Checkpoint 1: SQL Analytics

The Silent Foxes

Our theme is to explore the relationship between the misconducts in police officers and their career development.

Question 1: What is the statistics(mean, median, range..) of salary for the officers with the most complaints?

Analysis of officers with the most complaints and their salary:

officer_id	avg	avg
13788	10.7	59491.5
12074	10	58006.8
8658	8.64	59491.5
28805	8.2	64608
8562	7.95	67440
13095	7.54	91628.625
21837	6.85	70056.75
32265	6.8	75897.375

Distribution of officers with the most complaints:
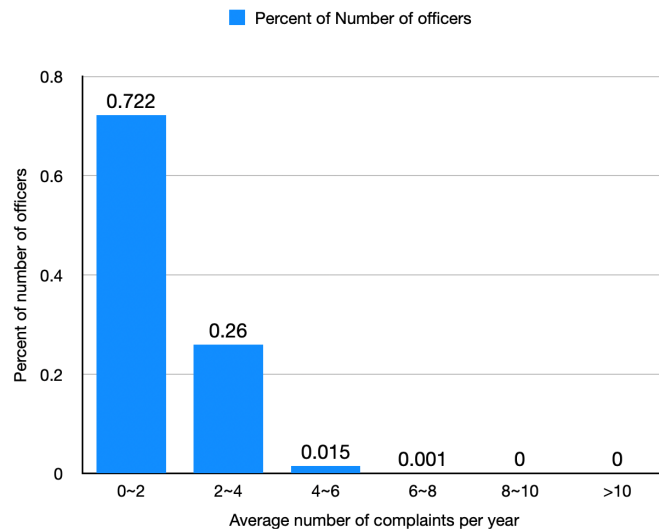
So officers with the most complaints means that these officers received at least 6 complaints. The average salary of whole officers and officers with most complaints in each year is below:

	avg	year
1	60085.85600976205	2002
2	61964.035547656076	2003
3	61878.361976847729	2004
4	67435.742833620238	2005
5	70272.415867866096	2006
6	72193.66042483902	2007
7	73069.761272809531	2008
8	73418.882534299368	2009
9	79136.356591564668	2010
10	81228.423466493801	2011
11	81436.660823982308	2012
12	80811.352352352352	2013
13	86426.702582900009	2014
14	87952.636126337771	2015
15	91059.263045223441	2016
16	92850.009811465948	2017

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|	avg	year
1	58957.428571428571	2002
2	60610.5	2003
3	61525.578947368421	2004
4	67872.631578947368	2005
5	70702.5	2006
6	73661.076923076923	2007
7	74078.769230769231	2008
8	74124.923076923077	2009
9	80046	2010
10	82107.818181818182	2011
11	83446.363636363636	2012
12	84385.2	2013
13	89548.8	2014
14	91023.6	2015
15	90579.272727272727	2016
16	93360.6	2017

Compare these two, we have this chart:

At the beginning, the average salary of officers with the most complaints is below the average of all officers, but starting from 2005, their salary is beyond the whole average.

