Philippines' Progress Towards the Millennium Development Goals: geographical and political correlates of subnational outcomes

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Abstract   While the Philippines seems to be on track towards achieving some Millennium Development Goals (MDGs), subnational disparities exist indicating possible patterns of isolation or discrimination. This paper examines whether and how geographical and political economy factors help to explain these disparities, focusing specifically on the MDG targets most closely related to the Human Development Index: poverty incidence, per-capita income, infant mortality and primary education completion rates. The paper shows that climate, topography and other spatial factors affect the pace of communities with respect to human development targets. In addition, history and institutions also play a role: provinces characterized by ongoing social-political or socio-cultural conflicts with the state, or those governed by local political dynasties, are lagging on most outcomes.

Key words: Millennium Development Goals, Geography, Political Economy

Introduction

The Philippines committed itself to the World Social Summit goals of reducing global poverty and other forms of human deprivation, using 1990 as the base year. These were later included among the Millennium Development Goals (MDGs) and are targeted to be achieved by the year 2015. In a recent assessment of the Philippines' effort towards the MDGs, regional disparities in outcomes were noted.[1] This suggested possible spatial factors driving performance, such as geography and location-specific socio-political dynamics.

   The objective of this paper is to examine provincial level outcomes and to determine why some areas or peoples may be lagging in key MDG outcomes. It seeks to answer the question: Are any patterns of isolation or discrimination across locations or subpopulations indicated by the current

dispersal of outcomes? If so, what geographic and/or political economy factors may explain these? We focus on current poverty, per-capita income, infant mortality and primary education completion rates — the MDG targets most closely related to the dimensions of the Human Development Index.

The second section will profile the Philippines, highlighting key administrative, geographic and socio-political features. The following section will review the status of the MDGs, highlighting notable disparities on the sub-national level. The fourth section will look more deeply into poverty rate and per-capita income, infant mortality and education goals, and explore possible correlates, both geographical (topography, climate, market proximity) and socio-political (ethnicity, social conflicts, public institutions). The final section will illustrate results and conclude.

Profile of the Philippines

Administrative subdivisions

The Philippines is an archipelago of 7100 islands off the coast of Southeast Asia with a total land area of about 300 000 square kilometers. Eleven islands make up 95% of the landmass; two — Luzon, in the North, and Mindanao, in the south — together with the cluster of Visayas Islands that separate them, represent the three major island groups of the archipelago. For political administration purposes, these three island groups are subdivided into 16 regions: Regions I–V, the Cordillera Administrative Region and National Capital Region, or Metro Manila in Luzon; Regions 6–8, in the Visayas; and Regions 9–12, CARAGA and the Autonomous Region of Muslim Mindanao (ARMM) in Mindanao — seventy-eight provinces, eighty-two cities, 1525 municipalities and 41 939 villages or '*barangays*'. Collectively, the 1608 towns and cities of the country form a national, hierarchical network of settlements characterized by a single large and dominant urban center, Metro Manila. Politically, local governments are still highly dependent on budget transfers from the National Government, which is based in Metro Manila (Appendix 1).

Fifty-six percent of the 76 million Filipinos live in Luzon; the rest are almost equally distributed in Mindanao and the Visayas. The average annual population growth rate between 1995 and 2000 was 2.36. By 1990, close to one-half of the country's total population was already living in urban areas.[2]

Topography[3]

The Philippines has great topographical variation that has posed major challenges for the provision of necessary infrastructure. It is largely mountainous, creating narrow coastal plains and interior valleys and plains. All islands are prone to earthquakes.

Climate and weather

Climate and weather is varied. Generally described as 'tropical marine', four climate types actually span the country. Average annual rainfall thus differs

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greatly across the country, with the mountainous east coast section of the country receiving five times more annual rainfall (about 5000 mm) than some sheltered valleys.

The Philippines has an average of 20 tropical cyclones per year occur with eight or nine of these directly crossing the archipelago. In addition, it is subject to the El Niño phenomena occurring every 3–6 years and lasting 18 months (for instance in 1992–1993, which actually persisted until early 1995, and again in 1997–1998).

