eAppendix of the accepted author's manuscript. Published in final edited form as:
Epidemiology 2020; 31(6): 779-787. Publisher DOI: 10.1097/EDE.0000000000001241

Additional information on data collection

Japan

We collected data for each of the 47 prefectures in Japan in the period 1972-2009. (1) Daily counts of deaths from all causes were extracted from a computerised death certificate database maintained by the Ministry of Health, Labour and Welfare of Japan. We derived daily mean temperature by averaging hourly measurements provided by the Japan Meteorological Agency for a single weather station in the capital city of each prefecture. We obtained prefecture-specific prevalence data of AC for households with two or more occupants in each year from a regional statistics database. (1)

USA

We collected data for 211 metropolitan areas in the USA with a nationwide geographic distribution in the period 1973-2006. (2) Metropolitan areas were composed of single or multiple counties. All cause daily mortality excluding any death from accidental causes (ICD-code 10th revision: V01-Y98, ICD-code 9th revision: 001-799) were calculated from individual mortality data obtained from the National Center for Health Statistics (NCHS). Daily mean temperature was obtained from the airport weather station nearest to each city (National Oceanic and Atmospheric Administration [NOAA]). We estimated percentage of households in each city with central air conditioning (AC) by combining county-level or metropolitan area-level data. For years in 1970's and 1980's, county-level AC data were gathered from the USA Census of Population. For later years, we used metropolitan area data from the American Housing Survey (AHS). As the AC prevalence shows a strong (north to south) geographical pattern in the USA, for cities not included in the AHS we used the nearest metropolitan area with available data. For northern New England cities, we used regional level data from the "US Energy Information Administration, Office of Energy Consumption Residential Energy Consumption Survey".

Canada

We collected data from 20 census metropolitan areas (CMA) and the city of Hamilton in the period 1986-2009. All-cause daily mortality was obtained from Statistics Canada through access to the Canadian Mortality Database. Mean daily temperature, computed as the 24-hour average based on hourly measurements, were obtained from Environment Canada. A single weather station was selected for each city using the airport monitoring station located closest to the CMA centre. Proportion of dwellings with an air conditioning system (central or with a window or room mounted air conditioning system) was available for years 1993, 1997, 2003, 2006, 2007, 2009. The information is available at regional level until 2003 (Survey of household & energy use (SHEU)), and from 2006 at city level (Households and environment survey (HES)).

Spain

We collected data from the 52 capital cities in the period 1990-2014. All-cause daily mortality was obtained from Spain National Institute of Statistics. Mean daily temperature, computed as the 24-hour average based on hourly measurements, was obtained from Spain National Meteorology Agency. A single weather station, located within the urban area or at the near airport, was selected for each city. Single-day missing values were imputed as the average of the days before and after. For periods longer than two days, no imputation was done. AC prevalence data were available for three years, in 1991, 2001 and 2007. Data for 1991 and 2001 available at city level come from the National Population and housing census and refers to number of family homes with “refrigeration". Data for year 2007 available at regional level (17 Regions) comes from “Life conditions" survey and refers to "homes with air conditioning".

Derivation of AC trends

For each country and location, using the original AC data, we estimated the AC prevalence for each sub-period. Briefly, for the USA, Canada and Spain we fitted a linear mixed-effects model with a B-spline parametrisation of the time variable (years), and city as grouping level. (3) The B-spline variables were used as fixed and random effects, borrowing information across locations, and allowing the random terms to model city-specific deviations in the trend. Best linear unbiased prediction (BLUP) estimates were used to predict yearly AC prevalence in mid-summer (1st of July) in each city of the three countries. For Japan, we used the original yearly data, and assigned it to mid-summer.

The original prevalence data for each country, location and sub-period for all the four countries, together with the estimated smoothed trends, are reported in eFigures 1 (a)-(d).

Sensitivity Analyses

Across countries AC prevalence data comes from different surveys with different frequency of reporting. To assess if changes in how AC prevalence was collected and reported affect our results we performed a sensitivity analysis in the linear mixed-effects models fitted for deriving trends in US and Canada. In particular we added an indicator that defines pre/post periods corresponding to implementation of the new reporting methods, using as threshold the year 1980 for US (transition from census (counties) to AHS survey (metropolitan areas), and the year 2003 for Canada (transition from regional to city level data). The parameters for these indicators are not significant at 95% (p=0.11 and p=0.10, and indeed their inclusion results in negligible changes in predicted AC prevalence).

AC data from cities in the USA come from different sources (USA Census of Population, American Housing Survey (AHS) and Residential Energy Consumption Survey), which were collected with different designs and frequency. We performed a sensitivity analysis to assess if the effect of AC in USA was different in cities with (n = 105) and without (n = 106) AHS data. Briefly, we applied multilevel multivariate meta-analytic model with calendar year, AC prevalence, average and range of mean temperature as fixed effects and city as random term. An indicator variable was introduced to represent cities with and without AHS data with an interaction term with AC prevalence to assess the AC effect is modified by the two group of

cities. The results of this analysis show that the AC effect is not modified (p=0.529) by the group of cities.

1. Chung Y, Yang D, Gasparrini A, et al. Changing Susceptibility to Non-Optimum Temperatures in Japan, 1972-2012: The Role of Climate, Demographic, and Socioeconomic Factors. *Environ Health Perspect* 2018;126(5):057002.
2. Nordio F, Zanobetti A, Colicino E, et al. Changing patterns of the temperature–mortality association by time and location in the US, and implications for climate change. *Environment international* 2015;81:80-6.
3. Ruppert D, Wand MP, Carroll RJ. *Semiparametric regression*. Cambridge university press; 2003.

Additional tables

eTable 1(a). Total number of deaths during summer months, daily mean temperature (Celsius degree) and average AC prevalence by 21 study locations in Canada during the study period 1986-2009.

City	Deaths	Daily Mean Temperature	Average AC prevalence
Abbotsford	7838	17.0	16.8
Calgary	38533	14.3	13.4
Edmonton	45066	15.4	11.3
Halifax	20661	16.9	7.8
Hamilton	33352	18.8	67.0
Kingston	11469	18.8	61.8
Kitchener-Waterloo	20230	17.9	64.0
London Ontario	28166	18.8	65.8
Montreal	80028	18.9	32.0
Ottawa	39664	18.7	64.3
Regina	14581	16.3	31.1
Saint John NB	12648	15.3	31.7
Saskatoon	16794	15.8	55.5
St. John's NFL	15741	13.9	7.4
Sudbury	12019	16.7	7.5
Thunder Bay	10529	15.3	53.0
Toronto	198640	19.4	66.5
Vancouver	94778	16.8	10.5
Victoria	24457	15.8	11.3
Windsor	18810	21.0	69.8
Winnipeg	49069	17.1	34.3

eTable 1(b). Total number of deaths during summer months, daily mean temperature (Celsius degree) and average AC prevalence by 47 study locations in Japan during the study period 1972-2009.

Prefecture	Deaths	Daily Mean Temperature	Average AC prevalence
Aichi	452427	25.0	74.7
Akita	124440	21.7	30.3
Aomori	138564	20.1	18.5
Chiba	353653	24.0	63.7
Ehime	145620	25.2	62.1
Fukui	73010	24.2	68.1
Fukuoka	390851	25.5	70.5
Fukushima	189597	22.5	33.6
Gifu	167354	25.2	62.1
Gunma	163532	23.7	59.4
Hiroshima	238543	25.1	69.8
Hokkaido	467270	19.2	6.0
Hyogo	429740	25.2	73.8
Ibaraki	226688	22.4	53.4
Ishikawa	99811	24.0	63.4
Iwate	131879	20.4	20.0
Kagawa	95519	25.3	74.8
Kagoshima	185235	26.4	53.6
Kanagawa	479908	24.0	66.1
Kochi	90113	25.3	58.2
Kumamoto	168999	25.8	61.3
Kyoto	210622	25.4	79.0
Mie	156597	24.8	68.8
Miyagi	170173	21.3	33.3
Miyazaki	104213	25.6	55.0
Nagano	197618	22.3	27.7
Nagasaki	146701	25.5	59.6
Nara	104561	24.2	76.0
Niigata	228737	23.4	58.2
Oita	119665	24.9	56.4
Okayama	174873	25.4	71.5
Okinawa	78148	27.8	57.9
Osaka	625918	26.0	83.4
Saga	83179	25.5	66.6
Saitama	382546	24.0	73.7
Shiga	94724	24.2	67.8
Shimane	83086	23.9	56.5
Shizuoka	279169	24.6	58.5
Tochigi	158398	22.9	55.0

Tokushima	83947	25.2	66.3
Tokyo	839158	24.7	74.2
Tottori	60834	24.1	59.6
Toyama	104314	23.5	63.4
Wakayama	108623	25.5	70.5
Yamagata	124152	21.9	38.8
Yamaguchi	155872	24.6	62.0
Yamanashi	75953	24.0	42.1

eTable 1(c). Total number of deaths during summer months, daily mean temperature (Celsius degree) and average AC prevalence by 52 study locations in Spain during the study period 1990-2014.

City	Deaths	Daily Mean Temperature	Average AC prevalence
A Coruna	16435	18.9	4.6
Albacete	7657	23.1	15.0
Alicante	17524	24.8	23.2
Almeria	9622	25.2	26.2
Avila	3293	19.0	5.7
Badajoz	7356	24.7	28.2
Bilbao	25981	19.8	6.1
Barcelona	119966	23.1	19.4
Burgos	10884	18.1	3.0
Cadiz	9221	23.8	18.0
Caceres	4585	24.5	29.3
Ciudad Real	4078	24.7	21.8
Ceuta	3668	23.3	8.4
Cordoba	18015	26.4	39.8
Castellon	8906	24.4	20.3
Cuenca	3405	21.7	12.2
Guadalajara	3780	21.6	17.5
Girona	4579	22.1	19.3
Granada	15302	23.7	26.4
Huelva	8310	24.6	19.7
Huesca	3506	22.3	16.6
Jaen	6148	25.2	35.7
Leon	9530	18.2	3.0
Logrono	8150	21.4	7.2
Lleida	7641	23.5	22.0
Lugo	6118	17.5	3.2
Malaga	32155	24.9	21.5
Madrid	194623	23.7	21.6
Melilla	3100	24.6	11.7

Murcia	19671	26.1	35.1
Ourense	7223	21.5	4.1
Oviedo	14887	18.1	5.0
Palmas G. Canaria	20947	23.9	3.9
Palma Mallorca	20727	23.7	22.6
Palencia	5697	19.5	3.9
Pamplona	11776	20.1	7.6
Pontevedra	4520	19.6	3.7
Segovia	3706	20.3	4.1
Salamanca	10890	19.8	4.7
San Sebastian	12657	18.5	6.5
Santander	13103	19.3	6.3
Soria	2366	18.7	3.8
Sevilla	42071	26.9	42.5
Teruel	2328	20.4	15.1
Tenerife	11999	24.7	6.3
Toledo	3927	24.8	27.5
Tarragona	6777	25.1	19.0
Vitoria	11886	18.1	6.0
Valladolid	18921	20.7	6.0
Valencia	51853	24.8	28.1
Zamora	4517	21.1	2.8
Zaragoza	42089	23.8	21.2

eTable 1(d). Total number of deaths during summer months, daily mean temperature (Celsius degree) and average AC prevalence by 211 study locations in USA during the study period 1973-2006.

