#### **DATABASE MANAGERS**

#### (Data for this tutorial at <u>www.peteraldhous.com/Data</u>)

We've already seen how spreadsheets can filter data and calculate subtotals. Database managers, such as Access, can handle larger datasets, and with practice are more flexible and nimble for filtering, grouping and making calculations on subsets of data.

They also allow you to join multiple data tables into one, or match records across different datasets, if they have common fields – which can be a powerful tool. Again, we'll work with data used in reporting this story: <a href="http://www.newscientist.com/article/dn18806-revealed-pfizers-payments-to-censured-doctors.html">http://www.newscientist.com/article/dn18806-revealed-pfizers-payments-to-censured-doctors.html</a>.

# **Basic database queries**

Open **Pfizer.mdb** under the **File tab**, then double click to open the table **Pfizer**.

| <b>A</b>   <b>→</b> <sup>1</sup> 7 × ( <sup>2</sup> 1 ×   <del>-</del> |         | Table Too                            | ls            |             |              |           |                           |             |            | Pfizer - Microso |
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| Tables   |         | 1 3-D MEDICAL SI STEVEN BRUCE        | STEVEN        | DEITELZWEIG | NEW ORLEANS  | LA        | Professional A            | \$2,625.00  | \$0.00     | \$2,625.00       |
| Pfizer Pfizer  |         | 2 AA DOCTORS, I AAKASH MOHA          | AAKASH        | AHUJA       | PASO ROBLES  | CA        | Expert-Led For            | \$1,000.00  | \$0.00     | \$1,000.00       |
|  |         | 3 ABBO, LILIAN N LILIAN MARGAI       | LILIAN        | ABBO        | MIAMI        | FL        | Business Relati           | \$0.00      | \$448.00   | \$448.00         |
|  |         | 4 ABBO, LILIAN N LILIAN MARGAI       |               | ABBO        |              | FL CI     | Profossional Au           | \$0.00      | \$119.00   | \$119.00         |
|  |         | 6 ABDULLAH RAF ABDULLAH              | ABDULLAH      | RAFFFF      | FLINT        | MI        | Expert-Led For            | \$750.00    | \$0.00     | \$750.00         |
|  |         | 7 ABEBE, SHEILA SHEILA Y             | SHEILA        | ABEBE       | INDIANAPOLIS | IN        | Educational Ite           | \$0.00      | \$47.00    | \$47.00          |
|  |         | 8 ABEBE, SHEILA SHEILA Y             | SHEILA        | ABEBE       | INDIANAPOLIS | IN        | Expert-Led For            | \$825.00    | \$0.00     | \$825.00         |
|  |         | 9 ABILENE FAMIL GALEN CHRIS          | GALEN         | ALBRITTON   | ABILENE      | ТХ        | Professional A            | \$3,000.00  | \$0.00     | \$3,000.00       |
|  |         | 10 ABOLNIK, IGOR IGOR Z              | IGOR          | ABOLNIK     | PROVO        | UT        | Business Relate           | \$0.00      | \$396.00   | \$396.00         |
|  |         | 11 ABOLNIK, IGOR IGOR Z              | IGOR          | ABOLNIK     | PROVO        | UT        | Expert-Led For            | \$1,750.00  | \$0.00     | \$1,750.00       |
|  |         | 12 ABOLNIK, IGOF IGOR Z              | IGOR          | ABOLNIK     | PROVO        | UT        | Meals                     | \$0.00      | \$58.00    | \$58.00          |
|  |         | 13 ABRAKSIA, SAN SAMIR               | SAMIR         | ABRAKSIA    | BEACHWOOD    | ОН        | Business Relation         | \$0.00      | \$88.00    | \$88.00          |
|  |         | 14 ABRAKSIA, SAN SAMIR               | SAMIR         | ABRAKSIA    | BEACHWOOD    | ОН        | Expert-Led For            | \$2,000.00  | \$0.00     | \$2,000.00       |
|  |         | 16 ARRAKSIA, SAN SAMIR               | SAMIR         | ABRAKSIA    | BEACHWOOD    | OH        | Professional A            | \$2,500,00  | \$185.00   | \$2,500,00       |
|  |         | 17 ABRAMSON, ST STEVEN BARRY         | STEVEN        | ABRAMSON    | NEW YORK     | NY        | Business Relati           | \$0.00      | \$38.00    | \$38.00          |
|  |         | 18 ABRAMSON, ST STEVEN BARRY         | STEVEN        | ABRAMSON    | NEW YORK     | NY        | Professional A            | \$4,400,00  | \$0.00     | \$4.400.00       |
|  |         | 19 ABUZZAHAB, F, FARUK S             | FARUK         | ABUZZAHAB   | MINNEAPOLIS  | MN        | Business Relate           | \$0.00      | \$2,074.00 | \$2,074.00       |
|  |         | 20 ABUZZAHAB, F, FARUK S             | FARUK         | ABUZZAHAB   | MINNEAPOLIS  | MN        | Meals                     | \$0.00      | \$218.00   | \$218.00         |
|  |         | 21 ABUZZAHAB, F, FARUK S             | FARUK         | ABUZZAHAB   | MINNEAPOLIS  | MN        | Professional A            | \$1,750.00  | \$0.00     | \$1,750.00       |
|  |         | 22 ABUZZAHAB, N MARY JENNIFEI        | MARY          | ABUZZAHAB   | SAINT PAUL   | MN        | Business Relate           | \$0.00      | \$154.00   | \$154.00         |
|  |         | 23 ABUZZAHAB, N MARY JENNIFEI        | MARY          | ABUZZAHAB   | SAINT PAUL   | MN        | Expert-Led For            | \$1,000.00  | \$0.00     | \$1,000.00       |
|  |         | 24 ACADIA WOME MICHELLE MCD          | MICHELLE      | OWENS       | CROWLEY      | LA        | Expert-Led For            | \$4,000.00  | \$0.00     | \$4,000.00       |
|  |         | 25 ACCACHA, SIH/ SIHAM DONIA2        | SIHAM         | ACCACHA     | MINEOLA      | NY        | Expert-Led For            | \$1,250.00  | \$0.00     | \$1,250.00       |
|  |         | 20 ACCACHA, SIHA SIHAM DONIAZ        |               |             |              | DP        | Export-Lod For            | \$0.00      | \$93.00    | \$93.00          |
|  |         | 28 ACEVEDO MAR IRIS ARIENE           | IRIS          | ACEVEDO MAR | CAGUAS       | PR        | Meals                     | \$0.00      | \$59.00    | \$59.00          |
|  |         | 29 ACKERMAN, IV IVAN FOSTER          | IVAN          | ACKERMAN    | BRANDON      | FL        | Expert-Led For            | \$1,250,00  | \$0.00     | \$1.250.00       |
|  |         | 30 ACOSTA, LUIS S LUIS SILVIO        | LUIS          | ACOSTA      | HOUSTON      | тх        | Expert-Led For            | \$1,000.00  | \$0.00     | \$1,000.00       |
|  |         | 31 ADAM LANDSN ADAM S                | ADAM          | LANDSMAN    | BOSTON       | MA        | Professional A            | \$3,000.00  | \$0.00     | \$3,000.00       |
|  |         | 32 ADAM ROSEN I ADAM MICHAE          | ADAM          | ROSEN       | CLEARWATER   | FL        | Business Relate           | \$0.00      | \$41.00    | \$41.00          |
|  |         | 33 ADAM ROSEN I ADAM MICHAE          | ADAM          | ROSEN       | CLEARWATER   | FL        | Expert-Led For            | \$2,400.00  | \$0.00     | \$2,400.00       |
|  |         | 34 ADAMS, SANDI SANDRA GAIL          | SANDRA        | ADAMS       | SAN ANTONIO  | ТХ        | Professional A            | \$12,840.00 | \$0.00     | \$12,840.00      |
|  |         | 35 ADDONA, TOM TOMMASO               | TOMMASO       | ADDONA      | NEW YORK     | NY        | Business Relati           | \$0.00      | \$39.00    | \$39.00          |
|  |         | 36 ADDONA, TOM TOMMASO               | TOMMASO       | ADDONA      |              | NY        | Expert-Lea For            | \$750.00    | \$0.00     | \$750.00         |
|  |         | 38 ADLER DAVID I DAVID ELLIOTT       | DAVID         | ADJONA      | PORTIAND     | OR        | Rusiness Relate           | \$0.00      | \$1.062.00 | \$1.062.00       |
|  |         | 39 ADLER, DAVID   DAVID FILIOTT      | DAVID         | ADLER       | PORTLAND     | OR        | Meals                     | \$0.00      | \$390.00   | \$390.00         |
|  |         |                                      |               |             |              |           |                           |             |            |                  |

