

Documentation for the  
Latin America and the Caribbean Population Time Series

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Center for International Earth Science Information Network (CIESIN),  
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**Abstract**

This document outlines the basic methodology and data sets used to construct the Latin America and the Caribbean Population Time Series, v1 (1990, 2000), along with use cases, limitations, and use constraints.

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We appreciate feedback regarding this data set such as suggestions, discovery of errors, difficulties in using the data, and format preferences. Please contact:

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## I. Introduction

Georeferenced census and other population data is used in risk assessment and management, including emergency planning, flood plain modeling, planning of social and educational services, poverty analysis, marketing analysis, epidemiological analysis, and agriculture (UNDESA, Statistical Division, 2009:15-16; Guzman et al., 2013). The analysis of the spatiotemporal distribution and change of population counts, density and growth requires a time series of both population census data and sub-national administrative boundaries.

However, the georeferencing of census data (and census cartography) is not fully standardized across countries, with each country doing it differently (although there are remarkable advances, see UNDESA Statistics Division, 2009). The boundaries of administrative or census units change over time (for reasons ranging from enumeration schemes to local government institutional changes). This complicates dynamic analysis of spatial data, raises issues of data comparability, and makes it more difficult to assess population change (Gregory, 2000; Gregory and Ell, 2005). In general, “there is a trade-off between geographical detail and chronological depth, so traditionally we can look at how a phenomenon varies over space *or* how it varies over time, but have only very limited capacity to look at both” (Gregory and Ell, 2005:420).

These issues make the spatial and temporal characterization of population dynamics difficult to perform on a large (regional or global) scale and at a higher level of detail (i.e. sub-national level), despite the availability of more and better data and the dissemination of methods for harmonizing information over time and space. As a result, spatial studies of population dynamics tend to be small-scale, local and regional, and more common than at continental-scale.

The Latin America and the Caribbean Population (LAC-POP) Time Series aims to contribute to bridge this gap. Its objective is to characterize changing population distribution and growth in Latin America and the Caribbean between 1990 and 2000 using spatial consistency and comparable units at a spatial resolution suitable to regional change analysis. This document describes the development of the population time series using census data and sub-national administrative boundaries. The data set consists of two vector polygon layers: one layer displays population estimates for sub-national administrative units in 1990 and 2000, including population counts, density, and percent change, at the municipality level or equivalent (level 2); a second layer summarize this information at the country level (level 0).

## II. Data and Methodology

An abridged version of methods and input data is available in Aide et al., 2013:165.

### Input data

The main data inputs are population counts and administrative boundaries. The characteristics and availability of data vary greatly by country, including the administrative level at which population and spatial data are made available to the public.

### Population data

Population data were compiled from national statistical offices, census bureaus and other sources for the 1990 and 2000 rounds of censuses, or as close as possible to the target years 1990 and 2000<sup>1</sup>. For detailed information on the data sources, see Appendix 3. Data Inputs.

For each country, population data were collected as close to the target years of 1990 and 2000 as possible (Table 1). Once gathered, the population data were first extracted from their original formats (which ranged from paper documents to spreadsheets), standardized (by transforming values into common units and changing variable names to common names), and adjusted to the years 1990 and 2000, as needed.

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<sup>1</sup> The main attractiveness of population censuses as sources of data are the *large, exhaustive, and rich geographic coverage* (although spatial detail of published data could be very coarse) usually organized in a nested geographic hierarchy (UN Statistics Division, 2009; Guzman et al., 2013). However, it is very important to note that (a) not all the collected information is actually available, either because it is not processed due to budget constraints, confidentiality or both; and (b) population censuses can also have other limitations or restrictions in terms of accuracy, privacy, immediacy, and coverage (Guzman et al., 2013; Balk et al., 2008; Rowland, 2003).

Table 1: Years of Input Population Data

Year 1	No. Countries	Year 2	No. Countries
Unknown	1	1999	2
1984	1	2000	18
1989	1	2001	13
1990	16	2002	5
1991	11	2003	1
1990, 1992	1	2004	2
1992	5	2005	2
1993	4	2005, 2007	1
1994	1	2007	2
1995	1	<b>Total</b>	<b>46</b>
1996	3		
1999	1		
<b>Total</b>	<b>46</b>		

### Spatial Boundary Data

Administrative boundary data, often less available than population data, were collected from a large variety of sources, usually as shapefiles. For detailed information on the data sources, see Appendix 3. Data Inputs. Where possible, boundary files were pursued that corresponded to the same reference year and reporting units as the census data. However, this was not the common occurrence since spatial boundary and population data are often collected and released by separate governmental agencies, and frequently in unconnected years. Consequently, in the majority of the cases, spatial boundary and population data sets had to be manually linked.

For each country, searches were conducted for second administrative level (what is commonly known in many Latin America countries as *municipio* level) data.<sup>2</sup> In the end, data were collected for 46 countries and territories throughout Latin American and the Caribbean totaling 16,054 administrative units, at several different administrative levels, ranging from national (level 0) to municipality (level 2 in most countries)<sup>3</sup>, as shown in Table 2.

<sup>2</sup> Data were available at higher resolution for some countries but the most common level was selected.

<sup>3</sup> The Geographic Level designations used here are based on the first and second level administrative divisions of the Second Administrative Level Boundaries (SALB) Project of the United Nations (United Nations, 2005). National-level administrative boundaries are designated as level 0, and administrative boundaries that are sub-ordinate to the second sub-national level but superior to national units are designated as level 1 (first sub-national level). For all countries/levels that are not defined under SALB, geographic level codes correspond to analogous hierarchal political administrative divisions. Within each country, finer administrative levels provide more sub-national detail (e.g. level 3 data is of higher resolution than level 2), but administrative level 3 units for one country may not be closely comparable in average area or population to level 3 units in another.

Table 2: Distribution of Countries and Administrative Units by Geographic Level

Level	# of countries	# of Units
0	9	9
1	11	102
2	24	10125
3	2	5818
<b>Grand Total</b>	<b>46</b>	<b>16054</b>

Most of the spatial boundary files collected did not have a direct correspondence with the individual country level spatial population data. In only a few cases, like Brazil and Argentina, the data did match exactly. In other cases, like Bolivia, the population data and spatial boundaries were off by a few units, however, the matching of the data still proved to be a challenge given the redrawing of municipal boundaries that took place between censuses (see example below). In others, like Jamaica, a matching spatial data set for population data at the municipal-equivalent level was not available. As a result, the population data was aggregated to the coarser level of the spatial data, rendering the more detailed level population data unusable in our analysis. For many of the small island nations in the Caribbean, sub-national resolution spatial or population data could not be collected and therefore only country level data were used.

One way to measure the relationship between the number of administrative units and the country land area is to estimate the data's spatial resolution (SR), measured as:

$$SR = \sqrt{\frac{\text{country area}}{\text{number of units}}}$$

Amongst the countries included in the database, the average resolution is 36 square kilometers, and it ranges from 3 (Netherlands Antilles) to 185 (Argentina).<sup>4</sup> The Median SR is 26 square kilometers.

## Methods

The two main steps for creating the data set are: (1) matching population data to geographic boundaries for each year and over time; and (2) estimating population counts for the target years of 1990 and 2000.