City	Deaths	Daily Mean Temperature	Average AC prevalence
AUGUSTA (GA)	16328	25.4	85.6
AKRON (OH)	50880	20.3	54.6
ALBANY (NY)	28663	19.7	59.2
ALBUQUERQUE (NM)	29823	23.6	61.6
ALLENTOWN (PA)	27587	21.3	73.2
ANCHORAGE (AK)	5904	13.5	1.0
ANAHEIM (CA)	137811	22.6	47.7
ANN ARBOR (MI)	14962	20.3	64.7
ANNANDALE (VA)	24150	23.7	92.9
AUSTIN (TX)	29496	27.6	94.8
ATLANTIC CITY (NJ)	23639	21.9	61.1
ATLANTA (GA)	133722	24.4	84.5
AZTEC (NM)	3051	21.7	76.7
BATH (NY)	7696	19.2	42.5
BUFFALO (NY)	102555	19.7	32.4
BAKERSFIELD (CA)	37912	27.1	73.7
BOULDER (CO)	10504	21.4	40.9
BALTIMORE (MD)	151409	23.3	79.6
BANGOR (ME)	12045	17.9	33.0
BOISE CITY (ID)	10125	20.9	50.2
PATERSON (NJ)	112797	22.4	81.0
BURLINGTON (VT)	7828	19.1	36.4
BIRMINGHAM (AL)	80149	25.1	84.2
BARNSTABLE (MA)	22275	20.1	50.7
BROWNSVILLE (TX)	15246	28.2	78.1
BOSTON (MA)	230062	20.8	58.0
BATON ROUGE (LA)	27480	26.4	92.9
CEDAR RAPIDS (IA)	12886	20.8	81.0
CHICAGO (IL)	543251	22.3	76.3
CHARLOTTE (NC)	34665	24.2	83.5
CHARLESTON (SC)	21786	26.0	86.5
CHATTANOOGA (TN)	27278	24.3	90.1
CHARLESTON (WV)	23102	21.8	77.9
COLUMBUS (OH)	73424	21.7	75.4
COLORADO SPRINGS (CO)	21173	19.0	39.0
CLEVELAND (OH)	192411	21.8	58.5
CINCINNATI (OH)	83233	22.5	78.9
CANTON (OH)	35823	20.2	58.8

COLUMBIA (SC)	32946	25.4	91.0
CARLISLE (PA)	16529	22.3	62.9
CORPUS CHRISTI (TX)	20657	27.9	84.9
LAYTON (UT)	7228	21.4	50.1
DALLAS (TX)	116462	28.3	95.4
DENVER (CO)	81168	20.4	43.0
BEAVER DAM (WI)	5773	19.7	60.5
DOVER (DE)	8362	22.8	75.9
DURHAM (NC)	14200	23.8	83.3
DES MOINES (IA)	25279	22.1	85.6
DETROIT (MI)	348759	21.6	63.1
DAVENPORT (IA)	25669	21.5	84.1
DAYTONA BEACH (FL)	44885	26.4	91.3
DAYTON (OH)	50614	21.8	78.1
EL CENTRO (CA)	6978	32.2	54.3
ELKHART (IN)	11791	22.3	73.7
EL PASO (TX)	30456	26.7	72.6
ELIZABETH (NJ)	46629	23.1	77.6
ERIE (PA)	25514	20.0	37.5
ESSEX (MA)	62360	20.5	58.2
EUGENE (OR)	22396	17.7	27.7
EVANSVILLE (IN)	17643	23.7	85.9
EVERETT (WA)	28599	17.0	6.0
FARGO (ND)	6372	19.1	48.7
FLINT (MI)	34774	19.7	51.1
FRESNO (CA)	44191	26.1	83.0
FORT LAUDERDALE (FL)	133746	28.2	93.6
FORT MYERS (FL)	34326	27.3	94.1
FORT PIERCE (FL)	26163	27.1	85.6
FORT WORTH (TX)	74381	27.9	96.0
FORT WAYNE (IN)	23452	21.0	76.6
FAYETTEVILLE (NC)	14727	25.2	85.7
GARY (IN)	42247	22.4	76.0
GREEN BAY (WI)	13173	18.9	60.8
GREENSBURG (PA)	39408	22.3	54.9
GRAND HAVEN (MI)	11578	19.4	56.3
GRAND JUNCTION (CO)	6151	23.1	49.6
GRAND RAPIDS (MI)	36477	19.9	55.3
GREENSBORO (NC)	29000	23.3	84.8
GREENVILLE (SC)	24980	24.8	82.5
GAINESVILLE (FL)	11380	25.9	87.1
GETTYSBURG (PA)	5058	22.7	56.9
HICKORY (NC)	9600	23.2	75.4
HOLLAND (MI)	5255	19.4	56.3

HONOLULU (HI)	36742	26.6	30.9
HARRISBURG (PA)	23678	22.3	61.7
HARTFORD (CT)	71541	21.4	60.4
HOUSTON (TX)	161273	27.3	94.4
INDIANAPOLIS (IN)	70216	22.2	81.8
IOWA CITY (IA)	3434	21.0	85.0
JACKSONVILLE (FL)	55432	26.9	89.1
JERSEY CITY (NJ)	52656	19.5	66.6
KLAMATH FALLS (OR)	4132	17.1	27.3
KALAMAZOO (MI)	15947	21.3	61.6
KENOSHA (WI)	10620	20.2	64.2
KANSAS CITY (KS)	100016	24.8	87.2
KNOXVILLE (TN)	36093	23.6	87.8
LAFAYETTE (IN)	8821	21.9	79.8
LAFAYETTE (LA)	10644	26.6	89.5
LAKE CHARLES (LA)	14017	27.4	88.6
LAKELAND (FL)	39449	27.8	79.7
LANCASTER (PA)	35226	22.5	78.9
LANSING (MI)	17190	19.6	53.4
LOGAN (UT)	2466	20.0	39.6
LOUISVILLE (KY)	65088	23.8	83.0
LA PORTE (IN)	9585	20.9	74.0
LOS ANGELES (CA)	585151	21.5	49.3
LAS VEGAS (NV)	60738	30.8	94.5
LITTLE ROCK (AR)	29271	25.9	92.4
MACON (GA)	15179	25.6	83.3
MCALLEN (TX)	20083	28.9	77.7
MIDDLESEX (NJ)	48927	22.8	86.1
MIDDLETOWN (OH)	21954	22.3	78.7
MEDFORD (OR)	13963	20.6	37.7
MADISON (IL)	21823	24.7	80.0
MODESTO (CA)	26730	25.8	49.9
MADISON (WI)	21529	19.8	62.4
MIAMI (FL)	173549	27.9	87.7
MELBOURNE (FL)	34939	27.3	89.3
MILWAUKEE (WI)	109839	20.2	64.7
MEMPHIS (TN)	70069	26.3	94.1
TOMS RIVER (NJ)	103364	23.0	78.4
MINNEAPOLIS (MN)	113123	20.6	75.9
MONTGOMERY (AL)	18371	27.3	87.2
MOBILE (AL)	32427	27.0	91.4
MONROE (LA)	11976	26.3	86.9
MERCER (PA)	12730	19.8	52.6
UPPER MARLBORO (MD)	33827	23.0	90.6

MUSKEGON (MI)	14426	19.4	55.2
MUNCIE (IN)	10741	22.4	74.6
MYRTLE BEACH (SC)	12073	25.6	83.4
NAMPA (ID)	4082	20.6	47.1
NASHUA (NH)	22925	21.5	47.9
MELVILLE (NY)	217220	21.4	73.4
NILES (MI)	14168	20.8	62.2
NORFOLK (VA)	69980	24.5	87.9
NASHVILLE (TN)	44063	24.5	94.8
NEWBURGH (NY)	23313	20.6	58.5
NEW HAVEN (CT)	72842	21.7	59.5
NEW LONDON (CT)	18931	20.6	54.1
NEW ORLEANS (LA)	88199	27.6	89.0
NEWARK (NJ)	107048	23.1	71.1
NEW YORK (NY)	691188	19.5	61.4
OCALA (FL)	21980	26.0	81.9
OKLAHOMA CITY (OK)	52741	25.7	93.7
OAKLAND (CA)	145642	16.9	31.0
OMAHA (NE)	33423	22.4	92.7
ORLANDO (FL)	65320	26.8	91.0
OTTAWA (IL)	11733	21.3	74.2
PHILADELPHIA (PA)	427954	22.6	78.0
PHOENIX (AZ)	152406	33.2	88.4
PALM BEACH (FL)	94124	27.3	89.5
PLYMOUTH (MA)	34916	20.2	56.5
PENSACOLA (FL)	21640	26.8	90.4
PORTLAND (OR)	94919	18.7	28.9
PROVO (UT)	11373	21.8	46.1
PORT ARTHUR (TX)	23927	26.9	90.1
PORTAGE (IN)	8380	22.4	78.8
PORTLAND (ME)	21078	18.3	36.1
PROVIDENCE (RI)	118928	20.7	50.4
PITTSBURGH (PA)	154655	21.1	57.4
RICHMOND (VA)	40673	23.8	86.4
ROCHESTER (NY)	60756	19.6	48.3
ROCKVILLE (MD)	38423	24.5	92.0
READING (PA)	32927	22.2	71.2
RENO (NV)	18059	20.6	71.0
RALEIGH (NC)	24517	23.9	89.2
RIVERSIDE (CA)	177334	23.3	79.6
SACRAMENTO (CA)	72377	22.1	89.2
SCRANTON (PA)	71109	19.9	47.2
SAN DIEGO (CA)	158466	21.3	34.0
SAN FRANCISCO (CA)	118777	16.9	7.2

SALT LAKE CITY (UT)	39245	22.8	50.9
SAN JOSE (CA)	79032	21.8	32.2
SANTA BARBARA (CA)	25352	18.2	38.1
SAN ANTONIO (TX)	81165	28.1	86.3
SPOKANE (WA)	31111	18.8	45.4
SPRINGFIELD (MA)	44171	21.1	61.9
SPRINGFIELD (MO)	18837	23.3	81.1
SPARTANBURG (SC)	19782	24.2	77.3
SARASOTA (FL)	62363	27.7	93.3
STEUBENVILLE (OH)	11219	21.5	58.6
ST. CHARLES (MO)	11185	24.4	88.9
STOCKTON (CA)	35179	23.5	84.1
EAST ST. LOUIS (IL)	23205	24.5	85.0
SOUTH BEND (IN)	22463	20.8	70.5
ST. LOUIS (MO)	131259	24.7	88.4
STAMFORD (CT)	66789	20.6	72.8
ST. PETERSBURG (FL)	68483	28.5	90.8
STATE COLLEGE (PA)	7171	19.7	55.5
SEATTLE (WA)	102243	16.0	7.3
SIOUX CITY (IA)	7325	21.5	83.5
TACOMA (WA)	41570	17.1	8.2
TAMPA (FL)	68483	27.3	89.9
TUCSON (AZ)	52297	29.1	60.8
TALLAHASSEE (FL)	10497	26.1	88.9
TOLEDO (OH)	44939	21.3	66.0
TOPEKA (KS)	14340	23.7	89.3
TRENTON (NJ)	27141	22.5	86.2
TERRE HAUTE (IN)	11482	22.2	80.6
TULSA (OK)	42061	26.1	92.6
VISALIA (CA)	22014	25.4	44.5
VANCOUVER (WA)	15616	18.6	8.6
VENTURA (CA)	37298	18.8	43.4
WICHITA (KS)	30425	24.9	92.4
OGDEN (UT)	10926	23.5	47.6
WILMINGTON (DE)	34130	22.7	81.6
WINSTON-SALEM (NC)	22695	24.2	80.4
WORCESTER (MA)	62512	18.8	46.6
WASHINGTON (DC)	67541	24.3	87.3
WASHINGTON (PA)	22831	20.7	54.5
YOUNGSTOWN (OH)	41226	19.6	56.9
YORK (PA)	28005	22.0	71.6

eTable 2. Country specific sub-periods, and period specific averagre daily mean temperature (Celsisus degree).

Country	Sub-period	Average daily mean temperature
Canada	[1991; 1995]	16.7
Canada	[1996; 2000]	17.1
Canada	[2001; 2005]	17.4
Canada	[2006; 2009]	17.0
Japan	[1972; 1976]	23.5
Japan	[1977; 1980]	24.0
Japan	[1981; 1984]	23.6
Japan	[1985; 1988]	23.9
Japan	[1989; 1992]	24.3
Japan	[1993; 1996]	24.1
Japan	[1997; 2000]	24.7
Japan	[2001; 2004]	24.6
Japan	[2005; 2009]	24.7
Spain	[1990; 1994]	22.0
Spain	[1995; 1998]	21.8
Spain	[1999; 2004]	22.5
Spain	[2005; 2009]	22.4
USA	[1973; 1976]	22.4
USA	[1977; 1981]	23.0
USA	[1982; 1986]	22.7
USA	[1987; 1991]	23.2
USA	[1992; 1996]	23.0
USA	[1997; 2001]	22.9
USA	[2002; 2006]	23.0

eTable 3. Multivariate multilevel meta-regression models with different fixed-effects specification and related p-values of Wald tests.