See that it looks much the same as a spreadsheet, except there is no coordinate system. Instead, the column names, called "fields" in a database, are fixed, and each row or "record" has an ID number, created by Access as a "Primary Key" when the data was imported. (We'll do this with a new table in a few minutes.)

Notice also that the field names are simplified and have no spaces – we'll see why later on.

## 1. Filtering queries

Let's repeat our spreadsheet task of making a list of all doctors in California who were paid \$10,000 or more to run expert-led forums.

Select **Query Design** under the **Create** tab. Then **Add** the table and the screen should look like this:

| A                                |  |   | Query Tools            |   |                                      |                   |                |
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| All Access Objects Tables Prizer |  | izer<br>*<br>P ID<br>org_indiv<br>first_plus<br>first<br>last<br>city |                        |   |                                      |                   |                |
|                                  | Field:<br>Table:<br>Sort:<br>Show:<br>Criteria:<br>or: |   |                        |   |                                      |                   |                |

Click on **Field** in the first column of the grid, and select **first\_plus**. Carry along across the grid, until the following fields have all been selected:

| A 🚽 🤊 - 🕅                | -  -   |               |               |                  | C  | Query Tools   |                            |   |             |                                 |                       |
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| All Access Obj           | ects   |               | « (           |                  |  |               |                            |   |             |                                 |                       |
| Tables                   |        |               | *             | Pfizer           |  |               |                            |   |             |                                 |                       |
| Dfizer                   |        |               |               | *<br>0           |  |               |                            |   |             |                                 |                       |
|                          |        |               |               | org_indiv        |  |               |                            |   |             |                                 |                       |
|                          |        |               |               | first_plus       |  |               |                            |   |             |                                 |                       |
|                          |        |               |               | last             |  |               |                            |   |             |                                 |                       |
|                          |        |               |               | city             |  |               |                            |   |             |                                 |                       |
|                          |        |               |               |                  |  |               |                            |   |             |                                 |                       |
|                          |        |               |               |                  |  |               |                            |   |             |                                 |                       |
|                          |        |               |               |                  |  |               |                            |   |             |                                 |                       |
|                          |        |               |               |                  |  |               |                            |   |             |                                 |                       |
|                          |        |               | Fiel          | d: first_plus    | last   |               | city                       | state   | category    | total                           | -                     |
|                          |        |               | So            | e: Pfizer<br>rt: | Pfizer   |               | Pfizer                     | Pfizer  | Pfizer      | Pfizer                          |                       |
|                          |        |               | Sho           | N:               | I  | /             | <b>V</b>                   | <b>V</b>  | 5           | V                               | V                     |
|                          |        |               | Criteri       | a:<br>or:        |  |               |                            |   |             |                                 |                       |
|                          |        |               |               |                  |  |               |                            |   |             |                                 |                       |
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|                          |        |               |               |                  |  |               |                            |   |             |                                 |                       |

Now we will filter using **Criteria**: type **CA** in the column for **state** and **Like Expert\*** under **category**, and **>=10000** under **total**. Also in this column, click on **Sort** and select **Descending**.