The topography, climate and weather patterns, among others, combine to determine land use and land capability, crop production patterns, housing patterns and disease burden. For instance, topography comes into play for malaria that is endemic to rural, hilly or mountainous, and hard to reach areas.[4]

Ethnicity and social conflict

Filipinos are principally a blend of Malay, Chinese, Spanish, Negrito, and American stock, and can be organized into at least three major groupings: the Christianized groups, constituting more than 90%, found mainly in the lowlands and the coastal areas of the archipelago; the Islamized or Muslim-influenced groups, constituting less than 10%, found in the Sulu archipelago and southwestern Mindanao; and the indigenous peoples or cultural communities, who inhabit the hilly and mountainous interiors of a number of major islands.

While there are at least fifty-one major ethno-linguistic groups in the country,[5] social cleavages seem to be founded primarily on socio-cultural (upland tribes versus lowlanders), socio-political (Muslims versus lowland Christians), and economic (land tenure) differences rather than ethnic or racial ones (Azama, 1985).

Indigenous people[6]

The identification of an 'unassimilated minority', or the indigenous people (IP), began during the Spanish era, referring to natives in the mountains as well as those who retreated to the hinterlands and put up a strong resistance against the colonizers. Today, the Philippines is the only country in Asia that has officially used the term 'indigenous people' and has recognized their rights as such, through the Indigenous People's Act of 1997.

The IP's customary concepts and practices of land use and ownership — *ancestral domain* — embody the basic rule of collectivism where the notion of private ownership by one or a few is alien. Unfortunately, until the Indigenous People's Act, state policy contradicted and even denied the customary concepts of collectivism, so that even ownership of the famous rice terraces of the Cordillera people in the north became questionable.

In 1989, the estimated IP population was about 11 million with 58% in Mindanao, 41% in Luzon, and 1% in the Visayas. The greatest concentration of IP is in the Cordillera Region.

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Moro secessionists

The Muslim–Christian or the Moro–Christian divide, is a second social conflict, armed, and possibly the most deeply rooted. Notwithstanding the terminology, it is not a religious struggle, but a *political* one, rooted in a struggle for justice. Hence the use of 'Moro' rather than 'Muslim'.

Moro insurgent movements date back to Spanish rule when the Muslim population of southwestern Mindanao and the Sulu Archipelago (i.e. today's Region 9, 12 and ARMM) strongly resisted colonization. More immediate causes of insurgency rose out during the late 1960s with 'homesteading' or occupation of traditional Muslim land by Christians from the north. In 1968, a distinctly Islamic movement, the Moro National Liberation Front or *Bangsamoro*,arose to fight for an independent Moro nation, reaching its peak in 1973-1975 with some 30 000 armed fighters. Today, a breakaway group called the Moro Islamic Liberation Front continues to advocate, a more exclusive, Islam-framed definition of Moro nationalism and is what remains of the secessionist movement today.

Communist insurgency

A final arena of conflict — the communist insurgency — has its roots in the peasant armed rebellions of the early 1900s. Driven primarily by land tenure issues, early communist and socialist groups coalesced in the late 1930s, became an anti-Japanese guerilla movement in the early 1940s and eventually a real rebellion in 1946 — the 50 000 strong 'Huk' Rebellion — which lasted until 1954.

Today's New People's Army (NPA), the military wing of a revived Communist Party of the Philippines (CPP), was formed from remnants of the Huk fighters in 1969. At its strongest, the CPP-NPA claimed 20% of the 40 000 villages across the country, a sphere of influence that decreased to 0.01% by 1995.[7] They continue their activities and have recently been branded as international terrorists by both Philippine and US governments.

