PRELIMINARY HUMAN DEVELOPMENT INDEX FOR CONNECTICUT
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INTRODUCTION

This report provides a description of the methods used to create the Human Development Index for the 169 towns in Connecticut. The methods and calculations used were consistent with those used and described in the Measure of America reports by Kristen Lewis and Sarah Burd-Sharps to create the human development index for the United States[1]. These reports were in turn based on human development indices that had been created by the United Nations to assess development at global levels[2]. The Measure of America reports use three major indices (Education, Income, and Health) to assign a 0-10 score to each state. Each index is calculated by comparing an actual number to a minimum and maximum "goalpost" – set by Burd-Sharps and Lewis at specific numbers based on ranges they observed in their data (see below). In order for the Connecticut HDI to be compared with the Measure of America reports, the same goalposts were used in calculating the indices for each town despite the fact that the range of the data for Connecticut was quite different.

$$Dimension\ Index = \frac{actual\ value - minimum\ value}{maximum\ value - minimum\ value} * 10$$

All of the data used to construct the indices was taken from the 2007-2011 American Community Survey, except for the raw life expectancy data, which was provided by the Connecticut Department of Public Health and which dates to 2010. This data was then compiled into an abridged life table for each town in Connecticut using the age groups described in the Measure of America reports. See below for more detailed information on the calculation of the life expectancies for each town. All of the calculations were performed in ArcGIS by using the geodatabase available from the Connecticut State Data Center which contains town boundaries as well as all of the necessary ACS tables, except the table used in calculating Educational Attainment (S1501), which was downloaded from American FactFinder and joined to the shapefile.

GOALPOSTS

Goalposts used in calculating the indices for Connecticut were the same that were used in calculating those for the Measure of America reports, as well as those for Louisiana (2009), Mississippi (2009), California (2011) and Marin County (2012). The goalposts used for the American HD index represent the range of values that the authors observed in the data. So that the results for Connecticut towns would be comparable to the American indices, we used the same goalposts. The goalposts for the median earnings differ in all 3 reports because they've been adjusted for inflation. For this report (Connecticut) we used the CPI-U-RS inflation calculator[3] to adjust the goalposts from the 2012 Marin County report to 2011 earnings because the Marin report

[1] http://www.measureofamerica.org
[2] http://hdr.undp.org/en/statistics/hdi/
[3] Bureau of Labor Statistics CPI Inflation Calculator, http://www.bls.gov/data/inflation_calculator.htm

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used the 2006-2009 ACS data which was adjusted to 2010 earnings.[4] The same method of adjusting inflation was used by Bud-Sharps and Lewis in their more recent reports as well.

Indicators	Minimum	Maximum
Life Expectancy at birth (years)	66	90
Educational attainment score	0.5	2.0
Combined gross enrollment ratio (%)	70	100
Median personal earnings (adj for inflation – 2011 $)	14,977	63,366

**Note: 2011 Poverty threshold for an individual is $11,484
(Taken from US Census website: http://www.census.gov/hhes/www/poverty/data/threshld/)

TABLES/FIELDS

All of the tables used in calculating the index for Connecticut were the same tables used in the Measure of America reports, as mentioned in the various methodologies. The tables and fields from the 2007-2011 ACS data that were used to calculate their respective data category are as follows:

Data description	Table	Fields
Percent high school grad or higher	S1501	HC01_EST_VD17
Percent bachelor's deg or higher	S1501	HC01_EST_VD16
Percent graduate degree	S1501	HC01_EST_VD14
Educational Attainment Index	See below for calculations	
Educational Attainment Score	See below for calculations	
# of enrolled students, ages 3-35	B14003	Multiple, see "Educational Enrollment Index" below
Total population, ages 3-24	B14003	Multiple, see "Educational Enrollment Index" below
Gross enrollment ratio	See below for calculations	
Gross enrollment ratio capped	See below for calculations	
Educational Enrollment Index	See below for calculations	
Education Index	See below for calculations	
Median earnings estimate (2011)	B20017	B20017002_EST
Numerator for Income Index	See below for calculations	
Denominator for Income Index	See below for calculations	
Median Earnings Index	See below for calculations	
Life Expectancy	Data created at CTSDC	
Health Index	See below for calculations	
Human Development Index	See below for calculations	

INDEX CALCULATIONS

The calculations for the index were performed in ArcGIS. Below is a list and accompanying description of each of the fields that were created and calculated to obtain the final HDI.

Field Name	Description	Formula (all calculations performed in ArcGIS)
HiSch	Percent high school grad or higher	Percentage / 100
Bach	Percent bachelor's deg or higher	Percentage / 100

[4] Burd-Sharps and Lewis, *A Portrait of Marin: Marin County Human Development Report 2012.* p.67. http://www.measureofamerica.org/docs/APOM_Final-SinglePages_12.14.11.pdf

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Grad	Percent graduate degree	Percentage / 100
EdAttInd	Educational Attainment Index	(AttScore – 0.5)/(2.0 – 0.5)
AttScore	Educational Attainment Score	[HiSch] + [Bach] + [Grad]
Enr3to35p	# of enrolled students, ages 3-35	B14003003_EST+ B14003012_EST+ B14003031_EST+ B14003040_EST
EnrPop3to24	Total population, ages 3-24	See "Educational Enrollment Index" below
GER	Gross enrollment ratio	[Enr3to35p] / [EnrPop3to24]*100
GER_capped	Gross enrollment ratio capped	All values > 100 changed to 100
EdEnrInd	Educational Enrollment Index	([GER_capped])-70)/(100-70)
EDINDEX	Education Index	(2/3*[EdAttInd])+(1/3*[EdEnrInd])
MedEar_Est	Median earnings estimate (2011)	None – see below for table info
Num_Log	Numerator for Income Index	math.log10(!MedEar_Est!)-math.log10(14977) ****see note**
Den_Log	Denominator for Income Index	math.log10(63366)-math.log10(14977) ****see note**
INCINDEX	Median Earnings Index	[Num_Log]/[Den_Log]*10
LifeExp	Life Expectancy	No formula – see below for info
HINDEX	Health Index	([LifeExp]-66)/(90-66)*10
HDI	Human Development Index	([EDINDEX]+[INCINDEX]+[HINDEX])/3

** Because VB Script in ArcGIS field calculator only performs natural log, this calculation was done using Python in order to use the log10 function.

