Evidence of Discrimination?

The Department of Developmental Services (DDS) in California is responsible for allocating funds to support over 250,000 developmentally-disabled residents. The data set `ca_dds_expenditures.csv` contains data about 1,000 of these residents. The data comes from a discrimination lawsuit which alleged that California's Department of Developmental Services (DDS) privileged white (non-Hispanic) residents over Hispanic residents in allocating funds. We will focus on comparing the allocation of funds (i.e., expenditures) for these two ethnicities only, although there are other ethnicities in this data set.

There are 6 variables in this data set:

- Id: 5-digit, unique identification code for each consumer (similar to a social security number and used for identification purposes)
- Age Cohort: Binned age variable represented as six age cohorts (0-5, 6-12, 13-17, 18-21, 22-50, and 51+)
- Age: Unbinned age variable
- Gender: Male or Female
- Expenditures: Dollar amount of annual expenditures spent on each consumer
- Ethnicity: Eight ethnic groups (American Indian, Asian, Black, Hispanic, Multi-race, Native Hawaiian, Other, and White non-Hispanic)

Question 1

Read in the data set. Make a graphic that compares the *average* expenditures by the DDS on Hispanic residents and white (non-Hispanic) residents. Comment on what you see.

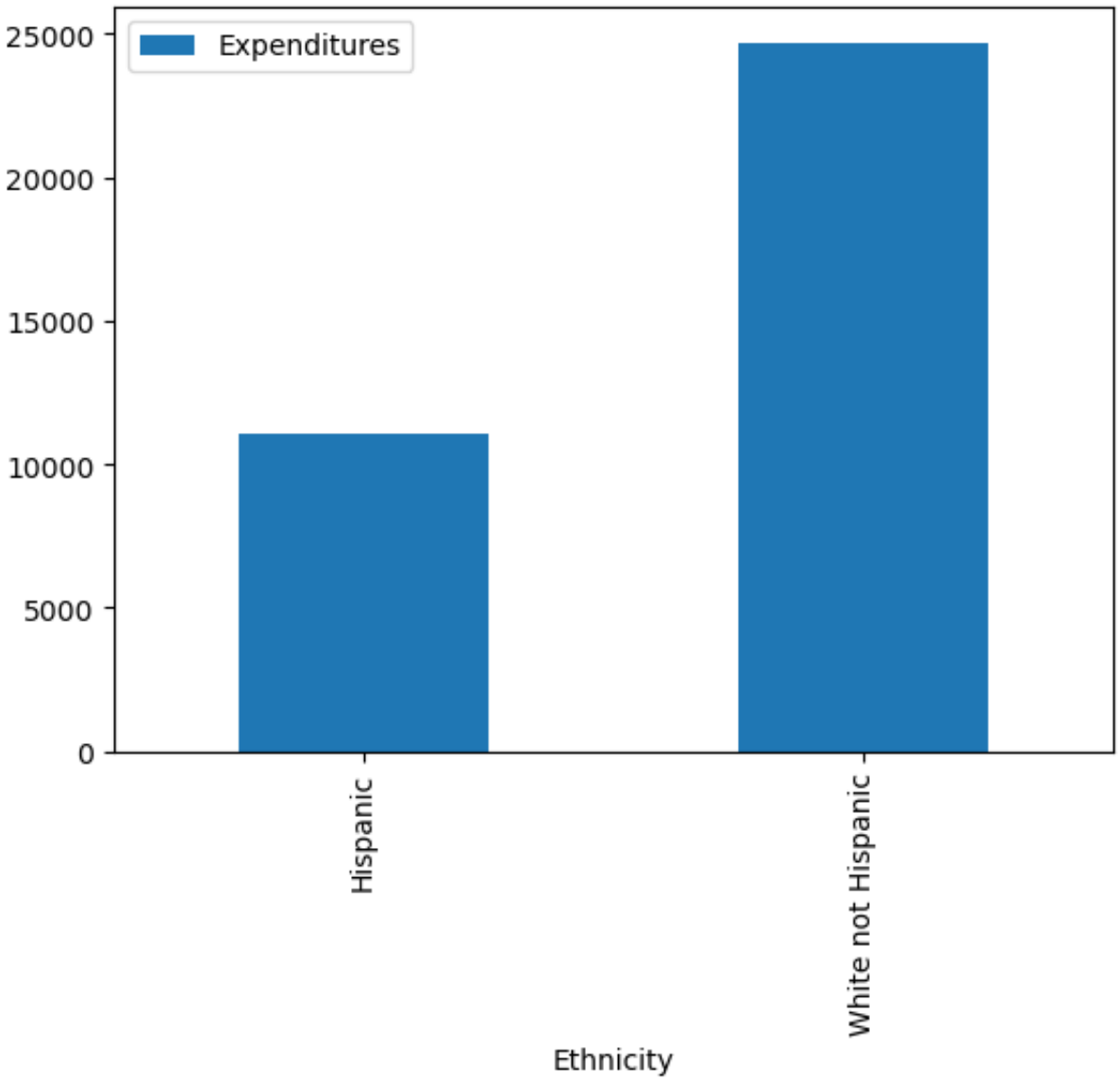
In [1]:
```
# YOUR CODE HERE
import pandas as pd
df = pd.read_csv("ca_dds_expenditures.csv")

#df.Ethnicity.str.count("Hispanic").sum()
df_group = df.groupby( 'Ethnicity' )[ 'Expenditures' ].count()
print(df_group)



table = pd.pivot_table(data = df , values = 'Expenditures' , index = 'Ethnic
table.loc [ [ 'Hispanic' , 'White not Hispanic' ] ].plot( kind = 'bar' )

#df.Expenditures.sum()
df
```

```
Ethnicity
American Indian          4
Asian                  129
Black                   59
Hispanic               376
Multi Race              26
Native Hawaiian          3
Other                    2
White not Hispanic     401
Name: Expenditures, dtype: int64
```