### 1. Matching population and boundary data for each input year and over time

As was mentioned before, for most of the countries, the spatial boundary and population data sets had to be manually linked since they came from different sources. Assembling these data

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<sup>4</sup> The size and number of administrative units can be influenced by the country's land area, population density and environmental characteristics (Tobler et al., 1997). For example, countries with small geographic size, such as the small island nations in the Caribbean, tend to have higher resolutions, even before accounting for the number of administrative units. Conversely, countries with vast regions with low or uninhabited areas, which tend to be grouped in large administrative units, often result in lower resolutions (e.g. Argentina). Additionally, the presence of relatively densely distributed populations generally necessitates a larger number of administrative units, which can lead to a higher resolution than a more sparsely populated country of equivalent size (Balk et al., 2005).

proved to be a time-consuming task, requiring extensive data checking for errors, reconciling boundary information, and integrating spatial data from a wide range of sources into a unified geodatabase. When assembling these data, the most up-to-date boundaries available were used, and were matched to the 1990 and 2000 adjusted census population data.

Census geography changes over time, especially—but not only—for the smallest units (census tract level or higher), and is usually defined in terms of the number of households or people. It is difficult to characterize with precision inter-annual changes in the spatial distribution of population because of changes in administrative boundaries/census geography across censuses. There are three main categories of mismatches: i) outdated boundaries that did not match the population data; ii) administrative unit names in the census that did not match those in the boundary file; and iii) administrative unit changes during the time period.

### **i) Outdated Boundaries**

For some countries, like Chile, the boundaries available were dated prior to 1990, so the population data did not match the boundaries. In these cases, in the absence of being able to find newer boundaries, investigations were done to see whether any new '*municipios*' were formed since the year of the spatial boundary file, and then the population data were either coarsened to fit those earlier boundaries or digitized so that the new boundary matched the new administrative unit/population data, whenever access to updated and detailed paper reference maps were available.

### **ii) Name Changes**

In other cases, the names and not the spatial extent of a given administrative boundary changed over time. In these cases, research on national websites, consultations with country experts, and reference materials were sought to confirm the name changes were just changes in the names of administrative units, and not changes in the composition of administrative units.

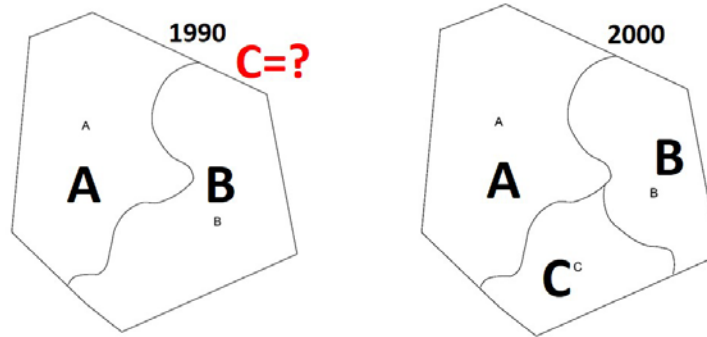
### **iii) Changes in Administrative Boundaries**

Changes in administrative boundaries may be due to the subdivision of census enumeration units, but also (and frequently) to administrative changes. Changes in spatial units can take several forms (Gregory, 2000:481): transfers, name changes, mergers, and divisions. All of them have different impacts in longitudinal analysis, and different methods can be used for re-allocating population, including areal weighting or areal interpolation.

We grouped changes in administrative boundaries in the following three situations:

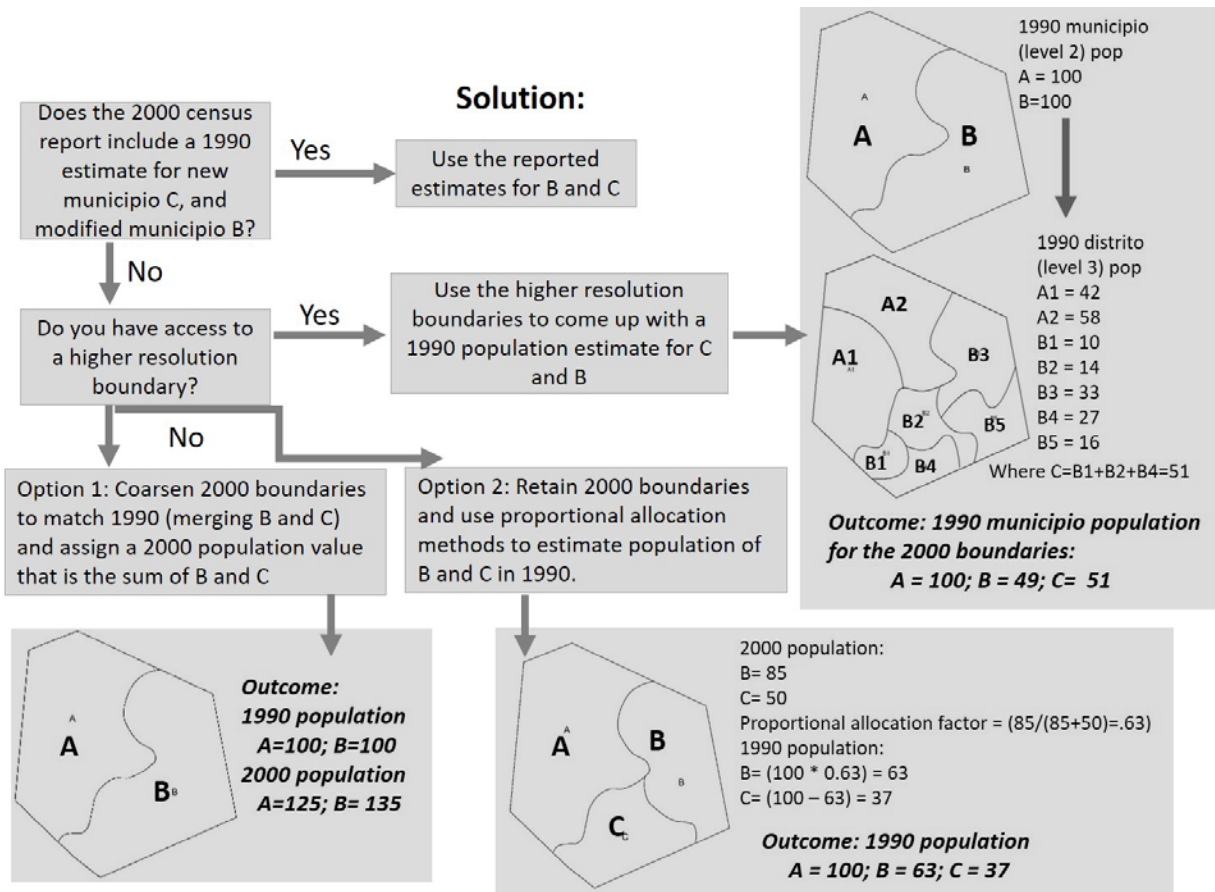
### A. Contiguously Split Administrative Units

In this example, a new municipio was formed in 2000 by splitting B into two separate units → B and C.



