Harmonized Census Geography in IPUMS International for Spatio-temporal Research: Examples of Sub-national Trends in select SDG Indicators from Developing Countries

Lara Cleveland

Minnesota Population Center University of Minnesota

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clevelan@umn.edu

Acknowledgements

Participating country NSOs

Co-author: Sula Sarkar

Research assistants:

Ding Fei, Majory Silisyene



MINNESOTA POPULATION CENTER, UNIVERSITY OF MINNESOTA

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PROJECT

About IPUMS-I How to Cite IPUMS-I User Registration and Login

DATA

Browse and Select Data Download Your Data Extract Geography and GIS Supplemental Data Files Analyze Data Online

SAMPLES

Sample Descriptions Variance Estimation Source Documents

RESOURCES

Help User Forum Bibliography International Partners Teaching with IPUMS

Integrated Public Use Microdata Series, International

census microdata for social and economic research

IPUMS-International is a project dedicated to collecting and distributing census data from around the world. Its goals are to:

- · Collect and preserve data and documentation
- Harmonize data
- · Disseminate the data absolutely free!

79 countries - 258 censuses - 560 million person records

Source data for IPUMS-International are generously provided by participating National Statistical Offices

IPUMSI News

NEW! 20 samples added NEW! Geography variables

revised

Online tabulator

Class accounts

Latin America project extended

Integrated DHS project funded

... All news items

MPC Data Projects

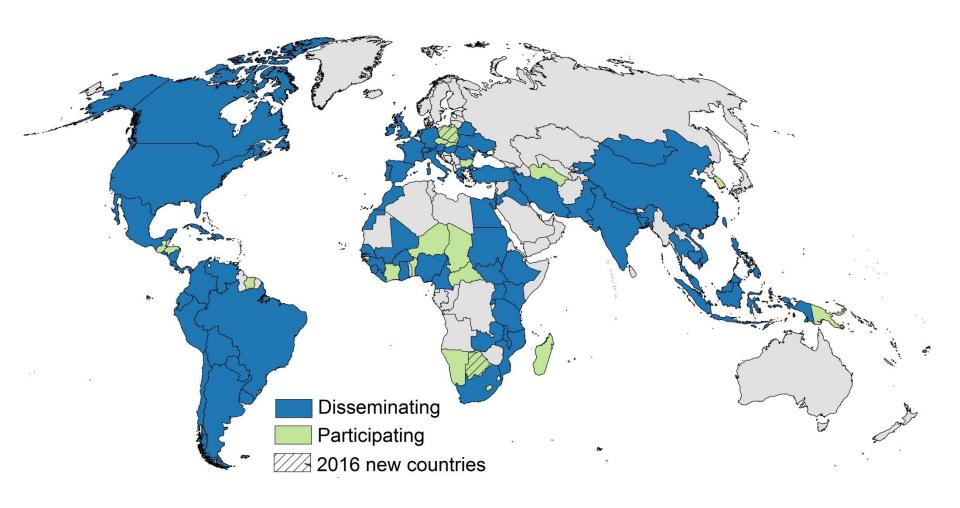
IPUMS-USA and others



<u>Sign up</u> to receive News of interest to

International data users and producers.

IPUMS Microdata Availability



82 countries - 277 censuses - 614 million person records



IPUMS Samples per Country

Argentina	5	Fiji	5	Malaysia	4	Saint Lucia	2	
Armenia	2	France	8	Mali	2	Senegal	2	
Austria	5	Germany	4	Mexico	8	Sierra Leone	1	
Bangladesh	3	Ghana	3	Mongolia	2	Slovenia	1	
Belarus	2	Greece	5	Morocco	3	South Africa	4	
Bolivia	3	Guinea	2	Mozambique	2	South Sudan	1	
Botswana	4	Haiti	3	Nepal	1	Spain	4	
Brazil	6	Hungary	5	Netherlands	3	Sudan	1	
Burkina Faso	3	India	6	Nicaragua	3	Switzerland	4	
Cambodia	2	Indonesia	9	Nigeria	5	Tanzania	3	
Cameroon	3	Iran	2	Pakistan	3	Thailand	4	
Canada	5	Iraq	1	Palestine	2	Trinidad & Tobago	4	
Chile	5	Ireland	9	Panama	6	Turkey	3	
China	3	Israel	1	Paraguay	5	Uganda	2	
Colombia	4	Italy	1	Peru	2	Ukraine	1	
Costa Rica	5	Jamaica	3	Philippines	3	UK	2	
Cuba	1	Jordan	1	Poland	4	USA	7	
Dominican Republic	5	Kenya	5	Portugal	4	Uruguay	6	
Ecuador	6	Kyrgyz Republic	2	Puerto Rico	6	Venezuela	4	
Egypt	3	Liberia	2	Romania	4	Vietnam	3	
El Salvador	2	Malawi	3	Rwanda	2	Zambia	3	
Ethiopia	3							



Harmonization for Comparative Analysis

NSO microdata: census-by-census, limited documentation IPUMS: simplify comparison across time and place

1. Integrate census samples

- common format for data and metadata
- bring together in common database

2. Harmonize variables

- common codes for variables across all data files
- composite coding structure
 - first digit = general code (common to many censuses)
 - trailing digits = detailed codes

3. Disseminate customized pooled data files

- user downloads custom data extracts
- pooled samples containing only selected variables



Translation Table

Input

Bangladesh	Mexico	Kenya
2011	1970	1999

1 = Unmarried	1 = Married, civil & relig	1 = Never married
2 = Married	2 = Married, civil	2 = Monogamous
3 = Widowed	3 = Married, religious	3 = Polygamous
4 = Divrc or separated	4 = Consensual union	4 = Widowed
	5 = Widowed	5 = Divorced
	6 = Divorced	6 = Separated
	7 = Separated	
	8 = Single	



Translation Table

Harmonized

Code Label

1	Single
2	Married or in union
2	
2	\triangleright
2	\triangleright
2	\triangleright
2	
2	
2	
3	Divorced or separated
3	
3	
4	Widowed



Variable Page: Metadata Documentation

MARST

Add to cart

Change samples

Marital status

Group: Demographic — PERSON

Description

Comparability

Universe

Codes

Availability

Questionnaire Text

Source Variables

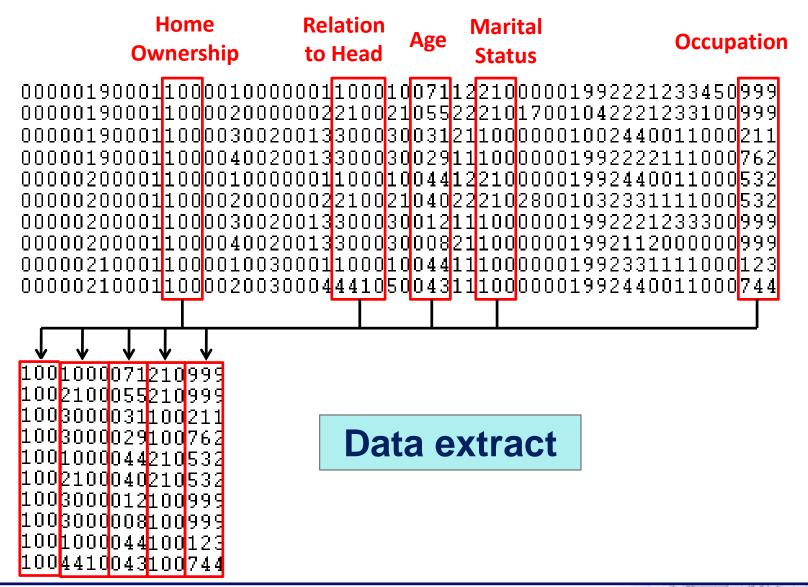
Description

MARST describes the person's current marital status according to law or custom. Individuals who remarried should report the status relevant to their most recent marriage. Census instructions rarely explicitly limit marital status to strictly legal unions.