Out[1]:

	Id	Age Cohort	Age	Gender	Expenditures	Ethnicity
0	10210	13 to 17	17	Female	2113	White not Hispanic
1	10409	22 to 50	37	Male	41924	White not Hispanic
2	10486	0 to 5	3	Male	1454	Hispanic
3	10538	18 to 21	19	Female	6400	Hispanic
4	10568	13 to 17	13	Male	4412	White not Hispanic
...	...	...	...	...	...	...
995	99622	51+	86	Female	57055	White not Hispanic
996	99715	18 to 21	20	Male	7494	Hispanic
997	99718	13 to 17	17	Female	3673	Multi Race
998	99791	6 to 12	10	Male	3638	Hispanic
999	99898	22 to 50	23	Male	26702	White not Hispanic

1000 rows × 6 columns



According to the graph, the average expenditures the DDS gives betweeen Hispanic reisdents and white (non-Hispanic) residents is vastly different. White (non-Hispanic) residents, on average, receive double the amount of expenditures from the DDS than Hispanic residents.

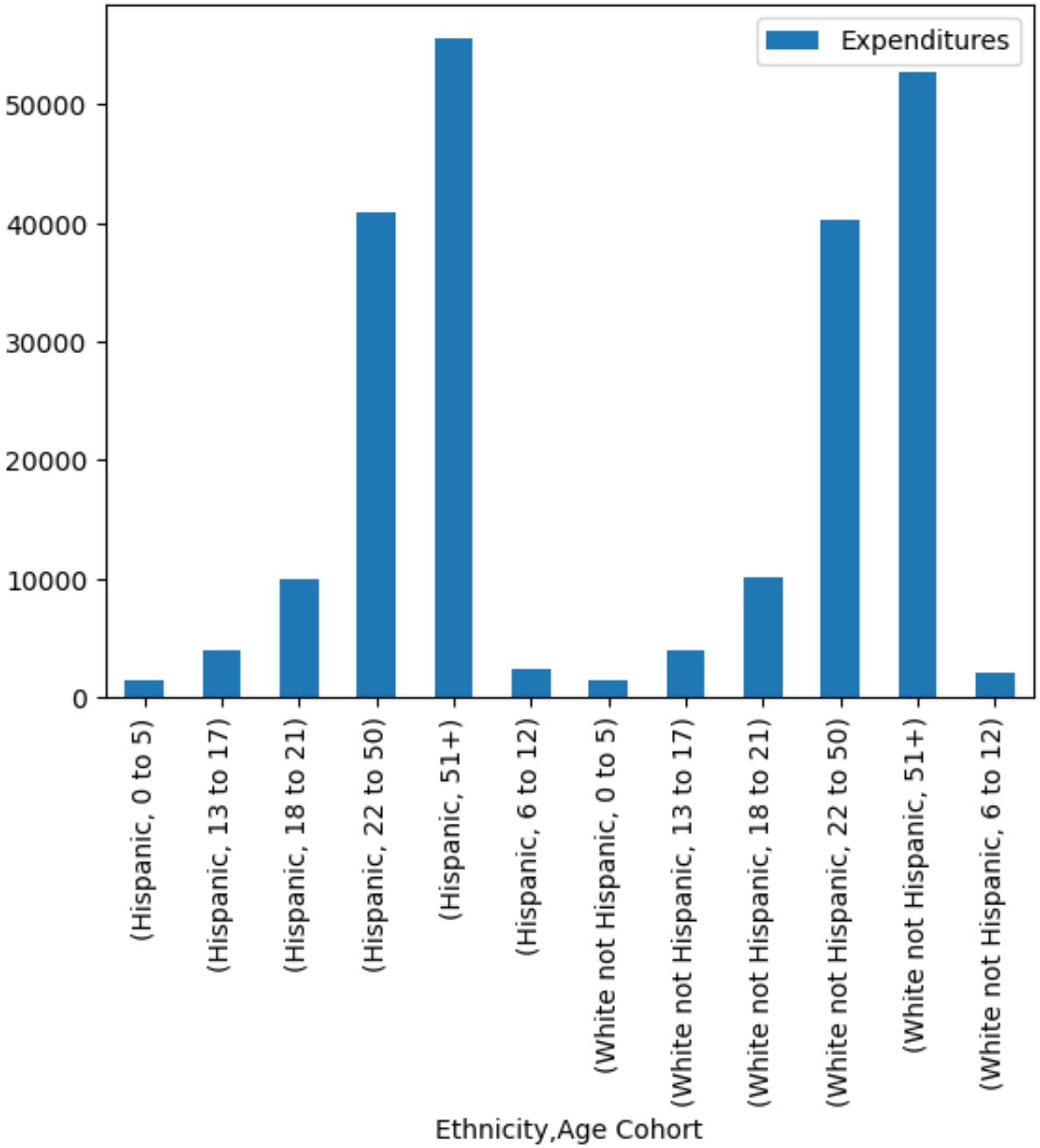
Question 2

Now, calculate the average expenditures by ethnicity and age cohort. Make a graphic that compares the average expenditure on Hispanic residents and white (non-Hispanic) residents, *within each age cohort*.

Comment on what you see. How do these results appear to contradict the results you obtained in Question 1?

In [2]:
```
# YOUR CODE HERE
import pandas as pd
df = pd.read_csv("ca_dds_expenditures.csv")

#index = [ 'Ethnicity' , 'Age Cohort' ]

table = pd.pivot_table(data = df , values = 'Expenditures' , index = [ 'Ethn
table.loc [ [ 'Hispanic' , 'White not Hispanic' ] ].plot( kind = 'bar' )
```

Out[2]:
```
<AxesSubplot:xlabel='Ethnicity,Age Cohort'>
```



According to the graph, it seems that the DDS is fair in terms of the age group that receives the average expenditures. The older age cohort receive more expenditures than the younger age cohorts in both Hispanic residents and white (non-hispanic) residents.

