

HAZARD ANALYSIS OF EMPLOYEES IN A PHARMACEUTICAL COMPANY

When is the biggest danger for employees to leave?

Our Approach – We have obtained year interval of highest Attrition Risk of the employees in the first 5 years & next 10 years of their employment from the hazard plots of:

- Age Groups
- Job Roles
- Work Experience groups (based on Total Working Years)
- Job Level
- Business Travel

Since we want to capture the hazard trend of employees for 15 years of their employment, we are considering time/tenure till 15 years.

a. DANGER of ATTRITION: Across Age Groups

We have created 5 age groups as <25, 25-30, 30-40, 40-50, 50-60, >60 as below:

```
length age_group $20.;  
if age=. then age_group="null";else  
if age<=30 then age_group="<=30";else  
if 30<age<=40 then age_group="30-40";else  
if 40<age<=50 then age_group="40-50";else  
if 50<age<=60 then age_group="50-60";else  
age_group=">60";
```

Age Group	Year Interval of highest Attrition Risk	
	0-5 years	5-15 years
<=30	0-2	9-11
30-40	0-2	9-11
40-50	3-5	9-11
50-60	3-5	9-11

The table on the Left Hand Side gives the year interval of highest risk of attrition in the first 5 years and the next 5-15 years of employment. Across all the Age Groups, the year

interval which has the **highest conditional probability of failure** is included here. Young Employees who are <=40 years have highest risk of attrition in the years 0-2 for the first 5 years of their employment and in the years 9-11 for the next 10 years of their employment. Attrition Risk for Employees above 40 years of age is highest in 3-5 years of their employment in the first 5 years of their job and years 9-11 for the next 10 years!

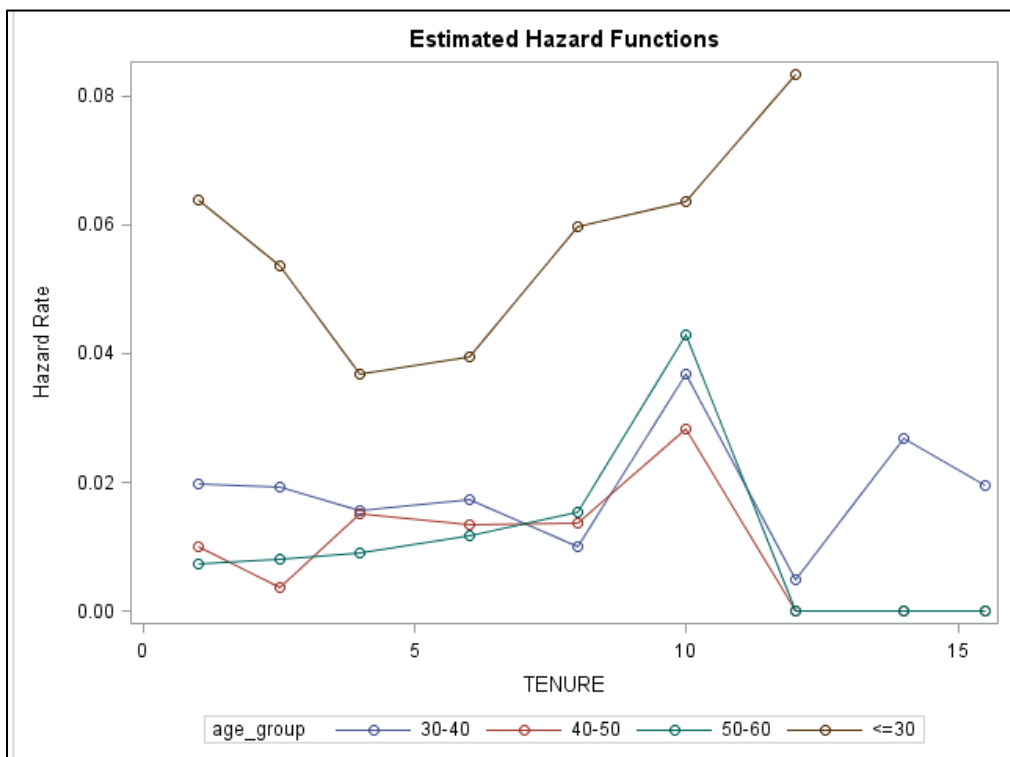
Summary of the Number of Censored and Uncensored Values					
Stratum	age_group	Total	Failed	Censored	Percent Censored
1	30-40	619	85	534	86.27
2	40-50	322	34	288	89.44
3	50-60	143	18	125	87.41
4	<=30	386	100	286	74.09
Total		1470	237	1233	83.88