Political dynasties

Guiterrez (1994) points out that the Philippine political experience is 'change in a changeless society', where powerful and elite groups have resisted change and political administration is treated as a personal affair. In his study of the 1992-1995 House of Representatives, he found that 145 out of 199 elected representatives, or almost three-quarters, were members of political families. The 1987 Philippine Constitution prohibits political dynasties but enabling legislation has yet to be passed.[8]

Status and trends: national and subnational levels

Trends in human outcomes from 1990–2000 reflect events of the decade. The 1980s saw a debt crisis in 1983, the toppling of a 20-year dictatorship

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through a people-power revolt in 1986, a series of military coups from 1987 to 1989, and devastating natural calamities in 1989 and 1990. The first three-quarters of the 1990s were then relatively 'peaceful', allowing notable gains for poverty reduction and human development. Two presidents — Corazon Aquino (1986–1992) and Fidel Ramos (1992–1998) — shepherded the integration of a social reform and human development-framework into national development plans that helped reduce the incidence of income poverty from 49% in 1985 to 45.3% in 1991 to 37% in 1997. Things took a turn for the worse in the final quarter of the 1990s however — and after the Asia-wide financial crisis in 1997, the El Niño weather phenomena in 1998, and yet another 'people power' movement during the final quarter of 2000, income poverty ticked-up once more to 39.4% in 2000.

Table 1 presents 10 of the key targets set out under the MDGs. Five have *high* prospects of being achieved by 2015 — namely, access to safe water, elimination of gender disparities in education, reducing under-5/infant mortality, halting the spread of HIV/AIDS, halting the incidence of malaria and other major diseases; four have *low* prospects — namely, reducing official income poverty, reducing hunger, universal completion of primary education, reducing maternal mortality; and one — increased access to reproductive health services — has a *fair* prospect (Box 1). To supplement the following discussion, selected tables and maps are presented in Appendix 2 (Tables A1–A4).[9]

TABLE 1. Likelihood of achieving MDG targets

Target for 2015[a]	Likelihood of achieving targets		
	High	Medium	Low
1. Halve percentage of people living in extreme poverty			
Official methodology			/
Consistent methodology	/		
2. Halve percentage of population below minimum level of dietary consumption and halve proportion of underweight under-5s			/
3. Halve percentage of population with no access to safe water	/		
4. Universal access to and completion of (to 80%) primary education			/
5. Eliminate gender disparities in all levels of education	/		
6. Reduce under-5s and infant mortality by two-thirds	/		
7. Reduce maternal mortality by three-quarters			/
8. Increase access to basic reproductive health services to 100% by 2015		/	
% of births attended by skilled personnel			
Contraceptive use			
9. Halt and reverse the spread of HIV/AIDS	/		
10. Halt and begin to reverse incidence of malaria and other major diseases	/		

[a] The numbering used does not correspond with MDG official numbering of goals and targets for 2015.

Box 1: measuring likelihood of achieving targets

We classify a target as *high* (highly likely) if it can be achieved using the same pace set between 1990 and 2000 (i.e. if the ratio of annual actual progress from 1990–2000 to annual required progress from 2001–2015 is greater than or equal to unity). Let λ represent this ratio. A target is classified as *fair* if a pace up to 1.5 times faster will be needed or $0.67 \leqslant \lambda < 1.0$; and *low* if a pace more than 1.5 times faster will be required or $\lambda < 0.67$

Operationally, λ is measured as:

$$\frac{(\text{current MDG level} - \text{baseline MDG level})/(\text{current year} - \text{base year})}{(\text{target MDG level} - \text{current MDG level})/(2015 - \text{current year})}$$

Note that current year and base year are years closest to 2000 and 1990, respectively, for which data is available, but not necessarily either.

For example, poverty incidence (consistent methodology) in the Philippines is 34.3% in 1991 and 27.5% in 2000. Target poverty incidence by 2015 is 17.2%. This means:

$$\lambda = \frac{(27.5 - 24.3)/(2000 - 1991)}{(17.2 - 27.5)/(2015 - 2000)} = 1.1$$

Target 1: reducing income poverty from 45.3% in 1991 to 22.5% in 2015

Prospects for achieving this target are either *low* or *high* depending on the methodology employed. Official national income poverty decreased from 45.3% of the population in 1991 to 37% in 1997, only to go up again to 39.4% in 2000.[10] At this rate, the proportion of the population living below poverty line has to be reduced by 17 percentage points or double the rate registered (9.9%) over the 15 years from 1985 to 2000, to reach the 2015 target of 22.5% poverty incidence.