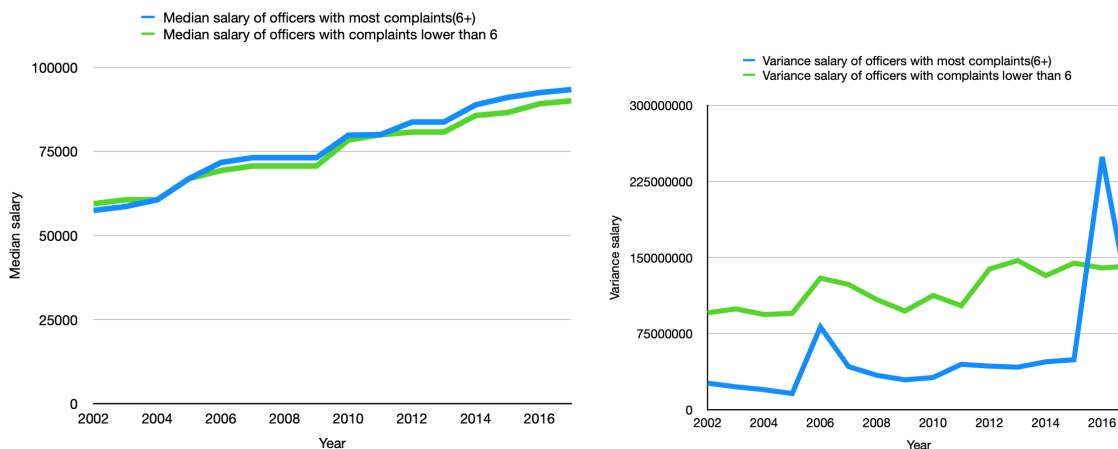Compare salary of officers with most complaints:
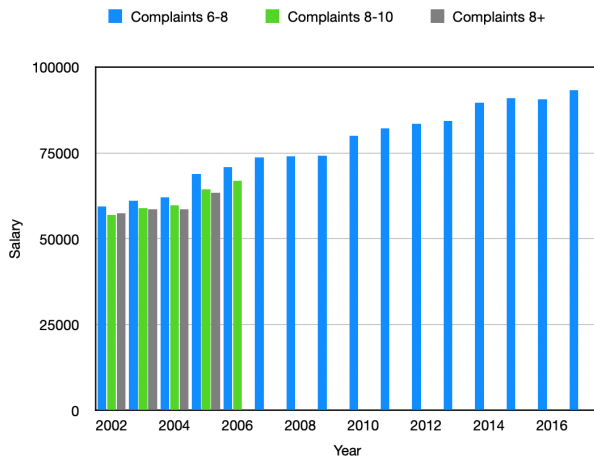
Officers with complaints over 10 haven't worked since 2006 and officers with complaints between 6 and 8 haven't worked since 2007.

Compare maximum and minimum salary of officers with most complaint(6+) and that of officers with complaints below 6 in each year:
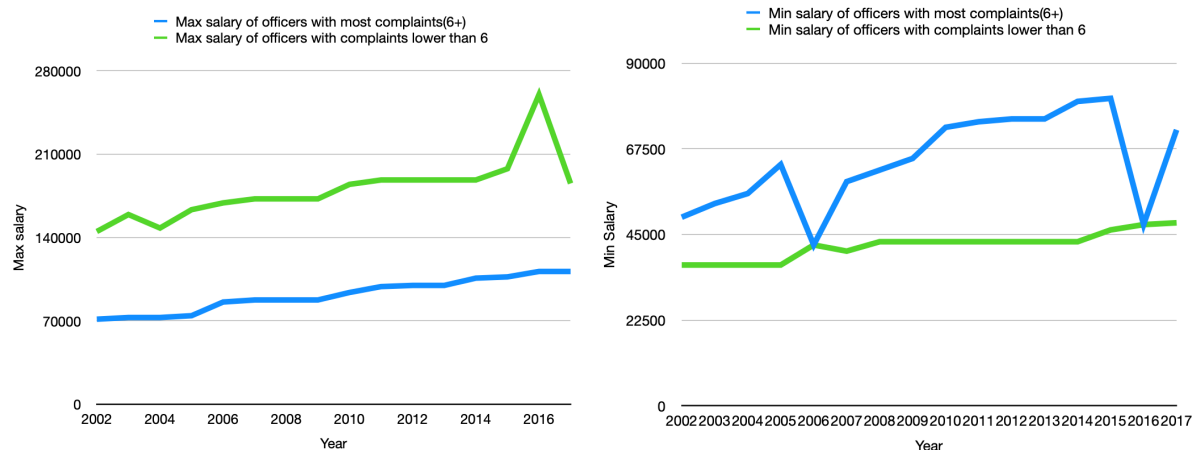
We can see though the maximum salary of officers with most complaints is lower than that of officers with complaints below 6, the minimum salary is quite higher. It means, if you get the most complaints, you will not be the one who has the lowest payment.

Compare median and variance salary of officers with most complaint(6+) and that of officers with complaints below 6 in each year:


There is not much difference on median salary according to the number of complaints, but the variance differs a lot. The variance salary of officers with most complaints is much lower than that of officers with lower complaints in most years.