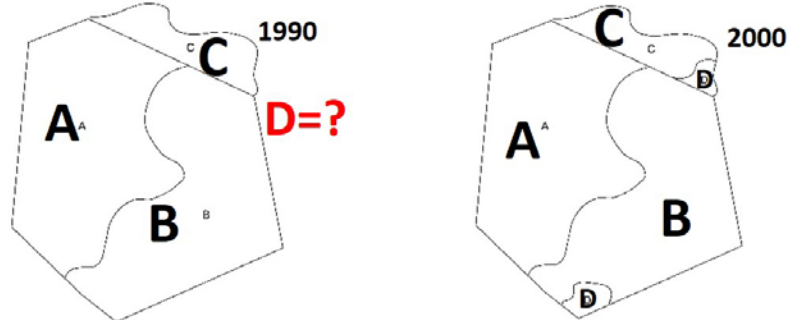
Municipio	1990 Population	2000 Population
A	100	125
B	100	85
C	?	50

**Problem:** You don't have an official 1990 population estimate for municipio C.



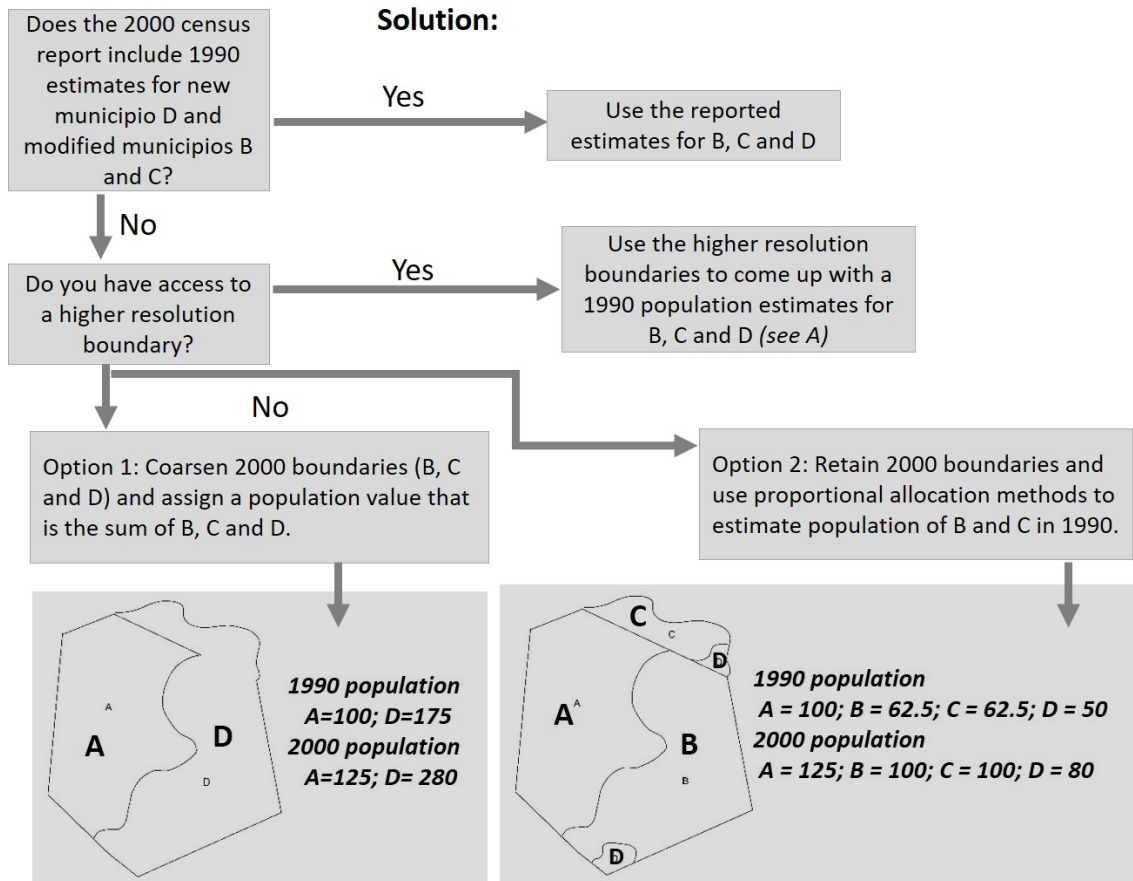
### B. Non-Contiguously Split Administrative Units

In this example, a new municipio **D** was formed in 2000 by taking parts of B and C.



Municipio	1990 Population	2000 Population
A	100	125
B	100	100
C	75	100
D	?	80

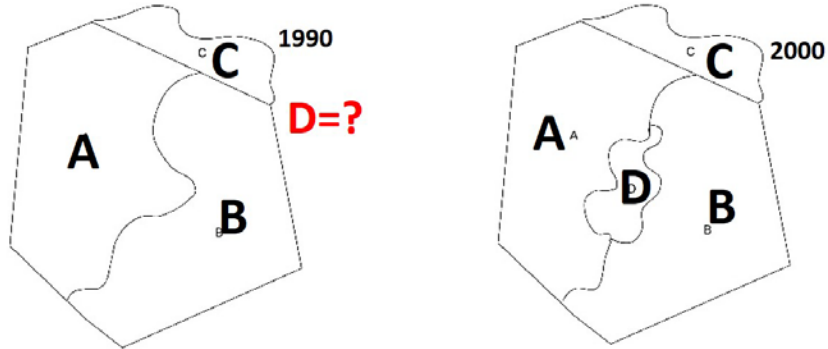
**Problem:** You don't have an official 1990 population estimate for municipio D.





### C. Newly Formed Units

In this example, a new municipio D was formed in 2000 by taking parts of B and C.