	Model 1	Model 2	Model 3	Model 4
Country*year interaction		<0.0001	<0.0001	<0.0001
Air Conditioning (%)			<0.0001	0.011
Average summer mean temperature ^{o}C				0.740
Interquartile range of mean temperature ^{o}C				<0.0001
I^2	35.0%	22.5%	22.1%	20.5%

Model 1: Intercept
Model 2: Intercept, country*year interaction
Model 3: Intercept, country*year interaction, AC
Model 4: Intercept, country*year interaction, AC, average mean temperature, interquartile range of mean temperature

eTable 4. Attributable fractions (AF%), Attributable deaths by country and sub periods calculated under observed air conditioning prevalence (Scenario 1) and under Scenario 2 on which, in each country, air conditioning prevalence is set at the level observed at the beginning of the observational period. Delayed deaths were calculated as difference between attributable deaths calculated between scenario 2 and scenario 1.

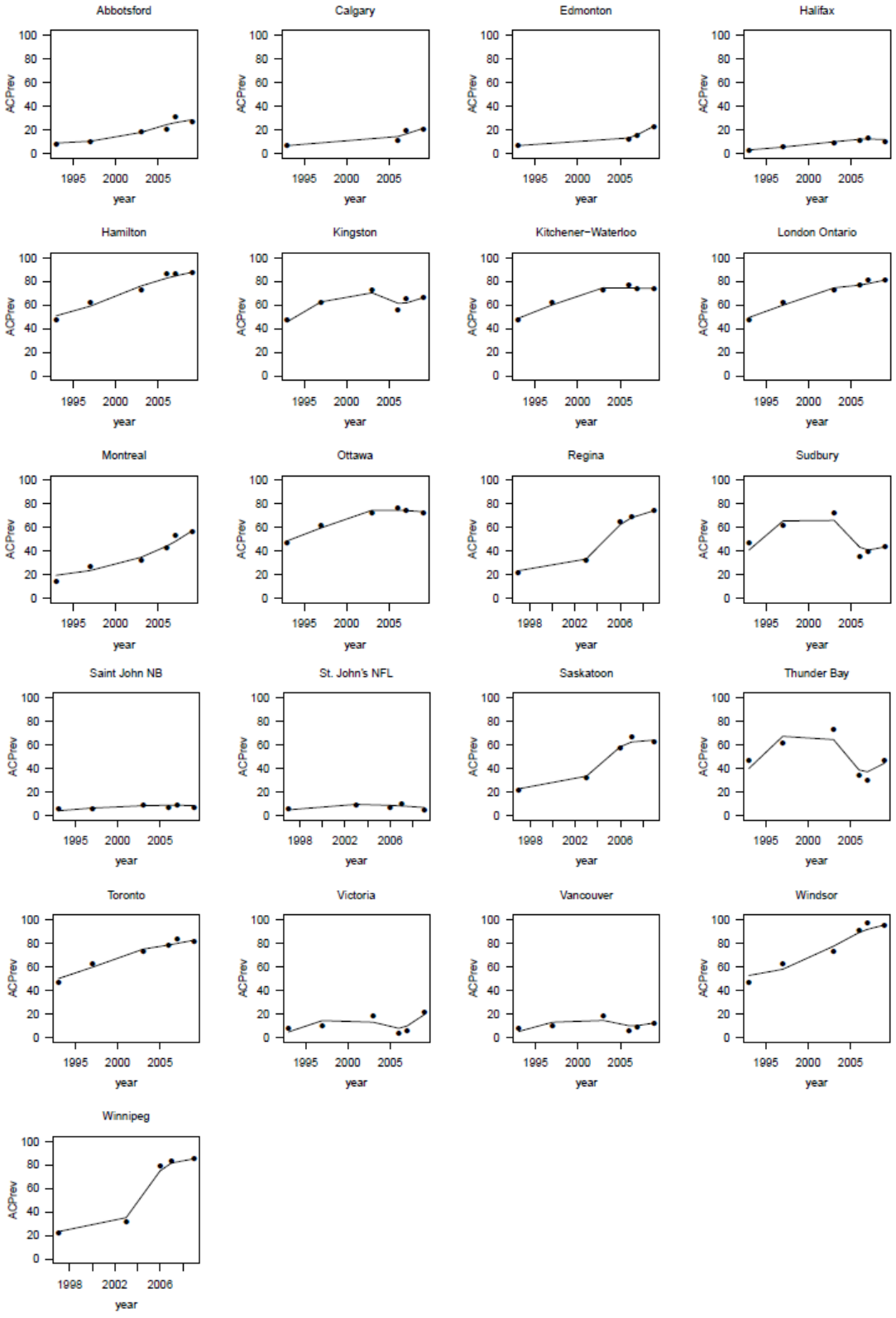
		Scenario 1. Observed air conditioning prevalence				**Scenario 2: Air conditioning prevalence set at the level observed at the beginning of the observational period**				
		AF%		**Attributable deaths**		**AF%**		**Attributable deaths**		**Delayed deaths**
Country	Period	**Point estimate**	**95%CI**	**Point estimate**	**95%CI**	**Point estimate**	**95%CI**	**Point estimate**	**95%CI**	
Canada	[1991; 1995]	1.4	(1.2; 1.6)	2366.4	(2070.9; 2642)	1.4	(1.2; 1.6)	2381.2	(2108.8; 2647)	14.8
	[1996; 2000]	1.3	(1.2; 1.5)	2284.4	(2047.4; 2506)	1.4	(1.2; 1.5)	2345.4	(2116.8; 2571.2)	61.0
	[2001; 2005]	1.2	(1.1; 1.4)	1928.1	(1663.4; 2191.7)	1.3	(1.2; 1.5)	2095.6	(1835.9; 2336.4)	167.5
	[2006; 2009]	0.8	(0.6; 1)	1002.3	(758.8; 1230.7)	0.9	(0.7; 1.1)	1136.8	(903.6; 1357.2)	134.5
									Delayed deaths	377.8
									Total deaths	793073
									Delayed AF%	0.05

Japan	[1972; 1976]	3.6	(3.5; 3.6)	37131.7	(36735.3; 37554.5)	3.6	(3.5; 3.6)	37293.1	(36862.9; 37678.3)	161.4
	[1977; 1980]	3.1	(3.1; 3.2)	26476.9	(26182.5; 26761.1)	3.3	(3.2; 3.3)	27486.9	(27206.4; 27779.2)	1010.0
	[1981; 1984]	2.8	(2.8; 2.9)	24687.3	(24383.1; 24972.6)	3.0	(3; 3.1)	26287.2	(25940.6; 26652.8)	1599.9
	[1985; 1988]	2.5	(2.5; 2.6)	23182.0	(22867.4; 23527.1)	2.8	(2.7; 2.8)	25453.3	(25014.1; 25890.6)	2271.3
	[1989; 1992]	2.2	(2.2; 2.3)	22402.2	(21979.9; 22798.3)	2.6	(2.5; 2.6)	25862.9	(25263.2; 26440.4)	3460.7
	[1993; 1996]	1.9	(1.9; 1.9)	20218.4	(19799.2; 20665.7)	2.3	(2.2; 2.4)	24519.9	(23831; 25203.5)	4301.5
	[1997; 2000]	1.7	(1.7; 1.7)	18937.1	(18452.2; 19409.5)	2.2	(2.1; 2.2)	24118.4	(23288.9; 24930.7)	5181.3
	[2001; 2004]	1.4	(1.4; 1.5)	17090.7	(16617; 17538)	1.9	(1.8; 2)	22989.7	(22051.7; 23992.8)	5899.0
	[2005; 2009]	1.1	(1; 1.1)	18268.8	(17422.3; 19040.2)	1.6	(1.5; 1.6)	26097.9	(24791.5; 27415.1)	7829.1
									Delayed deaths	31714.2
									Total deaths	9764534
									Delayed AF%	0.32
Spain	[1990; 1994]	3.5	(3.4; 3.7)	6055.3	(5791.6; 6306.5)	3.5	(3.4; 3.7)	6061.7	(5805.7; 6314.6)	6.4
	[1995; 1998]	3.5	(3.4; 3.7)	5005.7	(4848; 5179.8)	3.6	(3.5; 3.7)	5050.4	(4888.5; 5214.7)	44.7
	[1999; 2004]	3.5	(3.4; 3.6)	7775.2	(7545.3; 7997.1)	3.6	(3.5; 3.7)	7929.4	(7713.4; 8149.7)	154.2
	[2005; 2009]	2.8	(2.6; 2.9)	5201.3	(4919.3; 5455.6)	2.9	(2.8; 3)	5438.9	(5178.8; 5707.5)	237.6
									Delayed deaths	442.9
									Total deaths	918076

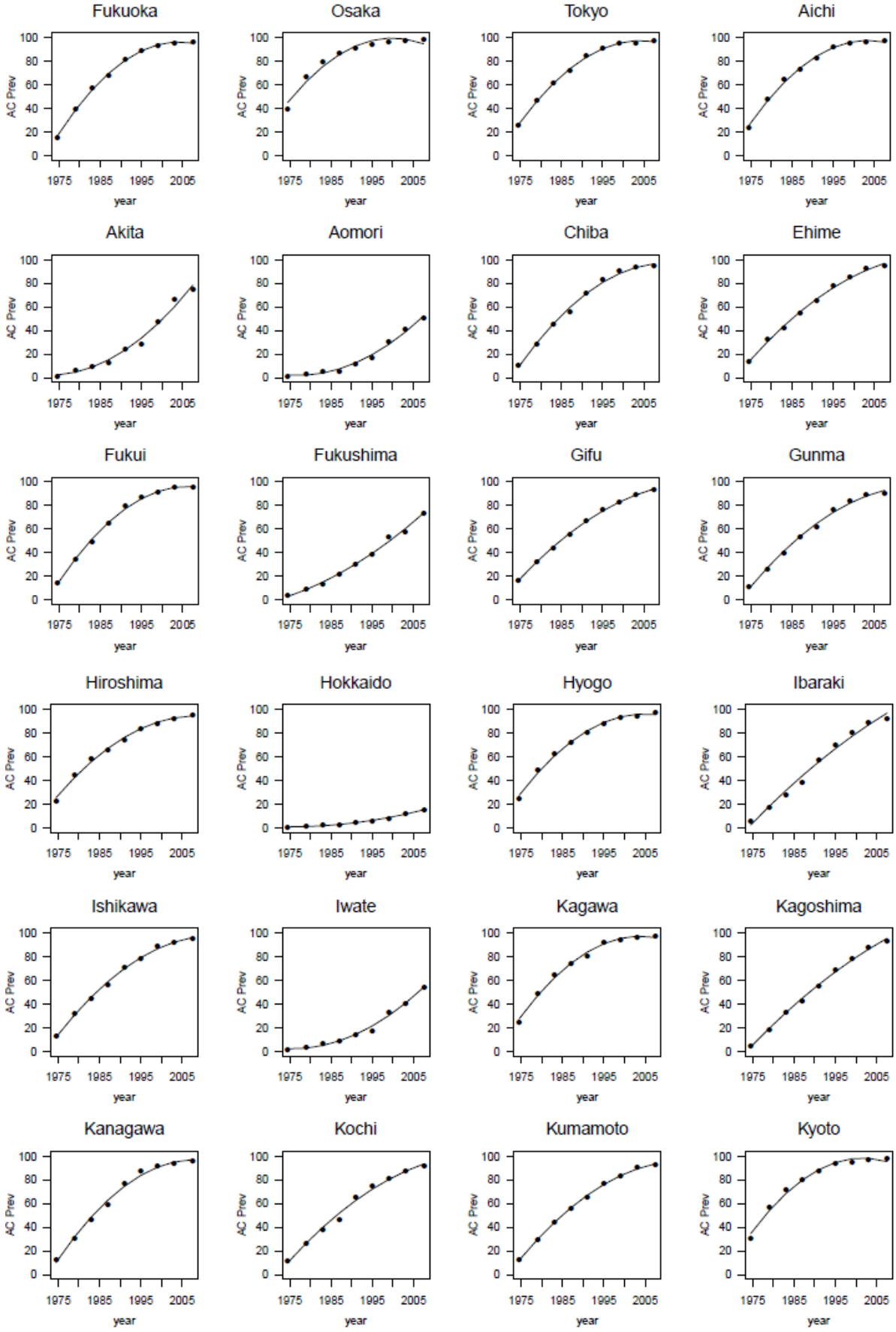
									Delayed AF%	0.05
USA	[1973; 1976]	1.7	(1.7; 1.7)	20659.3	(20327.1; 20967.7)	1.7	(1.7; 1.7)	20540.2	(20216.1; 20847.5)	-119.1
	[1977; 1981]	1.6	(1.5; 1.6)	23776.4	(23459.7; 24106.6)	1.6	(1.6; 1.6)	24229.1	(23923.3; 24518.9)	452.7
	[1982; 1986]	1.3	(1.3; 1.3)	21885.6	(21570.6; 22164.5)	1.4	(1.4; 1.4)	22920.2	(22655.3; 23188)	1034.6
	[1987; 1991]	1.1	(1.1; 1.1)	19344.4	(19079.4; 19619.4)	1.2	(1.2; 1.2)	21177.6	(20864.3; 21486.1)	1833.2
	[1992; 1996]	0.9	(0.9; 0.9)	16215.0	(15896.4; 16528.2)	1.0	(1; 1)	18368.7	(18049.8; 18680.7)	2153.7
	[1997; 2001]	0.7	(0.7; 0.7)	12353.9	(12062; 12604.9)	0.8	(0.8; 0.8)	15016.5	(14666.6; 15358.6)	2662.6
	[2002; 2006]	0.5	(0.5; 0.5)	10037.1	(9680.4; 10355.1)	0.7	(0.7; 0.7)	13255.1	(12815.9; 13693.2)	3218.0
									Delayed deaths	11235.7
									Total deaths	11839659
									Delayed AF%	0.09

