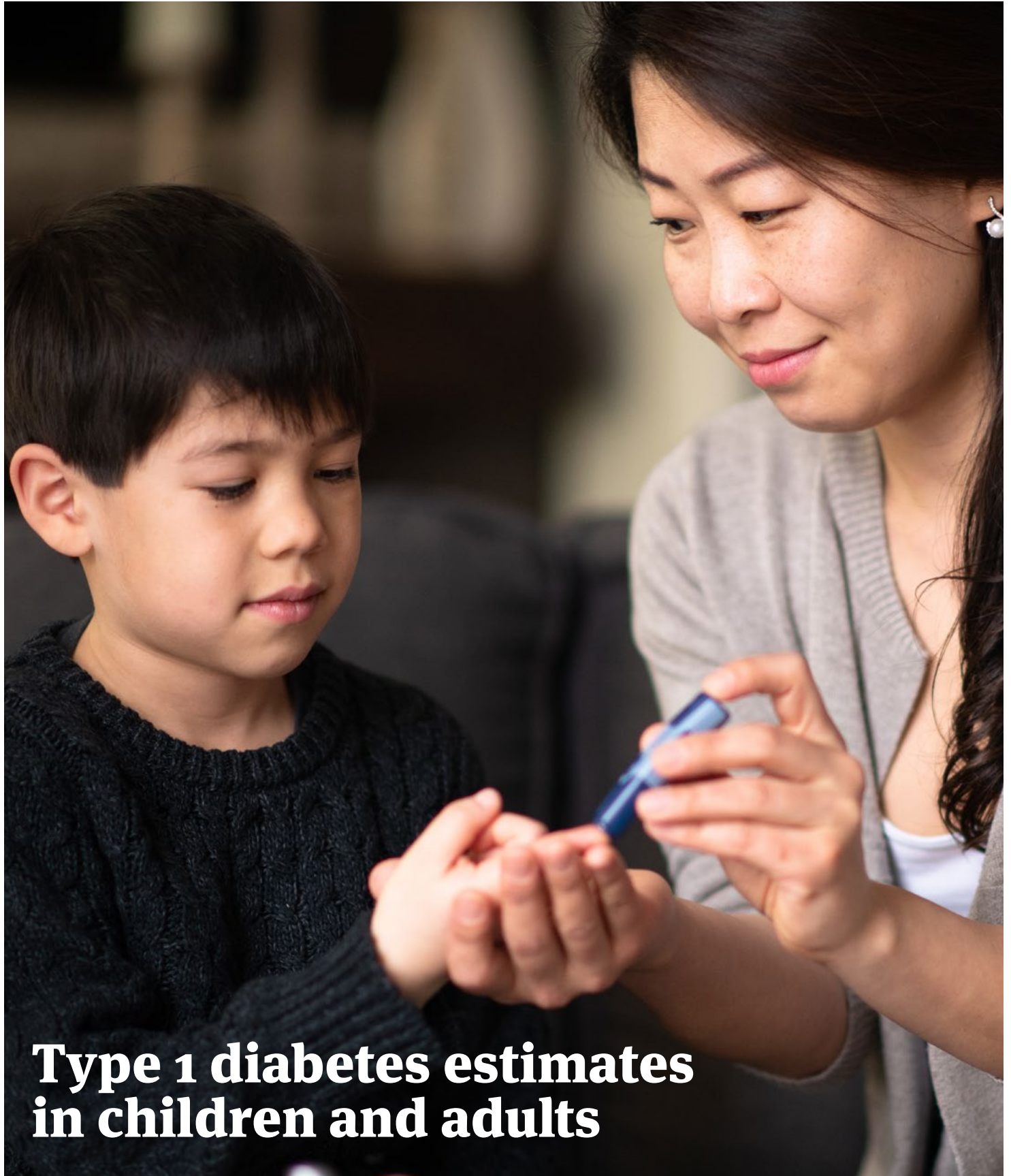


# IDF ATLAS REPORTS



2022

 International  
Diabetes  
Federation



**Type 1 diabetes estimates  
in children and adults**



# Acknowledgements

---

## Type 1 diabetes numbers in children and adults

### Authors:

Graham D Ogle <sup>1</sup>, Fei Wang <sup>1</sup>, Gabriel A Gregory <sup>1</sup>  
and Jayanthi Maniam <sup>1</sup>