**Tip!** Like Expert\* tells Access to look for entries that begin with Expert. In this case it's just saving us some typing, but filtering using this wildcard function can be helpful to return records that may have been entered into a database slightly differently. The wildcard \* can be inserted anywhere.)

The screen should now look like this:

| A 🖌 🤊 • (° - 🖛         |   | Query To   | ols  |                                    |                |                |
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| File Home Create Exte  | rnal Data 🔹 Database Tool   | s Acrobat Design   |  |                                    |                |                |
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| All Access Objects 💿 « |   |  |  |                                    |                |                |
| Tables *               | Pfizer<br>*<br>ID<br>org_indiv<br>first_plus<br>first<br>last<br>city |  |  |                                    |                |                |
|                        | Field: first plus   | last   | city   | state                              | category       | total          |
|                        | Table: Pfizer   | Pfizer   | Pfizer   | Pfizer                             | Pfizer         | Pfizer         |
|                        | Sort:   |  |  |                                    | [TT#]          | Descending     |
|                        | Criteria:   | ×  | v  | "CA"                               | Like "Expert*" | >=10000        |
|                        | or:   |  |  |                                    |                |                |

Hit ! to run the query, and we should obtain the same list of 31 doctors we had before.

| A 🔒    | 19 - (21 -  | Ŧ                            |       |      |  |  |                         |  |         | _   |             |        |
|--------|-------------|------------------------------|-------|------|--|--|-------------------------|--|---------|---|-------------|--------|
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| Tables | ess objects |                              | *     |      | GERALD MICHA                               | SACKS  | SANTA MONIC             | CA   | Expert- | Led For S   | 146.500.00  |        |
| PH PH  | fizer       |                              | ^     |      | MITCHELL                                   | NIDES  | LOS ANGELES             | CA   | Expert- | Led For   | \$70,500.00 |        |
|        | 14.61       |                              |       |      | STEVEN GARTH                               | ΡΟΤΚΙΝ   | ORANGE                  | CA   | Expert- | Led For   | \$48,350.00 |        |
|        |             |                              |       |      | DAVID ALAN                                 | GINSBERG                                       | LOS ANGELES             | CA   | Expert- | Led For   | \$45,750.00 |        |
|        |             |                              |       |      | SAMUEL                                     | LOUIE  | SACRAMENTO              | CA   | Expert- | Led For   | \$41,250.00 |        |
|        |             |                              |       |      | GURKIPAL                                   | SINGH  | WOODSIDE                | CA   | Expert- | Led For   | \$40,000.00 |        |
|        |             |                              |       |      | IVAN STEPHEN                               | BAROYA   | BONITA                  | CA   | Expert- | Led For   | \$26,400.00 |        |
|        |             |                              |       |      | MATTHEW JAY                                | BUDOFF   | MANHATTAN B             | CA   | Expert- | Led For   | \$24,000.00 |        |
|        |             |                              |       |      | QUANG H                                    | NGUYEN   | LA JOLLA                | CA   | Expert- | Led For   | \$22,500.00 |        |
|        |             |                              |       |      | JOHN SPEER                                 | SCHROEDER                                      | STANFORD                | CA   | Expert- | Led For   | \$21,500.00 |        |
|        |             |                              |       |      | DANIEL SHAHR                               | BANDARI  | LOS ANGELES             | CA   | Expert- | Led For   | \$21,000.00 |        |
|        |             |                              |       |      | ANDREW M                                   | BLUMENFELD                                     | DEL MAR                 | CA   | Expert- | Led For   | \$20,500.00 |        |
|        |             |                              |       |      | BRIAN RANDAL                               | KAYE   | BERKELEY                | CA   | Expert- | Led For   | \$18,000.00 |        |
|        |             |                              |       |      | GARY WILLIAM                               | WILLIAMS                                       | LA JOLLA                | CA   | Expert- | Led For   | \$18,000.00 |        |
|        |             |                              |       |      | SHAGUN                                     | CHOPRA   | SAN DIEGO               | CA   | Expert- | Led For   | \$17,250.00 |        |
|        |             |                              |       |      | FAIROOZ F                                  | KABBINAVAR                                     | LOS ANGELES             | CA   | Expert- | Led For   | \$17,250.00 |        |
|        |             |                              |       |      | GREGG CURTIS                               | FONAROW  | LOS ANGELES             | CA   | Expert- | Led For   | \$15,000.00 |        |
|        |             |                              |       |      | YUNGAE KRIST                               | KIM  | LOS ANGELES             | CA   | Expert- | Led For   | \$14,000.00 |        |
|        |             |                              |       |      | TAKKIN                                     | LO   | LOMA LINDA              | CA   | Expert- | Led For   | \$13,625.00 |        |
|        |             |                              |       |      | MICHAEL JAME                               | HARBOUR  | PALO ALTO               | CA   | Expert- | Led For   | \$13,500.00 |        |
|        |             |                              |       |      | MARK STEVEN                                | WALLACE  | LA JOLLA                | CA   | Expert- | Led For   | \$13,500.00 |        |
|        |             |                              |       |      | RICHARD                                    | CASABURI                                       | RANCHO PALO             | CA   | Expert- | Led For   | \$13,000.00 |        |
|        |             |                              |       |      | GLENN RICHAR                               | EHRESMANN                                      | LOS ANGELES             | CA   | Expert- | Led For   | \$12,000.00 |        |
|        |             |                              |       |      | EMILY ELIZABET                             | COLE   | SAN DIEGO               | CA   | Expert- | Led For   | \$12,000.00 |        |
|        |             |                              |       |      | SCOTT LEE                                  | ZELLER   | ORINDA                  | CA   | Expert- | Led For   | \$11,500.00 |        |
|        |             |                              |       |      | PAULN                                      | BARKOPOULOS                                    | LOS ANGELES             | CA   | Expert- | Led For   | \$11,500.00 |        |
| L      |             |                              |       |      | ALEX JAVIER                                | KOPELOWICZ                                     | GRANADA HILL            | CA   | Expert- | Led For   | \$11,500.00 |        |
|        |             |                              |       |      | BENJAMIN JESS                              | ANSELL   | IRVINE                  | CA   | Expert- | Led For   | \$11,250.00 |        |
| L      |             |                              |       |      | CLIFFORD KEITI                             | BECK   | TORRANCE                | CA   | Expert- | Led For   | \$10,500.00 |        |
| L      |             |                              |       |      | SAMUEL CRAIG                               | RISCH  | SAN FRANCISC            | CA   | Expert- | Led For   | \$10,500.00 |        |
| L      |             |                              |       |      | WILLIAM DAVII                              | HARDY  | LOS ANGELES             | CA   | Expert- | Led For   | \$10,000.00 |        |
|        |             |                              |       | *    |  |  |                         |  |         |   |             |        |
| L      |             |                              |       |      |  |  |                         |  |         |   |             |        |