Question 3

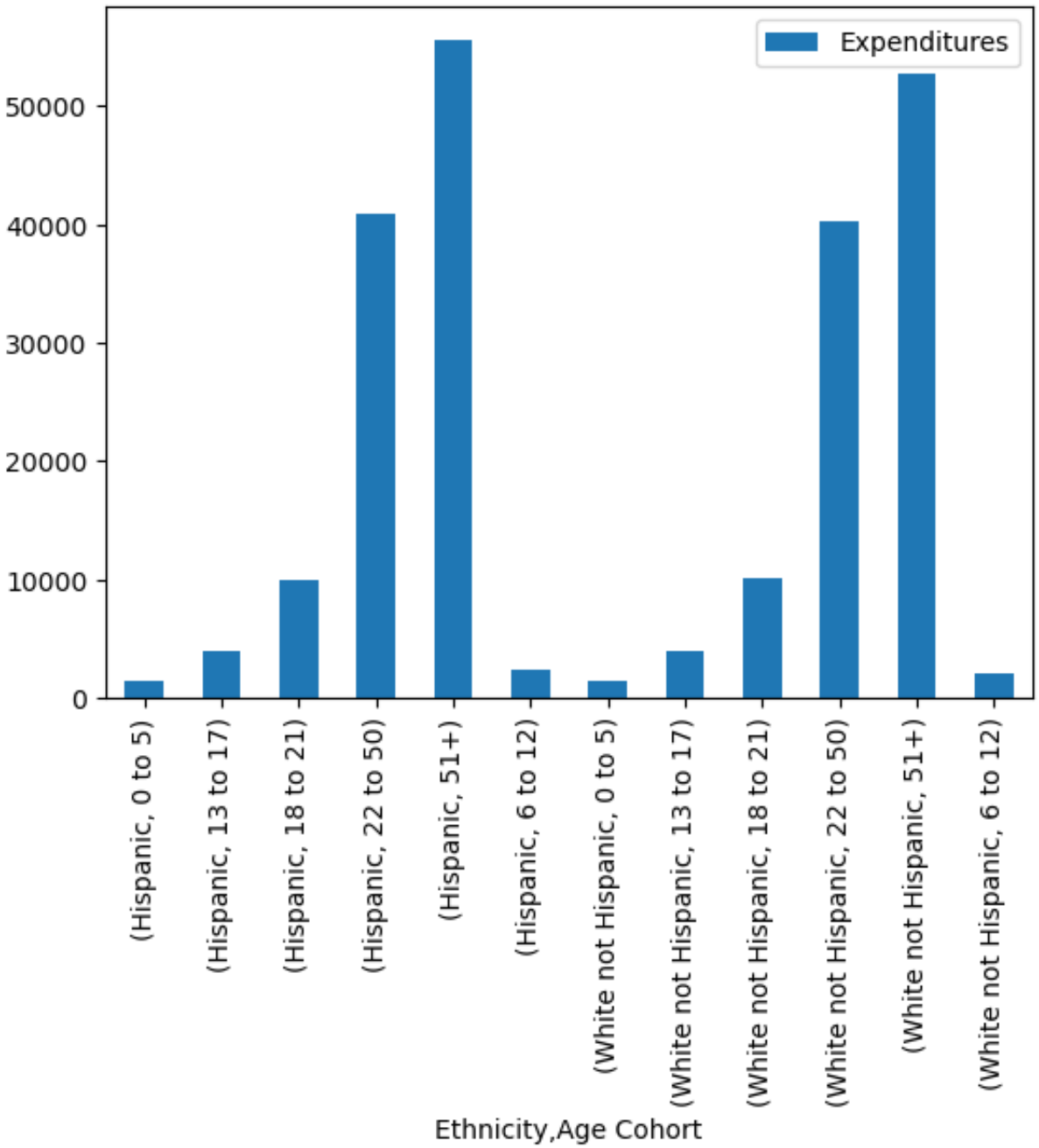
Can you explain the discrepancy between the two analyses you conducted above (i.e., Questions 1 and 2)? Try to tell a complete story that interweaves tables, graphics, and explanation.

