

# Munich Cancer Registry



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## ICD-10 C15-C26: GI cancer

### Survival

Year of diagnosis	1988-1997	1998-2016
Patients	15,286	96,513
Diseases	15,580	99,818
Cases evaluated	13,758	70,838
Creation date	08/22/2018	
Export date	08/09/2018	
Population	4.81 m	



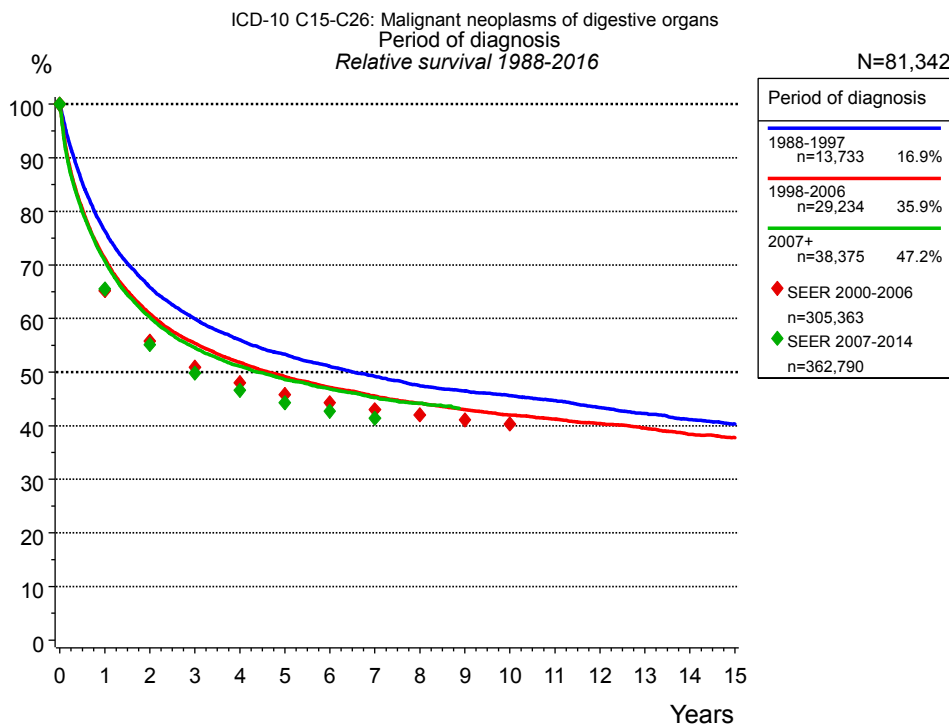
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<https://www.tumorregister-muenchen.de/en>

<https://www.tumorregister-muenchen.de/en/facts/surv/sC1526E-ICD-10-C15-C26-GI-cancer-survival.pdf>

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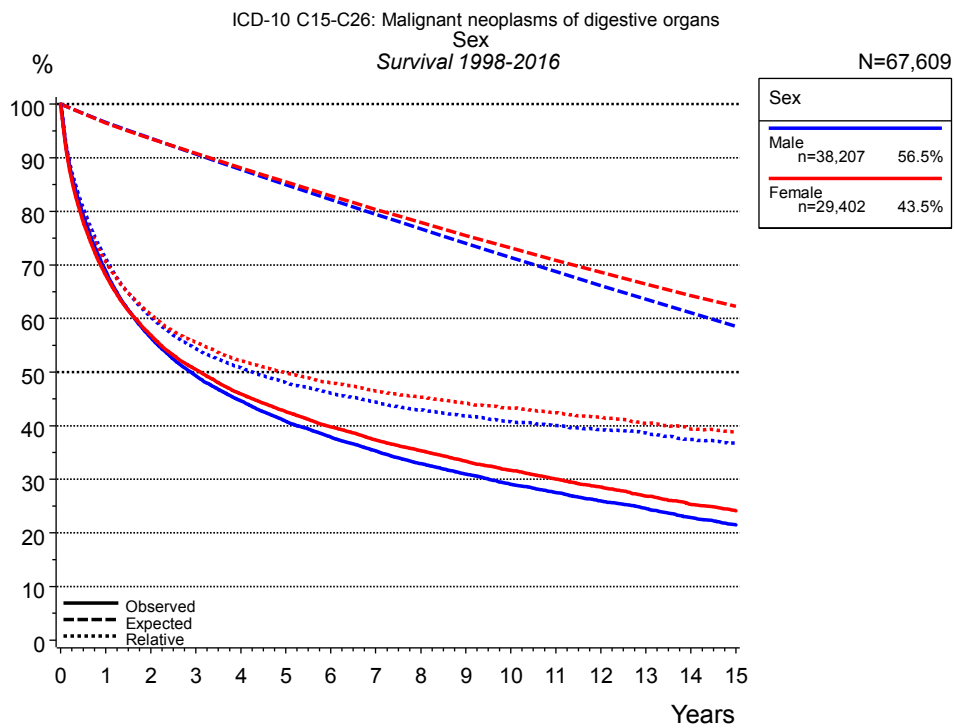
**Figure 1a.** Relative survival of patients with GI cancer by period of diagnosis. Included in the evaluation are 81,342 cases diagnosed between 1988 and 2016.

The survival results of the SEER program (Surveillance, Epidemiology, and End Results) of the American National Cancer Institute (NCI) are summarized as the period of diagnosis from 2000 to 2014, and are represented by colored diamonds in order to facilitate comparisons between MCR and SEER.

The presented survival curves are derived from clinical records with valid follow-up informations, which means that death certificate cases (DCO) cases are omitted from the analysis. With this one restriction, the MCR has provided population-based statistics since 1998, collecting data on all cancer cases in the region of southern Bavaria. Historical data of previous time periods can be heavily selected, therefore, univariate survival comparisons of the presented time periods must be carefully considered. Nonetheless, all calculable survival curves are depicted to facilitate the comparison of long time follow-up analyses of relative survival between particular cancers.

