CervicalCheck data (2008-2022)

Table 1: Detection of CIN and cancer in women referred for further investigation following screening from September 2008 to March 2020

	Low-grade	High-grade	Cancer	Totals*
Sep'08-Aug'09	1,652	3,648	99	**5,399**
Sep'09-Aug'10	2,947	5,379	184	**8,510**
Sep'10-Aug'11	3,939	6,343	222	**10,504**
Sep'11-Aug'12	4,885	6,508	185	**11,578**
Sep'12-Aug'13	4,334	5,261	158	**9,753**
Sep'13-Aug'14	4,658	5,265	177	**10,100**
Sep'14-Aug'15	5,618	5,741	170	**11,529**
Sep'15-Aug'16	6,217	6,786	174	**13,177**
Sep'16-Aug'17	6,263	5,853	124	**12,240**
Sep'17-Aug'18	6,702	5,231	119	**12,052**
Sep'18-Aug'19	8,357	5,010	100	**13,467**
Sep'19-Mar'20	5,078	3,085	74	**8,237**
Totals	**60,650**	**64,110**	**1,786**	**126,546**

* Figures recorded by the National Cancer Registry of Ireland (NCRI) for this period also include cancers detected in women diagnosed with cancer who did not come for screening.

Table 3: Number of unique people who had a CervicalCheck screening (all locations) test by age September 2017- March 2020

Age group	2017/2018	2018/2019	2019/2020*
	N (%)	N (%)	N (%)
<25*	598 (0.2)	578 (0.2)	**335 (0.3)**
25-29	46,612 (13.6)	37,502 (15.0)	**18,863 (15.7)**
30-34	53,691 (15.7)	40,397 (16.2)	**19,175 (16.0)**
35-39	64,225 (18.8)	46,823 (18.8)	**22,581 (18.8)**
40-44	56,986 (16.7)	40,757 (16.3)	**21,163 (17.6)**
45-49	40,578 (11.9)	30,226 (12.1)	**15,065 (12.5)**
50-54	35,895 (10.5)	24,373 (9.8)	**11,250 (9.4)**
55-59	29,733 (8.7)	19,743 (7.9)	**8,243 (6.9)**
60	4,733 (1.4)	3,046 (1.2)	**1,280 (1.1)**
>=61	8,866 (2.6)	6,281 (2.5)	**2,114 (1.8)**
Total	**341,917 (100)**	**249,726 (100)**	**120,069 (100)**

The period 2019 to 2020 runs from September 2019 to end of March 2020 and is only 7 months long instead of the usual 12 months

Table 6 shows the histology results from histological biopsies taken in colposcopy clinics. Low-grade CIN is usually treated conservatively as it has a high rate of regression (returning to normal with no treatment). High-grade CIN is less likely to regress and is usually treated by excision or ablation. The number of women screened in 2020 was lower than usual due to the impact of COVID-19. This impacted on numbers attending colposcopy clinics and therefore the number of biopsies taken.

Table 6. Histology results from diagnostic and therapeutic biopsies taken in colposcopy

Histology results in colposcopy patients	2020/21	%	2021/22	%
Low-grade CIN	6,954	**64.8%**	9,692	**61.8%**
High-grade CIN/CIN uncertain grade	3,602	**33.6%**	5,693	**36.3%**
Adenocarcinoma in-situ / CGIN	98	**0.9%**	182	**1.2%**
Cancer	79	**0.7%**	108	**0.7%**
Total	**10,733**		**15,675**	

New to return ratio

The table below (**Table 7**) details the new to return ratio. This is a measure of the number of follow-up visits generated by each new referral to colposcopy services.

Definition: The number of new patients who attend a service compared to the number of review patients who attend a service. The new to return ratio is expressed by setting out how many review patient attendances occur for each new patient attendance.

Standard: There is no agreed standard for this metric. This is a quality measure that helps ensure that colposcopy capacity is sufficient to meet the needs of the women referred. This is monitored to ensure that women who are referred to colposcopy are managed according to the programme's quality assurance standards and discharged when clinically appropriate and in line with programme policy.