Note regarding universe: The lowest age at which a person can be anything but "never married" varies among samples.



IPUMS Customizable Data Extract System





Geography in the microdata

H01100013200401313

P0110011322066193502001

P0110021331034196705001

P0110031331042195902001

H02100012200401313

P0210011221066583502001

P0210021322066313202002

P0210031331004006705001

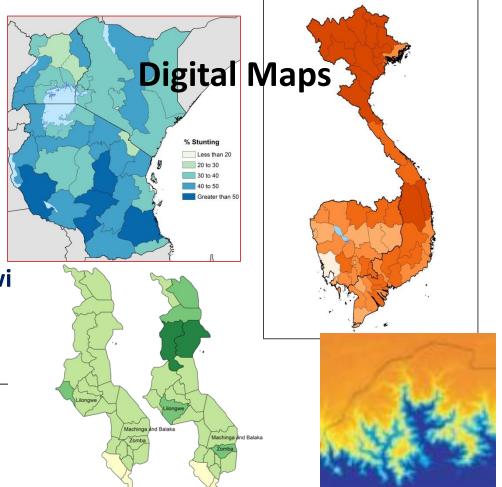
P0210041331002005902001

H03100012200401313

P0310011221056153802001

% Urban for 3 districts of Malawi (Censuses 1987-2008)

	Year	
Region	1998	2008
Mzimba/Mzuzu city	16.3	17.9
Lilongwe/Lilingwe city	32.6	34.2
Blantyre/ Blantyre city	62.3	58.2

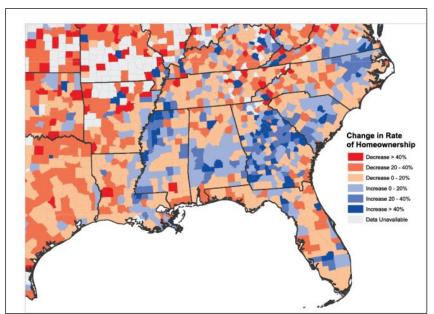




Spatial challenges: Estimation

How to summarize information

- Average
- Max
- % Change
- many others ...



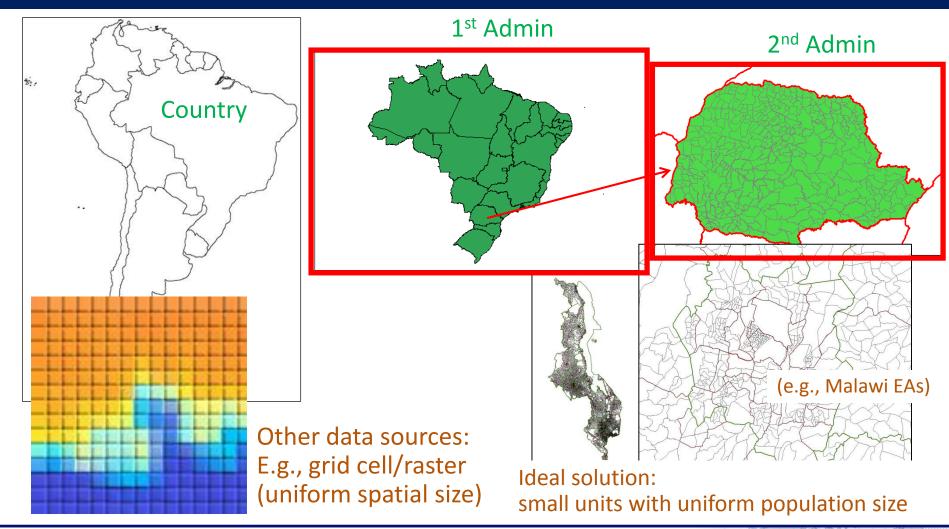
Microdata:

Appropriate summaries Test multiple methods

H01100013200401313 P0110011322066193502001 P0110021331034196705001 P0110031331042195902001 H02100012200401313 P0210011221066583502001 P0210021322066313202002 P0210031331004006705001 P0210041331002005902001 H03100012200401313 P0310011221056153802001