<sup>1</sup> T1D Index consortium

### Editorial Team:

Dianna J Magliano (Atlas Co-chair), Edward J Boyko  
(Atlas Co-chair), Irini Genitsaridi, Lorenzo Piemonte,  
Phil Riley, Paraskevi Salpea

## Corporate sponsors





---

04

**Introduction**

05

**Methodology**

06

**Findings**

09

**References**

10

**Appendix Table 1**



## Introduction



### Key messages

- In 2022, there were 8.75 million people living with type 1 diabetes globally
- 1.52 million of these people were under 20 years old
- The T1D Index initiative will update detailed figures for all countries as time goes on

In the most recent editions of the Atlas, the number of people living with type 1 diabetes (T1D) across the globe has only been estimated for children and adolescents less than 20 years of age. This has been due to insufficient data available for adult populations. Furthermore, the prevalence estimate for those less than 20 years of age did not take into account potential changes in incidence and mortality over time.

The development of the Type 1 Diabetes Index (T1D Index) has now permitted more current and accurate estimates to be calculated for all ages across all countries. The T1D Index is a joint initiative between JDRF, Life for a Child, IDF, and the International Society for Pediatric and Adolescent Diabetes (ISPAD). Global as well as per country estimates of the numbers of people with type 1 diabetes in 2021 were published recently.<sup>1</sup>





The T1D Index utilises a Markov Model and machine learning techniques to estimate the number of people with T1D globally and by individual country. It combines data on T1D incidence and mortality among those with T1D and those without T1D to estimate prevalence, incidence and life expectancy for those with T1D in all countries.

Contemporary childhood and adolescent T1D incidence data were sourced from the publications cited in all previous editions of the Atlas as well as other papers identified on a recent literature search. Incidence data for children and adolescents less than 20 years of age were available for 97 countries. Incidence data was extrapolated for countries without in-country data, using the previously described Atlas methodology.<sup>2</sup>

Adult incidence data were derived from a recent systematic review<sup>3</sup> and used to estimate incidence as a function of age, assuming a similar pattern of age of onset across countries. Estimates for countries in Sub-Saharan Africa were produced separately due to the later peak age of onset in that area.

Changes in incidence over time were then estimated for the period between 1985 and 2015, using the most representative data for each country, either from local data or extrapolated from regional or global averages. Incidence was assumed to be constant prior to 1985, unless there were earlier historical data, and to be increasing from 2015 into the future at the same rate as occurred in the final year of available data.

Age-standardised mortality over time was modelled using random forest regression of published T1D mortality data from 37 countries<sup>4</sup> and other sources. The model previously used in the Atlas, which used Infant Mortality Rate alone, was extended to include other data, including healthcare resources as reflected by, for example, doctors per capita and some other known country metrics, as well as estimates of the mortality rate associated with the varying levels of T1D care across countries.<sup>4–6</sup> T1D levels of care and also diagnosis rates were estimated from a survey of expert clinicians in diabetes care.



# Findings

In 2022, there were 8.75 million (95.0% uncertainty interval 8.4–9.1) individuals worldwide with T1D. One fifth (1.9 million) of these individuals live in low-income and lower-middle-income countries.

