382	2470	1180
Non-infected persons in % of persons tested	83.8%	86.2%	87.7%	90.0%	87.2%
IGRA carried out in % of persons tested	83.2%	92.1%	89.0%	92.8%	89.3%

Notes on Table 4:

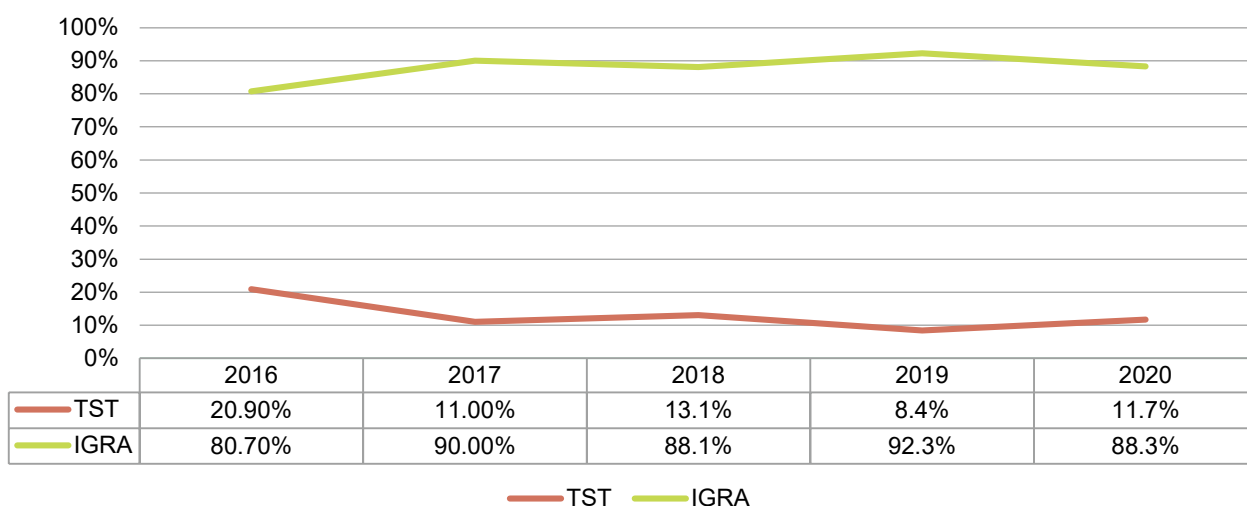
For 2020, due to the evaluation options of the new PDMS, no data could be collected on the total number of contact persons recorded in the system or on the missing test results (see data entry n/a in table). For 2016–2019, the data entries “persons tested” in the grey and yellow columns, as in Tables 1-3, correspond to the number of usable tests.

TST	Mantoux tuberculin skin test
IGRA	Interferon Gamma Release Assay
+	positive
infected	According to the 2019 Manual of Tuberculosis, persons are considered to be “infected” for the following test results: TST+ confirmed by IGRA+, only TST+ (without confirmation by IGRA) or only IGRA+.

*missing results	Missing test results may occur in the following cases: <ul style="list-style-type: none"> - explicit waiving of testing - after examination, test not necessary but already recorded in the system - only medical examination - did not appear for the test - did not appear for reading of the test result - test result not recorded in the system
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The number of persons only IGRA-tested increased from 80.7% in 2016 to 88.3% in 2020, with a slight decrease in 2018 to 88.1% (Fig. 19). One reason for the continuous increase in persons only INGRA-tested is no doubt the fact that tuberculin is no longer available on the Swiss market and can only be imported via the roundabout route of a special permit, as well as the generally prevailing preference for the exclusive use of IGRAs.

Figure 19: TSTs and IGRAs in % during the CIs



From 2016 to 2018, the percentage of positive tuberculin tests for persons tested (Table 4, line “TST+ in % of persons TST-tested”) varies between 20.1% (2017) and 10.4% (2018). In 2020 it increases again to 15.2%, comparable to 2019 (16.0%). However, more and more IGRAs are also being carried out instead of TST testing.

The percentage of infected contacts between 2016 to 2020 amounted to between 10.0% (2019) and 16.2% (2016) (Table 4, line “Infected persons in % of persons tested”) and remained about the same over this period. This also confirms that 2013, with a percentage of contacts infected of 26.0%, was an exceptional year (cf. the 2017 report on cantonal tuberculosis activities, chapter 3.7, Table 4).