Compare the change of average salary of officers with most complaints or not and the change of their average allegation number in each year:

One weird thing is that officers with the most complaints(6+) didn't get any allegation in 2005 and 2006.
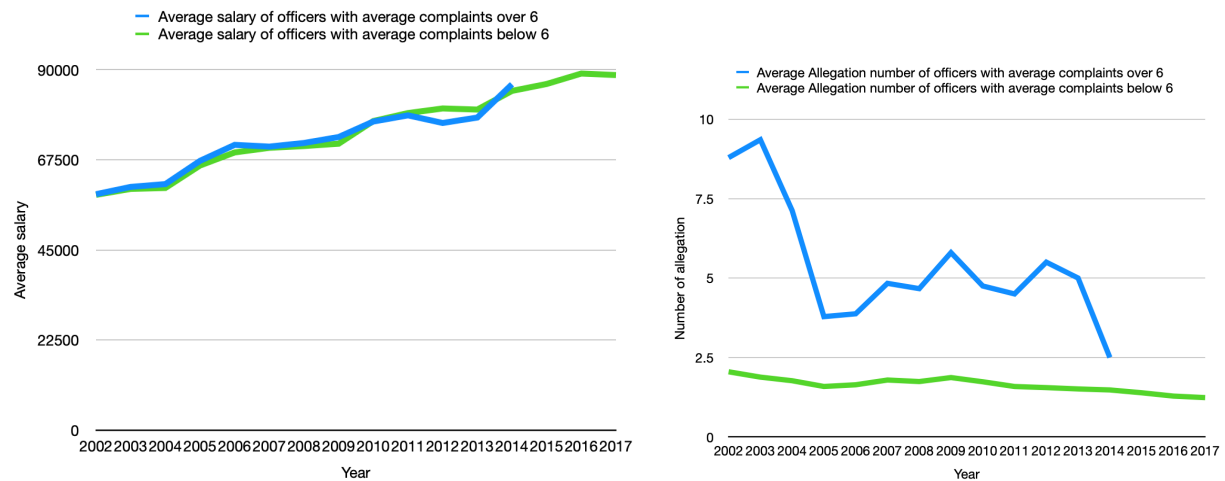


Compare the change of minimum salary of officers with most complaints or not:
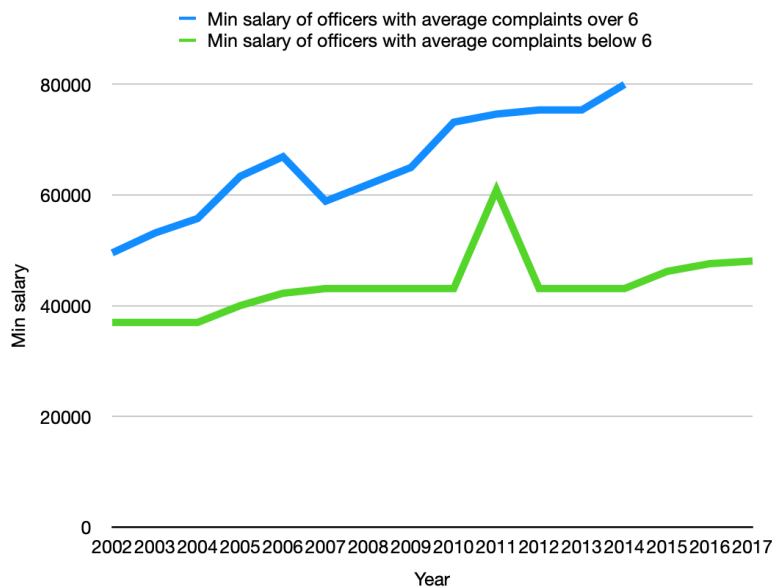
We can see the minimum salary of officers with most complaints always get higher payment compared to officers with less complaints.