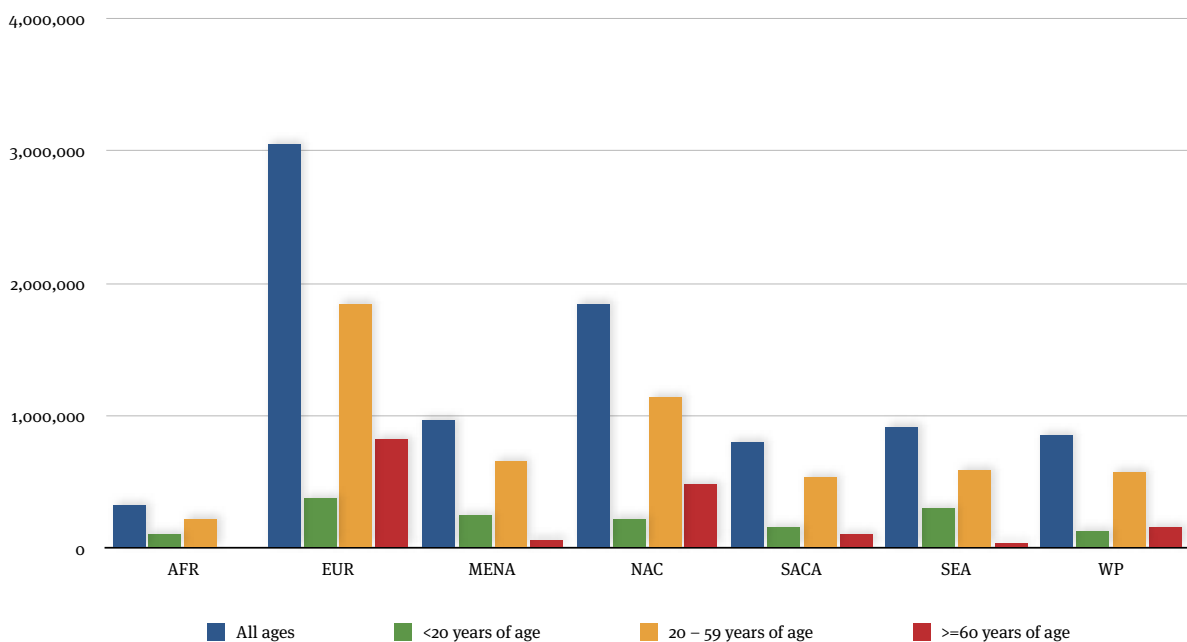
Of the total population with T1D in 2022, 1.52 million (17.0%) were younger than 20 years, 5.56 million (64.0%) were aged between 20 and 59 years, and 1.67 million (19.9%) were aged 60 years or older. This 2022 estimate of 1.52 million aged less than 20 years is higher than the 2021 Atlas estimate of 1.21 million due to the new methodology that includes estimates for increases in incidence over time for countries that do not have recent incidence data, as well as a more minor effect of population growth.

**Figure 1** shows the number of people with T1D in each of these age groups by world region. The IDF Europe Region has the highest number of cases, followed by the IDF North America and Caribbean Regions

In 2022, there were 530,000 new cases of T1D diagnosed at all ages, with 201,000 of these less than 20 years of age.

**In 2022, there were 530,000 new cases of T1D diagnosed at all ages, with 201,000 of these less than 20 years of age.**

**Figure 1 – Number of individuals with diabetes in each IDF Region, by age (2022)**





**Appendix Table 1** shows the number of individuals with T1D in each country. The ten countries with the highest number of prevalent cases at all ages were the United States of America (USA) (highest), India, Brazil, China, Germany, the United Kingdom (UK), Russia, Canada, Saudi Arabia, and Spain. The order was slightly different for the total number of prevalent cases of children and adolescents less than 20 years of age, with India (highest) then the USA, Brazil, China, Russia, Saudi Arabia, Algeria, the UK, Germany, Morocco, Canada, Ukraine and Turkey. The differences in rankings between the number of prevalent cases for all ages and those under 20 years reflect younger populations in countries such as India, Algeria, Morocco and Turkey, and also a higher mortality in non-high-income countries, which reduces the numbers of older adults with T1D.