EDUCATIONAL ATTAINMENT INDEX
Table S1501

In order to maintain consistency with the Measure of America reports, table S1501 was used because it provided the percentages of individuals with a bachelor's degree or higher, or a high school degree or higher. The raw data that was used to create S1501 can be found in B15002.

Fields & Calculations:
Percent high school or higher [HiSch]: HC01_EST_VD16
Percent bachelors or higher [Bach]: HC01_EST_VD17
Graduate degree [Grad]: HC01_EST_VD14
AttScore (Attainment Score) = [HiSch] + [Bach] + [Grad]
EdAttInd (Attainment Index) = ([AttScore] – 0.5)/(2.0 – 0.5)

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EDUCATIONAL ENROLLMENT INDEX
Table B14003

The data in this table are organized not only by sex, but by age groups and whether those groups are enrolled in public or private school, or unenrolled.

Enr3to35p (Total enrolled for ages 3 to 35):
Male Public + Male Private + Female Public + Female Private
[B14003.B14003003_EST]+ [B14003.B14003012_EST] + [B14003.B14003031_EST]+ [B14003.B14003040_EST]

EnrPop3to24 (Total population ages 3 to 24):
Male Public/Private/Unenrolled each group 3-24 + Female Public/Private/Unenrolled each group 3-24

[B14003.B14003004_EST]+ [B14003.B14003005_EST]+ [B14003.B14003006_EST]+
[B14003.B14003007_EST]+ [B14003.B14003008_EST]+ [B14003.B14003009_EST]+
[B14003.B14003013_EST]+ [B14003.B14003014_EST]+ [B14003.B14003015_EST]+
[B14003.B14003016_EST]+ [B14003.B14003017_EST]+ [B14003.B14003018_EST]+
[B14003.B14003022_EST]+ [B14003.B14003023_EST]+ [B14003.B14003024_EST]+
[B14003.B14003025_EST]+ [B14003.B14003026_EST]+ [B14003.B14003027_EST]+
[B14003.B14003032_EST]+ [B14003.B14003033_EST]+ [B14003.B14003034_EST]+
[B14003.B14003035_EST]+ [B14003.B14003036_EST]+ [B14003.B14003037_EST]+
[B14003.B14003041_EST]+ [B14003.B14003042_EST]+ [B14003.B14003043_EST]+
[B14003.B14003044_EST]+ [B14003.B14003045_EST]+ [B14003.B14003046_EST]+
[B14003.B14003050_EST]+ [B14003.B14003051_EST]+ [B14003.B14003052_EST]+
[B14003.B14003053_EST]+ [B14003.B14003054_EST]+ [B14003.B14003055_EST]

GER = [Enr3to35p] / [EnrPop3to24]*100

GER_capped = All values of GER that are above 100, change to 100.

EdEnrInd = ([GER_capped] – 70) / (100 - 70)

EDINDEX = (2/3*[EdAttInd]) + (1/3*[EdEnrInd])

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MEDIAN EARNINGS
MedEar_Est = B20017

In order to calculate this field in ArcGIS, Python was used because VBScript does not provide a log10 option – only natural log.

Num_Log = math.log10(!MedEar_Est!)-math.log10(14977)
Den_Log = math.log10(63366)-math.log10(14977)

INCINDEX = !Num_Log!/ !Den_Log!*10

HEALTH INDEX
Life expectancy data was calculated using abridged life tables. The abridged life tables were created using the number of deaths per age group and the total population for that age group (see pg. 285 in *Demographic methods and concepts* by Donald T. Rowland, 2003 Oxford University Press, Oxford) The age ranges were grouped based on the methods in the original "Measure of America" report from 2010-2011 (Under 1, 1-4, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85+.) The value interpreted as life expectancy was the value of e_x for the "Under 1" age group. The raw data was obtained from the Connecticut Department of Public Health.

HINDEX = ([LifeExp] – 66) / (90 - 66)

HUMAN DEVELOPMENT INDEX
The total index is calculated as the average of the three other main indices:

HDI = ([EDINDEX] + [INCINDEX] + [HINDEX]) / 3

Notes
The HDI does not appear to take into account areas with low population numbers. So, for example, the tract in Connecticut that contains the airport has a very poor in the Education Index, because there are no people there between the ages of 3 and 24 (it receives a low negative value). Other areas with similar low values for that population group also appear to get lower Education Index values, thus bringing down their overall HDI. For the airport tract, all of the values for each index and corresponding fields were set to 0 so as not to negatively influence the range of HDI values.

Negative values and values over 10 are a product of the 3 different indices being higher or lower than the national goalposts that were set for each specific index.

Tracts that contain group quarters (universities, prisons, nursing homes) can influence the data at the town level. For instance, the median earnings for the UConn tract are very low compared with the rest of the tracts in Mansfield. As a result, the median earnings at the town level are the lowest

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in the entire state, and thus Mansfield receives a low HDI score even though the other three tracts in the town have much higher median earnings. This is likely the case for other towns in Connecticut that have universities, prisons, or nursing homes. The existence of nursing homes can also influence life expectancy due to a proportionally higher number of people in older age groups.

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