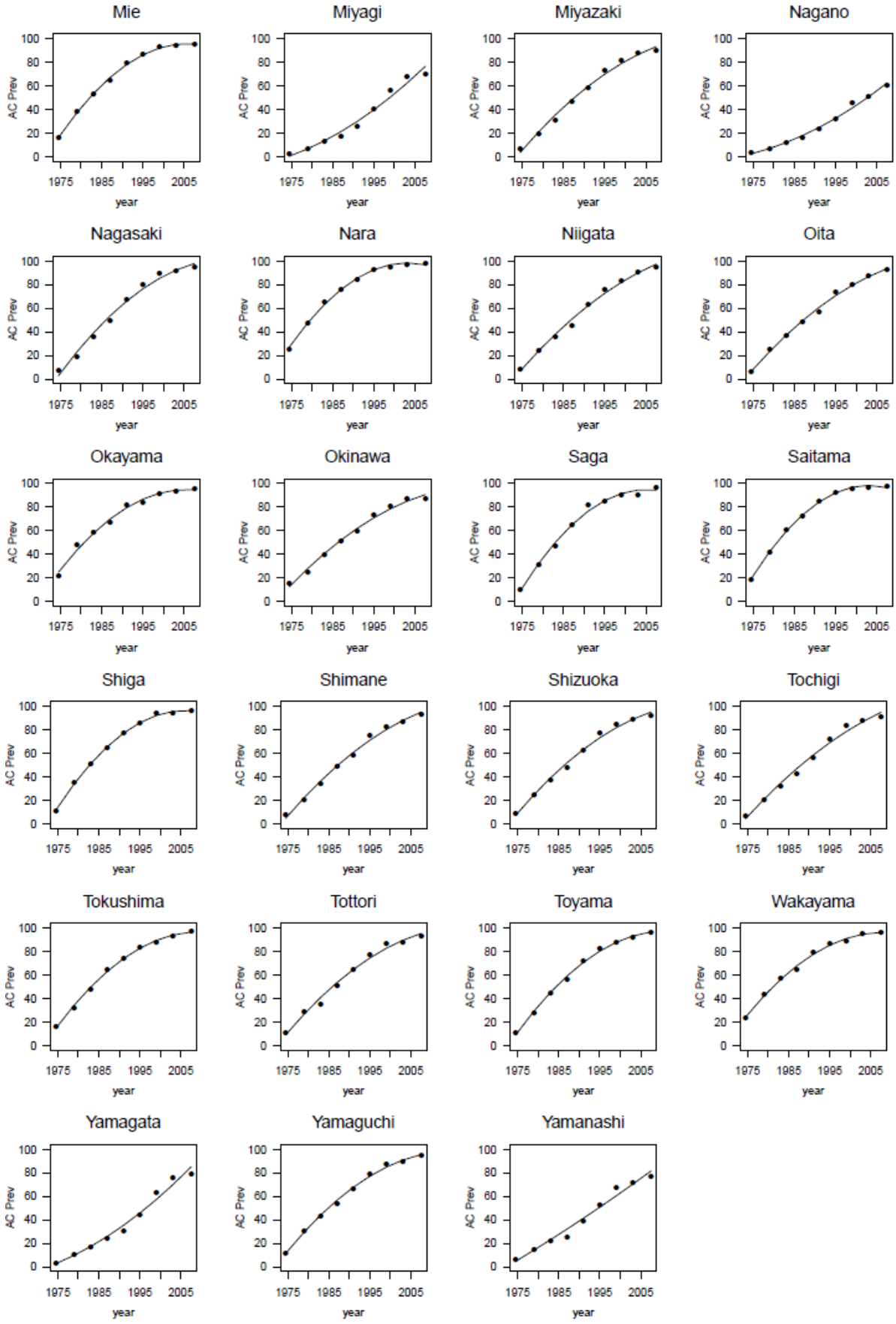
Additional figures

eFigure 1(a). Location specific air conditioning prevalence with the estimated smoothed trends. Canada, 21 locations, period 1986-2009.

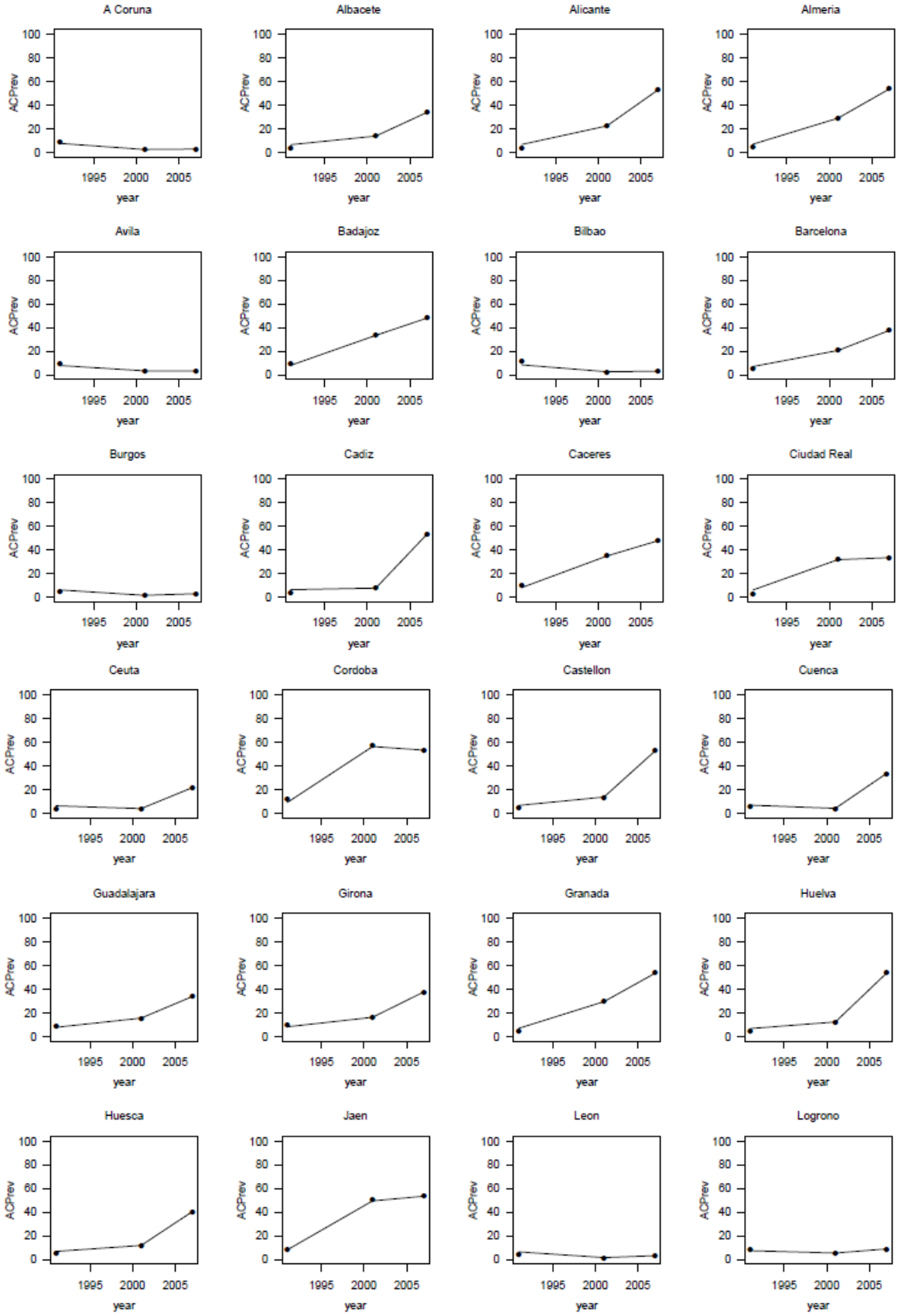


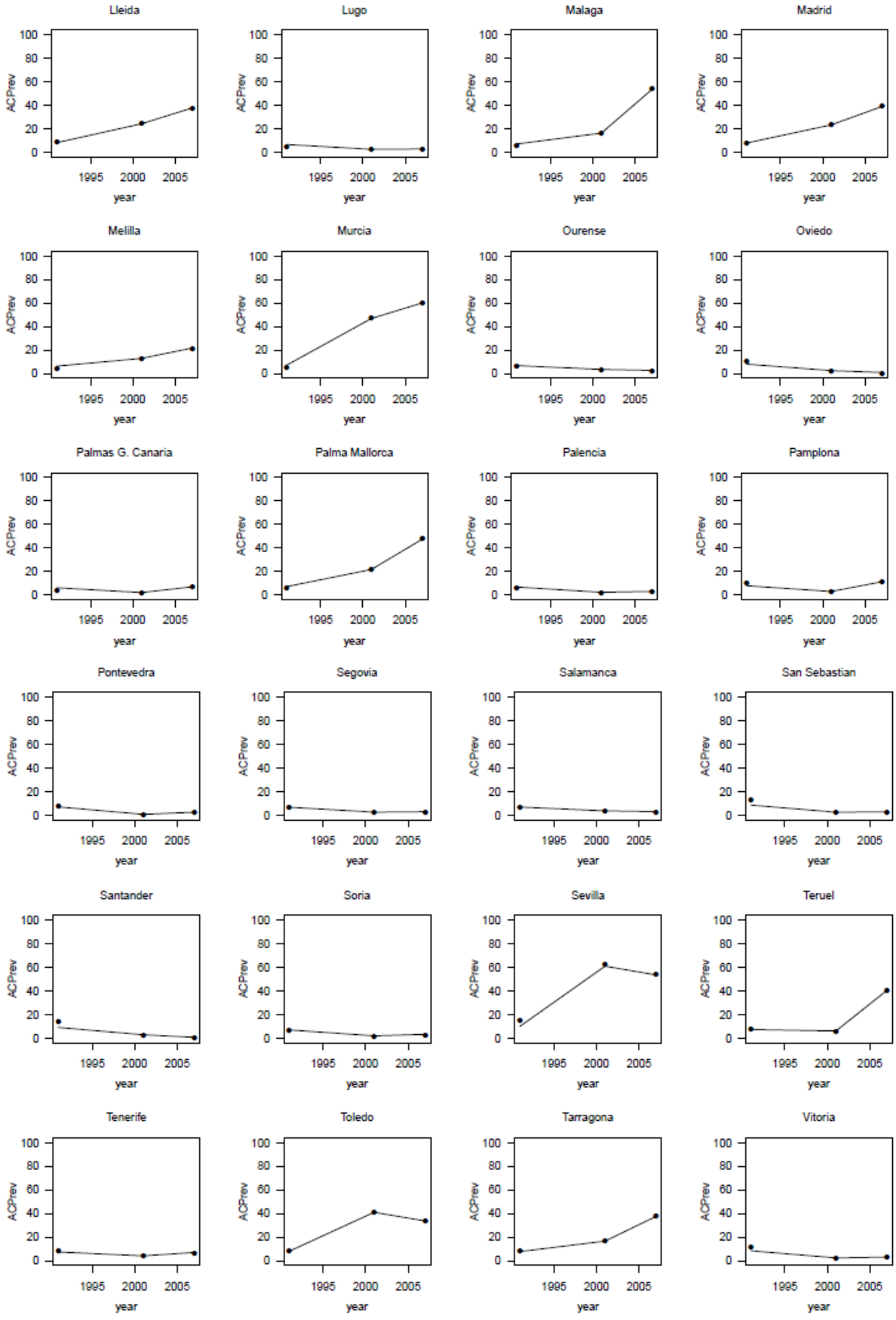
eFigure 1(b). Location specific air conditioning prevalence with the estimated smoothed trends. Japan, 47 locations, period 1972-2009.