**Ctrl-S** to save the query, giving it an appropriate name.

Click on **SQL** at the bottom-right of the screen and we can see how Access interprets the query, in **Structured Query Language:** 



This can be written more simply than Access's translation from the Design View:

#### SELECT first\_plus, last, city, state, category, total FROM Pfizer WHERE state="CA" AND category Like "Expert\*" AND total>=10000 ORDER BY total DESC;

Now it should be obvious why databases use abbreviated field names: it makes writing SQL queries much simpler!

Learning SQL is a good idea, as with practice it is quicker than using the Design View, and is a skill that transfers to other database managers.

**TIP!** Even when working in Design View, if you are running several related queries, you don't need to laboriously fill in the grid in Design View each time. Switch to the SQL View, copy it into a new query, then switch back to the Design View and edit from there.

## 2. Grouping and running calculations on the data

First, let's subtotal the payments by state, as before.

Create a new query, Add the table and click the  $\sum$  button, which adds Total to the grid. This is where we will group records together and perform calculations on them.

Select state in the first column of the grid, and accept the default function of **Group By**. Then add total in the second column, this time change the function to **Sum**. Also in this column, click on **Sort** and select **Descending**.

The screen should now look like this:



Here is the same query in SQL (giving a new name for the calculated field):

SELECT state, Sum(total) AS state\_total FROM Pfizer GROUP BY state ORDER BY Sum(total) DESC; Hit ! to run the query (notice how in Design View Access gives a default name to the calculated field):

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| All Access Objects | R            | 🗸 state 🗸          | SumOftotal +       |         |              |       |          |
| Tables             | *            | CA                 | \$4,737,807.00     |         |              |       |          |
| Pfizer             | ^            | TX                 | \$2,802,196.00     |         |              |       |          |
|                    |              | FL                 | \$2,564,047.00     |         |              |       |          |
|                    |              | PA                 | \$2,484,505.00     |         |              |       |          |
|                    |              | NC                 | \$2,328,435.00     |         |              |       |          |
|                    |              | NY                 | \$2,065,042.00     |         |              |       |          |
|                    |              | MA                 | \$1,764,771.00     |         |              |       |          |
|                    |              | IL                 | \$1,256,825.00     |         |              |       |          |
|                    |              | MI                 | \$1,146,285.00     |         |              |       |          |
|                    |              | ОН                 | \$1,019,450.00     |         |              |       |          |
|                    |              | MO                 | \$973,586.00       |         |              |       |          |
|                    |              | CO                 | \$915,238.00       |         |              |       |          |
|                    |              | MD                 | \$870,905.00       |         |              |       |          |
|                    |              | TN                 | \$849,225.00       |         |              |       |          |
|                    |              | AL                 | \$681,699.00       |         |              |       |          |
|                    |              | AZ                 | \$641,851.00       |         |              |       |          |
|                    |              | GA                 | \$032,282.00       |         |              |       |          |
|                    |              | NI                 | \$600.842.00       |         |              |       |          |
|                    |              | MN                 | \$569,300,00       |         |              |       |          |
|                    |              | WI                 | \$510,122,00       |         |              |       |          |
|                    |              | KY                 | \$436.938.00       |         |              |       |          |
|                    |              | SC                 | \$421,491.00       |         |              |       |          |
|                    |              | WA                 | \$396,066.00       |         |              |       |          |
|                    |              | UT                 | \$380,892.00       |         |              |       |          |
|                    |              | VA                 | \$367,992.00       |         |              |       |          |
|                    |              | IN                 | \$349,589.00       |         |              |       |          |
|                    |              | KS                 | \$307,205.00       |         |              |       |          |
|                    |              | OR                 | \$303,740.00       |         |              |       |          |
|                    |              | LA                 | \$261,921.00       |         |              |       |          |
|                    |              | DC                 | \$250,541.00       |         |              |       |          |
|                    |              | AI                 | \$243,706.00       |         |              |       |          |
|                    |              | RI                 | \$210,204.00       |         |              |       |          |
|                    |              | NE                 | \$200,250.00       |         |              |       |          |
|                    |              |                    | \$172,309.00       |         |              |       |          |
|                    |              | PR                 | \$130,394.00       |         |              |       |          |
|                    |              | wv                 | \$128,372.00       |         |              |       |          |
|                    |              | ок                 | \$111,523.00       |         |              |       |          |
|                    |              | MS                 | \$85,276.00        |         |              |       |          |
|                    |              | NV                 | \$73,024.00        |         |              |       |          |
|                    |              | NM                 | \$63,830.00        |         |              |       |          |
|                    |              | DE                 | \$53,987.00        |         |              |       |          |
|                    |              | HI                 | \$42,617.00        |         |              |       |          |
|                    |              | WY                 | \$39,962.00        |         |              |       |          |
|                    |              | ID                 | \$37,656.00        |         |              |       |          |
|                    |              | VT                 | \$29,888.00        |         |              |       |          |
|                    |              | SD                 | \$29,503.00        |         |              |       |          |
|                    |              | ME                 | \$18,731.00        |         |              |       |          |
|                    |              | ND                 | \$16,146.00        |         |              |       |          |
|                    |              | MT                 | \$11,208.00        |         |              |       |          |
|                    |              | AK                 | \$1,750.00         |         |              |       |          |

Save the query as before.