When poverty is measured using a more 'consistent' methodology rather than the official methodology however, prospects change.[11] Poverty incidence moved from 34.3% in 1991 to 25.1% in 1997, and back up to 27.5% in 2000, making the likelihood *high* that the poverty target of 17.2% will be met. Wide spatial disparities are noted, however: poverty incidence in Marinduque (48.8%) and Romblon (74.4%), which are small island provinces off Luzon, is seven to ten times more than that in Metro Manila (5.6%) and adjacent provinces, such as in Laguna (7.7%), Rizal (10.5%) and Cavite (10.9%). In Mindanao, the poverty incidence in island provinces of Region 9 (Basilan) and ARMM (Tawi-Tawi and Sulu) ranges from 63% to 92%, whereas it ranges from 19% to 30% in the regional centers of trade (Davao Sur, Misamis Oriental and South Cotabato) (Appendix 2, Table A1). 'Consistent' poverty figures will be used in this report henceforth.

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Target 2: reducing hunger from 34.5% in 1989–1990 to 17% in 2015

Prospects for achieving this are *low*. Based on International Reference Standards, the prevalence of moderately and severely underweight children under 5 years old decreased from 34.5% in 1989–1990 to 30.8 % in 1996, but then went up again to 32% in 1998; figures for stunted growth went from 40% in 1989–1990 to 34.5% in 1996 and 34% in 1998.[12]

Target 3: increasing access to safe water from 73.7% in 1991 to 87% in 2015

It is *highly* likely that this goal will be met. In 2000, access to safe water was already 78.5%, with some regions already surpassing the 87% target. Spatial disparities remain nonetheless, such as between ARMM in the south with only a 30.6% access rate compared with a Region 3 in mainland Luzon with 97% (Appendix 2, Table A2). Of the fifteen worse-off provinces, nine are in Mindanao; of the top fifteen provinces, thirteen are in mainland Luzon.

Target 4: universal completion (to 80%) of a full course of primary education

Prospects for this target are *low*. While 'participation' rates in elementary education for both public and private schools have significantly increased from 85% in 1991 to 97.02% in 2000, 'cohort survival rates' remained at 68.4% to 69.3% in the same period. Moreover, disparities suggest geographic, cultural and economic barriers to improved access and quality of education. The most obvious example is in Mindanao, where seventeen out of twenty-two provinces have low prospects of reaching the MDGs. Eleven of the fifteen worst-performing provinces of the country are from Mindanao, including all provinces of ARMM (Appendix 2, Table A3).

Target 5: eliminate gender disparities in all levels of education

The prospects for this target are *high*. As it is, girls have near equal or higher participation rates than boys in the elementary school level (96:100 in school year 2000–2001) and secondary levels (105:100). Moreover, women tend to have higher survival rates in school, with a greater number going forward to secondary and tertiary education. Literacy rates as of 1994 likewise show women (94%) having an edge over men (93.7%).[13]

Target 6: reduce infant mortality and under-5 mortality rates by two-thirds from 80 in 1990 to 27 in 2015

The prospects for this target are *high*. Under-5 mortality rates were significantly reduced from 80 in 1990 to 67 in 1995 while infant mortality rates declined from 57 in 1990 to 49 in 1995 — both achievements exceeding

2000 targets. On a subnational level, all provinces in Regions 3 and 4 surrounding Metro Manila are in the top fifteen performing provinces. On the other hand, provinces in Region 8 and ARMM in Mindanao are among the worst fifteen performing provinces (Appendix 2.4).

Target 7: reduce maternal mortality by one-half by 2000 (from 209 per 100 000 live births in 1993 to 105 in 2000) and by three-quarters to 52 in 2015

The prospects for this target are *low*.[14] Maternal mortality was 180 per 100 000 live births in 1995, making the first milestone in 2000 unattainable. Once again, the provinces in ARMM and Region 9 lead in highest maternal mortality rates.