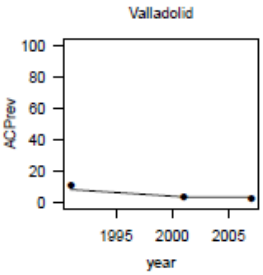


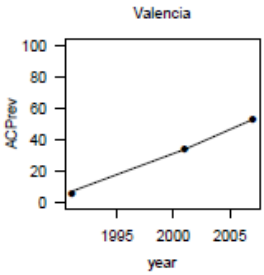

Mie
Miyagi
Miyazaki
Nagano
Nagasaki
Nara
Niigata
Oita
Okayama
Okinawa
Saga
Saitama
Shiga
Shimane
Shizuoka
Tochigi
Tokushima
Tottori
Toyama
Wakayama
Yamagata
Yamaguchi
Yamanashi
AC Prev
year
0
20
40
60
80
100
1975
1985
1995
2005

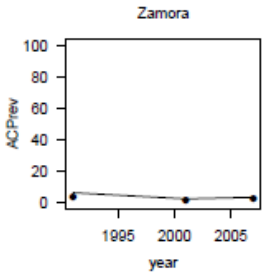
eFigure 1(c). Location specific air conditioning prevalence with the estimated smoothed trends. Spain, 52 locations, period 1990-2014.

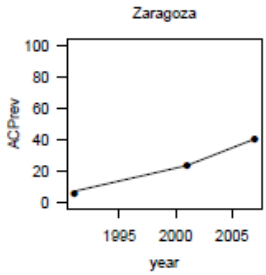



Lleida
Lugo
Malaga
Madrid
Melilla
Murcia
Ourense
Oviedo
Palmas G. Canaria
Palma Mallorca
Palencia
Pamplona
Pontevedra
Segovia
Salamanca
San Sebastian
Santander
Soria
Sevilla
Teruel
Tenerife
Toledo
Tarragona
Vitoria
ACPrev
year
0
20
40
60
80
100
1995
2000
2005