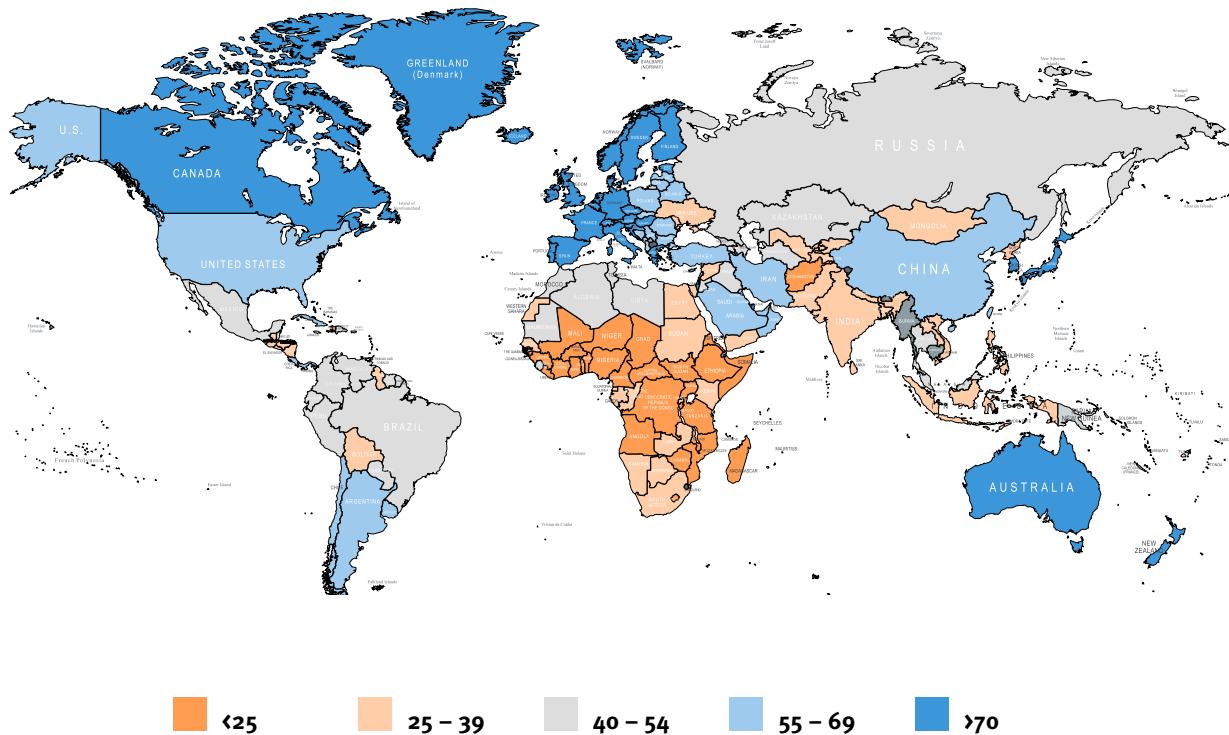
There were an estimated 182,000 deaths due to T1D in 2022, among which, 42,000 of these deaths were in the South-East Asia (SEA) Region, 38,000 in Africa (AFR), 34,000 in Europe (EUR), 20,000 in each of North America and Caribbean (NAC) and Middle East and North Africa (MENA), 14,000 in Western Pacific (WP), and 13,000 in South and Central America (SACA).

## **Due to steady improvements in medical care and technology, there are now millions of adults living with T1D who were diagnosed when they were children.**

T1D has traditionally been thought of as a condition that primarily has its onset in, and predominantly affects, children and youth. Research and programmes, concerning earlier diagnosis, improved treatments and diabetes education, peer-support initiatives, and global advocacy are largely focused on this younger age group. However, due to steady improvements in medical care and technology, there are now millions of adults living with T1D who were diagnosed when they were children. Furthermore, adult onset of T1D is not uncommon. Indeed, the Index work found that, globally, in 2022, the mean age of a person with T1D is 40 years. In 2022, 329,000 (62%) of all new T1D cases occurred in people aged 20 years or older.



Map 1 – Total estimated life expectancy of a 10-year old child diagnosed with T1D in 2022.



**Map 1** shows the estimated total average life expectancy for a 10-year old child diagnosed with T1D in 2022. Life expectancy ranges from up to 19 years (therefore nine years from diagnosis) in some Sub-Saharan African countries to over 75 years (therefore 65 years from diagnosis) in some high-income countries.

Of particular importance, the T1D Index estimated that approximately 35,000 of T1D deaths in 2022 were in non-diagnosed individuals less than 25 years of age, dying within 12 months of symptomatic onset. These young people develop symptoms of T1D – passing too much urine, drinking excessive amounts of water, losing weight etc., and then develop diabetic ketoacidosis, which can be misdiagnosed as pneumonia, gastroenteritis, malaria, typhoid, appendicitis or another condition.<sup>7</sup> Without a rapid diagnosis and appropriate treatment, the person will die quickly of diabetic ketoacidosis.