# **TIP!** To export a saved query, select Export to Excel or Export to Text File under the External Data tab.

Now let's create a pivot chart, totaling the payments by state and category simultaneously.

Set up the query as before, but this time Grouping by **category** as well as by **state**, as follows:

| <mark>▲ → → → → →</mark><br>File Home Create E | xternal Data Database Tool   | s Acrobat  | ery Tools<br>Design                       |  |                   |                |
|--|--|--|---|--|-------------------|----------------|
| View Run<br>Results                            | pend Update Crosstab Delete<br>Query Type  | <ul> <li>Union</li> <li>Pass-Through</li> <li>Data Definition</li> </ul> | Show<br>Table ☐ Insert Rows               | a Insert Columns<br>Delete Columns<br>Return: All →<br>tup | Totals Parameters | Property Sheet |
| All Access Objects  Tables  Prizer             | Pfizer Pfizer ID org_indiv first_plus first last city                                  |  |   |  |                   |                |
|  | Field: state<br>Table: Pfizer<br>Total: Group By<br>Sort:<br>Show:<br>Criteria:<br>or: | Category<br>Prizer<br>Group By   | total<br>Pfizer<br>Sum<br>Descending<br>✓ |  |                   |                |

Then select the **Pivot Table View** button at bottom right, and the screen should look like this:



Add state to the Column Area, category to the Row Area and SumOftotal to the Data Area, and this should be the result:

| A             | 9-0-1              | Ŧ   |                 |                            |            |                     | PivotTable Tools     |            |  |   |                      |  |                | Query1 - Microsoft |
|---------------|--------------------|---|-----------------|----------------------------|------------|---------------------|----------------------|------------|--|---|----------------------|--|----------------|--------------------|
| File          | Home               | Create  | Externa         | al Data Databa             | se Tools   | Acrobat             | Design               |            |  |   |                      |  |                |                    |
| View<br>Views | Field<br>List to S | Drop Zones<br>Drill Buttons<br>Hide Details<br>how/Hide | Show<br>Details | Group Ungrou<br>Selections | AutoFilte  | r Show<br>Top/Botto | Ascending            | ı Orderini | Refresh Export<br>Pivot to Excel<br>Data | ♥를 Expand Field<br>■를 Collapse Field<br>I Move Field ~ Ri<br>Active Field | emove<br>Field Sheet | Subtotal<br>Formulas •<br>Calc<br>% Show As •<br>Tools |                |                    |
| All Acc       | ess Objects        |   | « D             | rop Filter Fields          | Here       |                     |                      |            |  |   |                      |  |                |                    |
| Tables        |                    |   | *               |                            |            |                     |                      | st         | ate 🕶                                    |   |                      |  |                |                    |
| 💷 PI          | izer               |   |                 |                            |            |                     |                      | A          | <  | AL  | AR                   | AZ   | CA             | со                 |
|               |                    |   | c               | ategory                    |            |                     |                      | + Su       | -<br>Im of SumOftotal                    | Sum of SumOftotal   | Sum of SumOftota     | Sum of SumOftota                                       | + -            | Sum of SumOftotal  |
|               |                    |   | 0               | Blank)                     |            |                     |                      | +          |  |   |                      |  |                |                    |
|               |                    |   | B               | ,<br>usiness Related       | Travel     |                     |                      | +          |  | \$29,123.00   | \$3,783.00           | \$15,101.00  | \$248,627.00   | \$18,207.00        |
|               |                    |   | E               | ducational Item            | s          |                     |                      | +          |  | \$431.00  | \$318.00             | \$173.00   | \$947.00       | \$144.00           |
|               |                    |   | E               | xpert-Led Forun            | ns         |                     |                      | + -        | \$1,750.00                               | \$129,850.00  | \$72,825.00          | \$134,600.00   | \$1,460,650.00 | \$176,550.00       |
|               |                    |   | - b             | nvestigator-Initi          | ated Resea | irch                |                      | +          |  | \$55,937.00   |                      | \$76,102.00  | \$173,563.00   |                    |
|               |                    |   | N               | 1eals                      |            |                     |                      | +          |  | \$10,217.00   | \$3,700.00           | \$13,409.00  | \$156,716.00   | \$12,433.00        |
|               |                    |   | P               | fizer Sponsored            | Research   | nitiated b          | efore July 1, 2009   | +          |  | \$279,485.00  | \$77,670.00          | \$225,615.00   | \$1,125,624.00 | \$596,437.00       |
|               |                    |   | P               | fizer Sponsored            | Research   | nitiated o          | n or after July 1, 2 | 009 ±      |  | \$66,096.00   |                      | \$107,979.00   | \$328,149.00   |                    |
|               |                    |   | P               | rofessional Adv            | ising      |                     |                      | +          |  | \$110,560.00  | \$2,636.00           | \$68,872.00  | \$1,243,531.00 | \$111,467.00       |
|               |                    |   | G               | irand Total                |            |                     |                      | +          | \$1,750.00                               | \$681,699.00  | \$160,932.00         | \$641,851.00   | \$4,737,807.00 | \$915,238.00       |
|               |                    |   |                 |                            |            |                     |                      |            |  |   |                      |  |                |                    |

