

# Location Analytic Solutions

## Location Attributes – D-U-N-S Relative Performance (DRP) Attribute

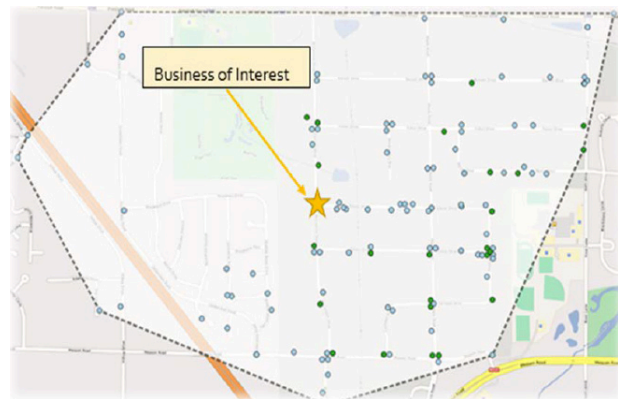
**D-U-N-S LEVEL** attributes evaluate a business relative to its neighboring businesses in terms of three dimensions: all businesses, businesses with similar SIC codes, and businesses of a similar profile. These three dimensions give our customers a more granular look at business entities in terms of their location and can be used to increase a model's predictive power in regards to a specific business behavior.

Dun & Bradstreet's Location Attributes are created based off a neighborhood defined around each business. For every business in the United States, Dun & Bradstreet identifies neighboring businesses that surround the business of interest, collects information on the neighboring businesses, and finally creates the attributes.

### NEIGHBORHOOD SIZE

The size of the neighborhood that Dun & Bradstreet uses to identify neighboring businesses varies, depending on the geographic location of the business of interest and the density of businesses within the location. As one would imagine, the business density in New York City is much greater than areas out in the Mid-West. Therefore, to collect neighboring businesses in New York City for example, Dun & Bradstreet does not need to go far to identify neighbors, however for some locations, we need to reach out further to identify neighbors. Typically, our neighborhood footprint covers a range from 0.2 square miles to 150 square miles. It is important to note that no consumer-level demographic type information is used when defining neighborhoods around a given business.

Right is an illustration of an example neighborhood. We've drawn a polygon (dotted lines) that clearly show businesses (blue & green dots) within the polygon or 'neighborhood.' These businesses are now 'neighbors' to the Business of Interest.



### THREE DRP ATTRIBUTES: drp\_\*\_loc\_index, drp\_\*\_prf\_index, & drp\_\*\_sic2d\_index

(Note: The framework described below applies to all DRP variables – not just CCS9\_PRCTL. The general attribute naming convention is: DRP\_<variable>\_<loc,sic,or prf>\_<index,zscore,or decile>.)

Dun & Bradstreet creates three types of DRP attributes for each business that compare the business of interest to its neighboring businesses within:

- The Neighborhood Location
- The Neighborhood Location using only businesses with Similar Company Profiles
- The Neighborhood Location using only businesses with Similar SICs.

As an example, let's understand how we create the variable DRP\_CCS9\_PRCTL\_LOC\_INDEX. The

description of `DRP_CCS9_PRCTL_LOC_INDEX` is: Relative index of credit score percentile within a location.

Meaning, for all the businesses within the neighborhood defined above, we look at the distribution of Dun & Bradstreet's Commercial Credit Score (CCS). When we create \*\_INDEX variables, we use the Median of the attribute (in this case Commercial Credit Score Percentile) as our denominator. For the Business of Interest, `DRP_CCS9_PRCTL_LOC_INDEX` is calculated like so:

$$= \frac{CCS9\ PERCENTILE_{BUSINESS\ i}}{MEDIAN\ CCS9\ PERCENTILE_{NEIGHBORHOOD\ i}}$$

Those values of `DRP_CCS9_PRCTL_LOC_INDEX` that are greater than 1 will indicate 'the Business of Interest has a higher value than its neighboring businesses in general.' Therefore, if the neighborhood has lower performing metrics, we can identify businesses that generally have better performance metrics than those around them.