Years	Period of diagnosis					
	1988-1997 n=13,733		1998-2006 n=29,234		2007+ n=38,375	
	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %
0	100.0	100.0	100.0	100.0	100.0	100.0
1	73.7	76.4	68.7	71.2	68.4	70.8
2	61.4	65.8	56.8	60.9	56.5	60.3
3	54.1	60.0	50.0	55.4	49.7	54.5
4	48.9	56.0	45.4	51.8	45.1	51.1
5	45.1	53.3	41.7	49.2	41.6	48.6
6	41.7	51.0	38.7	47.1	38.8	46.8
7	38.8	49.2	36.2	45.5	36.3	45.2
8	36.2	47.4	33.9	44.1	34.3	44.2
9	34.3	46.5	31.9	43.0		
10	32.5	45.6	30.1	42.0		
11	30.8	44.7	28.6	41.2		
12	28.8	43.4	27.0	40.4		
13	27.2	42.3	25.5	39.5		
14	25.5	41.1	23.9	38.4		
15	24.1	40.3	22.6	37.7		

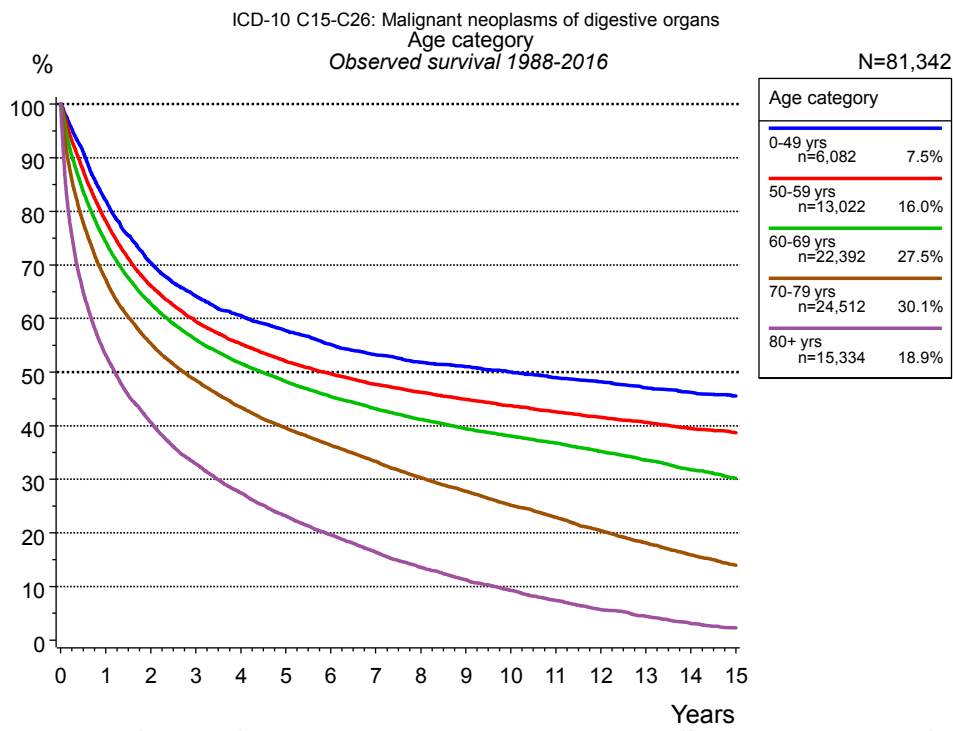
**Table 1b.** Observed (obs.) and relative (rel.) survival of patients with GI cancer by period of diagnosis for period 1988-2016 (N=81,342).



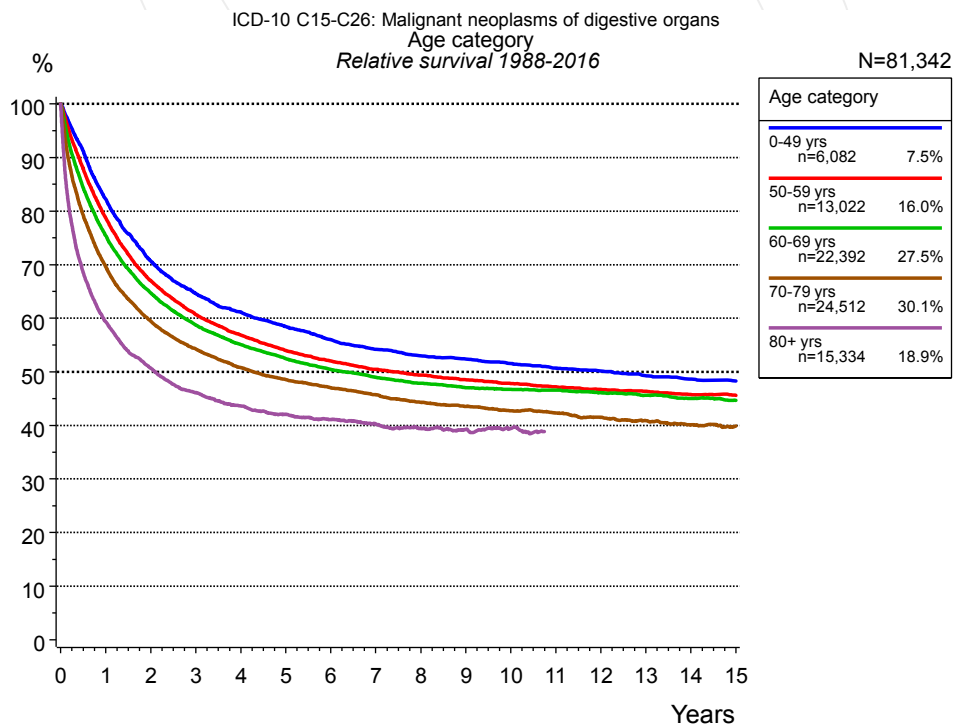
**Figure 2a.** Survival of patients with GI cancer by sex. Included in the evaluation are 67,609 cases diagnosed between 1998 and 2016.