## Matching and searching across multiple data tables

#### 1. Importing a new data table

Select Import Excel spreadsheet under the External data tab. Browse for the file FDA warning letters clinical investigators.xls, select Import the source data into a new table in the current database

| 😑 Import Spreadsheet W   | /izard     |             |            |        |              |                            | x        |  |  |
|--|------------|-------------|------------|--------|--------------|----------------------------|----------|--|--|
| Your spreadsheet file contains more than one worksheet or range. Which worksheet or range would you like?         Image: Show Worksheets         Show Worksheets |            |             |            |        |              |                            |          |  |  |
| Show Named Range   | es Sheet2  |             |            |        |              |                            |          |  |  |
|  | Sheets     |             |            |        |              |                            |          |  |  |
|  |            |             |            |        |              |                            |          |  |  |
|  |            |             |            |        |              |                            |          |  |  |
| Sample data for worksheet  | 'Sheet1'.  | 1           | 1          | 1      |              |                            |          |  |  |
| 1 last_name  | first_name | middle_name | issued     | office |              |                            | <b>_</b> |  |  |
| 2 ADELGLASS  | JEFFREY    | м.          | 5/25/1999  | Center | for          | Drug Evaluation and Resea  | r 🔟      |  |  |
| 3 ADKINSON   | Ν.         | FRANKLIN    | 4/19/2000  | Center | for          | Biologics Evaluation and   | R        |  |  |
| 4 ALLEN  | MARK       | s.          | 1/28/2002  | Center | for          | Devices and Radiological   | H        |  |  |
| 5 AMSTERDAM  | DANIEL     |             | 11/17/2004 | Center | for          | Biologics Evaluation and   | R        |  |  |
| 6 AMSTUTZ  | HARLAN     | c.          | 7/19/2004  | Center | for          | Devices and Radiological   | H        |  |  |
| 7 ANDERSON   | c.         | JOSEPH      | 2/25/2000  | Center | for          | Devices and Radiological   | H        |  |  |
| 8 ANDREWS  | DAVID      | Μ.          | 7/19/2000  | Center | for          | Biologics Evaluation and   | R        |  |  |
| 9 AQEL   | RAED       |             | 10/30/2002 | Center | for          | Devices and Radiological   | H        |  |  |
| 10 ARROWSMITH  | PETER      | Ν.          | 1/21/2004  | Center | for          | Devices and Radiological   | H        |  |  |
| 11 BARR  | JOHN       | D.          | 1/14/2000  | Center | for          | Devices and Radiological   | н        |  |  |
| 12 BARTHOLOMEW   | BRADLEY    | J.          | 11/8/2006  | Center | for          | Devices and Radiological   | н        |  |  |
| 13 BATSHAW   | MARK       | ь.          | 11/30/2000 | Center | for          | Biologics Evaluation and 1 | R        |  |  |
| 14 BEAR  | HARRY      | D.          | 9/27/2002  | Center | for          | Biologics Evaluation and 1 | R 🔫      |  |  |
| •  | •          | •           | •          |        |              |                            | ►        |  |  |
|  |            |             | Cancel     | <      | <u>B</u> ack | Next > Einish              |          |  |  |

Click the **Next** button.

# At the next dialog box, make sure to check **First row contains column** headings.

| 😑 Import Spreadsheet W   | lizard     |             |            |  | 23       |  |  |  |  |  |
|--|------------|-------------|------------|--|----------|--|--|--|--|--|
| Microsoft Access can use your column headings as field names for your table. Does the first row specified contain column headings?  First Row Contains Column Headings  last name first name middle name issued office |            |             |            |  |          |  |  |  |  |  |
| last name  | first name | middle name | issued     | office                                       | ٦        |  |  |  |  |  |
| 1 ADELGLASS  | JEFFREY    | м.          | 5/25/1999  | Center for Drug Evaluation and Resear        | - I - I  |  |  |  |  |  |
| 2 ADKINSON   | Ν.         | FRANKLIN    | 4/19/2000  | Center for Biologics Evaluation and F        |          |  |  |  |  |  |
| 3 ALLEN  | MARK       | s.          | 1/28/2002  | Center for Devices and Radiological H        | ۱ — ۱    |  |  |  |  |  |
| 4 AMSTERDAM  | DANIEL     |             | 11/17/2004 | Center for Biologics Evaluation and F        | ι        |  |  |  |  |  |
| 5 AMSTUTZ  | HARLAN     | c.          | 7/19/2004  | Center for Devices and Radiological H        | 1        |  |  |  |  |  |
| 6 ANDERSON   | c.         | JOSEPH      | 2/25/2000  | Center for Devices and Radiological H        | 1        |  |  |  |  |  |
| 7 ANDREWS  | DAVID      | Μ.          | 7/19/2000  | Center for Biologics Evaluation and F        | ι        |  |  |  |  |  |
| 8 AQEL   | RAED       |             | 10/30/2002 | Center for Devices and Radiological H        | 1        |  |  |  |  |  |
| 9 ARROWSMITH   | PETER      | Ν.          | 1/21/2004  | Center for Devices and Radiological H        | 1        |  |  |  |  |  |
| 10 BARR  | JOHN       | D.          | 1/14/2000  | Center for Devices and Radiological H        | 1        |  |  |  |  |  |
| 11 BARTHOLOMEW   | BRADLEY    | J.          | 11/8/2006  | Center for Devices and Radiological H        | 1        |  |  |  |  |  |
| 12 BATSHAW   | MARK       | г.          | 11/30/2000 | Center for Biologics Evaluation and F        | L L      |  |  |  |  |  |
| 13 BEAR  | HARRY      | Þ.          | 9/27/2002  | Center for Biologics Evaluation and F        | L        |  |  |  |  |  |
| 14 BELMONT   | SANDRA     |             | 6/1/2004   | Center for Devices and Radiological H        | [ 🖵 🗌    |  |  |  |  |  |
| •  | ·          | ·           |            |  | <u> </u> |  |  |  |  |  |
|  |            |             | Cancel     | < <u>B</u> ack <u>N</u> ext > <u>F</u> inish |          |  |  |  |  |  |

Click Next twice (in this case Access will recognize the correct data types, but normally you will want to check and correct if necessary).