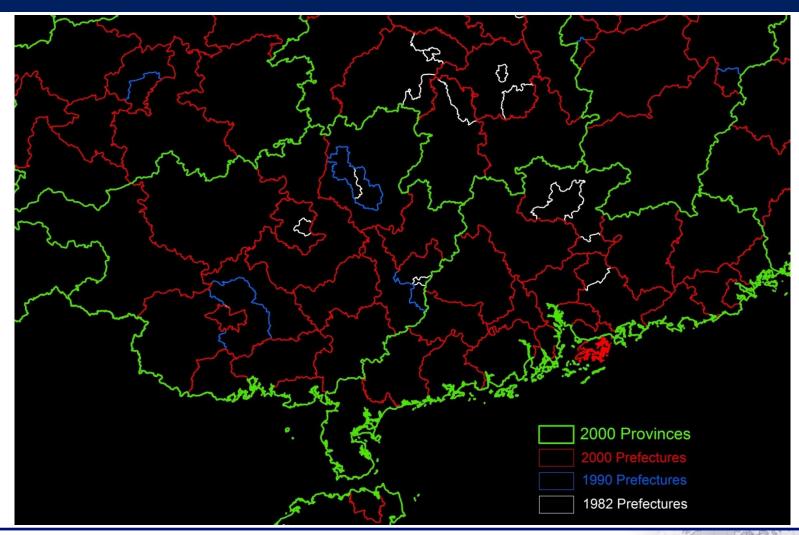


Spatial challenges: Scale





Space + Time





Harmonizing geographic units by name

code	label	mw1987a	mw1998a	mw2008a
rectype	DISTMW	Н	Н	Н
columns	District, Malawi			
proj1		MW87A094	MW98A021	MW08A022
proj2				
#	Northern Region			
101	Chitipa	101 = Chitipa {1982}	101 = Chitipa {2581}	101 = Chitipa {3687}
102	Karonga	102 = Karonga {2787}	102 = Karonga {4011}	102 = Karonga {5817}
103	Nkhata Bay and Likoma	103 = Nkhata Bay {2935}	103 = Nkhata Bay {3340}	103 = Nkhata Bay {4303}
103			106 = Likoma {155}	106 = Likoma {199}
104	Rumphi	104 = Rumphi {1992}	104 = Rumphi {2539}	104 = Rumphi {3930}
105	Mzimba	105 = Mzimba {9355}	105 = Mzimba {11728}	105 = Mzimba {14069}
107	Mzuzu			107 = Mzuzu city {2739}
#	Central Region			
201	Kasungu	201 = Kasungu {7245}	201 = Kasungu {9687}	201 = Kasungu {12629}
202	Nkhota Kota	202 = Nkhotakota {3930}	202 = Nkhota Kota {5006}	202 = Nkhota Kota {6126}
203	Ntchisi	203 = Ntchisi {2639}	203 = Ntchisi {3617}	203 = Ntchisi {4644}
204	Dowa	204 = Dowa {7180}	204 = Dowa {9045}	204 = Dowa {12720}
205	Salima	205 = Salima {4713}	205 = Salima {5869}	205 = Salima {7493}
206	Lilongwe	206 = Lilongwe {22720}	206 = Lilongwe {31102}	206 = Lilongwe {27703}
207	Mchinji	207 = Mchinji {5687}	207 = Mchinji {7086}	207 = Mchinji {10034}
208	Dedza	208 = Dedza {9551}	208 = Dedza {11404}	208 = Dedza {15173}
209	Ntcheu	209 = Ntcheu {8114}	209 = Ntcheu {8558}	209 = Ntcheu {11702}
210				210 = Lilongwe city {15341}
#	Southern Region			
301		301 = Mangochi {12315}	301 = Mangochi {15214}	301 = Mangochi {18297}
302	Machinga	302 = Machinga {7595}	302 = Machinga {9020}	302 = Machinga {11369}
303	Zomba	303 = Zomba {11033}	303 = Zomba {13836}	303 = Zomba {14651}
304		304 = Chiradzulu {5002}	304 = Chiradzulu {5879}	304 = Chiradzulu {7114}
305	,	305 = Blantyre {14452}	305 = Blantyre {19929}	305 = Blantyre {8509}
306		306 = Mwanza {2833}	306 = Mwanza {3258}	306 = Mwanza {2596}
307	,	307 = Thyolo {10232}	307 = Thyolo {11301}	307 = Thyolo {14203}
308		308 = Mulanje {10041}	308 = Mulanje {10445}	308 = Mulanje {12445}
309		309 = Phalombe {5319}	309 = Phalombe {5965}	309 = Phalombe {7505}
310		310 = Chikwawa {6961}	310 = Chikwawa {8002}	310 = Chikwawa {10081}
311		311 = Nsanje {4689}	311 = Nsanje {4357}	311 = Nsanje {5169}
312		312 = Balaka {4968}	312 = Balaka {6071}	312 = Balaka {7931}
313				313 = Neno {2620}
314	,			314 = Zomba city {2688}
315	Blantyre city			315 = Blantyre city {16377}

1987	Rural %	Urban %
Mzimba	88.1	11.9
Lilongwe	77.6	22.4
Blantyre	42.0	58.0

1998	Rural %	Urban %
Mzimba	81.7	18.3
Lilongwe	67.4	32.6
Blantyre	37.7	62.3

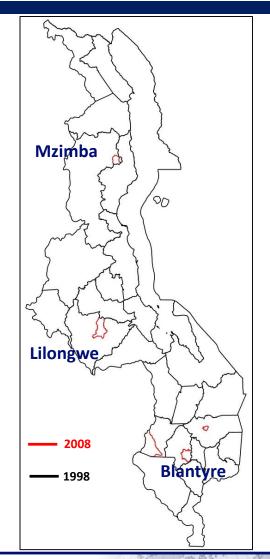
2008	Rural %	Urban %
Mzimba	96.2	3.8
Lilongwe	100	0
Blantyre	100	0

Malawi



Harmonizing by space and time

code	label	mw1987a	mw1998a	mw2008a
rectype	GEO1_MW	Н	Н	Н
olumns	Malawi, District 1998 - 2	008 [Level 1; consistent bound	aries, GIS]	
	# Northern Region	,		
4541		101 = Chitipa {1982}	101 = Chitipa {2581}	101 = Chitipa {3832}
4541	02 Karonga	102 = Karonga {2787}	102 = Karonga {4011}	102 = Karonga {5758}
4541	-	, , , , , , , , , , , , , , , , , , , ,	and the same of th	
4541		103 = Nkhata Bay {2781}	103 = Nkhata Bay {3340}	103 = Nkhata Bay {4311}
4541		106 = Likoma {154}	106 = Likoma {155}	106 = Likoma {229}
	04 Rumphi	104 = Rumphi {1992}	104 = Rumphi {2539}	104 = Rumphi {3808}
4541	05 Mzimba, Mzuzu city	1		
4541		105 = Mzimba {9355}	105 = Mzimba {11728}	
4541	05 Mzimba (2008)	,	,	105 = Mzimba {14314}
4541	, ,			107 = Mzuzu City {3043}
	# Central Region			
4542		201 = Kasungu {7245}	201 = Kasungu {9687}	201 = Kasungu {13096}
4542	•	202 = Nkhotakota {3930}	202 = Nkhota Kota {5006}	202 = Nkhota Kota {6273}
4542		203 = Ntchisi {2639}	203 = Ntchisi {3617}	203 = Ntchisi {4754}
4542		204 = Dowa {7180}	204 = Dowa {9045}	204 = Dowa {12407}
4542		205 = Salima {4713}	205 = Salima {5869}	205 = Salima {7737}
4542				
4542		206 = Lilongwe {22720}	206 = Lilongwe {31102}	
4542	- · · · · · · · · · · · · · · · · · · ·			206 = Lilongwe {27562}
4542	- '			210 = Lilongwe City {15651}
4542	3 7 7	207 = Mchinji {5687}	207 = Mchinji {7086}	207 = Mchinji {9917}
4542		208 = Dedza {9551}	208 = Dedza {11404}	208 = Dedza {14652}
	09 Ntcheu	209 = Ntcheu {8114}	209 = Ntcheu {8558}	209 = Ntcheu {11312}
	# Southern Region			
4543		301 = Mangochi {12315}	301 = Mangochi {15214}	301 = Mangochi {18518}
4543	•	302 = Machinga {7595}	302 = Machinga {9020}	302 = Machinga {11477}
4543				
4543	, ,	303 = Zomba {11033}	303 = Zomba {13836}	
4543	, ,	2024 [000]	221.124 (1000)	303 = Zomba {14241}
4543				314 = Zomba City {2545}
4543	, , ,	304 = Chiradzulu {5002}	304 = Chiradzulu {5879}	304 = Chiradzulu {7226}
4543				
4543		305 = Blantyre {14452}	305 = Blantyre {19929}	
4543		2.0, (2.2, ()	305 = Blantyre {8417}
4543				315 = Blantyre City {15631}
4543	, , , ,	307 = Thyolo {10232}	307 = Thyolo {11301}	307 = Thyolo {14254}
4543		308 = Mulanje {10041}	308 = Mulanje {10445}	308 = Mulanie {12776}
4543		309 = Phalombe {5319}	309 = Phalombe {5965}	309 = Phalombe {7568}
4543		310 = Chikwawa {6961}	310 = Chikwawa {8002}	310 = Chikwawa {9691}
4543		311 = Nsanje {4689}	311 = Nsanje {4357}	311 = Nsanje {5301}
4543		312 = Balaka {4968}	312 = Balaka {6071}	312 = Balaka {7569}
4543		J. Landing (1000)	The Bolland (0071)	J.E. Baland (1000)
4543		306 = Mwanza {2833}	306 = Mwanza {3258}	
4543		ooo wwanza (2000)	000 - MWaliza (0200)	306 = Mwanza {2241}