Target 8: increased access to reproductive health services to 100% by 2015

The prospects of this target are *fair*.[15] Ten women die everyday from pregnancy and childbirth-related causes, and most of the maternal complications and deaths are due to limited access to reproductive health services:[16] only 77% of mothers receive a minimum three pre-natal checkups, 57% receive iodine, 33% receive tetanus toxoid immunization, 56% of deliveries are attended by health professionals, and only 57% receive post-partum care. Data generally show patterns of increasing contraceptive use and declining fertility but subnational differentials are large, ranging from 16% of married women in ARMM to 55% of those in Regions 3 and 11. This may be correlated with the level of education.

Target 9: reverse the spread of HIV/AIDS

The prospects for this target are *high*. International experts consider the situation in the country as a 'nascent epidemic' due to the very low total number of confirmed cases and its slow rate of increase. The official number of recorded HIV ab seropositive cases is 1611 since 1984 and the annual number of confirmed cases has not exceeded 200 from 1993 to 1999.

Target 10: halt and begin to reverse the incidence of malaria and other diseases

The prospects for this target are *high*. Malaria is no longer a leading cause of death in the country, although it is still a leading cause of morbidity. Morbidity has fallen from 123 cases per 100 000 in 1990 to 73 cases per 100 000 population in 1998; mortality, from 1.5 to 0.9 deaths per 100 000 population.

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Examining disparities in subnational MDG outcomes: possible geographical and political correlates

Gallup and Sachs (1998) examine geographical correlates of economic development across one-hundred and fifty countries and find that variables related to transport costs, ecological conditions, and coastal access as well as openness and quality of public institutions are important in explaining per capita income levels. In turn, Balisacan and Pernia (2002) study the evolution of per-capita expenditures across provinces of the Philippines during the 1980s and 1990s, and find that (lack of) coastal access, frequency of typhoons and the quality of local politics, among others, help explain welfare levels of the poor.[17]

We examine geographic and political factors in relation to current levels of poverty incidence, per-capita income, adjusted cohort survival rates and infant mortality. Following Gallup and Sachs (1998), explanatory factors are grouped into: (1) those that relate to the natural environment or ecology of an area, (2) those that relate to transport costs and access to external markets, and (3) other political economy variables. The hypothesized relationships of each of the factors to the MDG outcomes as well as the actual variables used in the regression are discussed in the following.

Intrinsic geographic factors

Geographic factors such as climate, topography and frequency of natural calamities have a bearing on living conditions, human security and, therefore, on human capabilities and productivity. Food production (crop patterns and productivity), shelter and livelihood patterns are largely contingent on climate and topography; likewise for disease burdens and human health. In general, one would expect that the more severe the environment — the more volatile the climate or the less productive the terrain — the more difficult to maintain or improve standards of living.

In the regression, geographic factors are represented by dummies for climate types, frequency of typhoons, and the percentage of land classified as rehabilitation and conservation zones.[18] Land resources are categorized into 'development clusters' — namely, production, expansion, rehabilitation or conservation zones — based on present land use, surface gradient, state of degradation and other physical aspects. Production and expansion zones are lands currently for agricultural production or with great potential for it; rehabilitation zones, generally uplands and critical watershed areas whose productivity is severely downgraded; and conservation zones, generally lands that are performing functions of environmental enhancement. The remaining lands are built-up areas, among others.

Access/proximity variables

The quality of links to external markets is another route by which geographical factors may affect local outcomes. To the extent that geographical

conditions facilitate access to goods and services, mobility, or enables, say, agglomeration economies, local standards of living can improve. For example, the greater the distance to commercial centers, the greater the costs of trade and services and the lower the living standards. On the other hand, the advantages of external access may be not be leveraged if the local economy is poorly integrated; that is, if these benefits cannot be distributed properly within the local economy. Thus, the more dispersed or isolated a subpopulation (say, from the provincial commercial capital), the less efficient the distribution or diffusion of goods, services and technologies.

A note on coastal access. Gallup and Sachs (1998) find that coastal access, for reasons of lower transport costs and higher intrinsic productivity, presents a clear advantage for development relative to the hinterlands or landlocked areas. Balisacan and Pernia (2002) also find that landlocked areas have lower welfare levels. It is possible, however, that, for an archipelago like the Philippines, *proximity* to the coast *per se* may not translate to more effective coastal *access*.