Years	Sex			
	Male n=38,207		Female n=29,402	
	obs. %	rel. %	obs. %	rel. %
0	100.0	100.0	100.0	100.0
1	68.9	71.3	68.1	70.6
2	56.5	60.3	56.9	60.8
3	49.3	54.4	50.5	55.6
4	44.7	50.8	45.9	52.1
5	40.8	48.0	42.6	49.9
6	37.9	46.1	39.8	48.0
7	35.3	44.4	37.3	46.5
8	32.9	42.9	35.3	45.3
9	31.0	41.8	33.4	44.2
10	29.1	40.7	31.6	43.3
11	27.5	40.0	30.1	42.4
12	26.0	39.3	28.5	41.6
13	24.6	38.6	26.9	40.4
14	22.9	37.4	25.3	39.3
15	21.5	36.7	24.1	38.7

**Table 2b.** Observed (obs.) and relative (rel.) survival of patients with GI cancer by sex for period 1998-2016 (N=67,609).



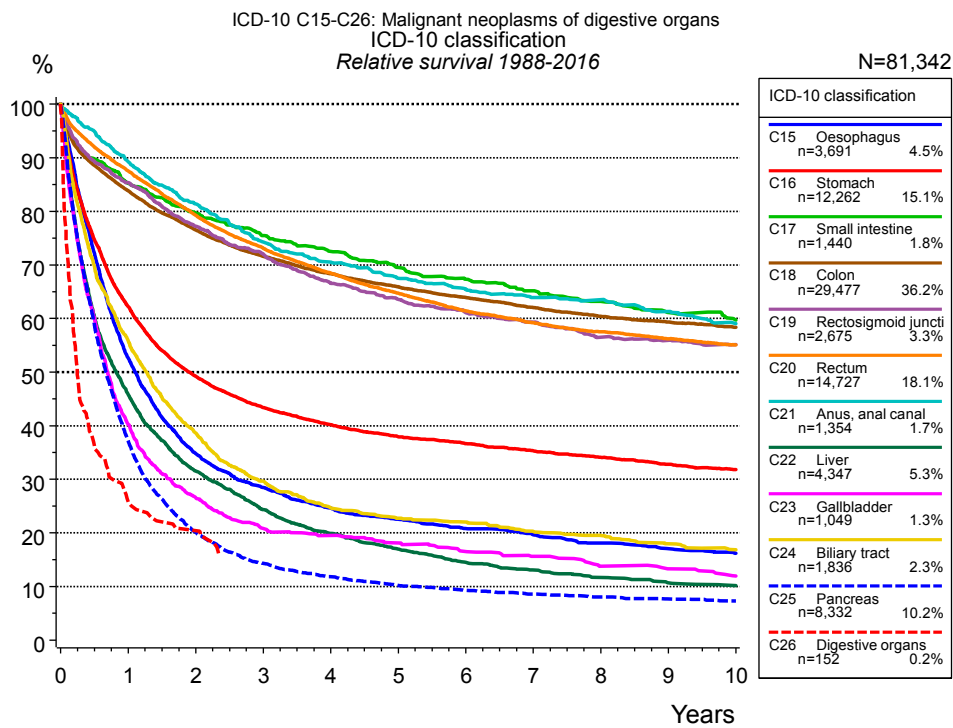
**Figure 3a.** Observed survival of patients with GI cancer by age category. Included in the evaluation are 81,342 cases diagnosed between 1988 and 2016.



**Figure 3b.** Relative survival of patients with GI cancer by age category. Included in the evaluation are 81,342 cases diagnosed between 1988 and 2016.

Years	Age category									
	0-49 yrs n=6,082		50-59 yrs n=13,022		60-69 yrs n=22,392		70-79 yrs n=24,512		80+ yrs n=15,334	
	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %
0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1	82.0	82.2	78.2	78.7	74.3	75.4	67.3	69.6	53.2	59.3
2	70.4	70.7	66.1	67.0	62.8	64.7	55.4	59.5	40.7	50.7
3	64.2	64.6	59.5	60.7	56.1	58.7	48.5	54.2	32.9	46.1
4	60.6	61.1	55.3	56.9	51.6	55.1	43.4	50.8	27.5	43.6
5	57.7	58.4	52.0	54.0	48.3	52.5	39.6	48.5	23.2	42.1
6	55.2	56.0	49.7	52.0	45.4	50.4	36.3	47.0	19.6	41.1
7	53.2	54.2	47.7	50.4	43.1	49.0	33.3	45.7	16.4	40.2
8	51.8	53.0	46.2	49.4	41.2	47.9	30.3	44.3	13.6	39.5
9	51.0	52.4	44.9	48.5	39.4	47.0	27.7	43.6	11.3	39.3
10	50.0	51.6	43.7	47.8	38.1	46.7	25.2	42.7	9.2	39.4
11	49.0	50.7	42.6	47.2	36.8	46.6	22.9	42.3	7.4	39.2
12	48.2	50.2	41.6	46.7	35.2	46.1	20.4	41.4	5.7	38.2
13	47.1	49.3	40.6	46.4	33.6	45.6	18.1	40.9	4.4	38.0
14	46.2	48.6	39.5	45.8	31.8	45.0	15.9	40.1	3.1	35.4
15	45.6	48.3	38.7	45.6	30.1	44.6	14.0	39.9	2.3	35.7

**Table 3c.** Observed (obs.) and relative (rel.) survival of patients with GI cancer by age category for period 1988-2016 (N=81,342).