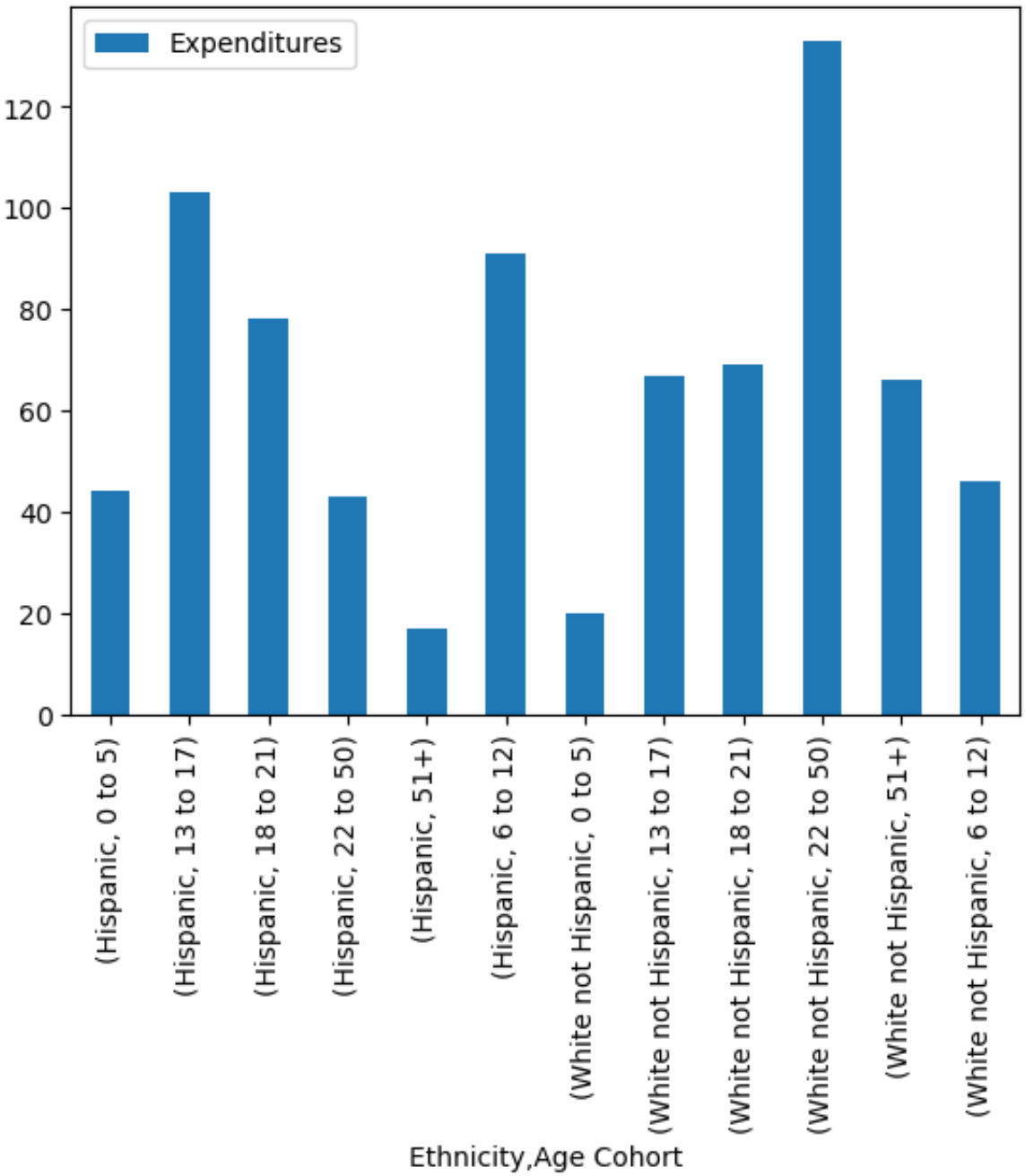
Hint: You might want to consider looking at:

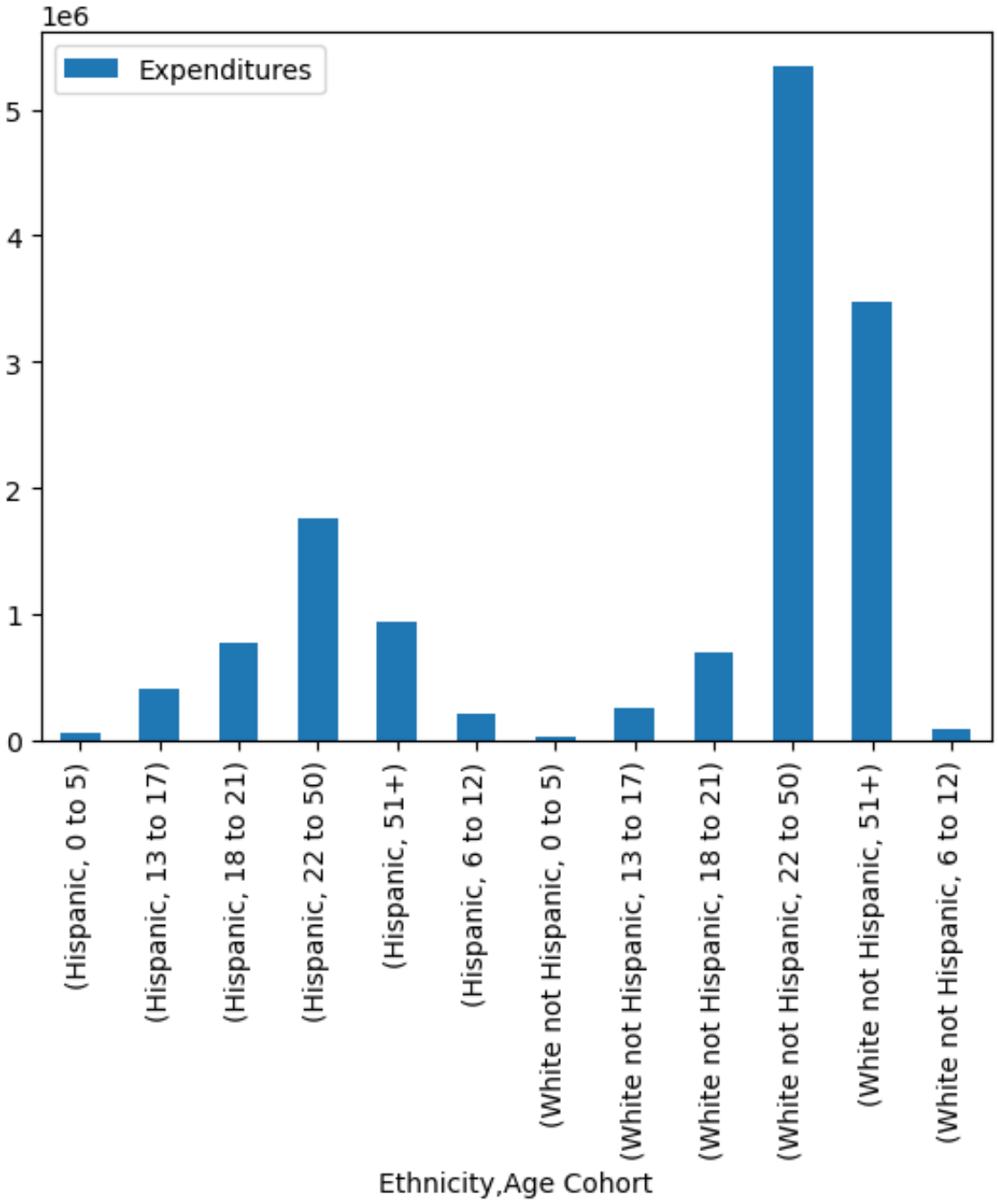
- the distributions of ages of Hispanics and whites
- the average expenditure as a function of age