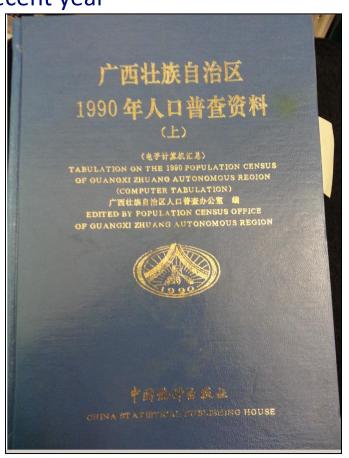




Map acquisition

- Match IPUMS codes to available map
- Digitize paper maps based on boundary of most recent year
- Align with standardized world map







Matching census codes and labels

	А	Б	C
1	label	code	freq_wt
5	Shanxi	14	30114000
6	Inner Mor	15	25474100
7	Liaoning	21	42450200
8	jilin	22	26666600
9	Heilongjia	23	38792700
10	Shanghai	31	15437000
11	Jiangsu	32	69573800
12	Zhejiang	33	43348700
13	Anhui	34	67426800
14	Fujian	35	34359600
15	Jiangxi	36	44985600
16	Shandong	37	82738100
17	Henan	41	86806400
18	Hubei	42	56224300
19_	Hunan	43	62531200
20	Guangdon	44	62832700
21	Guangxi	45	44642600
22	Hainan	46	7270800
23	Sichuan	51	1.05E+08
24	Guizhou	52	31156500
25	Yunnan	53	37375200
26	Tibet	54	2417500
27	Shaanxi	61	34037900
28	Gansu	62	24195200
29	Qinghai	63	5738600
	Ningxia	64	3866700
31	Xinjiang	65	15499200

207	4331 Xiangxi Tujia-Miao autonomous prefecture	2048300
208	4401 Guangzhou city	6318500
209	4402 Shaoguan city	2847400
210	4403 Shenzhen city	1697000
211	4404 Zhuhai city	597200
212	4405 Shantou city	8658300
213	4406 Foshan city	2989600
214	4407 Jiangmen city	3424800
215	4408 Zhanjiang city	5408500
216	4409 Maoming city	4897300
217	4412 Zhaoqing city	5260800
218	4413 Huizhou city	2289700
219	4414 Meizhou city	4044300
220	4415 Shanwei city	2194800
221	4416 Heyuan city	2522900
222	4417 Yangjiang city	2178800
223	4418 Qingyuan city	3258100
224	4419 Dongguan city	1721900
225	4420 Zhongshan city	1231600
226	4490 Guangdong province direct administrative area	1291200
227	4501 Nanning city	2904100
228	4502 [no label]	1274200
229	4503 Guilin city	1441900
230	4504 Wuzhou city	628800
231	4505 Beihai city	2050100
232	4521 Nanning prefecture	5882500
233	4522 Liuzhou prefecture	3287400
234	4523 Guilin prefecture	3313100
235	4524 Wuzhou prefecture	3240000
236	4525 Yulin prefecture	9860900
237	4526 Baise prefecture	4144700
238	4527 Hechi prefecture	3899700
239	4528 Qinzhou prefecture	2715200
240	4601 Haikou city	577600
241	4602 Sanya city	170300
242	4690 Hainan Province direct administrative area	6522900
243	5101 Chengdu city	9679600
244	5102 Chongqing city	14038100
245	5103 Zigong city	2536300

Hanchuan C	Hengshan C	Lianxian C	Longlin MMAC
	Hengdong C	Yangshan C	Xilin C
Xianning P	Changning C	Yingde C	Hechi P
Xianning C	Qidong C	Qingyuan C	Hechi C
Jiayu C	Qiyang C	Fogang C	Yishan C
Puqi C Tongcheng C	Chenzhou P	Wengyuan C	Luocheng C
Chongyang C	Chenzhou City	Lianshan Zhuang-Yao AC	Huanjiang C
Tongshan C	Chenxian C	Liannan Yao AC	Nandan C
Yangxin C	Guiyang C	Ruyuan Yao AC	Tian'e C
	Yongxing C	Foshan P	Fengshan C
Jingzhou P	Yizhang C	Foshan City	Donglan C
Jingmen City	Zixing C Jiahe C	Jiangmen City	Bama Yao AC
Jiangling C Songzi C	Linwu C	Sanshui C	Du'an Yao AC
Gong'an C	Rucheng C	Nanhai C	Qinzhou P
Shishou C	Guidong C	Shunde C	Beihai City
Jianli C	Laiyang C	Zhongshan C	Shangsi C
Honghu C	Anren C	Doumen C	Fangcheng MMAC
Mianyang C		Xinhui C	Qinzhou C
Tianmen C	Lingling P	Taishan C	Lingshan C
Qianjiang C	Yongzhou City	Enping C	Hepu C
Jingmen C	Lingling C Dong'an C	Kaiping C	Pubei C
Zhongxiang C	Daoxian C	Heshan C	
Jingshan C	Ningyuan C	Gaoming C	
Xiangyang P	Jiangyong C	Zhaoqing P	SICHUAN
Suizhou City	Jianghua Yao AC	Zhaoqing City	PROVINCE
Laohekou City	Lanshan C	Gaoyao C	
Xiangyang C	Xintian C	Sihui C	Chengdu City
Zaoyang C	Shuangpai C	Guangning C	Jintang C
Suixian C		Huaiji C	Shuangliu C
Yicheng C	Huaihua P	Fengkai C	Chongqing City
Nanzhang C	Huaihua City	Deging C	Changshou C
Guanghua C	Hongjiang City	Yunfu C	Baxian C
Gucheng C	Qianyang C	Xinxing C	Qijiang C
Baokang C	Yuanling C Chenxi C	Yunan C	Jiangbei C
V D	Xupu C	Luoding C	Zinana Cita
Yunyang P Junxian C	Mayang C	Zhanjiang P	Zigong City
Yunxian C	Xinhuang Dong AC	Zhanjiang City	Rongxian C
Yunxian C	Zhijiang C	Maoming City	Dukou City
Yunxi C	Huaihua C	Yangjiang C	Mivi C
Zhushan C	Huitong C	Yangchun C	Yanbian C
Zhuxi C	Jingxian C	Xinyi C	Vanashus B
Fangxian C Shennongjia FR	Tongdao Dong AC	Gaozhou C	Yongchuan P
Snennonglia i n		Dianbai C	Jiangjin C
Yichang P	Xiangxi Tujia-Miao	AP Wuchuan C	Hechuan C
Yichang C	Jishou C	Huazhou C	Tongnan C
Yidu C	Luxi C	Lianjiang C	Tongliang C
Zhijiang C	Fenghuang C	Suixi C	Yongchuan C
Dangyang C	Huayuan C	Haikang C	Dazu C
Yuan'an C	Baojing C	Xuwen C	Rongchang C
Xingshan C	Guzhang C	***************************************	Bishan C
Zigui C	Yongshun C	OUL CALLED TO	Wanxian P
Changyang C	Dayong C	GUANGXI	Wanxian City
Wufeng C	Sangzhi C	ZHUANG	Wanxian C
	Longshan C	AUTONOMOU	S Kaixian C
Enshi P	Lorigonari e		Zhongxian C
Enshi City	The second second	REGION	
Enshi C	GUANGDONG	Nanning City	Liangping C
Jianshi C	PROVINCE		Yunyang C
Badong C		Liuziiou City	Fengjie C
Lichuan C	Guangzhou City	Cultin City	Wushan C
Xuan'en C	11.000	Guilin City	Wuxi C
Xianfeng C	Conghua C	Yangshuo C	Chengkou C
Laifeng Tujia AC	Xinfeng C	Wuzhou City	Fuling P
Hefeng Tujia AC	Longmen C		Fuling C