For officers whose salary is over 100000, the maximum number of the average allegation is 5.5. Analysis of this officer's salary change and allegation change over years as one case:
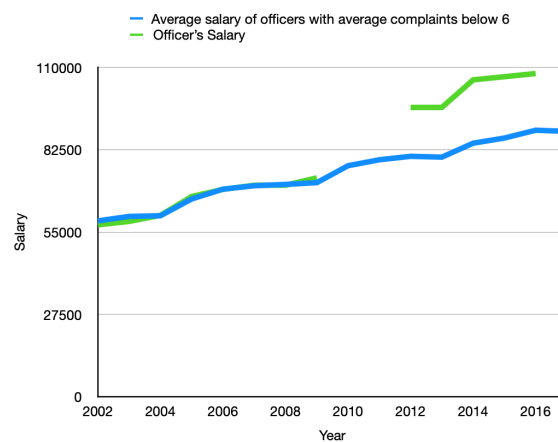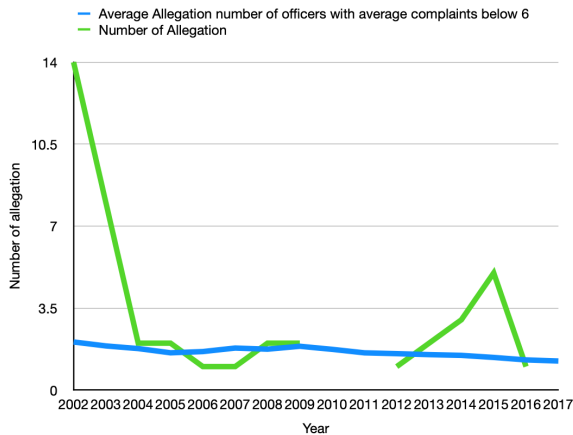
We can see after 2012, his number of allegations rose, and his salary also raised. When the number of allegations dropped, his salary rose slowly. Here one question appeared: Is it a normal situation or just one case? We need to check out question 5 to know more about it.

Question 2: What percentage of total complaints are these officers who have received an honor mention or award responsible for?

Total number of complaints from citizens: 235263
Total number of complaints received by officers who get awards: 225182
Total number of officers who receive complaints: 23098
Total number of officers who receive both complaints and awards: 20818

	total_complaints ⇕	total_complaints_office... ⇕	officer_with_complaints ⇕	award_officer_with_comp... ⇕
1	235263	225182	23098	20818

The percentage of total complaints these officers who have received an honor mention or award responsible for is 225182/235263, which is 0.9572
The percentage of officers who receive complaints get an honor mention or awards is 20818/23098, which is 0.9013

As the calculation shows, both the percentage of total complaints received by officers who get awards and the percentage of total officers who receive both complaints and awards are quite high. We can see that receiving complaints has little influence on officers who receive an honor mention or awards. In the police department, it is common to give an award to the officer who received a complaint before.
There could be a more precise way to conduct this analysis, in which we remove the data of officers who got awards before their first complaints. Because it is not relevant to the question if receiving a complaint impacts an officer getting honor mention and awards. In addition, if an officer gets an award a long time after receiving a complaint, it may also be irrelevant to our question. However, it is too complicated to achieve, but it is worthy to conduct more research in the future.

Question 3: What is the percentage of officers who were disciplined in an allegation get an honor mention or awards?

Total number of officers who were disciplined in an allegation: 9977

Total number of officers who were disciplined in an allegation get an award: 8895

	disciplined_officer ÷	disciplined_award_officer ÷
1	9977	8895

The percentage of officers who were disciplined in an allegation get an award is 8895/9977, which is 0.89155

We can see the percentage is quite high, but is consistent with the percentage we have in the previous question. This also means there is no strong relationship between misconducts in police officers and their achievements in career.

For this question, we may also take timeliness as consideration in our analysis, which removes any award before the first discipline for an officer.

Question 4: Can the total number or frequency of complaints received by the officer be reflected by his/her career advancement(whether an officer holding an award in a year receives less or no complaint)?