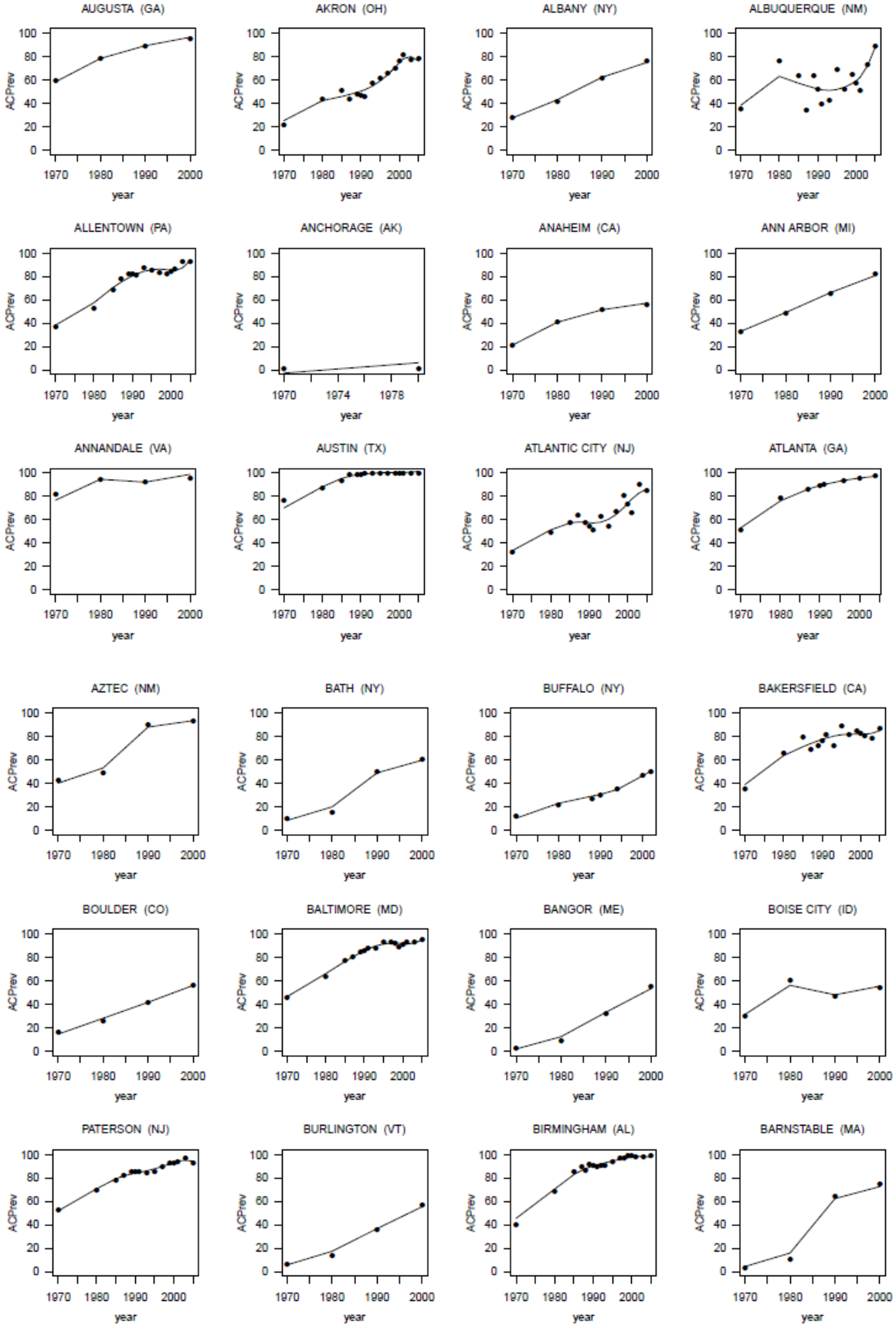

Valladolid
ACPrev
100
80
60
40
20
0
1995
2000
2005
year

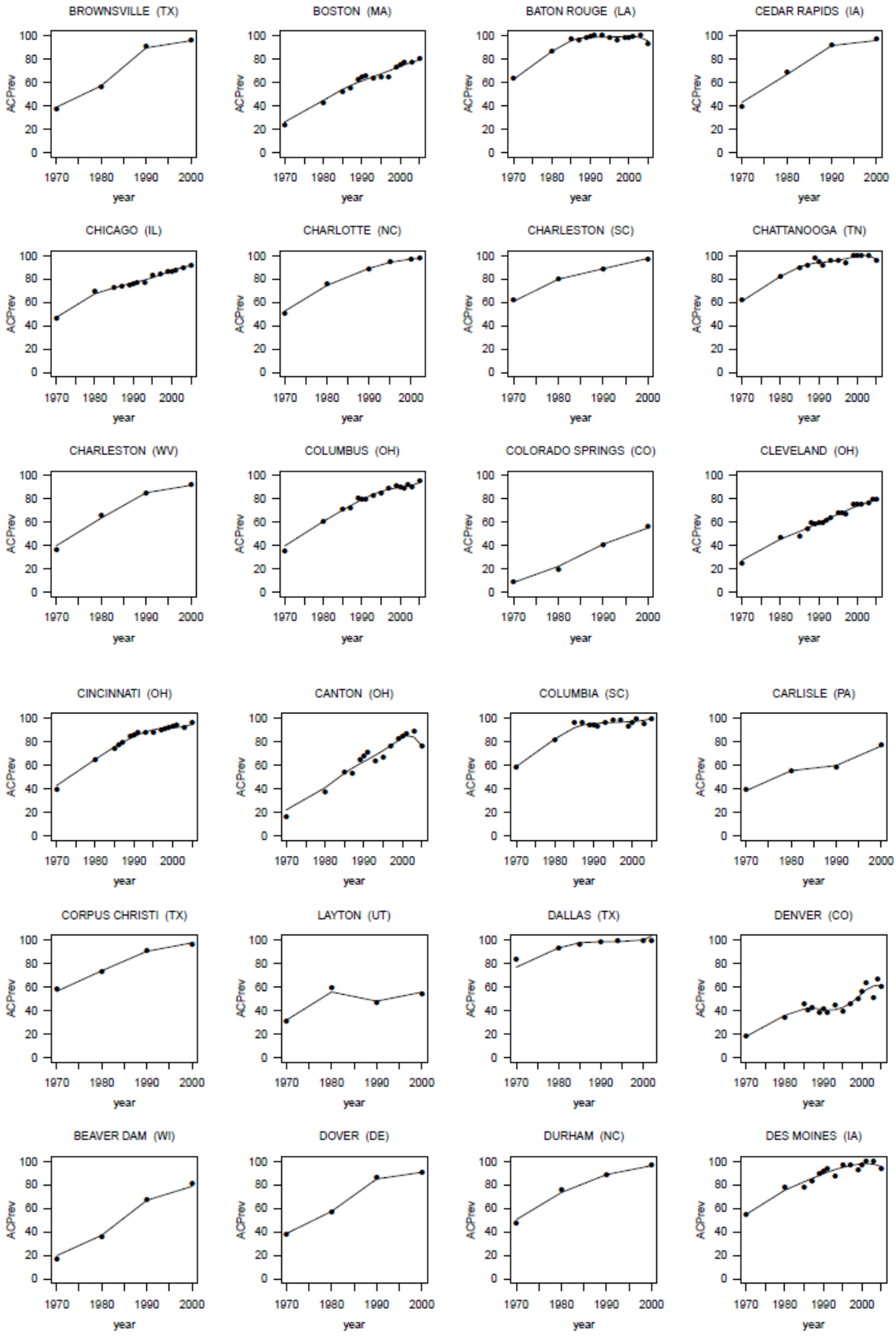

Valencia
ACPrev
100
80
60
40
20
0
1995
2000
2005
year

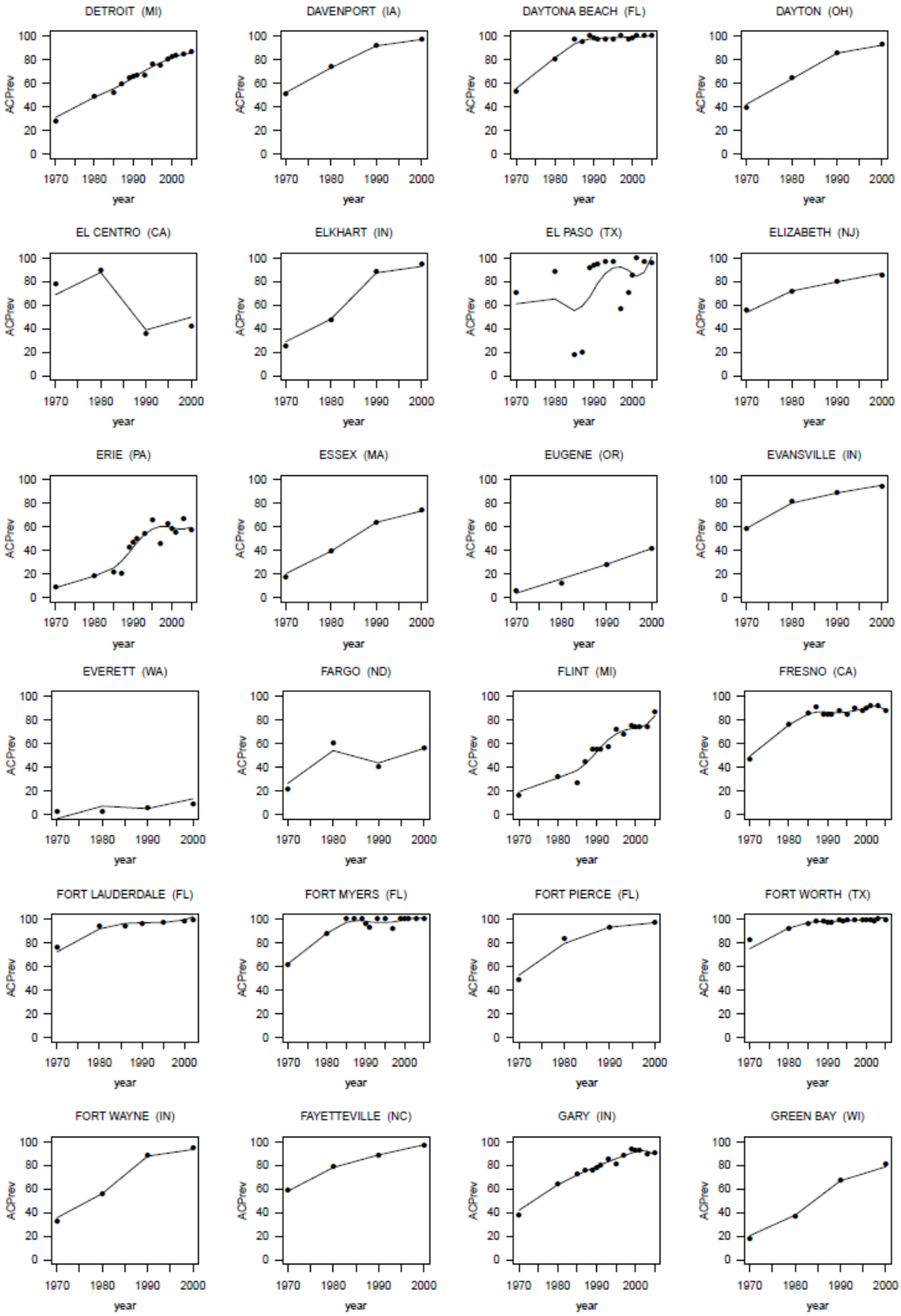

Zamora
ACPrev
100
80
60
40
20
0
1995
2000
2005
year

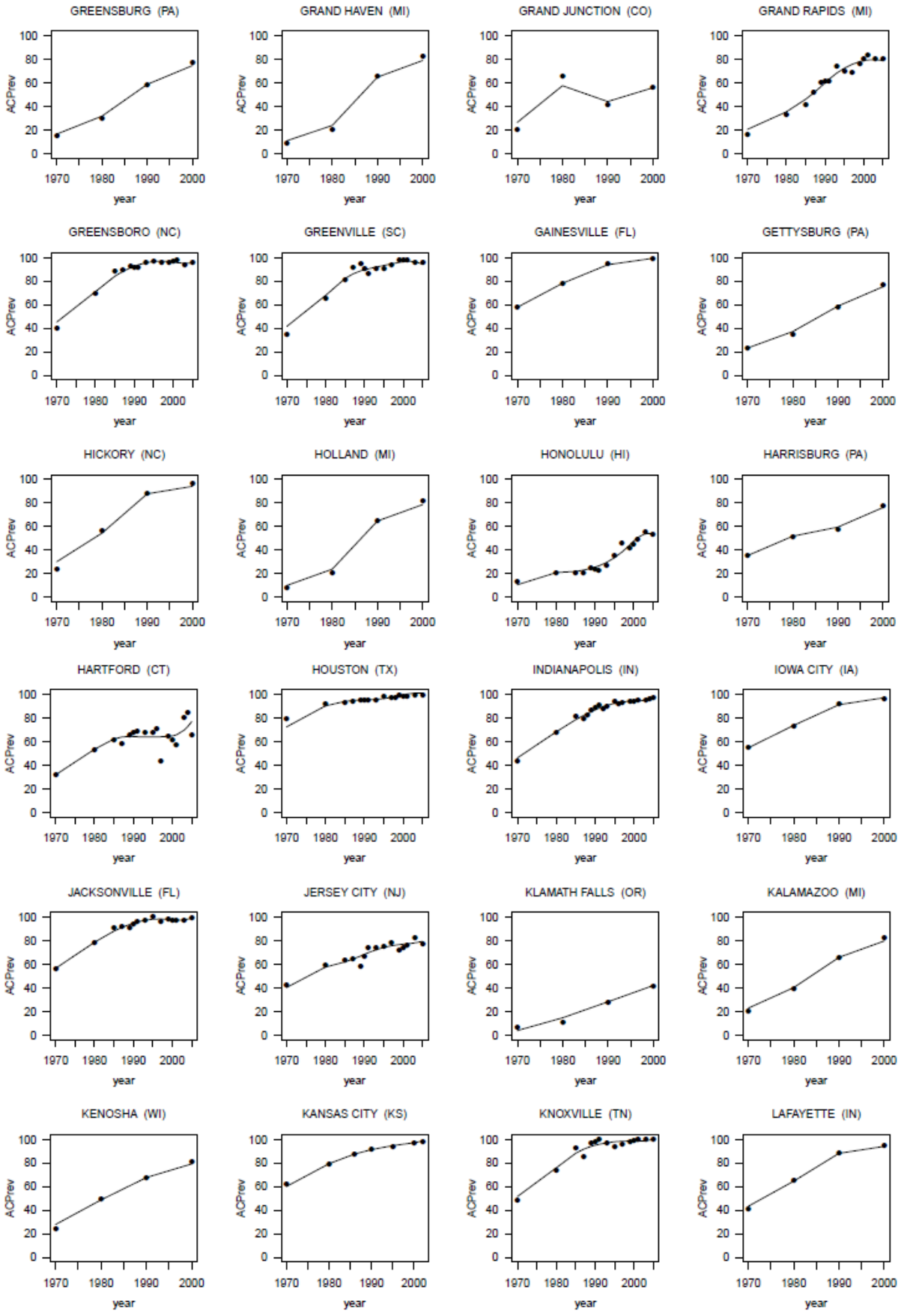

Zaragoza
ACPrev
100
80
60
40
20
0
1995
2000
2005
year

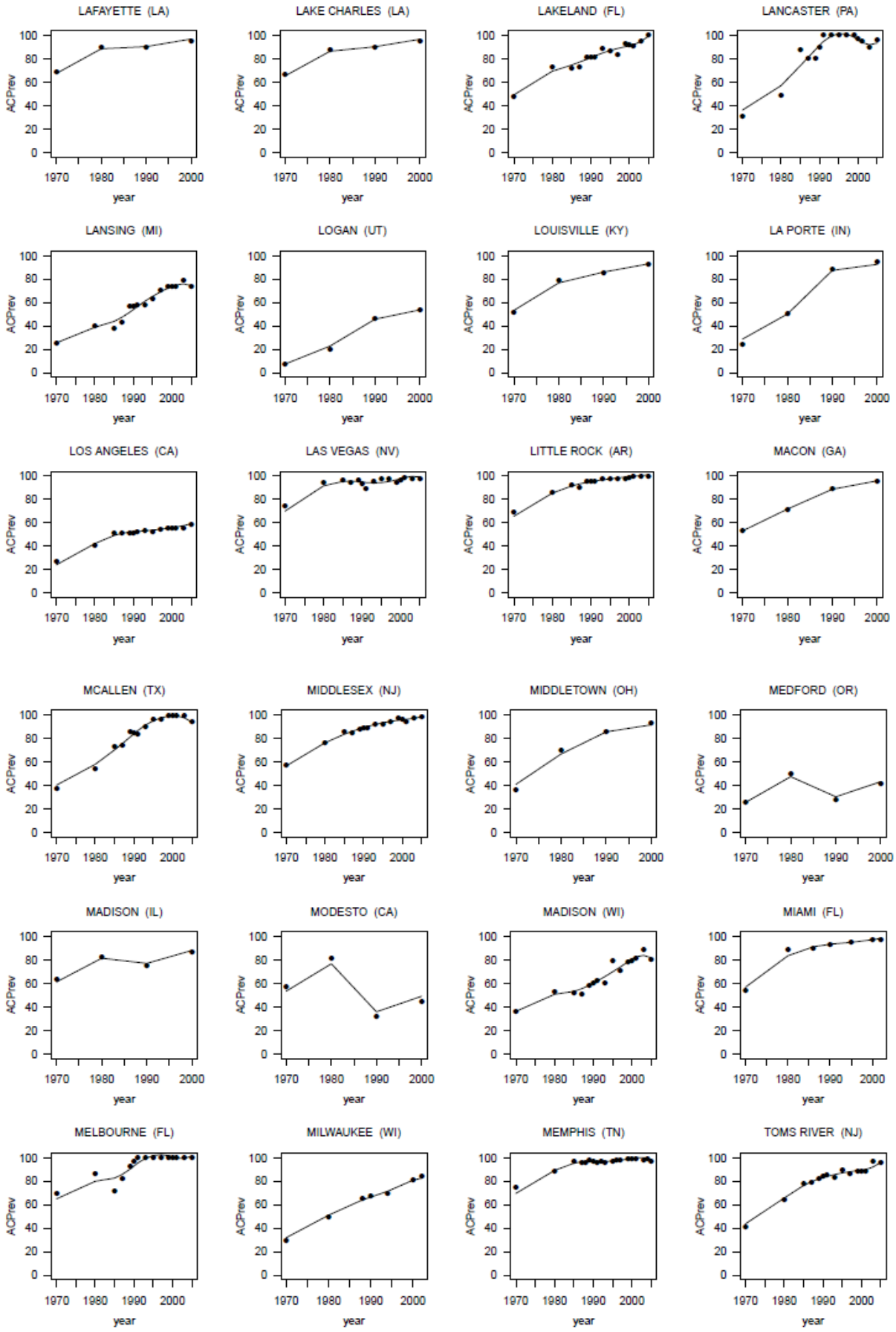
eFigure 1(d). Location specific air conditioning prevalence with the estimated smoothed trends. USA, 211 locations, period 1973-2006.