Municipio	1990 Population	2000 Population
A	100	125
B	100	100
C	75	100
D	?	80

**Problem:** You don't have an official 1990 population estimate for municipio D.

#### Solution:

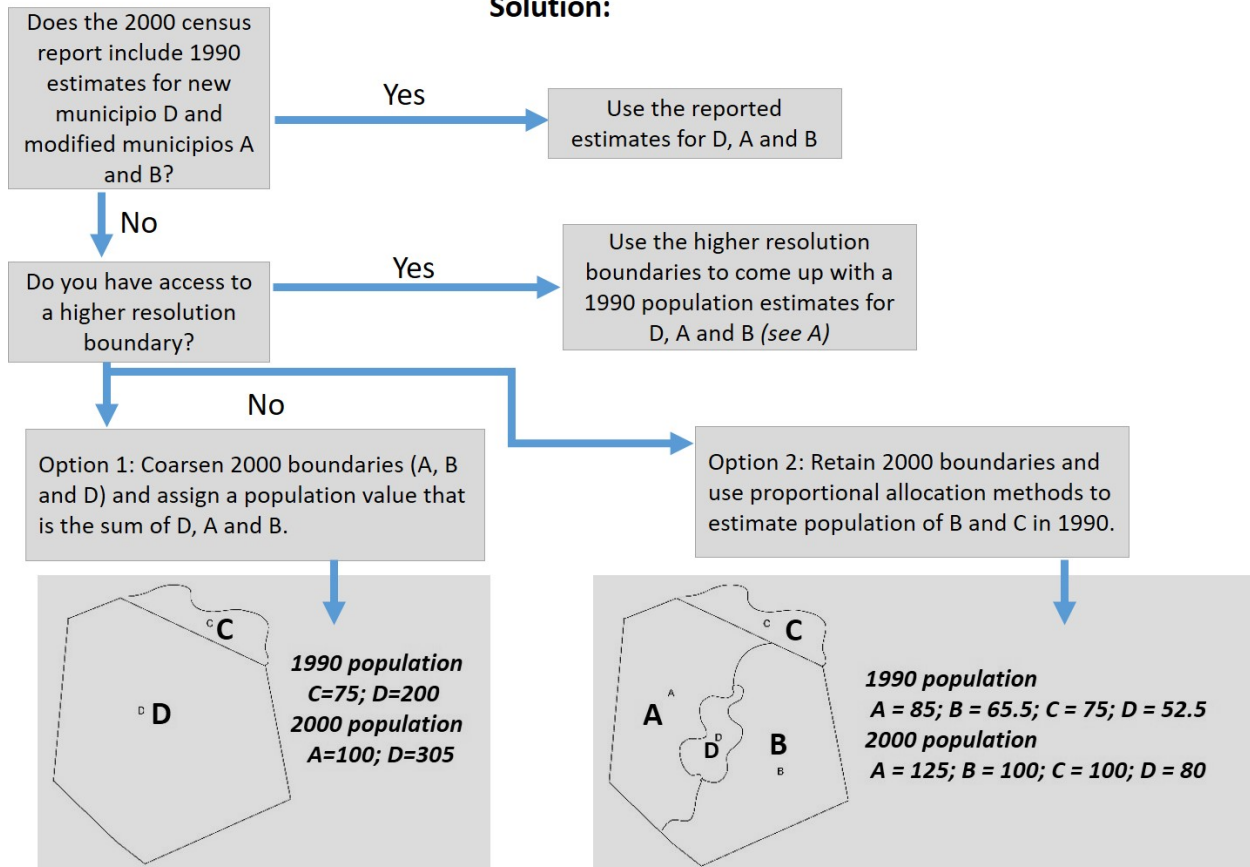


Table 3 provides the number and type of data mismatches for selected countries. As can be seen, the split of contiguous administrative units is the most common category in this group of countries.

Table 3: Matching Boundaries Process, Selected Countries

Country	A. Contiguously Split Administrative Units	B. Non-Contiguously Split Administrative Units	C. Newly Formed Units	Name Change
Bahamas			3	
Bolivia	16			
Chile	7			
Colombia			13	
Ecuador				1
Honduras	4	2		
Mexico	37	2		
Netherland Antilles				
Nicaragua	7			4
Panama	8			
Paraguay			11	
Peru				
Dominican Republic	2			
Trinidad and Tobago			2	
Uruguay	1			
Venezuela			40	

## 2. Population estimates

To adjust the official population estimates to 1990 and 2000, an average annual exponential growth rate was first calculated using the data from two input source years, then aligned with the official estimates to extrapolate to our target years of 1990 and 2000. This extrapolation method is the same one applied in CIESIN's Gridded Population of the World (GPW) data collection (Balk et al., 2005; Doxsey-Whitfield et al., 2015).

The formula employed for calculating the growth rate is:  $r = \frac{LN[(P_2/P_1)]}{(t_2 - t_1)}$

where, LN = the natural log, P<sub>1</sub> and P<sub>2</sub> = population counts for the first and second reference years, and t<sub>1</sub> and t<sub>2</sub> = time periods 1 and 2.

The growth rate is then applied to the official population estimates, to extrapolate the data, using the following formula:

$$e^{rt} \times P_1$$

where, r = the exponential growth rate (as defined above), t = the number of years the initial estimate will be projected forward/backward, and P<sub>1</sub> = population counts for the first reference year.

### III. Data Set Description(s)

The Latin America and the Caribbean Population (LAC-POP) Time Series provides total population estimates for municipalities or equivalent administrative units for the years 1990 and 2000. The data set consists of two vector polygon layers: one layer displays population estimates for sub-national administrative units in 1990 and 2000, including population counts, density, and percent change, at the municipality level or equivalent (level 2); a second layer summarizes this information at the country level (level 0). For more information, see Appendix 5. Layers.

#### Data set web page:

SEDAC URL:

<https://sedac.ciesin.columbia.edu/data/set/popdynamics-lac-pop-1990-2000>

Permanent URL: <https://doi.org/10.7927/H4R78C4K>

#### Data set format:

The data are available in Shapefile (SHP) format and Microsoft Excel (XLSX) format as a downloadable zip file. The downloadable is a compressed zip file, containing: 1) regional shapefiles, 2) Workbook with country-level information, and 3) PDF documentation.

#### Data set download:

popdynamics-lac-pop-1990-2000-shp-xlsx.zip

#### Codebook:

Field Name	Field Description
NAME1	Name of administrative unit level 1
NAME2	Name of administrative unit level 2
NAME3	Name of administrative unit level 3
CountryISO	International Standards Organization (ISO) 3-letter country code
Country	Country name
Pop90	Estimated population for the year 1990
Pop00	Estimated population for the year 2000
Country percent change	Country population change (percentage) between 1990 and 2000; can be positive or negative
Adm units mean pct chng	Administrative units mean percent change in population from 1990 to 2000; can be positive or negative
Area_km2	Area of the administrative unit(s) in square kilometers
Popdens90	Population density in the year 1990
Popdens00	Population density in the year 2000
Number_units	Number of administrative units for a country
Resolution (km2)	Spatial Resolution (square kilometers) = Area of the country / Number of administrative units

## **IV. How to Use the Data**

The data can be used in any standard Geographic Information System (GIS) and software package for direct mapping and geospatial analysis.

## **V. Potential Use Cases**

The dynamic characterization of the spatial distribution and density of human populations—across space and over time—is relevant for the study of different processes. For example, distribution and density could be analyzed as drivers of global transformations, among them land use/land cover change, climate change, hydrology, and emerging infectious diseases.

A population time series could also contribute to explore exposure and vulnerability to global environmental change, natural disasters, epidemics, or political conflict. It is also instrumental for addressing the spatial dimensions of social and economic processes (Tatem et al., 2012; DeFries et al., 2010; Foley et al., 2005; Carr et al., 2009; Balk, McGranahan, and Anderson, 2008; McGranahan, Balk and Anderson, 2007; Adamo, 2010; Jorgensen and Burns, 2007; Donner and Rodriguez, 2008).

Finally, this regional population time series is hardly modeled, and could be used as “ground truth” for testing models of population change.

## **VI. Limitations**

Pre-processing of the raw data was executed by two teams working out of the University of Puerto Rico and CIESIN. Despite intense efforts, documentation/provenance for some of the input data and details of the processing may be incomplete. Details of the processing may be incomplete for some countries.

## **VII. Acknowledgments**

The LAC-POP data set was originally developed as part of the project “The Impact of Economic Globalization on Human Demography, Land Use and Natural Systems in Latin America and the Caribbean”. This was a collaborative project between the University of Puerto Rico (PI: T. Aide), University of California-Santa Barbara (PI: D. Carr), University of Arizona (PI: M. Clark) and Columbia University (PI: M. Levy). The project was funded by the National Science Foundation's (NSF) Dynamics of Coupled Natural and Human Systems (CNH) program, NSF-CN H grant 0709645 (Aide et al., 2013).

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for the continued operation of the Socioeconomic Data and Applications Center (SEDAC), which is operated by the Center for International Earth Science Information Network (CIESIN) of Columbia University.

## VIII. Disclaimer

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## X. Recommended Citation(s)

### Data set(s):

Center for International Earth Science Information Network (CIESIN), Columbia University and University of Puerto Rico (UPR), Rio Piedras. 2020. Latin America and the Caribbean Population Time Series. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). <https://doi.org/10.7927/H4R78C4K>. Accessed DAY MONTH YEAR.