Since the award record in the database starts at 2005, we only analyze the complaints and awards received by officers from 2005 to 2008

We divide the data into 3 sections:

Year 2005 - 2006:

We select all officers who receive complaints but no awards in 2005, and then find all of these officers who receive both complaints awards in 2006. For these officers, we compare the number of complaints they received in 2005 and in 2006.

	officer_2005 ÷	officer_2006 ÷
1	1315	324

First, we have the number of officers who received complaints but no awards in 2005, which is 1315. For these officers, we find their record in 2006 to find the number of them who received both complaints and awards, which is 324. As we can see, for these 1315 officers, only 324 officers receive complaints next year, which is a 75.36% decrease.

	officer_id	count_2005	count_2006
1	8651	11	88
2	5193	9	63
3	5360	9	45
4	21260	7	35
5	11305	7	28
6	25039	6	24
7	21476	5	25
8	18112	5	30
9	8691	5	5

Also, we count the number of complaints for officers in both years separately to compare if there is any clear difference in the number of complaints received by an officer who does not hold any awards in a year, and this officer who holds an award in the next year.

	total_2005	total_2006
1	553	1228

Then, we calculate the total number of complaints for these officers in 2005, and in 2006. Surprisingly, though the number of officers who receive complaints in 2006 is largely less than in 2005, the total number of complaints received by these officers in 2006 is much greater than in 2005.

Year 2006 - 2007

We also have the number of officers who received complaints but no awards in 2006, which is 911. For these officers, we find their record in 2007 to find the number of them who received both complaints and awards, which is 207. As we can see, for these 911 officers, only 207 officers receive complaints next year, which is a 77.28% decrease.

	officer_2006	officer_2007
1	911	207

We can see the relationship between number and frequency of officers who receive complaints and awards they hold is consistent.

	officer_id	count_2006	count_2007
1	6164	5	15
2	14390	5	10
3	910	5	10
4	2659	5	10
5	11157	4	8
6	8799	4	16
7	31724	4	8
8	25772	4	12
9	30893	4	8

	total_2006	total_2007
1	312	589

Year 2007 - 2008

Result for officers who receive complaint but no awards in 2007 and officers who receive both complaints and awards as above:

	officer_2007	officer_2008
1	934	336

	officer_id ‡	count_2007 ‡	count_2008 ‡
1	22081	8	24
2	9712	7	14
3	25260	6	12
4	10698	6	12
5	4844	5	25
6	29730	5	15
7	3052	5	5
8	19620	5	25
9	23633	4	4

	total_2007 ‡	total_2008 ‡
1	523	973

As a result, we believe that the number of complaints received by the officers can be reflected by their career advancement, which is specifically whether officers hold an award. We see a clear decrease in the number of officers who receive complaints in the year that they hold awards. The frequency of officers who receive complaints is also reflected by whether these officers receive awards. Conversely, the frequency of offices who receive complaints is higher in the year they hold awards than in the year they do not have any awards.

Question 5: Is there a relationship between the change of frequency of an officer who gets allegations and the change of his/her salary(if any)?

	avg_2005 ‡	avg_2006 ‡	avg_2007 ‡	avg_2008 ‡
1	67448.293124863009	70243.065004324013	72148.680703277621	73078.770459081836

	sum_2005 ‡	sum_2006 ‡	sum_2007 ‡	sum_2008 ‡
1	6720	7045	8687	8819

We view this relationship by obtaining the average salary of the police officer from 2005-2008 and we collect the total allegations(reported by civilians) from 2005-2008. As shown in the above graphs, we have average salary for police and total number of allegations from 2005-2008.

From the first table, we can see that polices' average salary has been increasing from 2005-2008. The increasing percentages are as follows: 4.14%, 2.71%, 1.29%.
From the second table, we can see that the total number of allegations has been increasing from 2005 to 2008. The increasing percentages are as follows: 4.84%, 23.31%, 1.51%.

From the percentages,it seems that there might be a positive correlation between policies' average salary and allegations reported by civilians. When the positive increase in the percentage of salary dropped from 4.14% to 2.71%, the number of allegations increased tremendously from 4.84% to 23.31%. However, when we look at the changing percent between 2007 and 2008, along with the salary dropped from 2.71% to 1.29%, the number of allegations only increased by 1.51% which is far from the previous 23.31%.

As a result, we would conclude that there might be a weak correlation between the change of salary and the number of allegations.