In [14]:
```
# YOUR CODE HERE (although you may want to add more code cells)

table1 = pd.pivot_table(data = df , values = 'Expenditures' , index = [ 'Eth
table1.loc [ [ 'Hispanic' , 'White not Hispanic'] ].plot( kind = 'bar' )


table2 = pd.pivot_table(data = df , values = 'Expenditures' , index = [ 'Eth
table2.loc [ [ 'Hispanic' , 'White not Hispanic' ] ].plot( kind = 'bar' )


table3 = pd.pivot_table(data = df , values = 'Expenditures' , index = ['Ethn
table3.loc [ [ 'Hispanic' , 'White not Hispanic' ] ].plot( kind = 'bar' )
```

Out[14]:
```
<AxesSubplot:xlabel='Ethnicity,Age Cohort'>
```


Expenditures
50000
40000
30000
20000
10000
0
(Hispanic, 0 to 5)
(Hispanic, 13 to 17)
(Hispanic, 18 to 21)
(Hispanic, 22 to 50)
(Hispanic, 51+)
(Hispanic, 6 to 12)
(White not Hispanic, 0 to 5)
(White not Hispanic, 13 to 17)
(White not Hispanic, 18 to 21)
(White not Hispanic, 22 to 50)
(White not Hispanic, 51+)
(White not Hispanic, 6 to 12)
Ethnicity,Age Cohort


Expenditures
120
100
80
60
40
20
0
(Hispanic, 0 to 5)
(Hispanic, 13 to 17)
(Hispanic, 18 to 21)
(Hispanic, 22 to 50)
(Hispanic, 51+)
(Hispanic, 6 to 12)
(White not Hispanic, 0 to 5)
(White not Hispanic, 13 to 17)
(White not Hispanic, 18 to 21)
(White not Hispanic, 22 to 50)
(White not Hispanic, 51+)
(White not Hispanic, 6 to 12)
Ethnicity,Age Cohort


1e6
Expenditures
5
4
3
2
1
0
(Hispanic, 0 to 5)
(Hispanic, 13 to 17)
(Hispanic, 18 to 21)
(Hispanic, 22 to 50)
(Hispanic, 51+)
(Hispanic, 6 to 12)
(White not Hispanic, 0 to 5)
(White not Hispanic, 13 to 17)
(White not Hispanic, 18 to 21)
(White not Hispanic, 22 to 50)
(White not Hispanic, 51+)
(White not Hispanic, 6 to 12)
Ethnicity,Age Cohort

YOUR EXPLANATION HERE (although you may want to add more markdown cells)
Based on the statistics of the csv file. It's about even that Hispanic and White residents are receiving funds from the DDS. From the one thousand of residents receiving funds from the DDS, 37.6% are Hispanics and 40.1% are whites. Seems Hispanics and whites are more favored to receive funds than other races.

It also seems that the amount is being distributed evenly to Hispanics and white residents in terms of age cohorts. The younger groups of age cohorts receive significantly less funds than the older age cohorts. No indication of discrimination in terms of age cohort.

The discrepancy seems to lie in the mean. Taking the mean evens out what each resident based on ethnicity is suppose to receive. So on when placed a graph, the differences seem minimal. However, when the actual number is presented, that's when differences can become more clear and transparent.

In [ ]:

Submission Instructions Once you are finished, follow these steps: 1. Restart the kernel and re-run this notebook from beginning to end by going to `Kernel > Restart Kernel and Run All Cells`. 2. If this process stops halfway through, that means there was an error. Correct the error and repeat Step 1 until the notebook runs from beginning to end. 3. Double check that there is a number next to each code cell and that these numbers are in order. Then, submit your lab as follows: 1. Go to `File > Export Notebook As > PDF`. 2. Double check that the entire notebook, from beginning to end, is in this PDF file. (If the notebook is cut off, try first exporting the notebook to HTML and printing to PDF.) 3. Upload your Notebook (ipynb) to canvas (one submission per group). 4. Demo your lab.