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## XI. Source Code

No source code is provided for this data set.

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#### **Appendix 1. Data Revision History**

No revisions have been made to this data set.

#### **Appendix 2. Contributing Authors & Documentation Revision History**

Revision Date	ORCID	Contributors	Revisions
January 7, 2020	0000-0002-9168-7172	Susana B. Adamo	This document is the 1 <sup>st</sup> instance of documentation.



### Appendix 3. Data Inputs

ISO code	Country	UN Region	Level Used	Level name	Number Units	Population Data		Source
						Reference Year 1	Reference Year 2	
AIA	Anguilla	Caribbean	0	Country (Level 0)	1	1992	2001	CARICOM. 2009. 2000 Round of Population and Housing Census. National census Report Anguilla. <a href="http://www.caricomstats.org/Files/Publications/NCR%20Reports/Anguilla.pdf">http://www.caricomstats.org/Files/Publications/NCR%20Reports/Anguilla.pdf</a>
ATG	Antigua and Barbuda	Caribbean	1	Island (Level 1)	2	1991	2001	CARICOM. 2009. 2000 Round of Population and Housing Census. National census Report Antigua and Barbuda. (At the GPW4 folder: \\dataserver0\gpc\GPW4\Release_4_1\Alpha\InputData\Country\ATG\census\Census2001)
ARG	Argentina	South America	2	Departamento (Level 2)	511	1991	2001	Provincia segun departamento. Poblacion censada en 1991 y 2001 y variacion intercensal absoluta y relativa 1991-2001. Censo Nacional de Poblacion, Hogares y Viviendas del ano 2001. Instituto Nacional de Estadistica Y Censos Argentina: <a href="http://www.indec.mecon.ar/webcenso/index.asp">http://www.indec.mecon.ar/webcenso/index.asp</a>
ABW	Aruba	Caribbean	0	Country (Level 0)	1	1991	2000	Central Bureau of Statistics. 1992. Third Population and Housing Census. Aruba. Selected Tables. Oranjestad. <a href="http://cbs.aw/wp/wp-content/uploads/2013/02/05-02-Aa_Third_Population_and_Housing_Census_1991.pdf">http://cbs.aw/wp/wp-content/uploads/2013/02/05-02-Aa_Third_Population_and_Housing_Census_1991.pdf</a> ; Central Bureau of Statistics. 2001. Fourth Population and Housing Census. Aruba. Selected tables. Oranjestad. <a href="http://cbs.aw/wp/wp-content/uploads/2015/09/00_CENSO.pdf">http://cbs.aw/wp/wp-content/uploads/2015/09/00_CENSO.pdf</a>
BHS	Bahamas	Caribbean	1	Island/ Supervisory District (Level 1)	17	1990	2000	The Official Site of the The Commonwealth of the Bahamas. Total Population by Sex and by Island and Number of Households 2000 Census, <a href="http://www.bahamas.gov.bs/BahamasWeb/aboutbahamas.nsf/Subjects/General+Statistics">http://www.bahamas.gov.bs/BahamasWeb/aboutbahamas.nsf/Subjects/General+Statistics</a> .
BRB	Barbados	Caribbean	0	Country (Level 0)	1	1990	2000	United Nations. "World Population Prospects: 2000 Revision. Vol 1. Comprehensive Tables," UN: NY 2001. The values given are population estimates.
BLZ	Belize	Central America	1	District (Level 1)	6	1991	2000	National Population and Housing Census 2000 and 1991 from the Central Statistical Office, Ministry of Finance. downloaded from: <a href="http://www.cso.gov.bz/statistics.html">http://www.cso.gov.bz/statistics.html</a>

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BOL	Bolivia	South America	3	Municipio (Level 3)	311	1992	2001	Instituto Nacional de estadística, INE. Indicadores Socio-demográficos por Provincias. Censo de 1992. La Paz, Bolivia. 2001 population from Censo de Poblacion y Vivienda, Instituto Nacional de estadística, INE: <a href="http://www.ine.gov.bo">http://www.ine.gov.bo</a>
BRA	Brazil	South America	3	Municipio (Level 3)	5507	1991	2000	IBGE. Sinopse preliminar do censo demográfico: 2000 CD <a href="https://biblioteca.ibge.gov.br/pt/biblioteca-catalogo?view=detalhes&amp;id=7308">https://biblioteca.ibge.gov.br/pt/biblioteca-catalogo?view=detalhes&amp;id=7308</a>
VGB	British Virgin Islands	Caribbean	1	Island (Level 1)	4	1991	2001	The British Virgin Islands Welcome on-Line site: <a href="http://bviwelcome.com/">http://bviwelcome.com/</a>
CYM	Cayman Islands	Caribbean	1	Island (Level 1)	3	1989	1999	Cayman Census, 1989: <a href="http://www.columbiagazetteer.org/">http://www.columbiagazetteer.org/</a> Cayman Census, 1999: <a href="http://www.caymanislands.ky/tour_guide/population.asp">http://www.caymanislands.ky/tour_guide/population.asp</a>
CHL	Chile	South America	2	Municipio (Level 2)	341	1992	2002	Instituto Nacional de Estadística, INE. 1992 and 2002; <a href="http://www.ine.cl">www.ine.cl</a> ; GW3: refinements made at CIESIN using <a href="http://www.ine.cl/cd2002/index.php">http://www.ine.cl/cd2002/index.php</a> , an interactive map showing 1992 and 2002 population by municipio
COL	Colombia	South America	2	Municipio (Level 2)	1114	1993	2005	DANE, downloaded from <a href="http://190.25.231.242/cgibin/RpWebEngine.exe/PortalAction?&amp;MODE=MAIN&amp;BASE=CG2005AMPLIADO&amp;MAIN=WebServerMain.inl">http://190.25.231.242/cgibin/RpWebEngine.exe/PortalAction?&amp;MODE=MAIN&amp;BASE=CG2005AMPLIADO&amp;MAIN=WebServerMain.inl</a> specifically, <a href="http://190.25.231.242/redatam/CG2005/Total_poblacion_conciliada_mpal.xls">http://190.25.231.242/redatam/CG2005/Total_poblacion_conciliada_mpal.xls</a>
CRI	Costa Rica	Central America	2	Canton (Level 2)	81	1984	2000	INEC (Instituto Nacional Estadística Costa Rica) Url: <a href="http://www.inec.go.cr/REDATAM">http://www.inec.go.cr/REDATAM</a> <a href="http://sistemas.inec.cr:8080/cgibin/RpWebEngine.exe/PortalAction?&amp;MODE=MAIN&amp;BASE=2000&amp;MAIN=WebServerMain.inl">http://sistemas.inec.cr:8080/cgibin/RpWebEngine.exe/PortalAction?&amp;MODE=MAIN&amp;BASE=2000&amp;MAIN=WebServerMain.inl</a> ; <a href="http://sistemas.inec.cr:8080/cgibin/RpWebEngine.exe/PortalAction?&amp;MODE=MAIN&amp;BASE=1984&amp;MAIN=WebServerMain.inl">http://sistemas.inec.cr:8080/cgibin/RpWebEngine.exe/PortalAction?&amp;MODE=MAIN&amp;BASE=1984&amp;MAIN=WebServerMain.inl</a>
CUB	Cuba	Caribbean	2	Municipio (Level 2)	169	1991	2000	GPW3
DMA	Dominica	Caribbean	1	Parish (Level 1)	10	1991	2001	Census 2011. Preliminary Results: Table 4, page 11
DOM	Dominican Republic	Caribbean	1	Provincia (Level 1)	32	1993	2002	Instituto Nacional de Estadística
ECU	Ecuador	South America	2	Canton (Level 2)	960	1990	2001	INEC-REDATAM