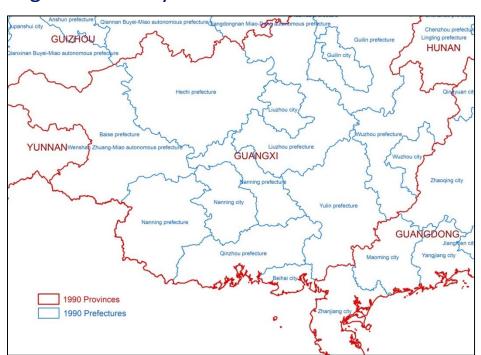


Paper maps to digital maps

Digital boundary from most recent year

HUNAN DEDICTIVE ET IN EXTENSIONS THE MALE THE MALE GLANGXI HOVEL GLANGS GLANGS

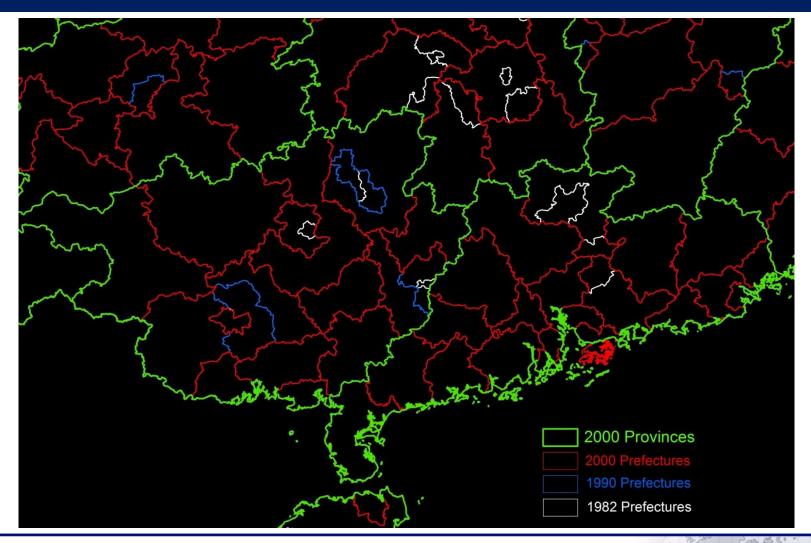
Digital boundary from 1990



- Digitization is based on available digital boundary of most recent year
- Most recent digital boundary source: Global Administrative Areas (GADM),
 Second Administrative Level Boundaries (SALB), National Statistical Offices (NSO)