Table 7. New to return ratio 2020-2022

	New to return ratio
2020/21	**1:1.7**
2021/22	**1:1.1**

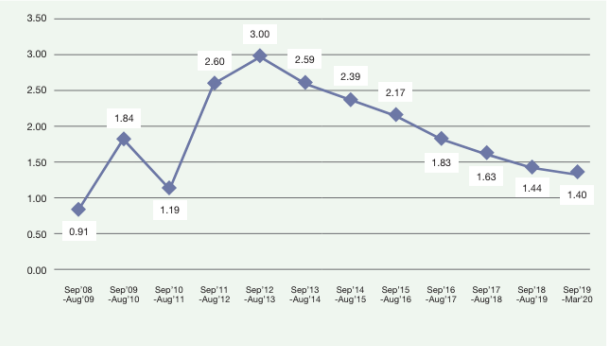
The new: review ratio

The graph below details the number of follow-up visits generated by each new referral to colposcopy services.

Definition: The number of new patients that attend a service compared to the number of review patients that attend a service. The New: Return ratio is expressed by setting out how many review patient attendances occur for each new patient attendance.

Standard: There is no agreed standard for this metric. We monitor this mainly to ensure that people who are referred to colposcopy are managed according to the programme's quality assurance standards and discharged when clinically appropriate and in line with programme policy. This is a quality measure and also helps ensure that colposcopy capacity is sufficient to meet the needs of the people referred.

Figure 13: Number of return visits generated by each new referral for colposcopy clinics 2008-2020



* The period 2019 to 2020 runs from September 2019 to end of March 2020 and is only 7 months long instead of the usual 12 months

The above are the relevant tables from cervical check reports 1 and 2. We do the same analysis, only now we factor out recalled cases so we don't double count!

In[ ]:=

```
year = Table[i,{i,2008,2022}];
(*Total CIN1 / HSIL cases handled that year*)
cin1total={Around[0,0.01],1652,2947,3939,4885,4334,4658,5618,6217,6263,6702,8357,5078,6954,969
hsiltotal={Around[0,0.01],3648,5379,6343,6508,5261,5265,5741,6786,5853,5231,5010,3085,3602,569

(*New to review ratio (only consider new cases, presume we can only prevent cancer ONCE)*)
newrecallratio = 1+{0,0.91,1.84,1.19,2.6,3,2.59,2.39,2.17,1.83,1.63,1.44,1.4,1.7,1.1};
cin1 = cin1total/newrecallratio;
hsil = hsiltotal/newrecallratio;

(*Cancers detected by screening and NCRI in total*)
cancersscreen = {0,99,184,222,185,158,177,170,174,124,119,100,74,79,108};
cancerstotal = {264,356,338,336,300,286,281,248,291,294,303,266,193,303,250};

(*Ratio of CIN1/2 cases*)
pc2=Around[0.4814,0.011];
pc3=Around[0.5186,0.011];
cin2=pc2*hsil;
cin3=pc3*hsil;

(*Transition probabilities for model 3*)
cc1m3=Around[0.013,0.007];
cc2m3=Around[0.076,0.034];
cc3m3=Around[0.308,0.112];

cin1prevm3 = cin1*cc1m3
cin2prevm3 = cin2*cc2m3
cin3prevm3 = cin3*cc3m3

eff = Around[0.993,0.004];

(*Total prevented that year over a lifetime... *)
```