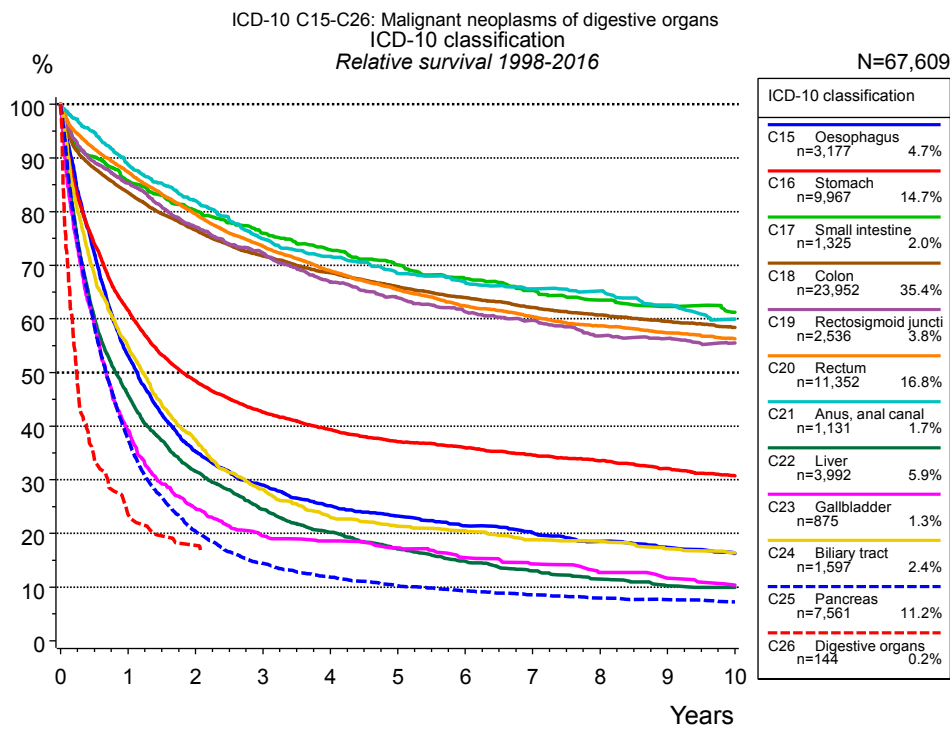


**Figure 4a.** Relative survival of patients with GI cancer by ICD-10 classification. Included in the evaluation are 81,342 cases diagnosed between 1988 and 2016.

Years	ICD-10 classification													
	C15 Oesophagus		C16 Stomach		C17 Small intestine		C18 Colon		C19 Rectosigmoid junction		C20 Rectum		C21 Anus, anal canal	
	n=3,691	n=12,262	n=1,440	n=29,477	n=2,675	n=14,727	n=1,354							
	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %
0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1	51.3	52.6	59.7	62.2	83.1	85.2	80.6	83.8	82.6	85.3	84.8	87.5	86.9	89.2
2	33.2	34.8	45.7	49.2	76.2	79.7	70.9	76.5	72.5	77.2	74.7	79.3	77.4	81.4
3	26.6	28.5	39.0	43.4	70.7	75.5	64.0	71.6	65.8	72.0	67.0	73.1	69.1	74.3
4	22.5	24.6	34.9	40.2	66.6	72.5	58.9	68.4	59.1	66.5	61.0	68.5	64.2	70.5
5	20.1	22.5	31.9	37.9	62.6	69.5	54.8	65.9	54.7	63.6	56.0	64.7	60.3	67.5
6	18.2	20.8	29.8	36.7	59.3	67.4	51.2	63.9	51.0	61.1	51.7	61.4	57.3	65.5
7	16.7	19.7	27.7	35.3	56.3	65.2	47.9	62.1	48.0	59.3	48.4	59.2	54.8	63.9
8	15.0	18.1	25.9	34.1	53.2	63.2	44.9	60.4	44.4	56.5	45.7	57.5	53.4	63.5
9	13.9	17.1	24.1	32.8	50.4	61.1	42.5	59.4	42.6	55.9	43.3	56.2	50.4	61.3
10	12.8	16.2	22.6	31.8	48.1	59.7	40.2	58.4	40.7	55.2	41.1	55.1	47.4	59.1

cont'd Years	ICD-10 classification									
	C22 Liver		C23 Gallbladder		C24 Biliary tract		C25 Pancreas		C26 Digestive organs	
	n=4,347	n=1,049	n=1,836	n=8,332	n=152					
	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %
0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1	44.6	45.8	38.6	40.3	53.9	55.8	36.1	37.1	25.4	25.8
2	29.9	31.5	24.6	26.6	36.3	38.6	19.2	20.1	19.6	20.4
3	22.6	24.3	18.6	20.8	27.3	29.7	13.3	14.3		
4	18.0	19.9	17.0	19.5	22.1	24.7	10.7	11.8		
5	15.0	17.0	15.3	18.1	19.9	22.7	9.1	10.2		
6	12.6	14.5	13.4	16.5	18.8	22.0	8.1	9.3		
7	11.0	13.0	12.1	15.6	16.8	20.3	7.3	8.6		
8	9.7	11.7	10.3	13.8	15.7	19.5	6.7	8.0		
9	8.6	10.7	9.5	13.3	14.1	18.0	6.2	7.7		
10	8.1	10.2	8.3	11.9	12.8	16.9	5.8	7.3		

**Table 4b.** Observed (obs.) and relative (rel.) survival of patients with GI cancer by ICD-10 classification for period 1988-2016 (N=81,342).