The summary table on the LHS shows that **Young employees** attrite the most as inferred from the “Percent censored” column. **Lower value of percent censored implies higher attrition.**

- **26% of the Employees aged <=30 years** attrite and the year which poses the biggest threat for them to leave is **0-2 years** in the first 5 years of their employment!
- In a time-span of 15 years, High attrition risk is present in years 9-11 after 5 years of employment!

Code used:

```
proc lifetest data=project1.emp_prep_final method=life plots=(s,h)
intervals= 2 3 5 7 9 11 13 15 16;
time tenure*censored(0);
strata age_group;
run;
```



Based on the hazard plot on the Left Hand Side, we find that young employees (≤ 30 years) have significantly higher risk of attrition than other age groups.

b. DANGER OF ATTRITION: Across Job Roles

Job Role	Year Interval of highest Attrition Risk	
	0-5 years	5-15 years
Laboratory Technician	0-2	9-11
Research Scientist	0-2	9-11
Healthcare Representative	0-2	9-11
Sales Representative	3-5	9-11
Sales Executive	3-5	9-11
Human Resources	3-5	No Risk
Manufacturing Director	3-5	9-11
Manager	No Risk	9-11
Research Director	No Risk	No Risk

The table on the Left Hand Side gives the year interval of highest risk of attrition in the first 5 years and the next 5-15 years of employment. Across all the Job Roles, the year interval which has the **highest conditional probability of failure** is included here. We find

that for Laboratory Technicians, Research Scientists & Healthcare Representatives the biggest threat of attrition is years 0-2 in the first 5 years and years 3-5 for other job roles. If the employees have chosen to stay beyond 5 years, then years 9-11 of their employment poses the biggest risk of attrition! For senior level positions of Manager & Research Director,

there is no risk of attrition during the initial 5 years. For Human Resources, there is No Risk in 5-15 years of employment. However, we ignore it since Human Resources constitutes just 4% of the employee data!

Summary of the Number of Censored and Uncensored Values					
Stratum	JOBROLE	Total	Failed	Censored	Percent Censored
1	Healthcare Representative	131	9	122	93.13
2	Human Resources	52	12	40	76.92
3	Laboratory Technician	259	62	197	76.06
4	Manager	102	5	97	95.10
5	Manufacturing Director	145	10	135	93.10
6	Research Director	80	2	78	97.50
7	Research Scientist	292	47	245	83.90
8	Sales Executive	326	57	269	82.52
9	Sales Representative	83	33	50	60.24
Total		1470	237	1233	83.88

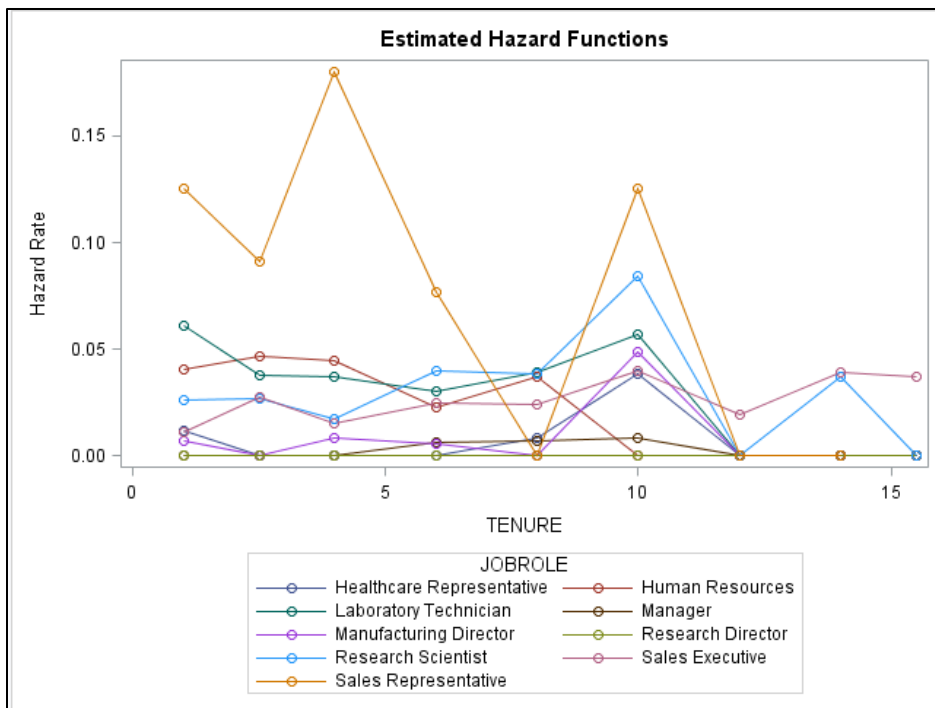
The summary table on the LHS shows that **Sales Representatives, Laboratory Technicians and Human Resources attrite the most** as inferred from the “*Percent censored*” column. **Lower value of percent censored implies higher attrition.**