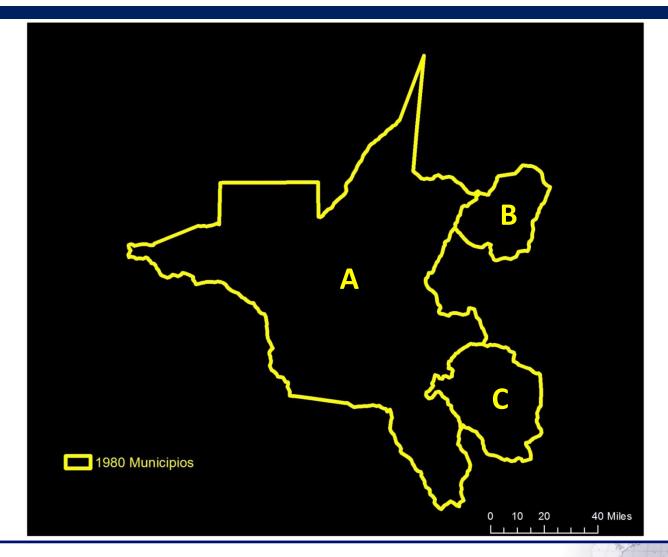


Boundaries change over time



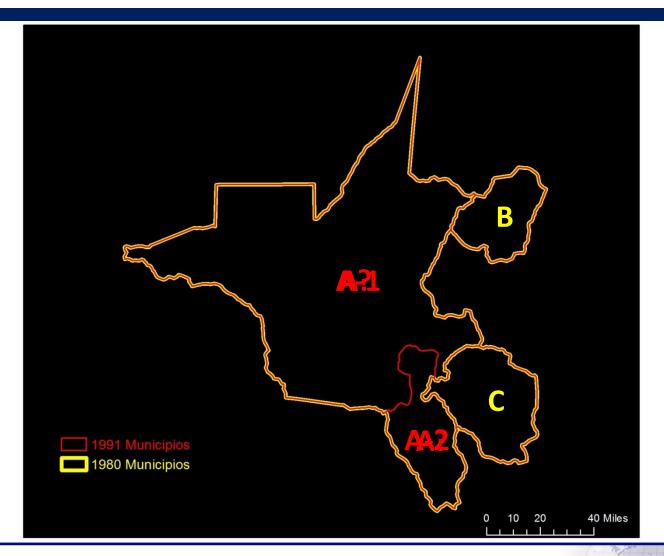


Spatial and temporal harmonization



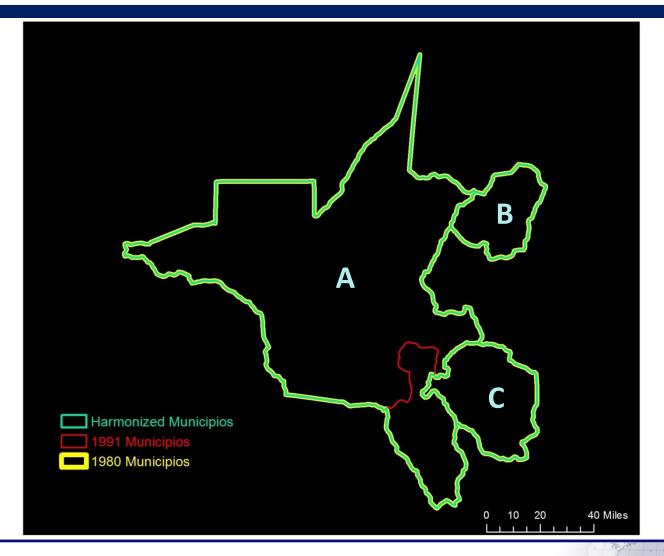


Spatial and temporal harmonization



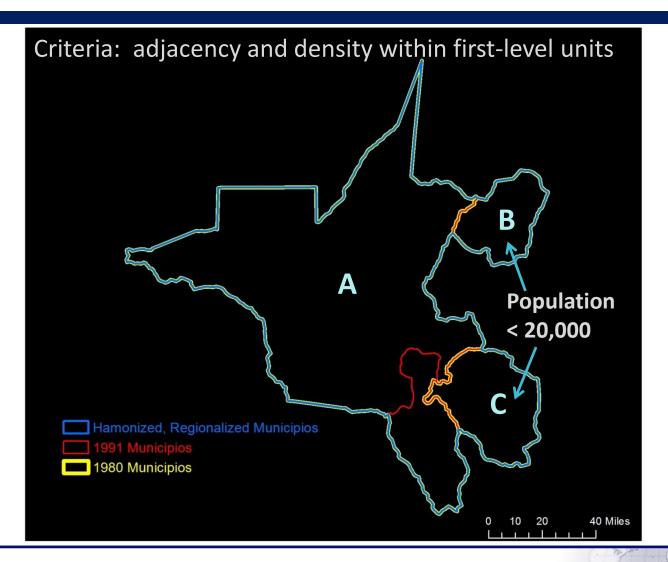


Spatial and temporal harmonization





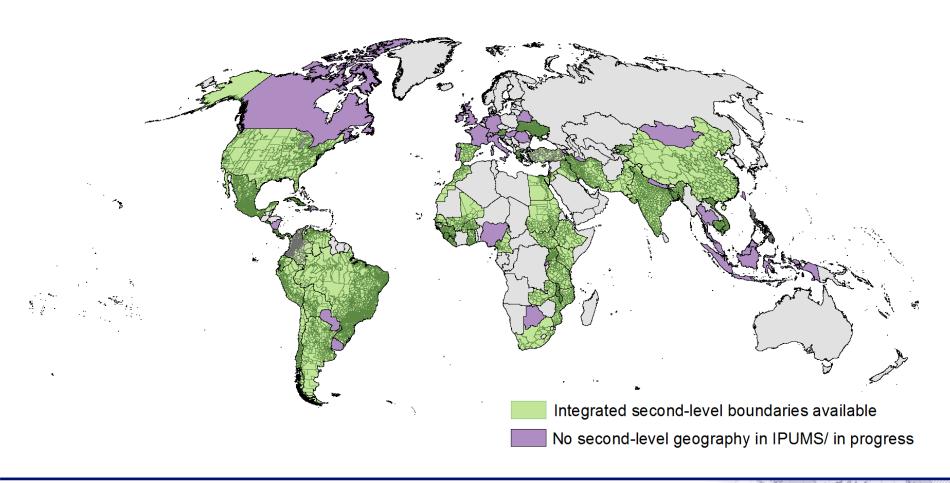
Regionalization (confidentialization)





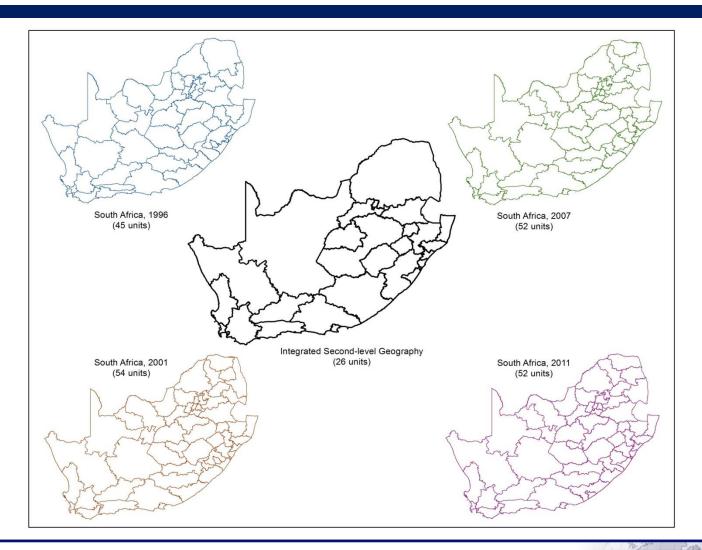
Harmonized-regionalized geography

Second-level geography in IPUMS





Year-specific geography





Harmonizing by space and time

code	label	missing	mw1987a	mw1998a	mw2008a
rectype	GEO1 MW			Н	Н
		L	61	11	11
columns	Malawi, District 1998 - 2008 [Level 1; consistent b	oundaries, Gi	5]		
norecode					
hide					
proj1			MW1987A 0021	MW1998A 0021	MW2008A 0022
			WW 1307A_0021	WW 1556A_0021	WWV2000A_0022
proj2					
proj3					
proj4					
proj5					
proj6					
<tt></tt>					
#	Northern Region				
454101	Chitipa		101 = Chitipa {1982}	101 = Chitipa {2581}	101 = Chitipa {3832}
454102			102 = Karonga {2787}	102 = Karonga {4011}	102 = Karonga {5758}
454103		•	TOZ - Raionga (2707)	102 - Italonga (4011)	102 - Italoliga (0100)
454103	Nkhata Bay		103 = Nkhata Bay {2781}	103 = Nkhata Bay {3340}	103 = Nkhata Bay {4311}
454103	Likoma		106 = Likoma {154}	106 = Likoma {155}	106 = Likoma {229}
454104	Rumphi		104 = Rumphi {1992}	104 = Rumphi {2539}	104 = Rumphi {3808}
	Mzimba, Mzuzu city				rumpin (cocc)
			105 - 11-1-1 - 10055	405 - Malanha (44700)	
454105			105 = Mzimba {9355}	105 = Mzimba {11728}	
	Mzimba (2008)				105 = Mzimba {14314}
454105	Mzuzu city (2008)				107 = Mzuzu City {3043}
	Central Region				7, 1-1
454201			201 = Keenney (7245)	201 = Keeungu (0007)	201 = Keenney (12000)
			201 = Kasungu {7245}	201 = Kasungu {9687}	201 = Kasungu {13096}
454202				202 = Nkhota Kota {5006}	202 = Nkhota Kota (6273)
454203	Ntchisi		203 = Ntchisi {2639}	203 = Ntchisi {3617}	203 = Ntchisi {4754}
454204	Dowa		204 = Dowa {7180}	204 = Dowa {9045}	204 = Dowa {12407}
	Salima		205 = Salima (4713)	205 = Salima {5869}	205 = Salima {7737}
			200 - Salilla (47 10)	200 - Saiina (5005)	200 - Salima (1701)
454206					
454206	Lilongwe (1998)		206 = Lilongwe {22720}	206 = Lilongwe {31102}	
454206	Lilongwe (2008)				206 = Lilongwe {27562}
454206					210 = Lilongwe City {15651}
454207			207 = Mchinji {5687}	207 = Mchinji {7086}	207 = Mchinji {9917}
454208			208 = Dedza {9551}	208 = Dedza {11404}	208 = Dedza {14652}
454209	Ntcheu		209 = Ntcheu {8114}	209 = Ntcheu {8558}	209 = Ntcheu {11312}
#	Southern Region				
454301			301 = Mangochi {12315}	301 = Mangochi /15214\	301 = Mangochi {18518}
454302			302 = Machinga {7595}	302 = Machinga {9020}	302 = Machinga {11477}
454303	Zomba, Zomba city				
454303	Zomba (1998)	1	303 = Zomba {11033}	303 = Zomba {13836}	
454303			,,	` '	303 = Zomba {14241}
454303					314 = Zomba City {2545}
454304			304 = Chiradzulu (5002)	304 = Chiradzulu (5879)	304 = Chiradzulu {7226}
454305	Blantyre, Blantyre city				
454305	Blantyre (1998)		305 = Blantyre {14452}	305 = Blantyre {19929}	
454305				, (,	305 = Blantyre {8417}
454305					
					315 = Blantyre City {15631}
454307			307 = Thyolo {10232}	307 = Thyolo {11301}	307 = Thyolo {14254}
454308	Mulanje		308 = Mulanje {10041}	308 = Mulanje {10445}	308 = Mulanje {12776}
454309			309 = Phalombe {5319}	309 = Phalombe {5965}	309 = Phalombe {7568}
454310			310 = Chikwawa (6961)		310 = Chikwawa {9691}
454311			311 = Nsanje {4689}	311 = Nsanje {4357}	311 = Nsanje {5301}
454312	Balaka		312 = Balaka {4968}	312 = Balaka {6071}	312 = Balaka {7569}
454313	Mwanza, Neno				
454313			306 = Mwanza {2833}	306 = Mwanza {3258}	
			SSS WWanza (2000)	SSS .VIWAIIZA (SZSS)	206 = Muenes (2244)
454313					306 = Mwanza {2241}
454313	Neno (2008)				313 = Neno {2496}
<univ></univ>					
	(Tell)				
mw1998a mw2008	(an)				
		1			