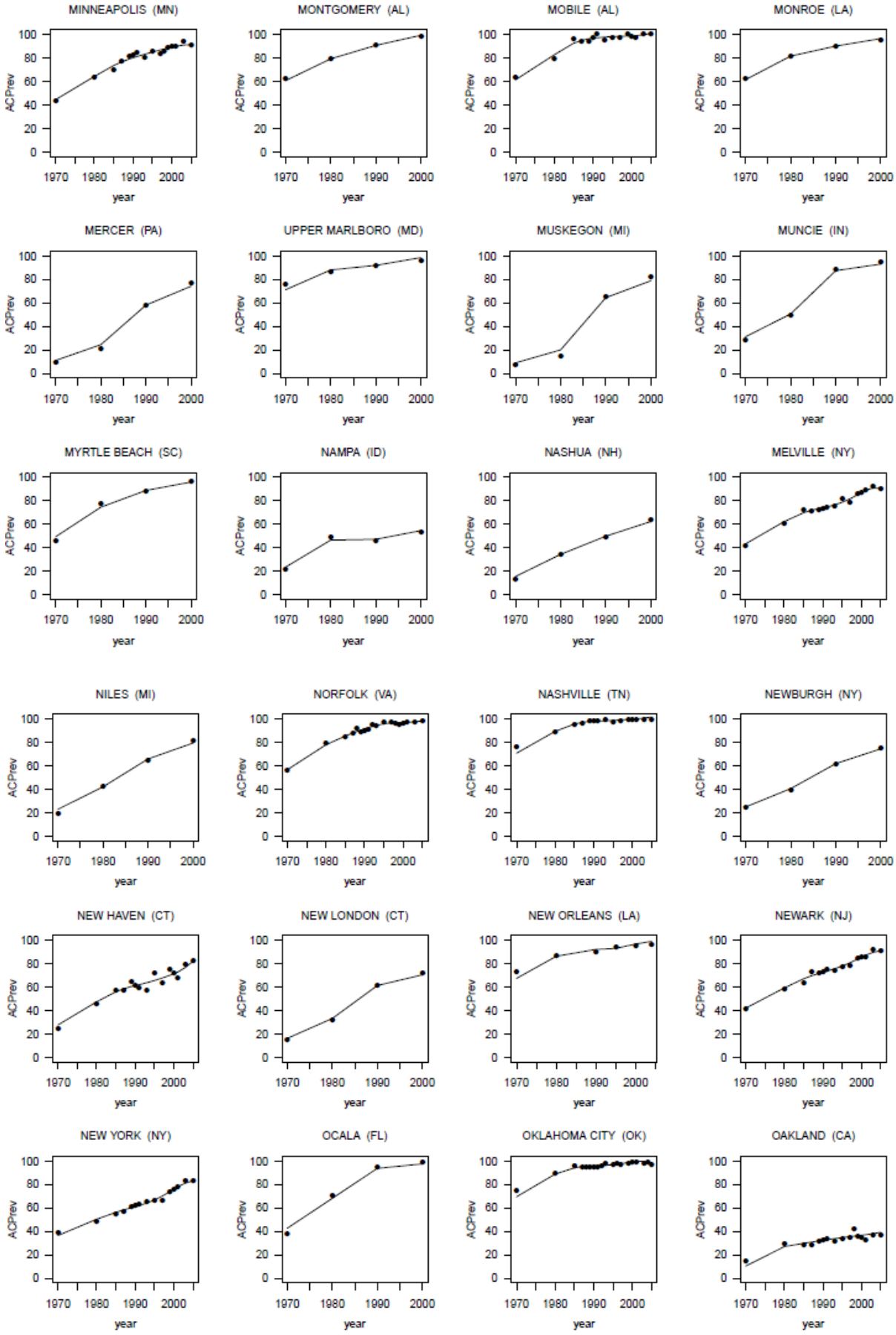


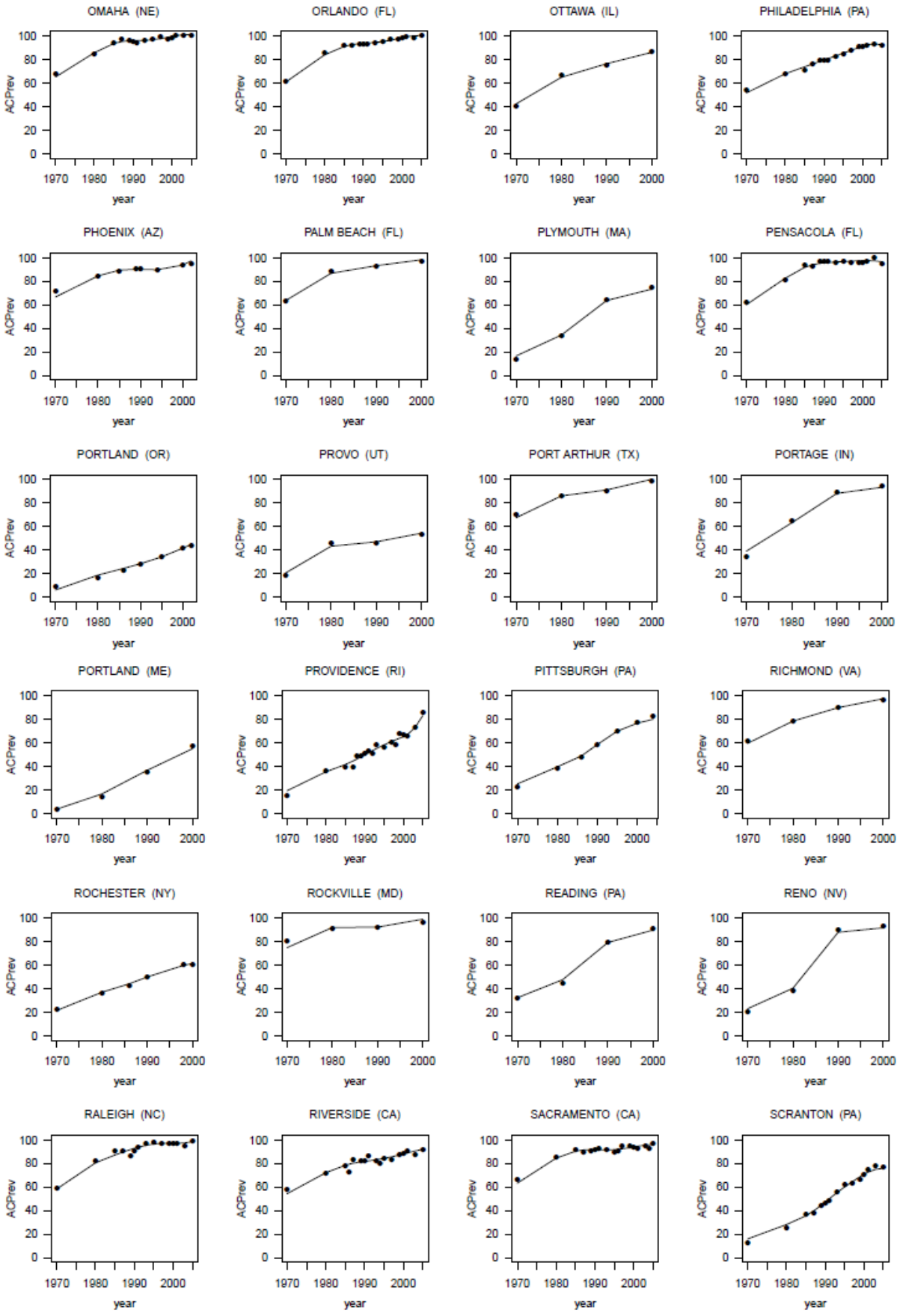

BROWNSVILLE (TX)
BOSTON (MA)
BATON ROUGE (LA)
CEDAR RAPIDS (IA)
CHICAGO (IL)
CHARLOTTE (NC)
CHARLESTON (SC)
CHATTANOOGA (TN)
CHARLESTON (WV)
COLUMBUS (OH)
COLORADO SPRINGS (CO)
CLEVELAND (OH)
CINCINNATI (OH)
CANTON (OH)
COLUMBIA (SC)
CARLISLE (PA)
CORPUS CHRISTI (TX)
LAYTON (UT)
DALLAS (TX)
DENVER (CO)
BEAVER DAM (WI)
DOVER (DE)
DURHAM (NC)
DES MOINES (IA)
ACPrev
year
0
20
40
60
80
100
1970
1980
1990
2000

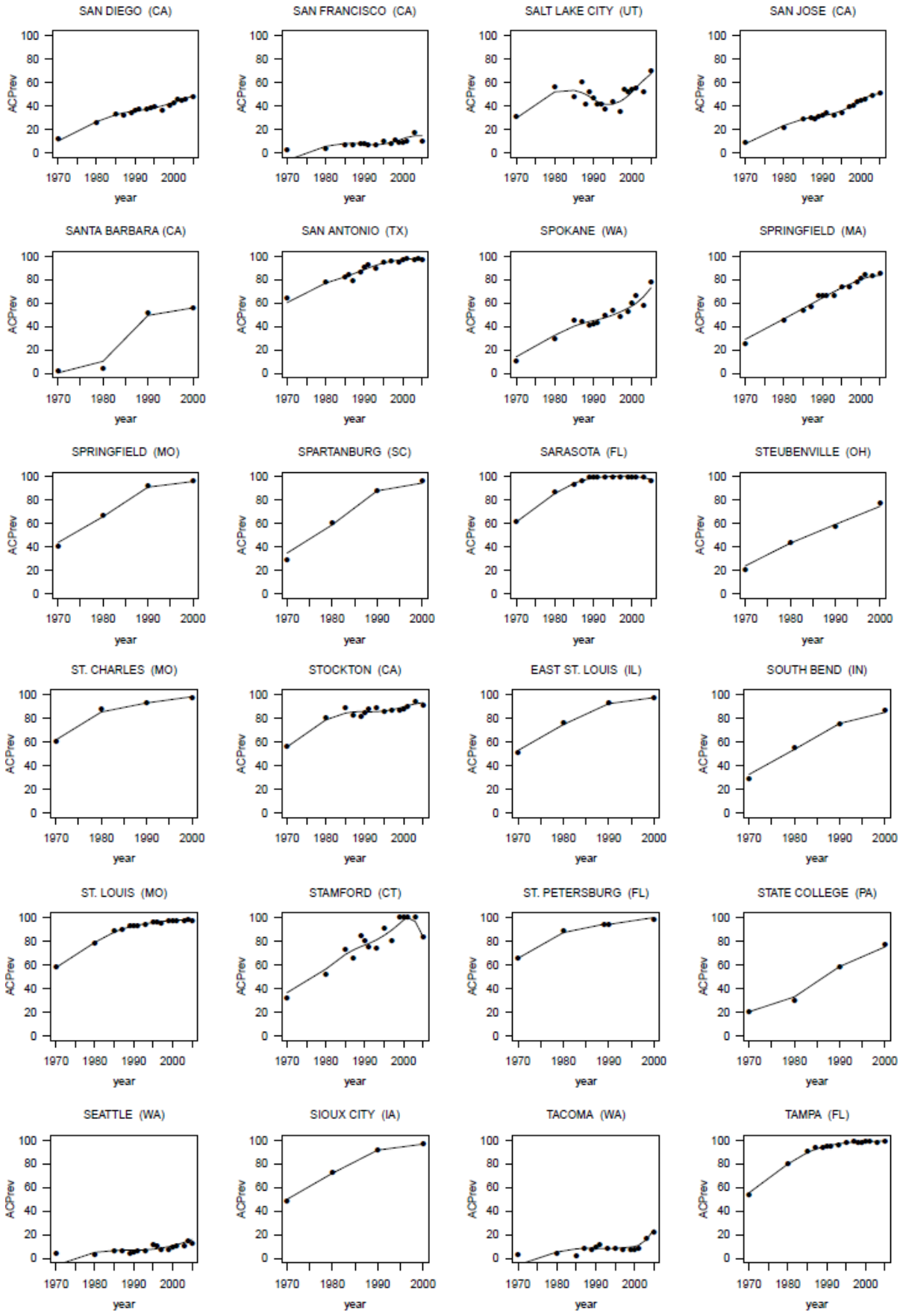

DETROIT (MI)
DAVENPORT (IA)
DAYTONA BEACH (FL)
DAYTON (OH)
EL CENTRO (CA)
ELKHART (IN)
EL PASO (TX)
ELIZABETH (NJ)
ERIE (PA)
ESSEX (MA)
EUGENE (OR)
EVANSVILLE (IN)
EVERETT (WA)
FARGO (ND)
FLINT (MI)
FRESNO (CA)
FORT LAUDERDALE (FL)
FORT MYERS (FL)
FORT PIERCE (FL)
FORT WORTH (TX)
FORT WAYNE (IN)
FAYETTEVILLE (NC)
GARY (IN)
GREEN BAY (WI)
ACPrev
year
0
20
40
60
80
100
1970
1980
1990
2000