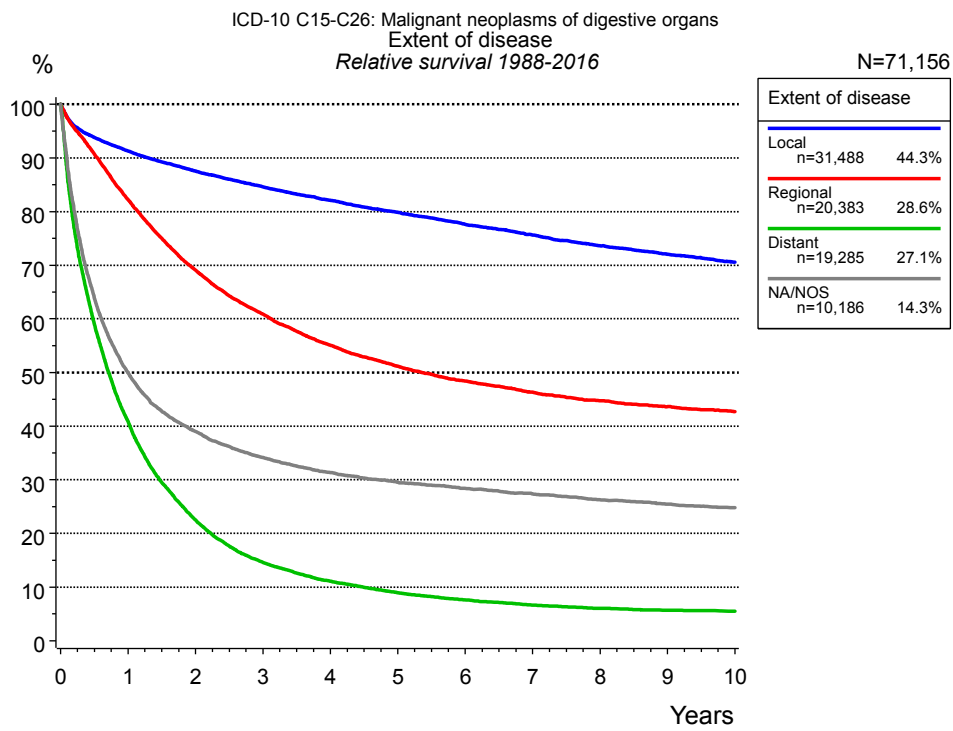
**Figure 4c.** Relative survival of patients with GI cancer by ICD-10 classification. Included in the evaluation are 67,609 cases diagnosed between 1998 and 2016.

Years	ICD-10 classification													
	C15 Oesophagus		C16 Stomach		C17 Small intestine		C18 Colon		C19 Rectosigmoid junction		C20 Rectum		C21 Anus, anal canal	
	n=3,177	n=9,967	n=1,325	n=23,952	n=2,536	n=11,352	n=1,131							
	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %
0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1	51.8	53.1	59.0	61.6	83.7	85.7	80.3	83.6	82.6	85.3	84.7	87.4	86.5	88.7
2	33.7	35.3	45.0	48.5	76.7	80.2	71.0	76.6	72.5	77.1	75.0	79.6	78.2	82.0
3	27.1	29.0	38.3	42.6	71.3	76.0	64.1	71.7	66.1	72.3	67.5	73.5	69.9	74.9
4	23.0	25.2	34.2	39.4	67.0	72.8	59.2	68.6	59.4	66.8	61.6	69.0	65.6	71.6
5	20.8	23.2	31.2	37.1	63.2	70.1	54.9	66.0	55.1	63.9	56.8	65.4	61.5	68.5
6	18.7	21.4	29.2	36.0	59.6	67.5	51.3	64.0	51.3	61.3	52.8	62.5	58.8	66.8
7	17.1	20.1	27.2	34.6	56.5	65.3	48.0	62.1	48.5	59.7	49.6	60.4	56.6	65.6
8	15.5	18.5	25.4	33.5	53.6	63.5	45.2	60.7	44.8	56.8	46.9	58.7	55.2	65.2
9	14.2	17.4	23.5	32.1	51.5	62.3	42.7	59.5	43.1	56.3	44.5	57.4	51.9	62.6
10	12.9	16.3	21.7	30.7	49.4	61.3	40.3	58.4	41.2	55.5	42.3	56.3	48.7	59.9

cont'd Years	ICD-10 classification									
	C22 Liver		C23 Gallbladder		C24 Biliary tract		C25 Pancreas		C26 Digestive organs	
	n=3,992	n=875	n=1,597	n=7,561	n=144					
	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %
0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1	44.5	45.7	37.6	39.2	53.0	54.8	36.6	37.6	23.2	23.6
2	30.0	31.6	22.8	24.6	35.2	37.4	19.4	20.4	17.1	17.8
3	22.7	24.4	17.5	19.5	26.0	28.3	13.4	14.4		
4	18.3	20.2	16.2	18.6	20.6	23.0	10.8	11.9		
5	15.1	17.1	14.7	17.3	18.6	21.3	9.2	10.2		
6	12.8	14.8	12.7	15.5	17.5	20.5	8.1	9.3		
7	11.0	13.0	11.2	14.3	15.6	18.8	7.3	8.5		
8	9.5	11.5	9.5	12.7	14.9	18.6	6.7	8.0		
9	8.3	10.2	8.3	11.7	13.4	17.1	6.2	7.7		
10	7.9	9.9	7.3	10.4	12.4	16.4	5.8	7.2		

**Table 4d.** Observed (obs.) and relative (rel.) survival of patients with GI cancer by ICD-10 classification for period 1998-2016 (N=67,609).