We use seven variables to capture the quality of access to external markets and services. The first three capture cost of access: (1) distance to Metro Manila using national road and sea routes; (2) the number of operational commercial seaports, which will represent *effective* coastal access; and (3) a dummy variable for the presence of a major international air/sea port of entry.

The next four variables try to capture local integration: (4) population density, (5) proportion of population living near the provincial commercial capital (i.e. within 2 municipalities),[19] (6) the proportion of inland population (i.e. those not living in a coastal city or municipality), and (7) road density. All variables are expected to have a positive effect on all outcomes, including — and in view of the distinction between 'proximity' and 'effective access' to the coast made earlier — the proportion of inland population.

Political economy variables

We are specifically concerned about the quality of public institutions and the effect of social and/or armed conflicts. The quality of public institutions is represented by: (1) the extent of local political dynasties, capturing the extent of collusion in local politics; and (2) per-capita national government transfers for education. Here, we measure the extent of local political dynasties as the percent of provincial officials (governor, vice governor, congressmen) in 1998 related by blood or marriage. The government transfers to education is the average for the years 1993 and 2000.

Social and/or armed conflicts are represented by: (1) the concentration of IP population per province; (2) a dummy variable for Moro-disputed areas, or where separatists have/are engaging in armed conflict; and (3) the breadth of CPP-NPA influence per province.

Poorer outcomes are expected for provinces with larger concentrations of IP: IP who have lost access to their land and other assets, or those whose livelihoods have been disrupted due to mining and logging activities, are likely

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to 'bear the burden of material poverty as well as socio-cultural deprivation'. We use IP population data from the National Commission on Indigenous People, although we are not confident about the quality of these figures.

We likewise expect poorer outcomes for Moro-disputed areas. It is asserted that the absence of political and economic self-determination has stunted progress. One demonstration of this, it is pointed out, is in education, where state policies have ignored Islamic culture and inputs in the design and delivery of programs. As a result, Muslims have rejected these programs as a key to social progress.[20]

With respect to the CPP-NPA variable, we use 1988 data on number of villages per province influenced or infiltrated by the CPP-NPA.[21] On the one hand, it is expected that widespread influence will be associated with under-development in line with claims from the Department of Defense that the communist insurgency has 'for years stunted the development of the countryside and cost the country so much in terms of development opportunities and potentials'. On the other hand, because of the steep decrease in CPP-NPA presence in the early 1990s, any influence may have become inconsequential for 2000 outcomes.

Geographical and political correlates

We combine all factors — geographic, market access and political — and augment these with five dummy variables that represent contiguous or 'homogeneous' regional clusters: Luzon 2 (for the Cordillera region), Luzon 3 (for the island provinces of Region 4 and Region 5, just off the Luzon mainland), Mindanao 1 (for Regions 9, 12 and ARMM), Mindanao 2 (for the rest of Mindanao), and Visayas. A summary of the regression results is presented in Table 2.[22]

Results for poverty and per-capita income are as follows:

1. For both poverty and per capita income, *climate matters*. Poverty incidence is higher for provinces with climate types 2, 3 and 4. Likewise, per-capita income is lower in provinces under climates 3 and 4.
2. The quality of local public institutions (i.e. *local political dynasties*) also matters. Greater collusion among provincial officials is correlated with higher poverty incidence and lower per capita incomes.
3. The *Luzon 2 (Cordilleras)*,[23] *Mindanao 1* and *Luzon 3* dummy variables show up strongly significant for both poverty and per-capita income: incidence is greater in these clusters while per-capita incomes are lower. Disparities are greatest for the Cordilleras, the region recognized as predominantly IP, and Mindanao 1, the former Muslim Mindanao, perhaps indicating the significant influence of *social-political conflict* on the development process.[24] The results for Luzon 3 on the other hand, indicate the *disadvantages of island provinces* off the Luzon mainland or, conversely, the location advantages of provinces adjacent to Metro Manila.
4. The population variables (i.e. *density, inland population and population near the capital*) show up strongly for both poverty and per-capita