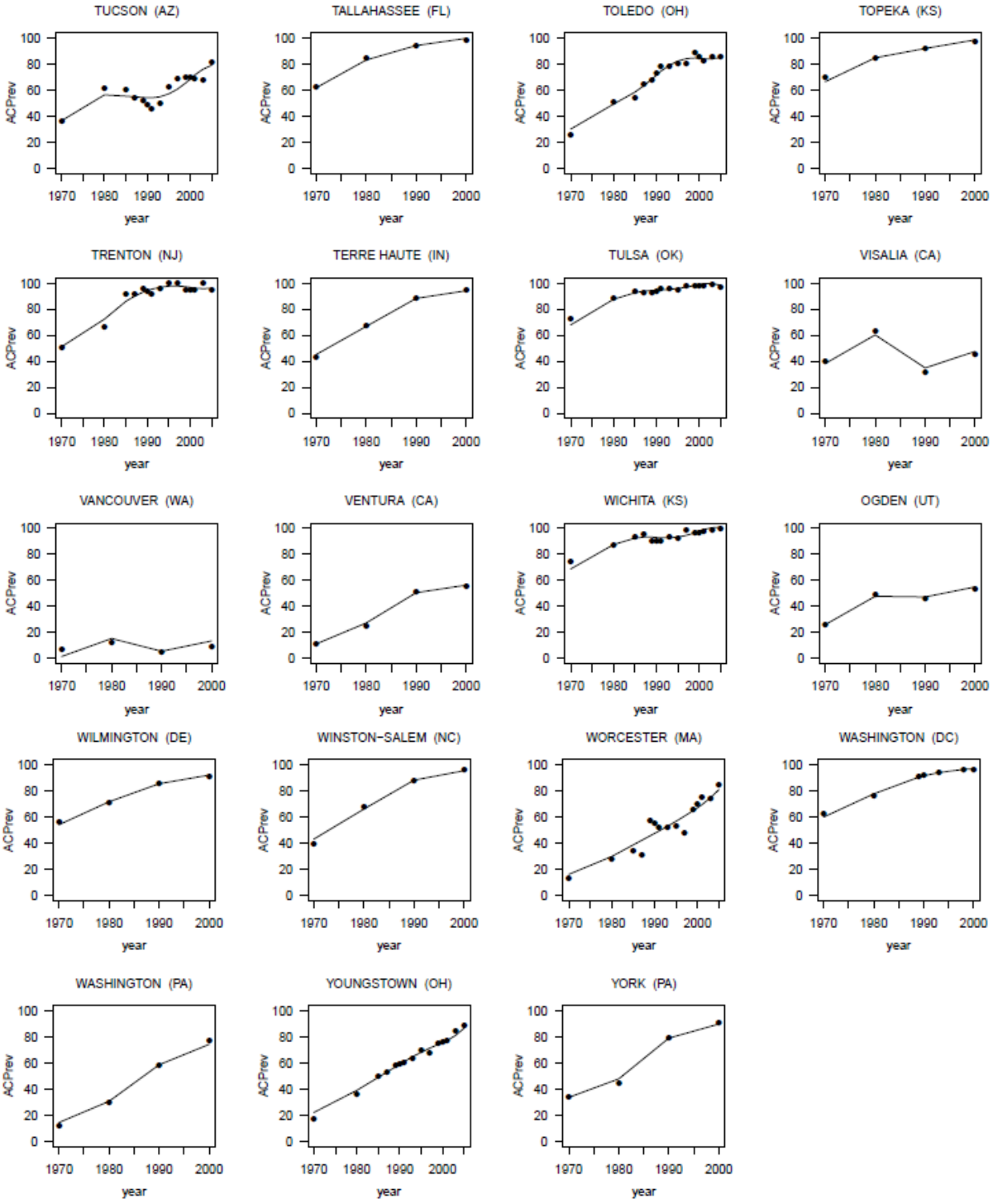

GREENSBURG (PA)
GRAND HAVEN (MI)
GRAND JUNCTION (CO)
GRAND RAPIDS (MI)
GREENSBORO (NC)
GREENVILLE (SC)
GAINESVILLE (FL)
GETTYSBURG (PA)
HICKORY (NC)
HOLLAND (MI)
HONOLULU (HI)
HARRISBURG (PA)
HARTFORD (CT)
HOUSTON (TX)
INDIANAPOLIS (IN)
IOWA CITY (IA)
JACKSONVILLE (FL)
JERSEY CITY (NJ)
KLAMATH FALLS (OR)
KALAMAZOO (MI)
KENOSHA (WI)
KANSAS CITY (KS)
KNOXVILLE (TN)
LAFAYETTE (IN)
ACPrev
year


LAFAYETTE (LA)
LAKE CHARLES (LA)
LAKELAND (FL)
LANCASTER (PA)
LANSING (MI)
LOGAN (UT)
LOUISVILLE (KY)
LA PORTE (IN)
LOS ANGELES (CA)
LAS VEGAS (NV)
LITTLE ROCK (AR)
MACON (GA)
MCALLEN (TX)
MIDDLESEX (NJ)
MIDDLETOWN (OH)
MEDFORD (OR)
MADISON (IL)
MODESTO (CA)
MADISON (WI)
MIAMI (FL)
MELBOURNE (FL)
MILWAUKEE (WI)
MEMPHIS (TN)
TOMS RIVER (NJ)
ACPrev
year
0
20
40
60
80
100
1970
1980
1990
2000

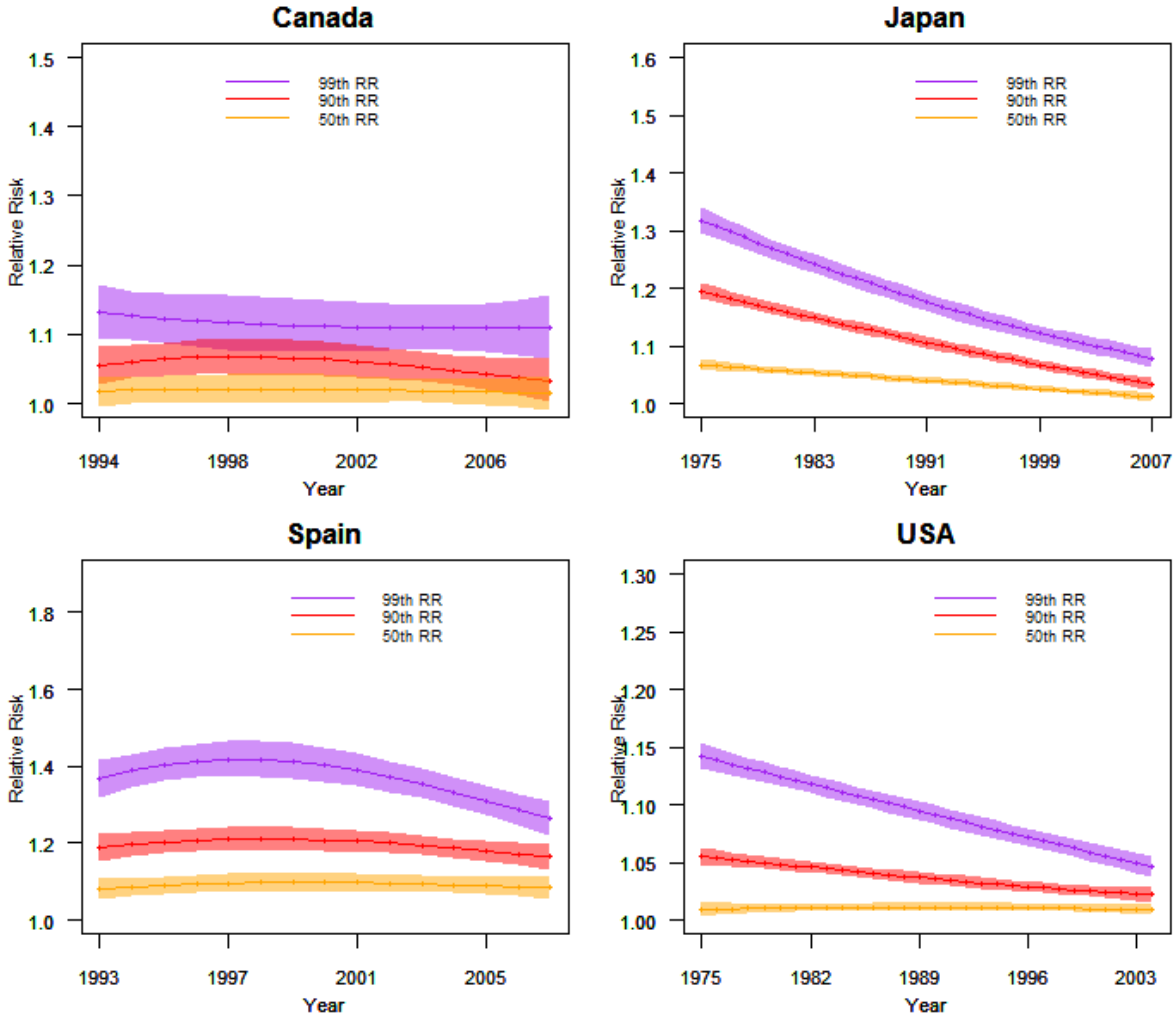

MINNEAPOLIS (MN)
MONTGOMERY (AL)
MOBILE (AL)
MONROE (LA)
MERCER (PA)
UPPER MARLBORO (MD)
MUSKEGON (MI)
MUNCIE (IN)
MYRTLE BEACH (SC)
NAMPA (ID)
NASHUA (NH)
MELVILLE (NY)
NILES (MI)
NORFOLK (VA)
NASHVILLE (TN)
NEWBURGH (NY)
NEW HAVEN (CT)
NEW LONDON (CT)
NEW ORLEANS (LA)
NEWARK (NJ)
NEW YORK (NY)
OCALA (FL)
OKLAHOMA CITY (OK)
OAKLAND (CA)
ACPrev
year
0
20
40
60
80
100
1970
1980
1990
2000


OMAHA (NE)
ORLANDO (FL)
OTTAWA (IL)
PHILADELPHIA (PA)
PHOENIX (AZ)
PALM BEACH (FL)
PLYMOUTH (MA)
PENSACOLA (FL)
PORTLAND (OR)
PROVO (UT)
PORT ARTHUR (TX)
PORTAGE (IN)
PORTLAND (ME)
PROVIDENCE (RI)
PITTSBURGH (PA)
RICHMOND (VA)
ROCHESTER (NY)
ROCKVILLE (MD)
READING (PA)
RENO (NV)
RALEIGH (NC)
RIVERSIDE (CA)
SACRAMENTO (CA)
SCRANTON (PA)
ACPrev
year
0
20
40
60
80
100
1970
1980
1990
2000


SAN DIEGO (CA)
SAN FRANCISCO (CA)
SALT LAKE CITY (UT)
SAN JOSE (CA)
SANTA BARBARA (CA)
SAN ANTONIO (TX)
SPOKANE (WA)
SPRINGFIELD (MA)
SPRINGFIELD (MO)
SPARTANBURG (SC)
SARASOTA (FL)
STEUBENVILLE (OH)
ST. CHARLES (MO)
STOCKTON (CA)
EAST ST. LOUIS (IL)
SOUTH BEND (IN)
ST. LOUIS (MO)
STAMFORD (CT)
ST. PETERSBURG (FL)
STATE COLLEGE (PA)
SEATTLE (WA)
SIOUX CITY (IA)
TACOMA (WA)
TAMPA (FL)
ACPrev
year
0
20
40
60
80
100
1970
1980
1990
2000


TUCSON (AZ)
TALLAHASSEE (FL)
TOLEDO (OH)
TOPEKA (KS)
TRENTON (NJ)
TERRE HAUTE (IN)
TULSA (OK)
VISALIA (CA)
VANCOUVER (WA)
VENTURA (CA)
WICHITA (KS)
OGDEN (UT)
WILMINGTON (DE)
WINSTON-SALEM (NC)
WORCESTER (MA)
WASHINGTON (DC)
WASHINGTON (PA)
YOUNGSTOWN (OH)
YORK (PA)
ACPrev
year
0
20
40
60
80
100
1970
1980
1990
2000

eFigure 2. Country specific trends of relative risks calculated at 90th, 95th and 99th percentile of the country specific mean temperature distribution in summer months.



eFigure 3. Analysis of the raw residuals of the multivariate multilevel meta-analysis model. For each outcome (spline coefficient) are shown the histogram of the residuals, and the scatterplot of the residuals (y axis) versus AC prevalence (%) and calendar year (x axes).