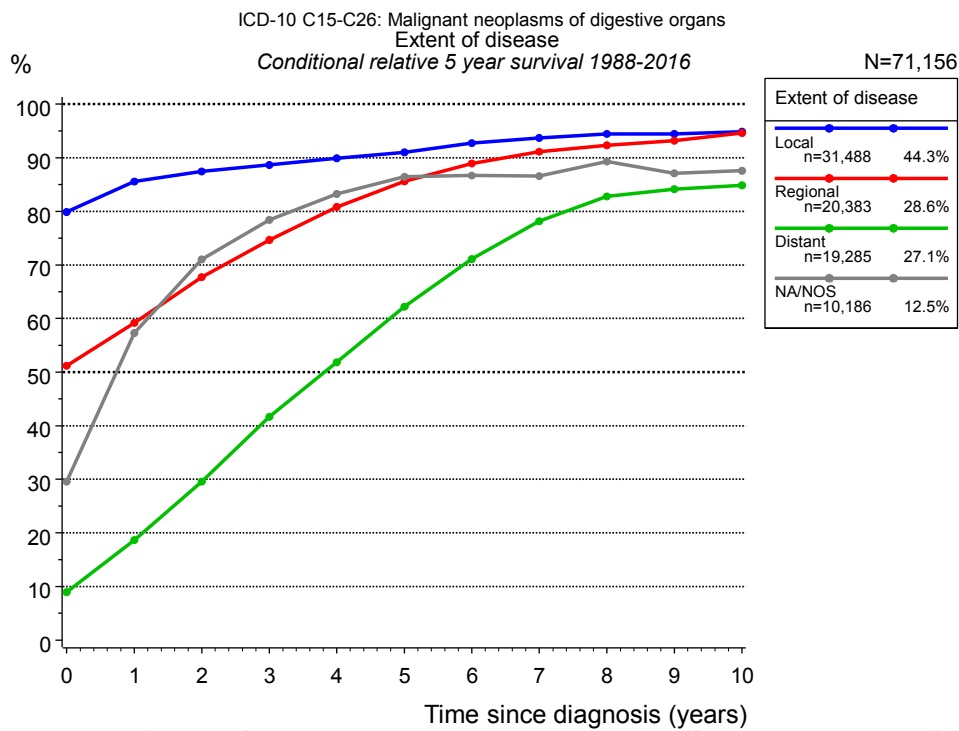




**Figure 4e.** Relative survival of patients with GI cancer by extent of disease. For 71,499 of 81,342 cases diagnosed between 1988 and 2016 valid data could be obtained for this item. For a total of 71,156 cases an evaluable classification was established. The grey line represents the subgroup of 10,186 patients with missing values regarding extent of disease (12.5 % of 81,342 patients, the percent values of all other categories are related to n=71,156).

Years	Extent of disease							
	Local n=31,488		Regional n=20,383		Distant n=19,285		NA/NOS n=10,186	
	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %	obs. %	rel. %
0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1	88.2	91.3	79.6	82.2	39.6	40.8	47.5	49.9
2	81.8	87.5	65.0	69.1	21.3	22.5	35.7	39.0
3	76.4	84.6	55.6	60.9	13.5	14.6	30.1	34.2
4	71.7	82.1	48.9	55.1	10.0	11.1	26.8	31.3
5	67.4	79.9	44.1	51.2	7.9	8.9	24.5	29.5
6	63.3	77.6	40.5	48.4	6.6	7.6	22.8	28.4
7	59.5	75.6	37.6	46.3	5.6	6.6	21.4	27.3
8	56.0	73.6	35.2	44.7	5.0	6.0	19.9	26.3
9	52.8	72.1	33.3	43.6	4.6	5.7	18.7	25.5
10	49.9	70.6	31.6	42.7	4.3	5.5	17.7	24.8

**Table 4f.** Observed (obs.) and relative (rel.) survival of patients with GI cancer by extent of disease for period 1988-2016 (N=71,156).

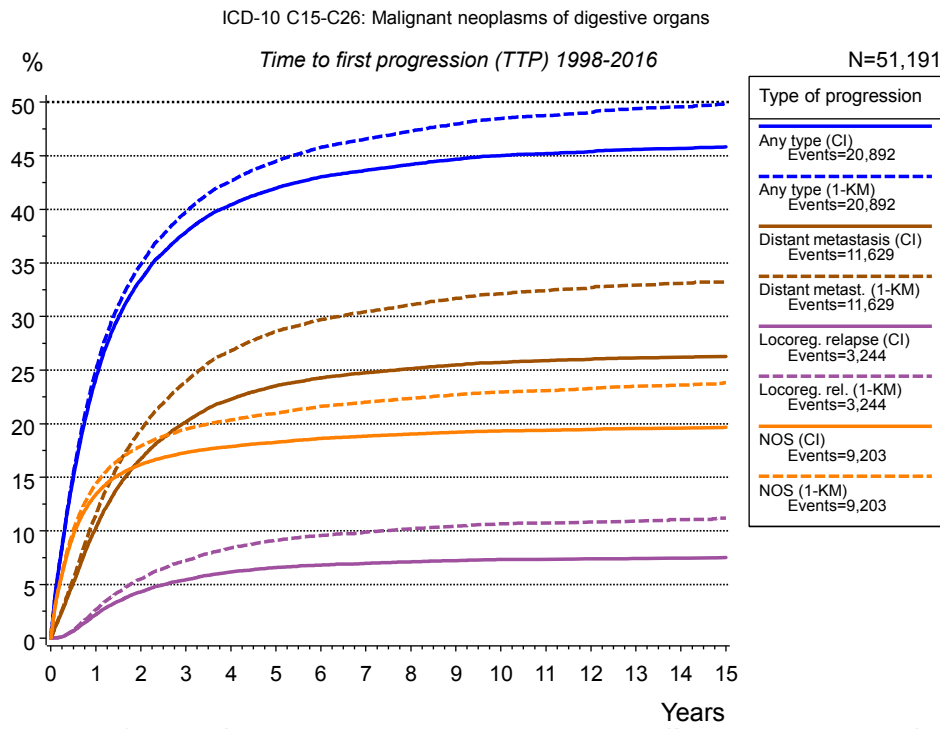


**Figure 4g.** Conditional relative 5-year survival of patients with GI cancer by extent of disease. For 71,499 of 81,342 cases diagnosed between 1988 and 2016 valid data could be obtained for this item. For a total of 71,156 cases an evaluable classification was established. The grey line represents the subgroup of 10,186 patients with missing values regarding extent of disease (12.5 % of 81,342 patients, the percent values of all other categories are related to n=71,156).