- **40% of the Sales Representatives attrite** and the year which poses the biggest threat for them to leave is **3-5 years** in the first 5 years of their employment!
- **24% of the Laboratory Technicians attrite** and the year which poses the biggest threat for them to leave is **0-2 years** in the first 5 years of their employment!
- In a time-span of 15 years, High attrition risk is present in years 9-11 after 5 years of employment!

Code used:

```
proc lifetest data=project1.emp_prep_final method=life plots=(s,h)
intervals= 2 3 5 7 9 11 13 15 16 ;
time tenure*censored(0);
strata jobrole;
run;
```

Based on the hazard plot below, we find Sales Representatives have significantly higher risks of attrition than other job roles. **Research Director seems to have no risk of attrition!**



c. DANGER OF ATTRITION: Across “Work Experience” Groups

We have created Total_Work groups as follows:

```
IF TOTALWORKINGYEARS <= 5 THEN TOTAL_WORK = "<=5 YEARS";
ELSE IF TOTALWORKINGYEARS <= 10 THEN TOTAL_WORK = "6-10 YEARS";
ELSE IF TOTALWORKINGYEARS <= 15 THEN TOTAL_WORK = "11-15 YEARS";
ELSE IF TOTALWORKINGYEARS <= 20 THEN TOTAL_WORK = "16-20 YEARS";
ELSE IF TOTALWORKINGYEARS <= 25 THEN TOTAL_WORK = "21-25 YEARS";
ELSE IF TOTALWORKINGYEARS <= 30 THEN TOTAL_WORK = "26-30 YEARS";
ELSE IF TOTALWORKINGYEARS <= 35 THEN TOTAL_WORK = "31-35 YEARS";
ELSE IF TOTALWORKINGYEARS <= 40 THEN TOTAL_WORK = "36-40 YEARS";
ELSE TOTAL_WORK = ">41 YEARS";
```

Work Experience Group	Year Interval of highest Attrition Risk	
	0-5 years	5-15 years
<=5 years	0-2	No Data
6-10 years	2-3	9-11
11-15 years	0-2	9-11
16-20 years	3-5	9-11
21-25 years	0-2	No Risk
26-30 years	No Risk	7-9
31-35 years	No Risk	9-11
36-40 years	No Risk	No Risk

The table on the Left Hand Side gives the year interval of highest risk of attrition in the first 5 years and the next 5-15 years of employment. Across all the Work Experience Groups, the year interval which has the **highest conditional probability of**

failure is included here.