1987	Rural %	Urban %
Mzimba/Mzuzu city	87.1	12.2
Lilongwe/Lilingwe city	77.6	22.4
Blantyre/ Blantyre city	42.0	58.0

1998	Rural %	Urban %
Mzimba/Mzuzu city	83.7	16.3
Lilongwe/Lilingwe city	67.4	32.6
Blantyre/ Blantyre city	37.7	62.3

2008	Rural %	Urban %
Mzimba/Mzuzu city	82.1	17.9
°Lilongwe/Lilingwe city	64.6	34.1
*Blantyre/ Blantyre city	36.1	58.2

^{° 1.4%} unknown





^{* 5.7%} unknown

GIS workshop: geographic expertise







Country NSOs send:

- Geographic experts
- Paper maps or images

IPUMS, ESRI, and funders provide:

- Digital camera
- Tripod
- 1-year ArcGIS license
- Digitization training

Outcomes:

- Digital maps
- Code-matched to census units
- Harmonization incorporates local expertise



UN Sustainable Development Goals Measurable with Census Microdata

Goal #	Title
1.4:	Proportion of population living in households with access to basic services
3.2:	Under-five mortality rate (deaths per 1,000 live births)
3.7:	Universal access to sexual and reproductive health-care Microdata for
3.c:	Health care workers Disaggregation
4.1:	Enrollment ratios by level and type of education
4.3:	Enrollment ratios by level and type of technical, vocational, and tertiary education
4.4:	Percentage of people participating in education or training (skill development focus)
4.5:	Parity indices in education
4.6:	Literacy and numeracy (limited capacity to measure literacy, no questions on numeracy)
4.c:	Supply of qualified teachers
5.3:	Early marriage
5.5:	Women's participation in societal decision-making
6.1:	Percentage of population using safely managed drinking water services
6.2:	Percentage of population using safely managed sanitation services
7.1:	Modern energy services, electricity
7.2:	Renewable energy, fuels
8.3:	Share or informal employment in non-agriculture employment by sex
8.5:	Full and productive employment
8.6:	Percentage of youth (15-24) not in education, employment, or training (NEET)
8.7:	Child labor
9.2:	Inclusive industrialization
9.5:	Enhance scientific research

sustainabledevelopment.un.org

SDG GOAL 8.6.1: Proportion of youth (aged 15-24) not in education, employment or training (NEET)

Reconfigured to positive measure:
Percentage in Employment, Education or Training (PEET)

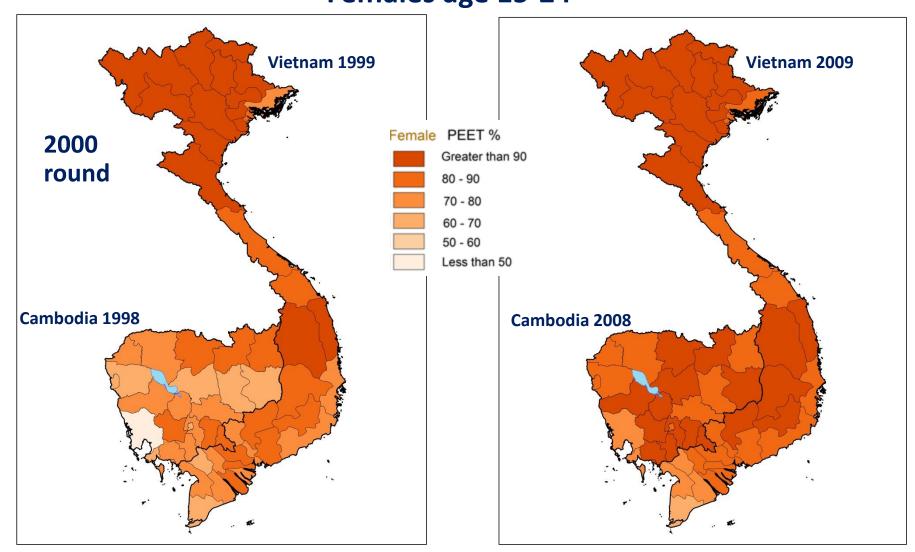
1st Administrative level disaggregation

- Cambodia and Vietnam
- 2000 and 2010 round censuses
- Mapped by sex



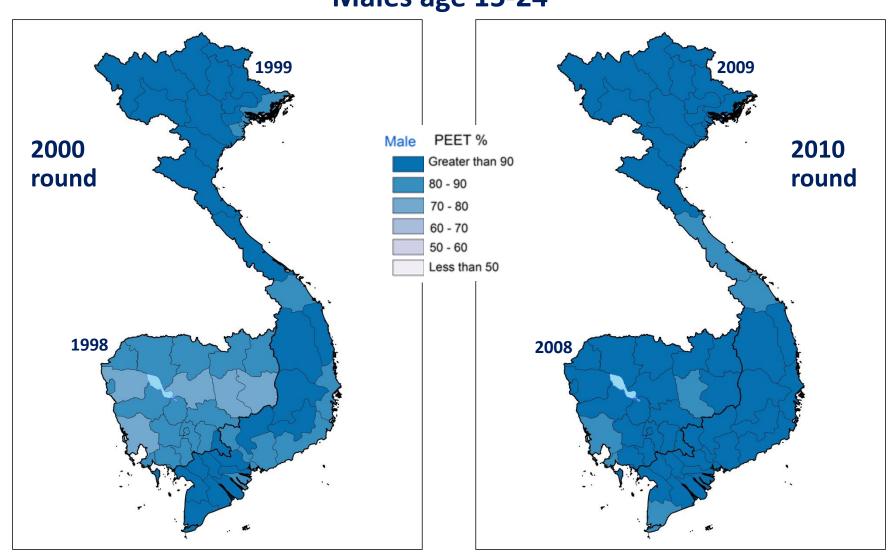
Percentage in Employment, Education or Training (PEET) Cambodia (1998, 2008) and Vietnam (1999, 2009)