Awareness and education campaigns about the signs and symptoms of T1D have been successful at reducing the rate of diabetic ketoacidosis at the time of diagnosis in some high-income countries.<sup>8</sup> The success of these initiatives suggests that similar campaigns, re-designed to not only reduce diabetic ketoacidosis rates but also to increase accurate diagnosis of T1D at clinical onset, may help to reduce deaths from non-diagnosis in less-resourced countries. In Mali, an awareness campaign involving distribution of posters to healthcare facilities was associated with a sharp increase in observed incidence.<sup>9</sup> The T1D Index consortium aims to foster similar initiatives.

Finally, the Index highlights the gaps particularly in mortality and prevalence information, but also in incidence information, particularly T1D incidence in adults. The difficulty of distinguishing T1D from type 2 diabetes in adults is also an area that requires further work.

Full data are available at the T1D Index website: [www.t1dindex.org](http://www.t1dindex.org).





- 1 Gregory GA, Robinson TIGR, Linklater SE, Wang F, Colagiuri S, de Beaufort C et al. *Global incidence, prevalence, and mortality of type 1 diabetes in 2021 with projection to 2040: a modelling study*. *Lancet Diabetes Endocrinol* 2022; doi.org/10.1016/S2213-8587(22)00218-2.
- 2 Ogle GD, James S, Dabelea D, Pihoker C, Svensson J, Maniam J et al. *Global estimates of incidence of type 1 diabetes in children and adolescents: results from the International Diabetes Federation Atlas, 10th edition*. *Diabetes Res Clin Pract* 2022; 183: 109083.
- 3 Harding JL, Wander PL, Zhang X, Li X, Karuranga S, Chen H et al. *The incidence of adult-onset type 1 diabetes: a systematic review from 32 countries and regions*. *Diabetes Care* 2022; 45: 994–100
- 4 Chan JCN, Lim L-L, Wareham NJ, Shaw JE, Orchard TJ, Zhang P et al. *The Lancet Commission on diabetes: using data to transform diabetes care and patient lives*. *Lancet* 2021; 396: 2019–82.
- 5 Ogle GD, von Oettingen JE, Middlehurst AC, Hanas R, Orchard T. *Levels of type 1 diabetes care in children and adolescents for countries at varying resource levels*. *Pediatric Diabetes*. 2019;20:95-98.
- 6 Gregory GA, Guo J, Klatman EL, Ahmadov GA, Besançon S, Ramaiya K et al. *Costs and outcomes of 'intermediate' versus 'minimal' care for youth-onset type 1 diabetes in six countries*. *Pediatr Diabetes* 2020;21:628-636.
- 7 Ogle GD, Middlehurst AC, Silink M. *The IDF Life for a Child Program Index of diabetes care for children and youth*. *Pediatr Diabetes* 2016; 17: 374–384.
- 8 Cherubini V, Marino M, Carle F, Zagaroli L, Bowers R, Gesuita R. *Effectiveness of ketoacidosis prevention campaigns at diagnosis of type 1 diabetes: A systematic review and meta-analysis*. *Pediatr Diabetes* 2021;175:108838.
- 9 Sandy JL, Besançon S, Sidibé AT, Minkailou M. Togo A, Ogle GD. *Rapid increases in observed incidence and prevalence of Type 1 diabetes in children and youth in Mali, 2007–2016*. *Pediatric Diabetes* 2021;2021:1-7. DOI: 10.1111/pedi.13191.



## Appendix: Table 1

Table 1 – Number of individuals with diabetes in each country, by age (2022)