4.8 Treatments of infected contact persons and number of contact persons who had contracted TB

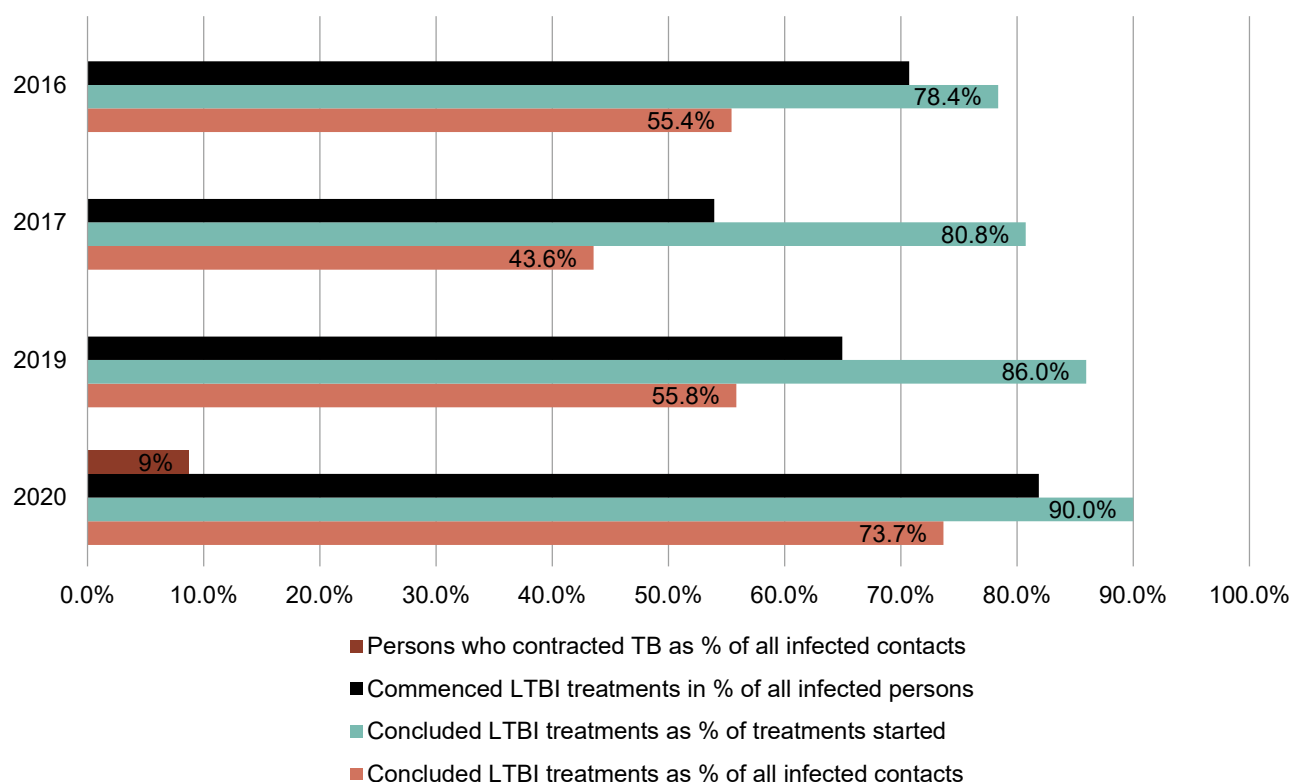
The primary objective of tracing persons recently infected is to treat latent tuberculosis infections (LTBI) in persons with an increased risk of a later reactivation of tuberculosis.

Of 171 infected contact persons (CPs), 140 received LTBI treatment and 126 of them were able to successfully conclude treatment (Table 5). This rate needs to be improved further in order to ensure that the prevention of TB cases occurring over time is as optimal as possible.

A new aspect was that for 2020 it was also possible to show the contacts who had contracted TB that was discovered in a CI (Table 5). Of the percentage of all contacts tested, this is barely 1%. Of the percentage of all infected contacts this amounts to 9%.

Table 5: LTBI treatments/ contacts who had contracted TB	2016	2017	2018	2019	2020
Number of infected contacts	386	443	325	274	171
Commenced LTBI treatments	273	239	32	178	140
Concluded LTBI treatments	214	193	12	153	126
Contacts who had contracted TB	n/a	n/a	n/a	n/a	15

Fig. 20: LTBI treatments and CPs who contracted TB from 2016 to 2020



Note on Figure 20: In 2018 these data could not be analysed for technical reasons. The chart shows the LTBI treatments and contacts who had contracted TB in % of all infected contacts per year. The results pertaining to the treatments are incomplete because not all cantonal tuberculosis specialist services recorded this systematically.

Number of infected persons: “latent infected” refers to persons who have a positive test result but show no signs of active tuberculosis. The tests simply indicate a previous contact with mycobacteria. In the tuberculin skin test these are not only mycobacteria of the *M. tuberculosis* complex, but also atypical mycobacteria. The tests show no indication of the date of infection. Consequently, the positive test result may also be based on a contact that took place years ago.

Commenced LTBI treatments: Not all persons considered to be “infected” ultimately had indications for LTBI treatment (tuberculosis/LTBI already treated, advanced age, medical contraindications). However, as a general principle, it is to be assumed that the intention to test also includes an intention to treat. Nevertheless, there are also people who do not wish to receive a treatment that has been recommended. Consequently, the number of commenced LTBI treatments is lower than the number of persons with LTBI (infected contact persons). The percentage of commenced LTBI treatments in 2020 was 81.9% (140/171) of the persons who tested positive. This percentage was considerably higher than in 2016 and 2019.