There are other dimensions that we create for this attribute as well. We also create a variable labeled "DRP\_CCS9\_PRCTL\_PRF\_INDEX" which is defined as: Relative Index of credit score percentile within a location & similar profile. For this attribute, the numerator is the same. We only change the denominator to reflect the Median CCS Percentile of businesses within the same neighborhood that have similar company profiles. A profile is defined by Dun & Bradstreet's Viability Score – Company Profile component.

For example, in Figure 1 – let's assume all the Blue dots are businesses that have similar Company Profiles. We look at the CCS9 Percentile distribution of these select businesses, then extract the Median value. The `DRP_CCS9_PRCTL_PRF_INDEX` is calculated like so:

$$= \frac{CCS9\ PERCENTILE_{BUSINESS\ i}}{MEDIAN\ CCS9\ PERCENTILE\ with\ Similar\ Company\ Profile_{NEIGHBORHOOD\ i}}$$

Another dimension we create using the same process is a relative index reflecting similar SICs. Here, the numerator is again the same, however the denominator reflects the Median of 'Similar SIC' businesses.

### DRP\_\*\_zscore & DRP\_\*\_decile EXPLANATION

There are two other aspects of creating our 'relative' type attribute; these are ZSCORE & DECILE. Again, for each of these, we create DRP attributes for a business compared to:

- The Neighborhood Location
- The Neighborhood Location using only businesses with Similar Company Profiles

- The Neighborhood Location using only businesses with Similar SICs.

For Z-Score variables, we use the standard formula of calculating a Z-Score for a given record, which is subtracting the mean from the record value & dividing the quantity by the standard error.

For Decile variables, we take all records and give them a 1 through 10 value based on the ranking of their attributes within their neighborhood. For example, if the Business of Interest has a Commercial Credit Score Percentile that is in the bottom 10% of all neighboring businesses, then the business of interest will receive a value of 1. If the Business of Interest has a Commercial Credit Score Percentile that is in the top 10% of all neighboring businesses, then the business of interest will receive a value of 10.

## DRP ATTRIBUTE RELATIONSHIP WITH CENSUS DEMOGRAPHICS

Dun & Bradstreet has checked our DRP attributes and their relationship with freely available Census demographic data. Using a sample population of about 100,000 D&B Active businesses as of December 2014, we compared DRP values to several Census demographic attributes.

### APPROACH

For a business of interest, we identified their neighboring businesses. For each neighboring business, we identified the zip code to which it belongs. The neighboring businesses were then given the Census demographic attribute assigned to the zip code they belong to. An Average was then taken for the Census demographic attribute.

The Census demographic attributes analyzed were:

1. Median Age
2. Percent White population
3. Percent African American population
4. Percent Spanish
5. Median income
6. Percent Poverty

For the sample of businesses, we have their DRP attributes along with the Average Census attributes. We used this information to create the well-known Pearson's Correlation Coefficient. Pearson's Correlation Coefficient ranges from -1 to 1. A value of -1 means a perfect negative linear relationship. A value of 1 means a perfect positive linear relationship. A value of 0 means no linear relationship.

Below you will notice that all correlation coefficients fall around the value of 0. This is indicating that there is no linear relationship between the selected Census demographic variables (no positive or negative linear relationship).

	MEDIAN AGE	%WHITE POPULATION	%AFRICAN AMERICAN POPULATION	%SPANISH POPULATION	MEDIAN INCOME	% POVERTY
drp_ccs9_prctl_loc_decile	0.0044	-0.0002	0.0017	-0.0051	0.0019	-0.0037
drp_ccs9_prctl_prf_zscore	0.0062	0.0025	-0.0026	-0.0007	0.0036	-0.0043
drp_ccs9_prctl_sic2d_index	0.0206	-0.0251	0.0293	0.0299	-0.0036	-0.0056
drp_fspct7p1_loc_decile	0.0015	0.0002	0.0043	-0.0043	0.0023	-0.0045
drp_fspct7p1_prf_zscore	0.0038	0.0044	-0.0031	0.0033	0.0017	-0.0045
drp_fspct7p1_sic2d_index	0.0005	-0.0168	0.0199	-0.0069	-0.0040	0.0094

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