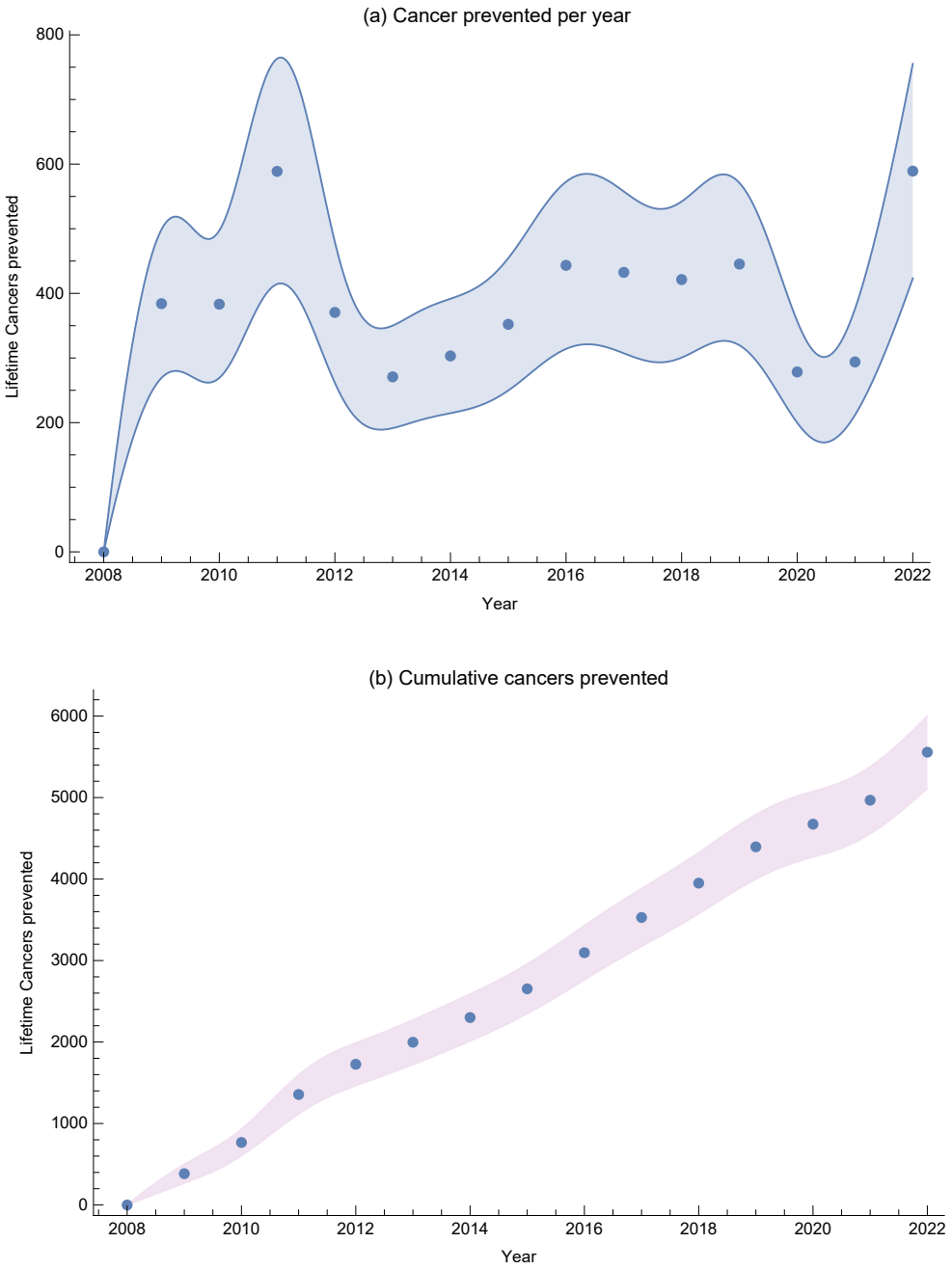
```
totalm3 = cin1prevm3 + cin2prevm3 + eff*cin3prevm3;
cumversion = Accumulate[totalm3];
combinedlist = Transpose[{year,totalm3}];
combinedlist2 = Transpose[{year,cumversion}];
aplot = ListPlot[combinedlist,IntervalMarkers→"Bands",InterpolationOrder→5,PlotRange→All,
Frame→{True,True,False,False},FrameLabel→{"Year","Lifetime Cancers prevented"},
PlotLabel→"(a) Cancer prevented per year ",ImageSize→500];
bplot = ListPlot[combinedlist2,IntervalMarkersStyle -> Directive[LightPurple, Opacity[0.9]],
IntervalMarkers→"Bands",InterpolationOrder→5,PlotRange→All,Frame→{True,True,False,False},
FrameLabel→{"Year","Lifetime Cancers prevented"},PlotLabel→"(b) Cumulative cancers prevented"
Row[{aplot,bplot}]

(*Quick calculation to work out annual cancers prevented*)
timetotal = 13 + 7/12;
totalpre = (Mean[totalm3]*14)/timetotal;

TextCell[formattedText = Row[{
  "Average lifetime cancers prevented per year: ",
  totalpre
}],"Text"]


timetotal = 13 + 7/12;
totalpre = (Mean[totalm3]*14)/timetotal
```