Years	Extent of disease							
	Local		Regional		Distant		NA/NOS	
	n	Cond. surv. % 5 yrs	n	Cond. surv. % 5 yrs	n	Cond. surv. % 5 yrs	n	Cond. surv. % 5 yrs
0	31,488	79.9	20,383	51.2	19,285	8.9	10,186	29.5
1	26,246	85.6	15,273	59.2	7,176	18.7	4,565	57.3
2	23,096	87.4	11,783	67.7	3,598	29.5	3,299	71.0
3	20,338	88.6	9,435	74.6	2,096	41.6	2,658	78.4
4	17,911	89.9	7,680	80.8	1,414	51.8	2,247	83.3
5	15,744	91.0	6,361	85.6	1,013	62.2	1,924	86.4
6	13,683	92.7	5,364	88.9	747	71.1	1,704	86.7
7	11,811	93.7	4,503	91.1	554	78.1	1,462	86.6
8	10,160	94.4	3,731	92.3	429	82.8	1,242	89.3
9	8,667	94.4	3,116	93.2	330	84.1	1,069	87.1
10	7,396	94.9	2,628	94.6	266	84.9	932	87.5

**Table 4h.** Conditional relative 5-year survival of patients with GI cancer by extent of disease for period 1988-2016 (N=71,156).

Conditional relative survival rates refer to the relative survival probability, in this case for 5 years after cancer diagnosis, compared to the age- and sex-matched population (=100 %) under the condition of being alive for a certain time period (x-axis in Figure 4e). The results illustrate to what extent the cancer induced mortality of particular subgroups declines in the subsequent years after detection of the malignancy. For instance, according to the presented survival statistics, patients in the subgroup extent of disease="Local", who are alive at least 3 years after cancer diagnosis, the conditional relative 5-year survival rate is 88.6% (n=20,338).

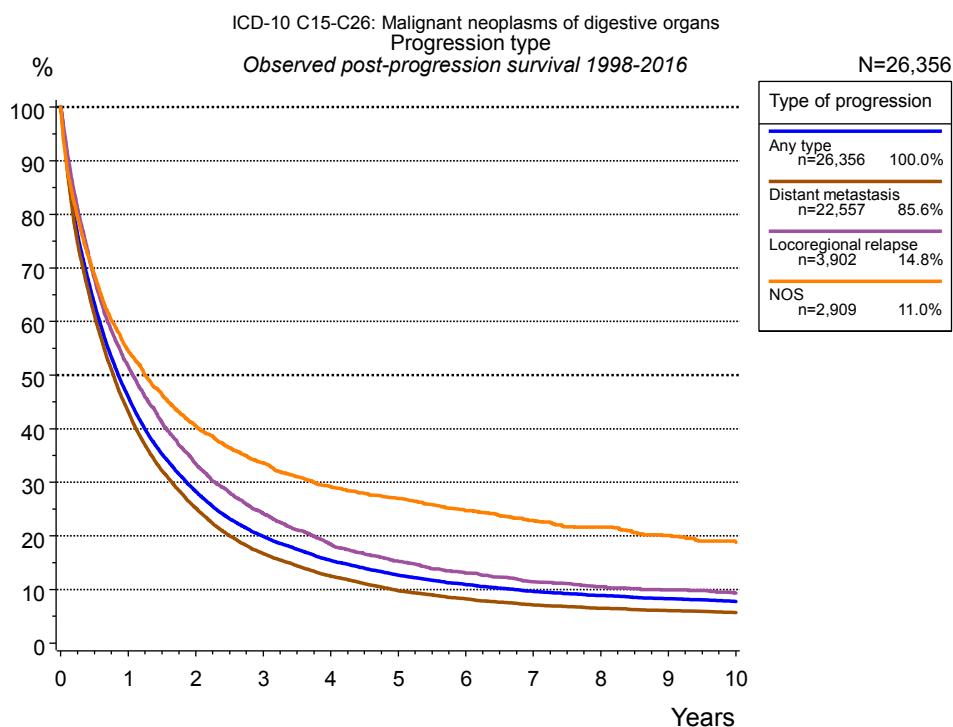


**Figure 5a.** Time to first progression of 51,191 patients with GI cancer diagnosed between 1998 and 2016 (in solid cancers M0 only) estimated by cumulative incidence function (CI, solid line) accounting for death as competing risk and by inverse Kaplan-Meier estimate (1-KM, dashed line). The frequency of events may be underestimated due to underreporting.

Years	Type of progression						
	Any type (CI)	Any type (1-KM)	Distant metastasis (CI)	Distant metast. (1-KM)	Locoreg. relapse (CI)	Locoreg. rel. (1-KM)	NOS (CI)
	n=51,191 %	n=51,191 %	n=51,191 %	n=51,191 %	n=51,191 %	n=51,191 %	n=51,191 %
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	24.2	25.0	10.3	11.5	2.2	2.6	13.4
2	33.4	34.8	16.7	19.4	4.3	5.5	16.2
3	37.8	39.7	20.1	23.9	5.4	7.2	17.3
4	40.4	42.6	22.3	26.8	6.2	8.4	17.9
5	42.0	44.5	23.5	28.6	6.6	9.1	18.2
6	43.0	45.8	24.3	29.7	6.8	9.6	18.6
7	43.6	46.6	24.8	30.4	7.0	9.9	18.8
8	44.2	47.3	25.1	31.1	7.1	10.2	19.0
9	44.7	48.0	25.5	31.7	7.2	10.4	19.2
10	45.0	48.5	25.7	32.1	7.3	10.7	19.3
11	45.2	48.8	25.9	32.4	7.4	10.8	19.4
12	45.4	49.1	26.0	32.7	7.4	10.8	19.5
13	45.6	49.4	26.1	32.9	7.4	10.9	19.6
14	45.7	49.6	26.2	33.1	7.5	11.0	19.6
15	45.8	49.8	26.3	33.2	7.5	11.2	19.7

Type of progression	
<i>cont'd</i>	NOS (1-KM) n=51,191
Years	%
0	0.0
1	14.4
2	17.9
3	19.5
4	20.3
5	21.0
6	21.6
7	22.0
8	22.4
9	22.7
10	23.0
11	23.1
12	23.3
13	23.5
14	23.6
15	23.8