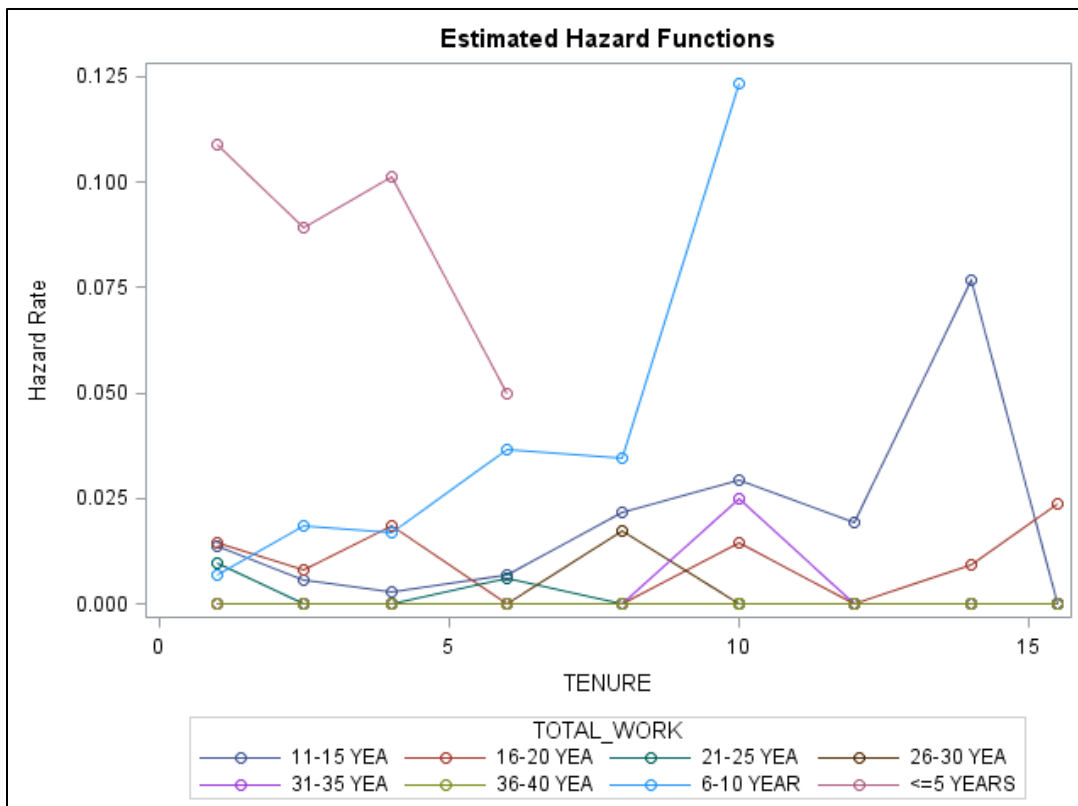
Summary of the Number of Censored and Uncensored Values					
Stratum	TOTAL_WORK	Total	Failed	Censored	Percent Censored
1	11-15 YEA	191	24	167	87.43
2	16-20 YEA	149	15	134	89.93
3	21-25 YEA	109	9	100	91.74
4	26-30 YEA	52	2	50	96.15
5	31-35 YEA	33	3	30	90.91
6	36-40 YEA	13	2	11	84.62
7	6-10 YEAR	607	91	516	85.01
8	<=5 YEARS	316	91	225	71.20
Total		1470	237	1233	83.88

The summary table on the LHS shows that employees with work experience ≤ 5 years attrite the most attrite the least as inferred from the "Percent censored" column. **Lower value of percent censored implies higher attrition.**

- **29% of the Employees with work experience ≤ 5 years attrite and the year which poses the biggest threat for them to leave is 0-2 years in the first 5 years of their employment!**
- **In a time-span of 15 years, High attrition risk is present in years 9-11 after 5 years of employment!**

Code used:

```
proc lifetest data=project1.emp_prep_final method=life plots=(s,h)
intervals= 2 3 5 7 9 11 13 15 16 ;
time tenure*censored(0);
strata total_work;
run;
```



The hazard plot on the RHS shows that employees having ≤ 5 years of work experience have the highest risk of attrition which exponentially drops. However, attrition risk of employees having work experience of 6-10 years increases exponentially.

d. DANGER of ATTRITION: Across "Job Level"

Job Level	Year Interval of highest Attrition Risk	
	0-5 years	5-15 years
1	0-2	9-11
2	3-5	9-11
3	0-2	9-11
4	0-2	No Risk
5	No Risk	5-7

The table on the Left Hand Side gives the year interval of highest risk of attrition in the first 5 years and the next 5-15 years of employment. Across all the Job Level Groups, the

year interval which has the **highest conditional probability of failure** is included here. Job Level groups are based on the seniority in management with 1 being the lowest and 5 being the highest.