Out[•]= {0.00000 ± 0.00013, 11. ± 6., 13. ± 7., 23. ± 13., 18. ± 9., 14. ± 8., 17. ± 9.,
22. ± 12., 25. ± 14., 29. ± 15., 33. ± 18., 45. ± 24., 28. ± 15., 33. ± 18., 60. ± 32.}

Out[•]= {0.0000 ± 0.0004, 70. ± 31., 69. ± 31., 106. ± 47., 66. ± 30., 48. ± 22., 54. ± 24.,
62. ± 28., 78. ± 35., 76. ± 34., 73. ± 33., 75. ± 34., 47. ± 21., 49. ± 22., 99. ± 44.}

Out[•]= {0.0000 ± 0.0016, 305. ± 111., 303. ± 110., 463. ± 169., 289. ± 105., 210. ± 77., 234. ± 85.,
271. ± 99., 342. ± 125., 330. ± 120., 318. ± 116., 328. ± 119., 205. ± 75., 213. ± 78., 433. ± 158.}

Out[ ]=



Out[ ]= Average lifetime cancers prevented per year: 382. ± 30.

Out[ ]= 382. ± 30.

In[ ]:=
```
(*Also, let's work out the cancer prevented per 1000 screened based on UNIQUE screenings! *)
yearsunique = Table[i,{i,2017,2022,1}];
uniqueprevents = Table[totalm3[[i]],{i,10,15}];
uniquescreens = {355353,257449,121269,216471,310345};
preper1000 = 1000*Total[uniqueprevents]/(Total[uniquescreens]);
(*Just a graph of proportion of screening detected cancers versus non-screening detected! *)
proportionscreened = cancersscreen/cancerstotal;

(* Use BarChart*)
barChart = BarChart[100*proportionscreened,
  ChartLabels -> {year}, (* Add year labels *)
  ChartStyle -> "Pastel", (* Set chart style *)
  PlotTheme -> "Marketing", (* Set plot theme *)
  ImageSize -> 800, (* Set image size *)
  FrameLabel -> {"Year", "Proportion (%)"} (* Add axis labels *)
];

TextCell[formattedText = Row[{
  "Cancers prevented per 1000 screens: ",
 preper1000
}],"Text"]
```

Out[ ]= Cancers prevented per 1000 screens: 1.95 ±0.23

In[ ]:=
```
(*In this section, we can also check the exponential distribution part of the paper! From lite
Let's presume exp. distribution, of form: CDF(t) = 1 - exp(-λt) - therefore, we estimate para

λ=N[-Log[1 - 62/10000]/7];

(*median time to cancer from low grade is 21 years in lit, thus from expo dist, mean time is 3
meantime = N[21/Log[2]];
meancancerlg = 1 - Exp[-meantime*λ];
medcancerlg = 1 - Exp[-21*λ];

Plot[100*(1-Exp[-λ*x]),{x,0,50},Frame→True,FrameLabel→{"Time (years)","Cumulative cancers (%
```

Out[ ]=