Concluded LTBI treatments: The percentage of concluded LTBI treatments, relative to the number of commenced treatments, was stable between 2016 and 2020 with a percentage of between 78.4% and 86.0%. In 2020, the percentage rose to 90.0%, which confirms the tendency that was identified in past reports. This result most probably suggests improved quality of care and data collection. Therefore, the percentage of concluded LTBI treatments, relative to the number of persons who tested positive, shows an increasingly upward trend between 2016 and 2020, from 50.0% in 2015 to 73.7% in 2020, with a slump in 2017 (43.6%).

5 Results of directly observed therapy (DOT)

The most important measure with respect to tuberculosis is the assurance of treatment (interruption of the chain of infection and prevention of the development of resistance). The evaluation of the probable adherence of every individual patient is the initial stage of every treatment, in particular in the case of pulmonary tuberculosis. One part of treatment is therefore carried out with the taking of each dose of medication being supervised (directly observed therapy, DOT). Table 5 shows the DOTs which a TB specialist service had either carried out itself or for which it had administrative responsibility. Because not all TB specialist services receive notification of all cases of tuberculosis from their cantonal medical service (cf. chapter 2, Fig. 5), it is possible that other DOTs are prescribed by the attending physician of which the cantonal TB specialist service has no knowledge. This applies in particular to cases of tuberculosis that do not trigger a CI.

Table 5: Number of DOTs per canton and in % of TB cases notified to the FOPH

Cantons	2019			2020		
	Number of DOTs	DOTs in % of all cases	Cases notified to the FOPH	Number of DOTs	DOTs in % of all cases	Cases notified to the FOPH
AG	8	23%	35	5	23%	22
AI	0	0%	0	0	0%	0
AR	0	0%	1	0	0%	1
BE	3	9%	35	6	18%	33
BL	0	0%	7	0	0%	5
BS	15	100%	15	9	100%	9
GL	0	0%	2	0	0%	0
GR	0	0%	10	0	0%	7
LU	1	6%	17	3	18%	17
NW	2	100%	2	0	0%	2
OW	0	0%	0	0	0%	2
SG	4	20%	20	2	12%	17
SH	0	0%	8	3	100%	3
SO	2	20%	10	0	0%	10
SZ	1	25%	4	0	0%	7

TG	6	60%	10	5	45%	11
UR	0	0%	1	0	0%	1
ZG	0	0%	4	4	40%	10
ZH	71	70%	102	40	57%	70
German Switzerland	113	40%	283	77	34%	227
FR	0	0%	12	1	11%	9
GE	*	n/a	43	35	63%	56
JU	5	100%	5	1	100%	1
NE	5	100%	5	6	55%	11
TI	0	0%	9	0	0%	10
VD	4	7%	55	33	80%	41
VS	0	0%	13	0	0%	16
unknown	n/a	n/a	2	n/a	n/a	2
FL	n/a	n/a	1	n/a	n/a	2
Latin Switzerland	14	10%	142	76	53%	144
Total	127	30%	427	153	41%	375

Notes on Table 5:

**The Centre Antituberculeux (CAT) – part of the Hôpital Universitaire de Genève (HUG) – migrated to the new software Pulmocare in 2014. However, data were not systematically recorded until the end of 2019. At the time of the final editing of the 2019 report, the data from 2019 were not available to the Swiss Lung Association. For 2020, the data from the canton of Geneva were included in the analysis.*

The average number of DOTs/notified cases throughout Switzerland in 2020 was 41%, an increase of 11% compared with the previous year. The data from the past few years still show a great degree of heterogeneity among the cantons with regard to the frequency of use of DOT.

In 2019, relative to the TB cases notified to the FOPH, DOT was carried out four times more often in German-speaking Switzerland than in Latin Switzerland. In 2020, this relationship was reversed with Latin Switzerland carrying out 19% more DOT than German-speaking Switzerland. This may be due to a new development in 2020 in which the data from the canton of Geneva were also included in the analysis.

In the majority of cantons, the attending physician decides alone – or in consultation with the TB specialist services and the cantonal medical officer – about carrying out DOT (cf. chapter 2, Fig. 9). The majority of DOT therapies are delegated by the cantonal TB specialist services to other organisations. In these cases, the daily administration of medication is carried out by third-party organisations (e.g. pharmacies or socio-medical institutions). However, the overall supervision, administrative responsibility and the compilation of the results of treatment fall to the cantonal TB specialist service, which has usually been mandated by the canton to organise DOT (cf. chapter 2, Fig. 5). The number of DOT therapies carried out under a cantonal TB specialist service's own control exhibited a gradual increase from 2014-2018.

Bern, 8 December 2021

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