Summary of the Number of Censored and Uncensored Values					
Stratum	JOBLEVEL	Total	Failed	Censored	Percent Censored
1	1	543	143	400	73.66
2	2	534	52	482	90.26
3	3	218	32	186	85.32
4	4	106	5	101	95.28
5	5	69	5	64	92.75
Total		1470	237	1233	83.88

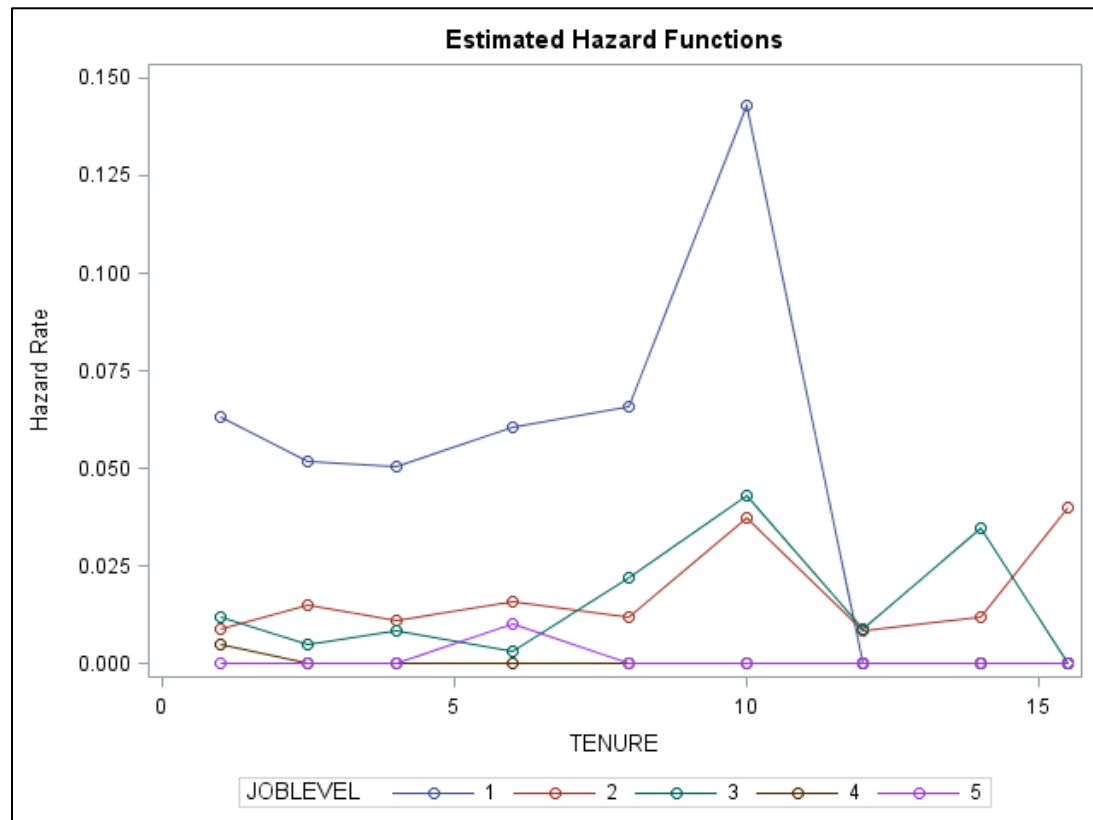
The summary table on the LHS shows that employees with Job Level 1 attrite the most while employees with job Level 4,5 attrite the least as inferred from the "Percent censored" column. **Lower value of percent censored implies higher attrition.** In other words, **senior management attrite the least while junior employees attrite the most.**

- **26% of the Employees with Job Level=1, i.e. holding junior positions attrite and the year which poses the biggest threat for them to leave is 0-2 years in the first 5 years of their employment!**
- **In a time-span of 15 years, High attrition risk is present in years 9-11 after 5 years of employment!**

Code used:

```
proc lifetest data=project1.emp_prep_final method=life plots=(s,h)
intervals= 2 3 5 7 9 11 13 15 16 ;
time tenure*censored(0);
strata joblevel;
run;
```

The risk of attrition is significantly higher in employees holding junior positions.



e. DANGER of ATTRITION: Across “Business Travel” frequency

Business Travel	Year Interval of highest Attrition Risk	
	0-5 years	5-15 years
Travel Frequently	0-2	9-11
Travel Rarely	0-2	9-11
Non Travel	0-2	9-11

The table on the Left Hand Side gives the year interval of highest risk of attrition in the first 5 years and the next 5-15 years of

employment. Across all the Business Travel Groups, the year interval which has the **highest conditional probability of failure** is included here. We see here across all groups, years 0-2 are with highest risk of attrition in the first 5 years of the employment and for the next 10 years, it is years 9-11!