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SLV	El Salvador	Central America	2	Municipio (Level 2)	261	1992	2007	Censos El Salvador. Ministerio de Economia
FLK	Falkland Islands (Malvinas)	South America	1	Island (Level 1)	2	1996	2001	Falkland Islands Government: <a href="http://www.falklands.gov.fk/9ca.htm">http://www.falklands.gov.fk/9ca.htm</a>
GUF	French Guiana	South America	2	Canton (Level 2)	21	1999	2007	Institute National de la Statistique et des Etudes Economiques, INSEE. Tableaux Economiques Régionaux. Guyane, 1990, and 1999; <a href="http://www.recensement.insee.fr">www.recensement.insee.fr</a> .
GRD	Grenada	Caribbean	0	Country (Level 0)	1	1990	2000	United Nations. "World Population Prospects: 2000 Revision. Vol 1. Comprehensive Tables," UN: NY 2001. The values given are population estimates.
GLP	Guadeloupe	Caribbean	2	Commune (Level 2)	31	1990	1999	1999 Commune population data from Recensement (INSEE) 1999, <a href="http://www.insee.fr">www.insee.fr</a> . 1990 Commune population data from the National Institute of Statistics and Economic Studies (INSEE): <a href="http://www.insee.fr/">http://www.insee.fr/</a> .
GTM	Guatemala	Central America	2	Municipio (Level 2)	329	1994	2002	Instituto Nacional de Estadistica
GUY	Guyana	South America	2	Subregion (Level 2)	10	1991	2002	Guyana Bureau of Statistics, 1991.
HTI	Haiti	Caribbean	2	Arrondissement (Level 2)	570	no data	2003	IHSI (Haitian Statistical Institute) census data of 2003 from CIESIN Haiti project
HND	Honduras	Central America	2	Municipio (Level 2)	292	1993	2001	1993: CIAT. Atlas de Honduras Datos Mitch. 2000: Archivo socioeconómico del Atlas de Honduras, documento munofpop.xls, <a href="http://gisweb.ciat.cgiar.org/Mitch/">http://gisweb.ciat.cgiar.org/Mitch/</a>
JAM	Jamaica	Caribbean	1	Parish (Level 1)	14	1991	2001	Population Census 2001 Jamaica, Volume 1, Country Report and Preliminary Report for 1991's Urban /Rural. Provided by the Statistical Institute of Jamaica, <a href="http://www.statinja.com/">http://www.statinja.com/</a>
MTQ	Martinique	Caribbean	0	Country (Level 0)	1	1990	2000	United Nations. "World Population Prospects: 2000 Revision. Vol 1. Comprehensive Tables," UN: NY 2001. The values given are population estimates.
MEX	Mexico	Central America	2	Municipio (Level 2)	2443	1990	2000	INEGI 1990 and 2000 censuses ( <a href="http://www.inegi.org.mx/inegi/default.aspx?c=10202&amp;s=est">http://www.inegi.org.mx/inegi/default.aspx?c=10202&amp;s=est</a> ) and "Enciclopedia de municipios de Mexico" ( <a href="http://www.e-local.gob.mx/wb2/ELOCAL/ELOC_Enciclopedia">http://www.e-local.gob.mx/wb2/ELOCAL/ELOC_Enciclopedia</a> )

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MSR	Montserrat	Caribbean	0	Country (Level 0)	1	1990	2000	United Nations. "World Population Prospects: 2000 Revision. Vol 1. Comprehensive Tables," UN: NY 2001. The values given are population estimates.
ANT	Netherland Antilles	Caribbean	2	Geozone (Level 2)	69	1990, 1992	2001	Population for 1990 through 1999: Source-- Statistical Yearbook Netherlands Antilles 2000, Central Bureau of Statistics, Willemstad, March 2001. 2001 population from the The Fourth Population and Housing Census Netherlands Antilles 2001. Central Bureau of Statistics Netherlands Antilles, <a href="http://www.central-bureau-of-statistics.an/census.asp">http://www.central-bureau-of-statistics.an/census.asp</a>
NIC	Nicaragua	Central America	2	Municipio (Level 2)	142	1995	2005	Nicaragua's Instituto nacional de estadistica
PAN	Panama	Central America	2	Municipio (Level 2)	67	1990	2000	Panama's Direccion de estadistica y censos
PRY	Paraguay	South America	2	Municipio (Level 2)	223	1992	2002	Dirección Nacional de Estadística, Encuestas y Censos, DGEEC, 1995. Atlas del Paraguay 1995. Necesidades Básicas Insatisfechas, Asunción, Paraguay. Dirección General de Estadística, Encuestas y Censos, 2002.
PER	Peru	South America	2	Provincia (Level 2)	1828	1993	2005, 2007	Instituto Nacional de Estadística e Informática
PRI	Puerto Rico	Caribbean	2	Counties (level 2)	76	1990	2000	T. Mitch Aide (not other source provided)
KNA	Saint Kitts and Nevis	Caribbean	1	Island (Level 1)	2	1991	2001	United Nations. "World Population Prospects: 2000 Revision. Vol 1. Comprehensive Tables," UN: NY 2001. The values given are population estimates.
LCA	Saint Lucia	Caribbean	0	Country (Level 0)	1	1990	2000	"World Population Prospects: 2000 Revision. Vol 1. Comprehensive Tables," UN: NY 2001. The values given are for estimates.
VCT	Saint Vincent	Caribbean	0	Country (Level 0)	1	1990	2000	United Nations. "World Population Prospects: 2000 Revision. Vol 1. Comprehensive Tables," UN: NY 2001. The values given are population estimates.
SUR	Suriname	Caribbean	1	Distrito (Level 1)	10	1996	2004	General Bureau of Statistics, 1999
TTO	Trinidad and Tobago	Caribbean	2	Ward (Level 2)	30	1990	2000	Ward (administrative level 2) data for 1990, Central Statistical Office, 1990 Population and Housing Census, Vol II(2), Demographic Report, 1994 Port of Spain. The 1990 county and 2000 county and wards within St George County obtained from the Trinidad and Tobago Central Statistics Office 2000 Census Table 8 ( <a href="http://www.cso.gov.tt/statistics/cssp/census2000/default.asp">http://www.cso.gov.tt/statistics/cssp/census2000/default.asp</a> ).