**Table 5b.** Time to first progression of patients with GI cancer for period 1998-2016 (N=51,191).

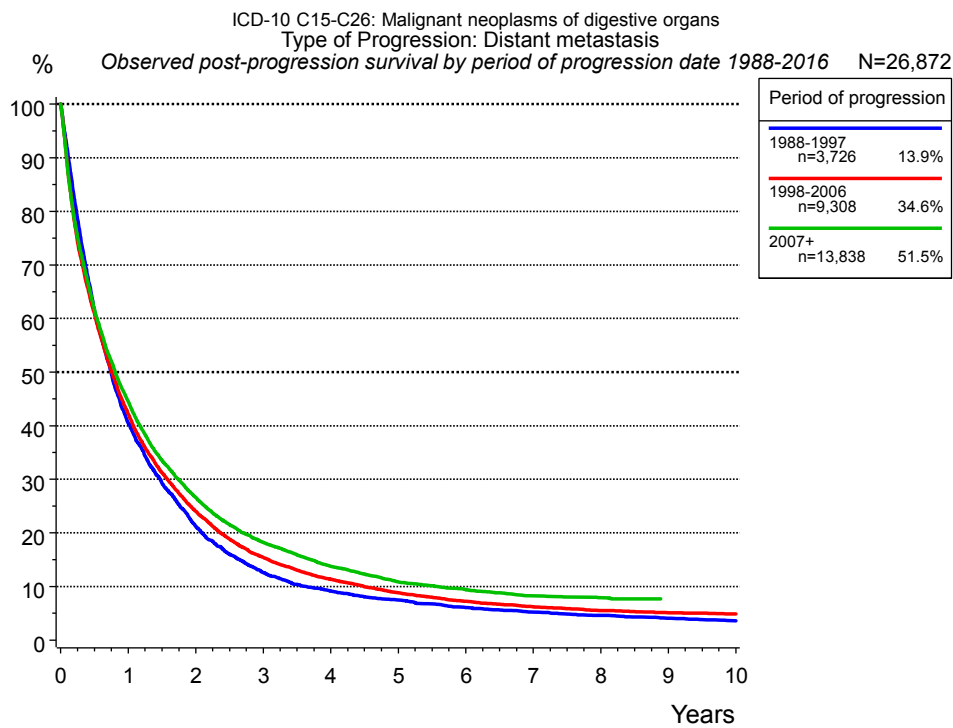


**Figure 5c.** Observed post-progression survival of 26,356 patients with GI cancer diagnosed between 1998 and 2016. These 26,356 patients with documented progression events during their course of disease represent 39.1 % of the totally 67,329 evaluated cases (incl. M1, n=16,138, 24.0 %). Patients with cancer relapse documented via death certificates only were excluded (n=10,674, 15.9 %). Multiple progression types on different sites are included in the evaluation even when not occurring synchronously. The NOS (not otherwise specified) class is included under the condition, that it is the one and only progression type during the course of disease.

Medical record documentation often lacks the linguistic severity to distinguish between local relapse, regional lymph node metastasis and distant spread in solid cancers. Frequently, the statement “not specified” is the only information in registries regarding relapse of the disease. The category “Any type” denotes all cases who suffered from at least one relapse during the course of disease (incl. primary M1-status). Although, the real number of relapsed patients is likely to be much higher. The accumulated percentage of patients with local relapse or distant metastasis exceeds the 100 % value because patients are potentially considered in more than one subgroup.

Years	Type of progression			
	Any type n=26,356 %	Distant metastasis n=22,557 %	Locoregional relapse n=3,902 %	NOS n=2,909 %
0	100.0	100.0	100.0	100.0
1	46.0	43.2	51.7	54.6
2	28.3	25.2	33.5	40.4
3	19.9	16.7	24.2	33.6
4	15.4	12.5	18.4	29.2
5	12.7	9.8	15.3	26.9
6	10.9	8.2	13.1	24.7
7	9.6	7.1	11.4	22.9
8	8.9	6.5	10.5	21.6
9	8.3	6.0	9.9	20.1
10	7.8	5.7	9.3	18.8

**Table 5d.** Observed post-progression survival of patients with GI cancer for period 1998-2016 (N=26,356).



**Figure 5e.** Observed post-progression (distant metastasis) survival of 26,872 patients with GI cancer diagnosed between 1988 and 2016 by period of progression.

Years	Period of progression		
	1988-1997 n=3,726 %	1998-2006 n=9,308 %	2007+ n=13,838 %
0	100.0	100.0	100.0
1	40.5	42.3	44.5
2	21.2	24.0	26.6
3	12.6	15.4	18.2
4	9.1	11.3	13.7
5	7.5	8.8	10.8
6	6.1	7.2	9.4
7	5.2	6.2	8.2
8	4.6	5.5	7.9
9	4.1	5.1	7.9
10	3.6	4.8	4.8

**Table 5f.** Observed post-progression (distant metastasis) survival of patients with GI cancer for period 1988-2016 by period of progression (N=26,872).

## Shortcuts

MCR Munich Cancer Registry, Germany

NCI National Cancer Institute, USA

SEER Surveillance, Epidemiology, and End Results, USA

UICC Union for International Cancer Control, Geneva

DCO Death certificate only Death certificate provides the only notification to the registry.

NA Not available

NOS Not otherwise specified

OS Overall/Observed survival Overall/Observed survival (Kaplan-Meier estimate)  
Date of entry: diagnosis  
Event: death from any cause

RS Relative survival Survival compared to “general population”,  
ratio of observed to expected survival (Ederer II method),  
reflecting cancer specific survival

AS Assembled survival Assembled chart of  
observed, expected, relative survival

CS Conditional survival Survival probability under the condition of surviving  
a given period of time

TTP Time to progression Time to first progression / relapse  
Date of entry: diagnosis  
Event: (progression / relapse): first local-, lymph node recurrence,  
distant metastasis or unspecified progression

1-KM 1 minus Kaplan-Meier estimator  
 (“inverse” Kaplan-Meier estimator)

CI Cumulative incidence  
Death as competing risk (according to Kalbfleisch und Prentice)

PPS Post-progression survival Survival since first progression / relapse (Kaplan-Meier estimate)  
Date of entry (progression / relapse): first local-, lymph node  
recurrence, distant metastasis or unspecified progression  
Event: death from any cause

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