Summary of the Number of Censored and Uncensored Values

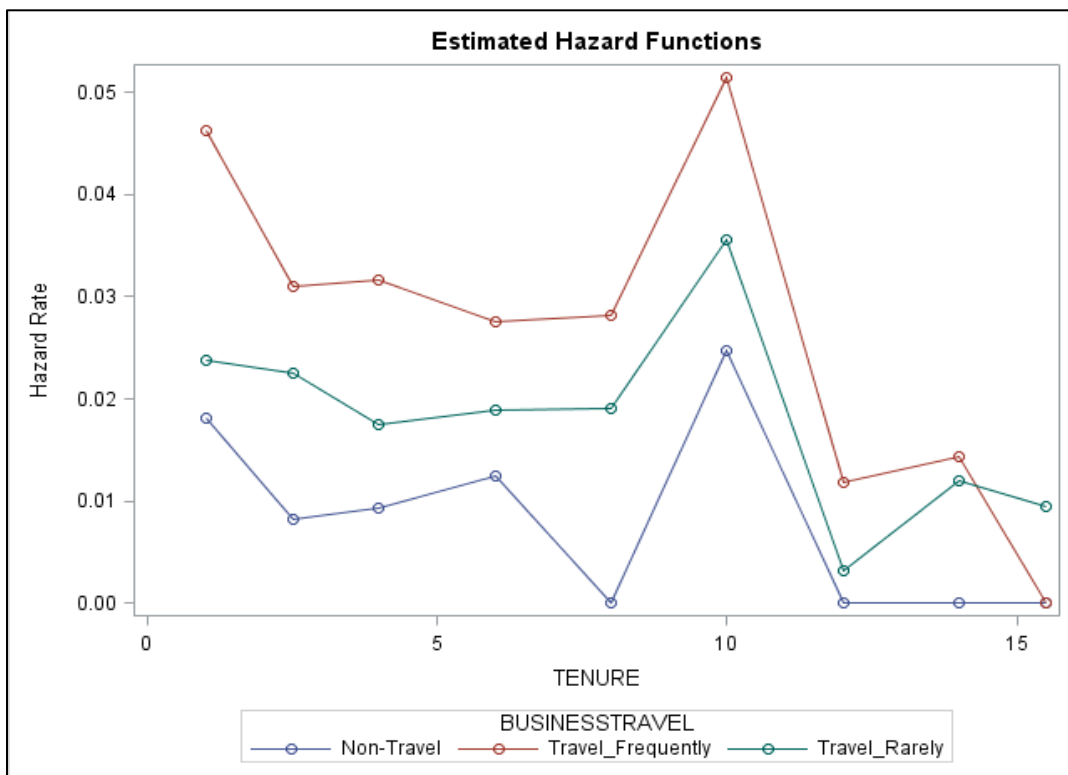
Stratum	BUSINESSTRAVEL	Total	Failed	Censored	Percent Censored
1	Non-Travel	150	12	138	92.00
2	Travel_Frequently	277	69	208	75.09
3	Travel_Rarely	1043	156	887	85.04
Total		1470	237	1233	83.88

The summary table on the LHS shows that employees who travel frequently attrite the most as inferred from the “Percent censored” column. **Lower value of percent censored implies higher attrition.**

- **25%** of the Employees Who **Travel frequently** attrite and the year which poses the biggest threat for them to leave is **0-2 years** in the first 5 years of their employment!
- In a time-span of 15 years, High attrition risk is present in years 9-11 after 5 years of employment!

Code used:

```
proc lifetest data=project1.emp_prep_final method=life plots=(s,h)
intervals= 2 3 5 7 9 11 13 15 16;
time tenure*censored(0);
strata businesstravel;
run;
```



Employees who travel frequently have the highest risk of attrition!