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TCA	Turks and Caicos	Caribbean	0	Country (Level 0)	1	1990	2000	"World Population Prospects: 2000 Revision. Vol 1. Comprehensive Tables," UN: NY 2001. The values given are for estimates.
VIR	United States Virgin Islands	Caribbean	2	Census Tract (Level 2)	32	1990	2000	US Census Bureau 2000 census data, <a href="http://factfinder.census.gov/servlet/DatasetMainPageServlet">http://factfinder.census.gov/servlet/DatasetMainPageServlet</a> .
URY	Uruguay	South America	2	Seccion Censal (Level 2)	203	1996	2004	DATOS DE LA PAGINA DEL INE DE URUGUAY <a href="http://www.ine.gub.uy/">http://www.ine.gub.uy/</a>
VEN	Venezuela	South America	2	Municipio (Level 2)	322	1990	2001	Instituto Nacional de Estadística, Republica Bolivariana de Venezuela. XIII Censos General de Poblacio y Vivienda, Primeros Resultados, Censo 2001. Downloaded from: <a href="http://www.ine.gov.ve/ine/censo/fichascenso/fichacenso.asp">http://www.ine.gov.ve/ine/censo/fichascenso/fichacenso.asp</a>
	<b>Total number of units</b>				<b>16054</b>			

Data Inputs (Continued)

		Spatial Boundaries				
ISO code	Country	Year	Spatial Resolution (sq km)	Source	Observations	
AIA	Anguilla	ca. 1991/92	9.56	Digital Chart of the World (DCW).		
ATG	Antigua and Barbuda	n/a	15.57	Centro Internacional de Agricultural Tropical (CIAT).		
ARG	Argentina	2001	185.29	Map library and Atlas de Suelos de la República Argentina. Inta y la Fundación Argentina. Prepared by Aeroterra.	Number of units does not includes Antarctica	
ABW	Aruba	n/a	14.06	Centro Internacional de Agricultural Tropical (CIAT).		
BHS	Bahamas	n/a	30.72	GPW 3 boundaries	Dissemination status of the spatial boundaries is unknown	
BRB	Barbados	ca. 1991/92	21.52	Digital Chart of the World (DCW).		

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BLZ	Belize	n/a	63.69	Mapa de la Regionalización de la República de Guatemala. Ministerio de Agricultura. Escala 1:750000. Copia heliográfica. Prepared by the Centro Internacional de Agricultural Tropical (CIAT).	
BOL	Bolivia	ca. 2001	61.68	Oficina de Ordenamiento Territorial de Bolivia	
BRA	Brazil	2001	39.99	IBGE CD <a href="https://biblioteca.ibge.gov.br/pt/biblioteca-catalogo?view=detalhes&amp;id=7308">https://biblioteca.ibge.gov.br/pt/biblioteca-catalogo?view=detalhes&amp;id=7308</a>	
VGB	British Virgin Islands	n/a	6.79	CARICOM	
CYM	Cayman Islands	ca. 1991/92	10.20	Digital Chart of the World (DCW).	
CHL	Chile	1987	62.15	CIESIN	Number of units does not includes Antarctica
COL	Colombia	n/a	32.06	GPW3	
CRI	Costa Rica	1984	25.36	Map library	Restrictions may apply
CUB	Cuba	n/a	27.60	GPW2	Spatial boundaries status unknown
DMA	Dominica	ca. 1991/92	9.08	GPW 3	
DOM	Dominican Republic	2002	40.97	National Statistical Office (by request, contact: Raul Ponce) (June 2009)	
ECU	Ecuador	1998	16.15	Almanaque Electrónico del Ecuador/CIAT	
SLV	El Salvador	1987	9.02	Map Library	
FLK	Falkland Islands (Malvinas)	ca. 1991/92	125.03	Digital Chart of the World (DCW)	
GUF	French Guiana	1995	63.04	Institute Geographique National.Carte Touristique Guyane au 1:500000. 1995	
GRD	Grenada	ca. 1991/92	18.40	Digital Chart of the World (DCW).	

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GLP	Guadeloupe	n/a	7.81	Commune boundaries were digitized based on a map downloaded from Petit Atlas de France, La France. Département de la Guadeloupe, <a href="http://www.france.diplomatie.fr/france/fr/geo/atlas/atlas23.html">http://www.france.diplomatie.fr/france/fr/geo/atlas/atlas23.html</a> .	
GTM	Guatemala	2000	18.86	Mapa de la Regionalización de la República de Guatemala. Ministerio de Agricultura.	
GUY	Guyana	1995	145.43	Guyana North-East Sheet compiled in the Cartographic Division. Lands Department, Ministry of Agriculture	
HTI	Haiti	1999	7.25	CNIGS (Haitian Geospatial Institute) (CIESIN Haiti Project)	
HND	Honduras	1987	20.17	International Center for Tropical Agriculture (CIAT) (Datos: Atlas Honduras Mitch) <a href="http://gisweb.ciat.cgiar.org/Mitch/">http://gisweb.ciat.cgiar.org/Mitch/</a>	NOTA: Los datos utilizados en estas coberturas no podrán ser transferidos a terceros sin autorización de CIAT. Les agradecemos de antemano su colaboración para mejorar o distribuir este Atlas. El financiamiento que recibe CIAT para desarrollar este Atlas será sostenido siempre cuando podremos demostrar que fue utilizado y tuvo impacto. Por lo tanto, favor de mencionar CIAT si el Atlas le ha sido de utilidad, y comunicarse con nosotros si es el caso. (Atlas Honduras Mitch) (\\dataserver0\PovMap\LAC\LA_countries_done_UPR\Honduras\source\DATA\honduras\DOCUMTO\Interfac e.doc)
JAM	Jamaica	n/a	29.52	World Boundary Databank II	
MTQ	Martinique	ca. 1991/92	34.93	Digital Chart of the World (DCW).	
MEX	Mexico	2000	31.09	INEGI	
MSR	Montserrat	ca. 1991/92	10.57	Digital Chart of the World (DCW).	
ANT	Netherland Antilles	ca. 1991/92	3.50	Digital Chart of the World (DCW) and World Vector Shoreline, <a href="http://www.ngdc.noaa.gov/mgg/shorelines/shorelines.html">http://www.ngdc.noaa.gov/mgg/shorelines/shorelines.html</a> .	
NIC	Nicaragua	1997	30.52	GPW3	
PAN	Panama	1998	33.75	GPW3	
PRY	Paraguay	2002	45.57	Dirección General de Estadística, Encuesta y Censos. FNUAP-PNUD. 1995. Atlas de Necesidades Básicas Insatisfechas del Paraguay.	

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PER	Peru	1984	26.93	INEI (cd Sistema de Consulta de Datos)	
PRI	Puerto Rico	2000	3.31	T. Mitch Aide (not other source provided)	The original data was at the 'barrio' level and included 881 units. This data was dissolve at the county level (76 units) to make it "municipio-equivalent". (S. Adamo, 07/20/2017)
KNA	Saint Kitts and Nevis	ca. 1991/92	12.29	Digital Chart of the World (DCW).	
LCA	Saint Lucia	ca. 1991/92	25.59	Digital Chart of the World (DCW).	
VCT	Saint Vincent	ca. 1991/92	21.81	Digital Chart of the World (DCW).	
SUR	Suriname	n/a	121.20	Centro Internacional de Agricultural Tropical (CIAT)	
TTO	Trinidad and Tobago	1988	13.36	Republic of Trinidad & Tobago Central Statistical Office (CSO), 1988.	
TCA	Turks and Caicos	n/a		Digital Chart of the World	
VIR	United States Virgin Islands	2000	3.59	US Census Bureau Cartographic Boundary Files, <a href="http://www.census.gov/geo/www/cob/">http://www.census.gov/geo/www/cob/</a> .	
URY	Uruguay	n/a	35.15	Map library	
VEN	Venezuela	1993	53.42	Oficina Central de Estadística e Informática Presidencia de la República. Dirección de Geografía y Cartografía. 1993. Mapa de la División Política Territorial de Venezuela. Copia Heliográfica. Prepared by the Centro Internacional de Agricultural Tropical (CIAT).	