**Tip!** If you get import errors, re-enter the data selecting the column with problems as text, then change the data type for that column once you have created the table.

At the dialog box illustrated below, select Let Access Add primary key, then click Finish, naming the table FDA.

| 🔳 Import Spreadshe   | et Wizard      |                |            |            |                     | X      |  |  |  |  |
|--|----------------|----------------|------------|------------|---------------------|--------|--|--|--|--|
| Microsoft Access recommends that you define a primary key for your new table. A primary key is used to uniquely identify each record in your table. It allows you to retrieve data more quickly. |                |                |            |            |                     |        |  |  |  |  |
|  |                |                |            |            |                     |        |  |  |  |  |
|  |                |                |            |            |                     |        |  |  |  |  |
| ID last  | name first nam | ne middle name | issued     | office     |                     |        |  |  |  |  |
| 1 1 ADELGI   | ASS JEFFREY    | м.             | 5/25/1999  | Center for | Drug Evaluation and | nd R 🔺 |  |  |  |  |
| 2 2 ADKINS   | son n.         | FRANKLIN       | 4/19/2000  | Center for | Biologics Evaluat:  | ion    |  |  |  |  |
| 3 3 ALLEN  | MARK           | s.             | 1/28/2002  | Center for | Devices and Radio   | logi   |  |  |  |  |
| 4 4 AMSTER   | RDAM DANIEL    |                | 11/17/2004 | Center for | Biologics Evaluat:  | ion    |  |  |  |  |
| 5 5 AMSTU  | Z HARLAN       | c.             | 7/19/2004  | Center for | Devices and Radio   | logi   |  |  |  |  |
| 6 6 ANDERS   | son c.         | JOSEPH         | 2/25/2000  | Center for | Devices and Radio   | logi   |  |  |  |  |
| 7 7 ANDREW   | IS DAVID       | Μ.             | 7/19/2000  | Center for | Biologics Evaluat:  | ion    |  |  |  |  |
| 8 8 AQEL   | RAED           |                | 10/30/2002 | Center for | Devices and Radio   | logi   |  |  |  |  |
| 9 9 ARROW  | SMITH PETER    | Ν.             | 1/21/2004  | Center for | Devices and Radio   | logi   |  |  |  |  |
| 10 10 BARR   | JOHN           | D.             | 1/14/2000  | Center for | Devices and Radio   | logi   |  |  |  |  |
| 11 11 BARTHO   | DLOMEW BRADLEY | J.             | 11/8/2006  | Center for | Devices and Radio   | logi   |  |  |  |  |
| 12 12 BATSHA   | AW MARK        | L.             | 11/30/2000 | Center for | Biologics Evaluat:  | ion    |  |  |  |  |
| 1313 BEAR  | HARRY          | D.             | 9/27/2002  | Center for | Biologics Evaluat:  | ion    |  |  |  |  |
| 1414 BELMON  | IT SANDRA      |                | 6/1/2004   | Center for | Devices and Radio   | logi 👻 |  |  |  |  |
| •  |                |                |            |            |                     | F      |  |  |  |  |
|  |                |                | Cancel     | < Back     | Next > Finis        | sh     |  |  |  |  |
|  |                |                |            | < Dack     |                     |        |  |  |  |  |

#### 2. Joining data tables

Now we're going to create a query across the two data tables, having linked them together in the right way, so we select doctors paid by Pfizer to run Expert-led forums who had also received a warning letter from the FDA for problems in their conduct of clinical research.

To link the tables, select **Relationships** under the **Database Tools** tab, select and **Add** both tables, then close the dialog box.

Now click on **first\_name** in the FDA warning letters table and drag it across to **first** in the Pfizer payments table. When the dialog box pops up, click on **Create**:

| A     →     →     →     →       File     Home     Create     Ext       →     →     Clear Layout       Edit     →     Relationship Report       Tools     Tools | ernal Data Database Tools Acrobat  | Relationship Tools<br>Design  |  |   |
|--|--|---|--|---|
| All Access Objects   | FDA<br>Iast_name<br>first_name<br>middle_name<br>issued<br>office<br>subject | Pfizer<br>org_indiv<br>first_plus<br>first<br>last<br>city<br>state | Edit Relationships Table/Query: Related Table/Query: FDA | ?     SX       Create     Cancel       Join Type     Create New |

Repeat the process for the **last\_name** and **last** fields, clicking **No** when you see this dialog box:

| Microsoft | Access   |
|-----------|--|
| <u> </u>  | A relationship already exists.   |
|           | Do you want to edit the existing relationship? To create a new relationship, click No. |
|           | Yes No Cancel  |
|           | Was this information helpful?  |

(This has created **INNER JOINS** between the two tables, so that queries run across them will only return data if the first and last name fields match. It is also possible to link tables in other ways, using the **Join Type** button in the dialog box above. For example, queries run on **LEFT** or **RIGHT JOINS** would return all the requested data from the one table, and just those with matching first and last names from the other. )

The screen should now look like this:



Ctrl-S to save the new relationship and close.