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TABLE 2. Summary of results

Variable	Poverty		Per-capita income		Infant mortality		Primary education	
	Coefficient	p value	Coefficient	p value	Coefficient	p value	Coefficient	p value
Climate type 2	12.78	0.03	−3204.85	0.22	4.55	0.10	−3.34	0.51
Climate type 3	15.02	0.00	−3810.78	0.03	3.86	0.03	−5.89	0.08
Climate type 4	16.97	0.00	−3775.79	0.08	3.92	0.09	−2.98	0.48
Number of typhoons	−1.63	0.80	1025.75	0.72	−1.00	0.74	−0.57	0.92
Rehabilitation zZones	−0.08	0.43	37.25	0.40	0.08	0.08	−0.11	0.19
Distance from Manila	0.00	0.79	0.51	0.89	0.00	0.97	0.00	0.82
Road density	5.82	0.34	2094.73	0.44	−4.32	0.13	14.76	0.01
Ports	−0.37	0.00	130.07	0.02	−0.18	0.00	−0.02	0.87
International port	4.65	0.38	−3815.97	0.11	−1.34	0.59	−1.24	0.79
Population density	−0.02	0.05	9.41	0.06	0.00	0.35	0.01	0.57
Population capital	−13.46	0.04	2018.61	0.47	−2.44	0.41	10.67	0.06
Population inland	−0.14	0.01	40.95	0.08	−0.04	0.08	0.02	0.66
Indigenous people[a]	−0.24	0.00	66.02	0.07	−0.04	0.32	0.03	0.65
Moro[b]	−9.21	0.16	5900.59	0.04	−6.79	0.03	−2.09	0.71
Rebel	−0.71	0.52	34.23	0.94	−0.01	0.99	−0.32	0.74
Dynasty	13.09	0.01	−5517.07	0.02	2.53	0.28	−13.64	0.00
National government	−0.01	0.23	0.51	0.85	0.01	0.06	0.00	0.88
Luzon 2 (Cordilleras)	33.92	0.00	−6259.04	0.09	7.56	0.05	−11.76	0.10
Luzon 3	15.65	0.00	−4088.50	0.05	2.59	0.24	−4.27	0.29
Visayas	4.79	0.46	−1217.83	0.67	2.89	0.35	−6.54	0.25
Mindanao 1 (former Muslim − Mindanao)	27.45	0.01	−11254.9	0.02	13.40	0.01	−22.93	0.02
Mindanao 2	7.97	0.41	−3298.74	0.44	3.13	0.49	-16.77	0.05
Intercept	44.79	0.00	17936.53	0.00	50.88	0.00	67.25	0.00
Number of observations	70		70		70		70	
R^2	0.794		0.660		0.746		0.762	

[a] As explained in note 23, the odd results for this variable are probably due to the unreliability of the IP population data. Instead, we turn to the 'Luzon 2' variable, which represents the Cordillera provinces, to represent the IP factor.
[b] See note 24.

Base data: Armed Forces of the Philippines (1988, 1995), Department of Agriculture (1991, 1992, 1995), Department of Education (various years), Department of Health (various years), Department of Science and Technology (various years), Human Development Network (2000, 2002), National Land Use Committee (2000), National Statistics Office (various years), National Statistical Coordination Board (various years).

income (except for population near the capital). Their effect is positive; that is, higher values for each are correlated with lower poverty incidence and higher per-capita incomes. The greater proportion near the capital (i.e. a greater 'urbanizing' population) may matter more for the distribution rather than for the level of per-capita incomes.
5. A greater number of *commercial ports* remain significant and correlated with lower poverty incidence and higher per capita income.

We now move to other MDG outcomes.