## Appendix 4. Country Summary

Country ISO	Country	Pop90	Pop00	Country percent change	Adm units mean pct chng	Area_km2	Popdens90	Popdens00	Number_ units	Resolutio n (km2)
ABW	Aruba	65,939	100,572	52.52	52.52	188.68	349.47	533.03	1	188.68
AIA	Anguilla	8,483	11,124	31.13	31.13	82.57	102.74	134.72	1	82.57
ANT	Netherlands Antilles	191,608	176,348	-7.96	-8.32	811.08	973.70	803.67	69	11.75
ARG	Argentina	32,294,823	35,856,445	11.03	15.16	2,781,356.58	278.19	291.70	511	5,442.97
ATG	Antigua and Barbuda	58,913	63,396	7.61	7.18	442.38	103.99	111.88	2	221.19
BHS	Bahamas	255,087	303,664	19.04	13.31	13,336.59	52.03	64.03	17	784.51
BLZ	Belize	184,622	240,204	30.11	31.94	22,303.26	10.02	12.73	6	3,717.21
BOL	Bolivia	6,098,746	8,029,866	31.66	30.56	1,080,759.57	28.95	39.93	311	3,475.11
BRA	Brazil	144,675,042	169,799,170	17.37	14.19	8,501,778.97	80.61	96.73	5,507	1,543.81
BRB	Barbados	257,169	267,498	4.02	4.02	439.35	585.33	608.84	1	439.35
CHL	Chile	13,062,173	14,903,033	14.09	12.06	751,808.98	1,125.65	1,103.25	341	2,204.72
COL	Colombia	31,179,735	38,277,740	22.76	20.10	1,137,353.85	104.76	126.31	1,114	1,020.96
CRI	Costa Rica	2,881,215	3,810,179	32.24	32.69	51,081.09	529.87	680.30	81	630.63
CUB	Cuba	10,863,398	11,217,100	3.26	4.04	111,344.32	990.84	889.98	169	658.84
CYM	Cayman Islands	26,467	40,746	53.95	111.03	277.69	52.44	78.70	3	92.56
DMA	Dominica	71,238	70,270	-1.36	-1.00	766.69	132.40	132.94	10	76.67
DOM	Dominican Republic	6,934,628	8,253,088	19.01	13.97	48,195.09	394.32	493.33	32	1,506.10
ECU	Ecuador	9,549,452	11,691,395	22.43	16.45	249,833.32	85.38	103.83	960	260.24
FLK	Falkland Islands (Malvinas)	2,131	2,431	14.08	22.06	12,033.89	0.17	0.19	2	6,016.94
GLP	Guadeloupe	386,987	427,258	10.41	9.86	1,745.21	423.45	407.15	31	56.30
GRD	Grenada	90,732	93,502	3.05	3.05	323.87	280.15	288.70	1	323.87
GTM	Guatemala	7,231,494	10,373,365	43.45	47.68	108,179.28	186.82	276.51	329	328.81
GUF	French Guiana	113,262	162,871	43.80	59.98	83,185.86	39.20	49.64	21	3,961.23

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GUY	Guyana	721,663	745,425	3.29	15.81	210,341.24	31.55	32.92	10	21,034.12
HND	Honduras	4,687,755	6,194,933	32.15	33.08	111,458.05	65.59	86.46	292	381.71
HTI	Haiti	6,465,361	8,149,044	26.04	21.97	26,940.76	414.46	535.30	570	47.26
JAM	Jamaica	2,359,902	2,583,253	9.46	7.57	11,025.39	311.04	327.37	14	787.53
KNA	Saint Kitts and Nevis	40,094	45,714	14.02	18.49	275.77	132.37	153.46	2	137.89
LCA	Saint Lucia	131,413	147,783	12.46	12.46	617.41	212.84	239.36	1	617.41
MEX	Mexico	81,251,660	97,483,412	19.98	12.54	1,959,802.54	212.25	249.23	2,443	802.21
MSR	Montserrat	10,728	3,749	-65.05	-65.05	102.49	104.67	36.58	1	102.49
MTQ	Martinique	360,303	383,385	6.41	6.41	1,142.39	315.40	335.60	1	1,142.39
NIC	Nicaragua	4,044,757	4,785,527	18.31	37.09	118,661.16	100.48	115.30	142	835.64
PAN	Panama	2,326,291	2,839,177	22.05	16.61	74,646.93	119.92	151.56	67	1,114.13
PER	Peru	22,085,402	24,433,467	10.63	9.35	1,286,495.30	339.57	351.07	1,828	703.77
PRI	Puerto Rico	3,467,150	3,751,312	8.20	11.68	8,686.25	446.94	484.65	76	114.29
PRY	Paraguay	3,998,297	4,936,410	23.46	18.17	395,578.67	132.12	181.52	223	1,773.90
SLV	El Salvador	5,057,276	5,406,958	6.91	12.53	20,070.99	404.16	435.22	261	76.90
SUR	Suriname	403,893	476,277	17.92	32.04	146,098.59	150.51	167.77	10	14,609.86
TCA	Turks and Caicos Islands	11,556	16,699	44.51	44.51	546.25	21.16	30.57	1	546.25
TTO	Trinidad and Tobago	1,176,825	1,225,092	4.10	1.78	5,181.15	238.72	247.74	30	172.70
URY	Uruguay	3,144,387	3,166,207	0.69	-2.28	176,240.06	48.34	50.39	203	868.18
VCT	Saint Vincent and the Grenadines	105,760	113,279	7.11	7.11	451.18	234.41	251.08	1	451.18
VEN	Venezuela	18,104,143	22,531,727	24.46	24.36	901,452.48	1,255.72	1,269.06	322	2,799.54
VGB	British Virgin Islands	15,462	22,240	43.84	51.58	165.73	62.63	88.93	4	41.43
VIR	United States Virgin Islands	93,626	108,612	16.01	16.01	372.68	974.86	1,130.86	32	11.65

## Appendix 5. Layers

### 1. popdynamics-lac-pop-1990-2000

This layer contains a polygon feature class of population counts by administrative level 2 or equivalent, for two points in time (ca 1990 and ca 2000) for Latin American countries and territories. Matched boundaries and adjusted population counts allow for comparisons between the two time points. This layer includes modifications to the input data during the matching process and the type of edits made during the topology checking. The data use policy for the original NSF-CHN project was that the data sets would become publicly available after January 2013. Pre-processing of the raw data was done by two teams working out of the University of Puerto Rico and CIESIN, Columbia University.

Once the matching process was finalized, the spatial boundary files were transformed to a common projection (WGS1984) and were loaded into a geodatabase, with a common set of matched population attributes. After the data were loaded, international boundaries were validated topologically (rules: they must not have gaps, they must not overlap), and edited so that all countries shared a common set of coastal boundaries. Some topological corrections were also made to internal boundaries.

### 2. popdynamics-lac-pop-1990-2000-countries

This layer contains boundaries and content of the *municipio* level data set dissolved to the country level. Attributes included country total population for 1990 and 2000 and total area of the country (left map in Figure 1). Country level summary data were also available as a stand-alone spreadsheet, and are included in the downloadable zip file.

Figure 1: Latin America and the Caribbean Population Time Series - Country boundaries (left), and matching 1990 and 2000 boundaries, *municipio*-equivalent administrative units (right)