Females age 15-24



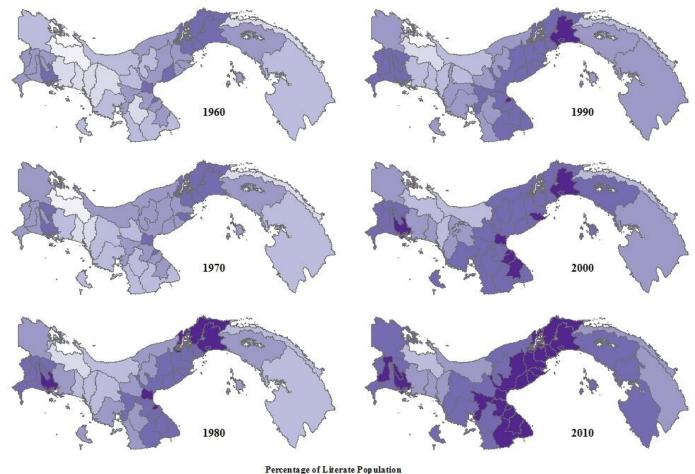
Percentage in Employment, Education or Training (PEET) Cambodia (1998, 2008) and Vietnam (1999, 2009)

Males age 15-24



Spatially consistent geography

Changes in literate population 1960 to 2010, Panama

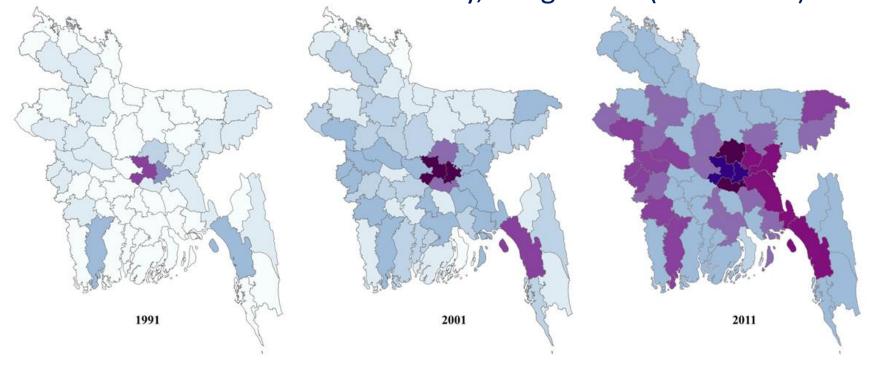


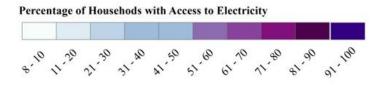




Spatially consistent geography

Household Access to Electricity, Bangladesh (1991-2011)



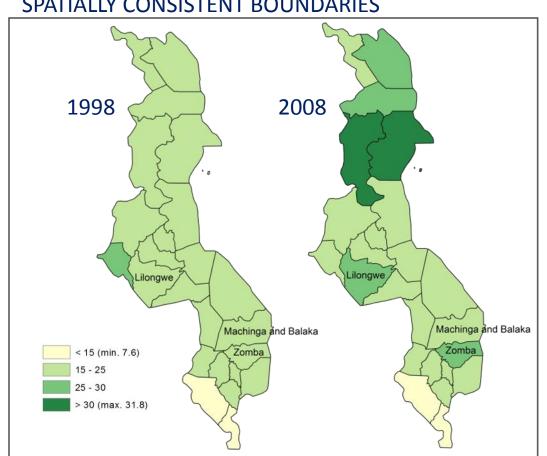




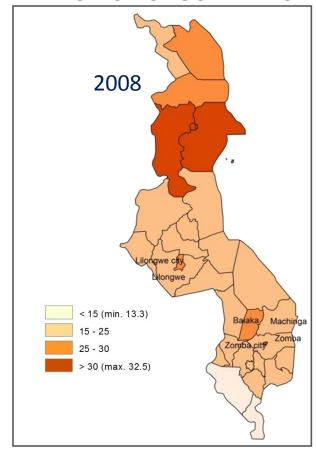
Utility of year-specific detail

% of Females Employed in Wage Labor





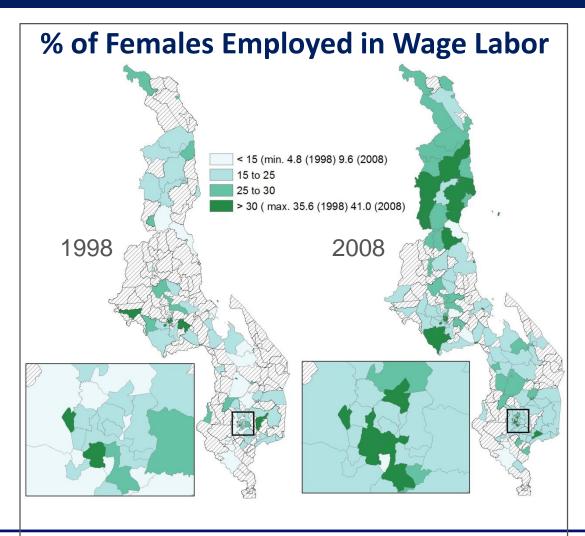
YEAR-SPECIFIC BOUNDARIES



Malawi, Districts



Advantages and limitations of small units

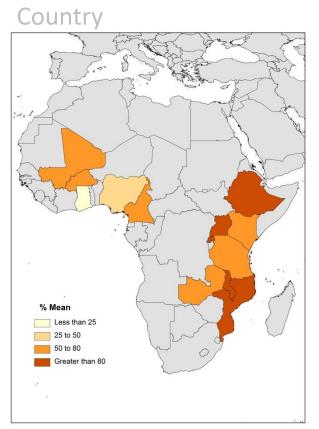


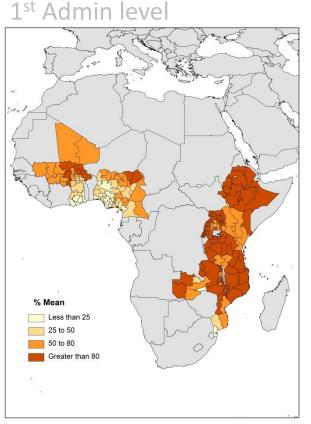
- Precision and detail in highly populated urban areas
- Enables targeted policy response
- Facilitates quasi-experimental design research
- Data "too thin" in some areas
 = limits of small areas and
 sample data

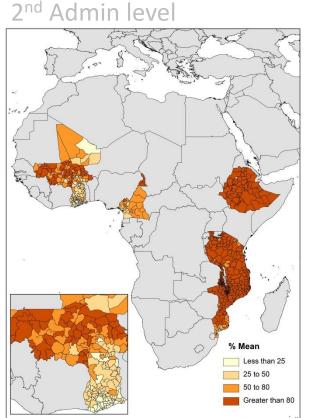


Multi-scale options

Percentage of children who are less than 5 years old and live in a dwelling with dirt floor, Africa (single census per country 2000s)









Conclusions

Microdata

- Essential for data disaggregation
- Facilitate appropriate aggregation calculations

Value added by IPUMS to meet mapping needs

- GIS Boundary files
- Year-specific geographic units and maps
- Cross-temporally consistent units and maps
- Available at country-level as well as 1st and 2nd Administrative Units where possible



UN-DESA Encourages Microdata Dissemination





Resolution 2016/1 UN Commission on Population and Development Strengthening the demographic evidence base for the 2030 Agenda for Sustainable Development

22. Encourages Governments to adopt open-data policies allowing the dissemination of public-use, geo-referenced and anonymized microdata from censuses, household surveys, civil registration, population registers, health information systems and other relevant administrative records with respect for confidentiality;





Lara Cleveland clevelan@umn.edu

ipums.org ipums@umn.edu