Country	Age <20 years	Age 20 - 59 years	Age ≥60 years	Total
Afghanistan	5,487	4,370	120	9,964
Albania	723	2,790	898	4,406
Algeria	46,642	103,731	13,423	163,767
Angola	3,946	8,074	207	12,237
Antigua and Barbuda	26	87	13	126
Argentina	17,144	56,599	11,836	85,529
Armenia	774	2,334	542	3,649
Aruba	1	4	1	5
Australia	14,306	78,926	32,743	126,008
Austria	3,447	19,869	9,144	32,475
Azerbaijan	2,200	6,139	838	9,183
Bahamas	191	600	89	880
Bahrain	331	1,817	132	2,281
Bangladesh	5,719	18,558	617	24,878
Barbados	108	401	116	624
Belarus	2,888	10,147	3,256	16,303
Belgium	4,575	25,778	12,291	42,637
Belize	39	108	9	157
Benin	1,101	2,488	86	3,675
Bhutan	151	308	16	475
Bolivia	1,056	1,591	131	2,779
Bosnia and Herzegovina	869	3,998	1,359	6,224
Botswana	148	755	43	946
Brazil	112,240	402,894	73,330	588,800
Brunei Darussalam	19	70	9	98
Bulgaria	3,176	14,278	6,114	23,556
Burkina Faso	349	777	19	1,146
Burundi	715	1,378	42	2,135
Cambodia	874	1,327	66	2,267
Cameroon	2,542	5,493	160	8,188
Canada	32,211	177,426	75,724	285,324
Cape Verde	43	238	9	291
Central African Republic	82	125	4	211
Chad	254	422	14	690
Channel Islands	95	667	201	962
Chile	6,295	24,157	6,396	36,874
China	66,040	318,949	63,452	448,480
Colombia	3,561	12,263	2,215	18,043
Comoros	112	198	6	316
Costa Rica	389	1,541	362	2,289
Cote d'Ivoire	2,500	5,147	164	7,804
Croatia	2,008	8,313	3,893	14,217
Cuba	1,155	6,122	2,070	9,348
Curaçao	2	5	2	9



Cyprus	401	2,611	1,028	4,040
Czech Republic	5,556	27,175	11,407	44,144
Democratic Republic of the Congo	5,811	12,283	423	18,534
Denmark	3,213	19,424	10,287	32,927
Djibouti	407	1,611	73	2,090
Dominican Republic	386	911	124	1,421
Ecuador	1,442	3,973	595	6,007
Egypt	14,029	23,991	1,121	39,133
El Salvador	557	1,143	113	1,813
Equatorial Guinea	127	485	12	623
Eritrea	1,985	4,355	132	6,468
Estonia	971	3,719	1,733	6,426
Eswatini	129	275	9	413
Ethiopia	4,227	15,310	478	19,998
Federated States of Micronesia	1	1	-	2
Fiji	37	77	7	121
Finland	6,230	38,903	24,557	69,685
France	24,884	112,754	64,467	202,160
French Guiana	219	503	63	784
French Polynesia	10	31	5	46
Gabon	196	757	36	988
Gambia	39	96	2	138
Georgia	1,239	2,775	468	4,483
Germany	40,390	252,997	138,120	431,313
Ghana	2,761	7,883	276	10,925
Greece	2,435	15,539	9,110	27,104
Grenada	53	155	22	231
Guadeloupe	155	473	179	807
Guam	1	3	1	5
Guatemala	1,960	4,378	362	6,702
Guinea	221	512	15	748
Guinea-Bissau	31	64	2	97
Guyana	10	18	2	30
Haiti	390	423	26	840
Honduras	997	2,052	119	3,166
Hong Kong	540	3,202	1,244	4,982
Hungary	4,594	23,033	9,485	37,087
Iceland	150	856	399	1,405
India	282,832	544,478	32,910	860,423
Indonesia	13,311	26,781	1,721	41,817
Iran	19,758	75,568	8,941	104,230
Iraq	12,373	26,080	1,414	39,875
Ireland	3,563	16,842	6,005	26,412
Israel	4,177	14,194	5,394	23,761
Italy	12,119	106,873	67,709	186,755



Jamaica	428	1,452	217	2,098
Japan	5,453	43,285	30,471	79,226
Jordan	1,291	4,675	377	6,344
Kazakhstan	1,243	3,472	512	5,231
Kenya	6,237	16,432	427	23,096
Kiribati	6	7	-	13
Kuwait	5,907	26,044	2,592	34,544
Kyrgyzstan	480	950	47	1,477
Laos	412	601	25	1,038
Latvia	716	2,903	1,255	4,872
Lebanon	640	3,570	687	4,895
Lesotho	195	424	21	640
Liberia	84	211	7	302
Libya	5,413	17,667	1,484	24,556
Lithuania	1,194	5,188	2,436	8,822
Luxembourg	242	1,667	537	2,447
Macao	51	309	85	445
Macedonia	489	2,137	569	3,194
Madagascar	2,998	7,525	209	10,732
Malawi	2,238	4,196	97	6,534
Malaysia	1,490	4,901	687	7,082
Maldives	89	345	21	456
Mali	299	539	17	856
Malta	191	1,471	835	2,499
Martinique	124	453	205	781
Mauritania	444	1,355	38	1,838
Mauritius	100	604	98	802
Mayotte	41	89	3	133
Mexico	10,971	69,163	9,702	89,834
Moldova	1,467	4,775	511	6,750
Mongolia	222	457	20	699
Montenegro	381	1,383	437	2,201
Morocco	37,194	78,786	8,968	124,911
Mozambique	3,662	6,492	179	10,346
Myanmar	2,569	4,162	262	6,984
Namibia	273	980	40	1,293
Nepal	6,641	10,988	454	18,094
Netherlands	7,716	47,522	25,000	80,220
New Caledonia	10	33	6	49
New Zealand	2,244	11,527	4,358	18,126
Nicaragua	618	1,334	85	2,039
Niger	410	747	21	1,179
Nigeria	17,670	32,125	1,200	51,035
North Korea	2,537	7,661	609	10,808
Norway	4,055	25,302	11,982	41,344