# 3. Querying across the joined data tables

Create a new query, **Add** both tables. The screen should now look something like this:

| A   J ♥ ▼ (♥ ▼   <del>↓</del><br>File Home Create Exte | rnal Data Database Tools   | Query Tools<br>Acrobat Design   |   |   |
|--|--|---|---|---|
| Application<br>Parts v<br>Templates Tables             | nt Query Query<br>Wizard Design<br>Queries                               | Blank<br>n Form Wizard<br>Mavigation *<br>Forms                                     | Report Report<br>Design Report<br>Reports | ort Wizard<br>els<br>Macro<br>Wisual Basic<br>Macros & Code |
| All Access Objects                                     | FDA<br>* D<br>last_name<br>first_name<br>middle_name<br>issued<br>office | Pfizer<br>*<br>Pfizer<br>*<br>P<br>org_indiv<br>first_plus<br>first<br>last<br>city |   |   |
|  | Field:   |   |   |   |

Fill in the grid as follows. Selecting \* returns all relevant records from a table. Adding **category** from the Pfizer table allows us to filter to just see those doctors paid to run expert forums, using Criteria: **Like Expert\*.** Uncheck **Show** so that **category** doesn't appear twice in the results.

| A   🚽 🤊 • (° -   -                            |                                    |                  | Query T                     | pols        |   |                  |                |  |  |  |
|---|------------------------------------|------------------|-----------------------------|-------------|---|------------------|----------------|--|--|--|
| File Home Create Ext                          | ernal Data                         | Database Tools A | crobat Desig                | n           |   |                  |                |  |  |  |
| View Run<br>View Table                        | end Update Cr                      | osstab Delete    | ion Sh<br>ta Definition Tat | Delete Rows | ☐ Insert Columns<br>☐ Delete Columns<br>☐ Return: All | Totals Parameter | Property Sheet |  |  |  |
| Results Query Type Query Setup Show/Hide      |                                    |                  |                             |             |   |                  |                |  |  |  |
| All Access Objects                            |                                    |                  |                             |             |   |                  |                |  |  |  |
| FDA   | FDA *                              |                  | Pfizer<br>*                 |             |   |                  |                |  |  |  |
| Pfizer  | ₿ ID                               |                  | ₿ ID                        |             |   |                  |                |  |  |  |
| first_name<br>middle_name<br>issued<br>office |                                    |                  |                             |             |   |                  |                |  |  |  |
|   | Field:                             | Pfizer.*         | category                    | FDA.*       |   |                  |                |  |  |  |
|   | Table:                             | Pfizer           | Pfizer                      | EDA         |   |                  |                |  |  |  |
|   | Sort:                              | THEET            |                             |             |   |                  |                |  |  |  |
|   | Sort:<br>Show:<br>Criteria:<br>or: |                  | Like "Expert*"              |             |   |                  |                |  |  |  |
|   | Sort:<br>Show:<br>Criteria:<br>or: |                  | Like "Expert*"              |             |   |                  |                |  |  |  |

The screen should now look something like this:

Here is the SQL for this query:

## SELECT Pfizer.\*, FDA.\* FROM FDA INNER JOIN Pfizer ON FDA.last\_name = Pfizer.last AND FDA.first\_name = Pfizer.first WHERE Pfizer.category Like "Expert\*";

Hit ! to run the query, and we should have four doctors:

|                           |        |   |  |                         |  |              |                              |                  |                      |                |             |                         | 0               |
|---------------------------|--------|---|--|-------------------------|--|--------------|------------------------------|------------------|----------------------|----------------|-------------|-------------------------|-----------------|
| A Conto Estas             |        | -t- D-t-b   | Taala Assala                                 |                         |  |              |                              |                  |                      |                |             |                         | Queryz - Micros |
| View Paste Format Painter | Filter | Accending<br>Accending<br>Accending<br>Accending<br>Accending<br>Accending<br>Accending | V Selection -<br>Advanced -<br>Toggle Filter | Refresh<br>All - X Dela | Σ Totals<br>ABC Spelling<br>ete ▼ More ▼ | ind the sele | ace<br>Size to<br>Fit Form W | witch<br>ndows * | alibri<br>B <i>I</i> |                |             | 徒徒   ⋈ ▾<br>≡   ⊞•   壨• |                 |
| Views Clipboard           |        | Sort & Fil  | lter   | Rec                     | cords                                    | Find         | Wind                         | w                |                      | Text           | Formatting  | G                       |                 |
| All Access Objects 🛛 💌 «  |        | Pfizer.ID 👻   | org_indiv 👻                                  | first_plus 👻            | first 👻                                  | last 👻       | city +                       | state            | -                    | category -     | cash 👻      | other 🝷                 | total 👻         |
| Tables                    |        | 1150  | BUKOWSKI COI                                 | RONALD MATH             | RONALD                                   | BUKOWSKI     | CLEVELAND                    | OH               |                      | Expert-Led For | \$22,500.00 | \$0.00                  | \$22,500.00     |
| FDA                       |        | 9024  | THOMAS D GAZ                                 | THOMAS DAVII            | THOMAS                                   | GAZDA        | SCOTTSDALE                   | AZ               |                      | Expert-Led For | \$1,000.00  | \$0.00                  | \$1,000.00      |
| Direc                     |        | 5148  | LEVENSON, JEF                                | JEFFREY RONAL           | JEFFREY                                  | LEVENSON     | SAINT PETERSE                | FL               |                      | Expert-Led For | \$1,500.00  | \$0.00                  | \$1,500.00      |
| Plizer                    |        | 9554  | WARD, DOUGL                                  | DOUGLAS JAME            | DOUGLAS                                  | WARD         | WASHINGTON                   | DC               |                      | Expert-Led For | \$1,500.00  | \$0.00                  | \$1,500.00      |
|                           |        |   |  |                         |  |              |                              |                  |                      |                |             |                         |                 |
|                           |        |   |  |                         |  |              |                              |                  |                      |                |             |                         |                 |
|                           |        |   |  |                         |  |              |                              |                  |                      |                |             |                         |                 |
|                           |        |   |  |                         |  |              |                              |                  |                      |                |             |                         |                 |
|                           |        |   |  |                         |  |              |                              |                  |                      |                |             |                         |                 |
|                           |        |   |  |                         |  |              |                              |                  |                      |                |             |                         |                 |
|                           |        |   |  |                         |  |              |                              |                  |                      |                |             |                         |                 |