Oman	1,054	5,074	258	6,386
Pakistan	7,927	11,449	456	19,851
Palestine	692	1,745	51	2,489
Panama	404	1,146	205	1,755
Papua New Guinea	65	74	3	142
Paraguay	411	1,081	128	1,620
Peru	1,158	4,008	633	5,798
Philippines	6,100	9,788	559	16,443
Poland	15,220	74,921	29,942	119,995
Portugal	3,312	22,770	12,419	38,515
Puerto Rico	2,643	8,981	3,752	15,384
Qatar	1,543	17,621	1,177	20,340
Republic of Congo	557	1,319	43	1,917
Réunion	84	300	32	415
Romania	7,059	27,517	8,575	43,174
Russia	58,338	213,345	65,267	336,901
Rwanda	872	2,692	89	3,651
Samoa	10	16	1	28
Sao Tome and Principe	24	67	2	93
Saudi Arabia	49,118	177,957	14,202	241,348
Senegal	1,706	4,410	126	6,245
Serbia	3,387	15,026	4,952	23,377
Seychelles	9	46	6	60
Sierra Leone	118	210	7	335
Singapore	564	4,131	1,489	6,187
Slovakia	3,102	13,911	4,535	21,545
Slovenia	817	3,966	1,774	6,559
Solomon Islands	6	7	-	13
Somalia	7,821	12,920	440	21,182
South Africa	5,342	24,670	1,536	31,536
South Korea	3,626	23,246	8,267	35,128
South Sudan	3,954	4,134	174	8,261
Spain	17,245	119,883	69,651	206,944
Sri Lanka	3,971	9,021	1,089	14,094
St Lucia	72	266	35	373
St Vincent and the Grenadines	53	153	24	229
Sudan	17,886	31,342	1,188	50,447
Suriname	7	18	2	28
Sweden	10,283	57,728	31,308	99,411
Switzerland	2,226	15,983	8,432	26,642
Syria	2,052	5,043	235	7,324
Taiwan	2,012	14,904	4,882	21,802
Tajikistan	1,541	1,968	73	3,581
Tanzania	6,915	14,955	411	22,263
Thailand	2,196	7,415	1,807	11,408



Timor L' Este	86	108	4	199
Togo	131	304	9	444
Tonga	5	8	1	14
Trinidad and Tobago	590	1,991	380	2,961
Tunisia	7,307	20,519	2,148	29,959
Turkey	29,000	96,478	17,919	143,396
Turkmenistan	2,406	5,930	439	8,774
Uganda	5,554	10,327	216	16,087
Ukraine	32,093	81,872	14,688	128,701
United Arab Emirates	1,560	11,188	517	13,263
United Kingdom	42,048	253,055	117,927	413,042
United States	170,408	880,937	397,447	1,447,298
United States Virgin Islands	49	162	85	296
Uruguay	1,578	7,027	1,939	10,546
Uzbekistan	4,368	8,376	478	13,215
Vanuatu	16	22	1	39
Venezuela	363	887	138	1,387
Viet Nam	4,061	9,897	839	14,780
Western Sahara	7	45	1	54
Yemen	7,109	8,991	226	16,313
Zambia	2,279	4,908	113	7,299
Zimbabwe	1,741	3,167	95	5,000



[atlas@idf.org](mailto:atlas@idf.org) | [diabetesatlas.org](https://diabetesatlas.org)