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Infant mortality

1. For infant mortality, *all climate* variables are significant and positive, indicating the strong correlation between health outcomes and climate. Infant mortality is higher under climates 2, 3 and 4, relative to climate 1.
2. A greater proportion of rehabilitation and conservation lands (i.e. generally non-productive in the uplands or highlands) is also highly correlated with higher infant mortality rates. Again, this reflects the strong correlation between health and *topography*, most probably through disease burden patterns.
3. While political dynasty is not significant, the *Mindanao 1* variable continues to be significant and positive as is the *Cordilleras (Luzon 2)* variable.
4. The number of commercial *ports* and the proportion of *inland population* is significant. Lower costs of external access and greater proximity are correlated with lower infant mortality rates.
5. Finally, the *national government* variable is significant. Higher national transfers are correlated with higher infant mortality rates. Given the distributional role of the national government, this is expected.

Primary education completion rates

Primary education completion rates are simply cohort survival rates adjusted for participation rates. Regressing against the same geographical and policy variables results in the following:

1. As was the case for all previous models, *Mindanao 1* is again significant. Completion rates are lower in the former Muslim Mindanao.[25] This is consistent with the observation that public education programs as currently designed may be inappropriate or irrelevant to the non-Christian population. In addition, the completion rates in *Mindanao 2* are lower significantly lower, indicating that the *whole of Mindanao* is significantly disadvantaged in primary education outcomes.
2. Following the Mindanao provinces, completion rates in the *Cordilleras (Luzon 2)* are significantly lower as well.
3. *Political dynasty* is significant. Political collusion *could be* hindering the effective delivery of or full access to public education services.
4. *Road density* is significant and positive: a greater road density is correlated with higher completion rates. Finally, one *climate* variable is significant; provinces subject to climate 3 have lower completion rates relative to others.

Illustration of results and concluding remarks

In summary, the country seems to be on track in achieving the MDGs related to poverty, infant mortality, the control of major diseases, access to safe

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water and gender equity in education. However, it will be unlikely that targets related to universal completion of primary education, malnutrition, access to reproductive health services and maternal mortality would be achieved. Nonetheless, subnational disparities exist, indicating possible patterns of isolation or discrimination.

The objective of this paper was to examine whether and how geographical and political economy factors help explain such subnational MDG disparities.

It turns out that climate, topography and other spatial factors correlate highly with the pace of provinces with respect to key development targets. In addition, the political economy or institutional context of a people is found significantly linked to progress: provinces with a history of socio-political or socio-cultural conflicts as well as dynasties in local politics have generally done worse.

1. *Climate type* explains a great deal of the variation in poverty, per-capita income and infant mortality outcomes. In particular, areas subjected to persistent rainfall or no pronounced seasons are disadvantaged relative to areas with distinct dry and wet seasons (Figure 1). While the frequency of typhoons is not statistically significant, this does not mean that typhoons have no bearing. Rather it indicates that overall climate conditions, of which typhoons is one factor, is the more important concern.
2. *Topography* matters to infant mortality. Along with climate, this contributes to the disease burden of a locality.
3. Proximity or access to markets is also important. *Commercial ports*, *road density*, *proportion of population inland*, *proportion of population near capital* and *population density* are statistically significant for a number of outcomes. A higher number of commercial ports is correlated with lower poverty incidence, higher per-capita income and lower infant mortality, while greater road density is correlated with higher education completion. Greater inland populations are also correlated with lower poverty, higher per-capita income and lower infant mortality, while a greater population near the capital with lower poverty and higher education completion rates. The isolation of the *island provinces of Luzon* may explain their high poverty rates and low per-capita incomes.
4. Beyond geography, the socio-political appear to matter. For one, political collusion at the local level, represented by a *provincial political dynasty*, is correlated with higher poverty, lower per-capita income and lower primary education completion rates. Dynasties seem to inhibit the efficient functioning of markets and the quality or delivery of public services.
5. While it is difficult to isolate examples of provinces with high poverty attributed solely to dynasties, the Bicol region provides a rough illustration (Figure 2). While all six Bicol provinces have similar climate (climate types 2–4) and typhoon patterns, the poverty incidence in two provinces that feature dynasties (i.e. Masbate at 73% and Sorsogon at 53%) is notably lower than that of the other four. In fact, it can be shown that the political dynasty of Masbate is actually more entrenched and enduring, further explaining the 20 percentage point gap between it and Sorsogon.
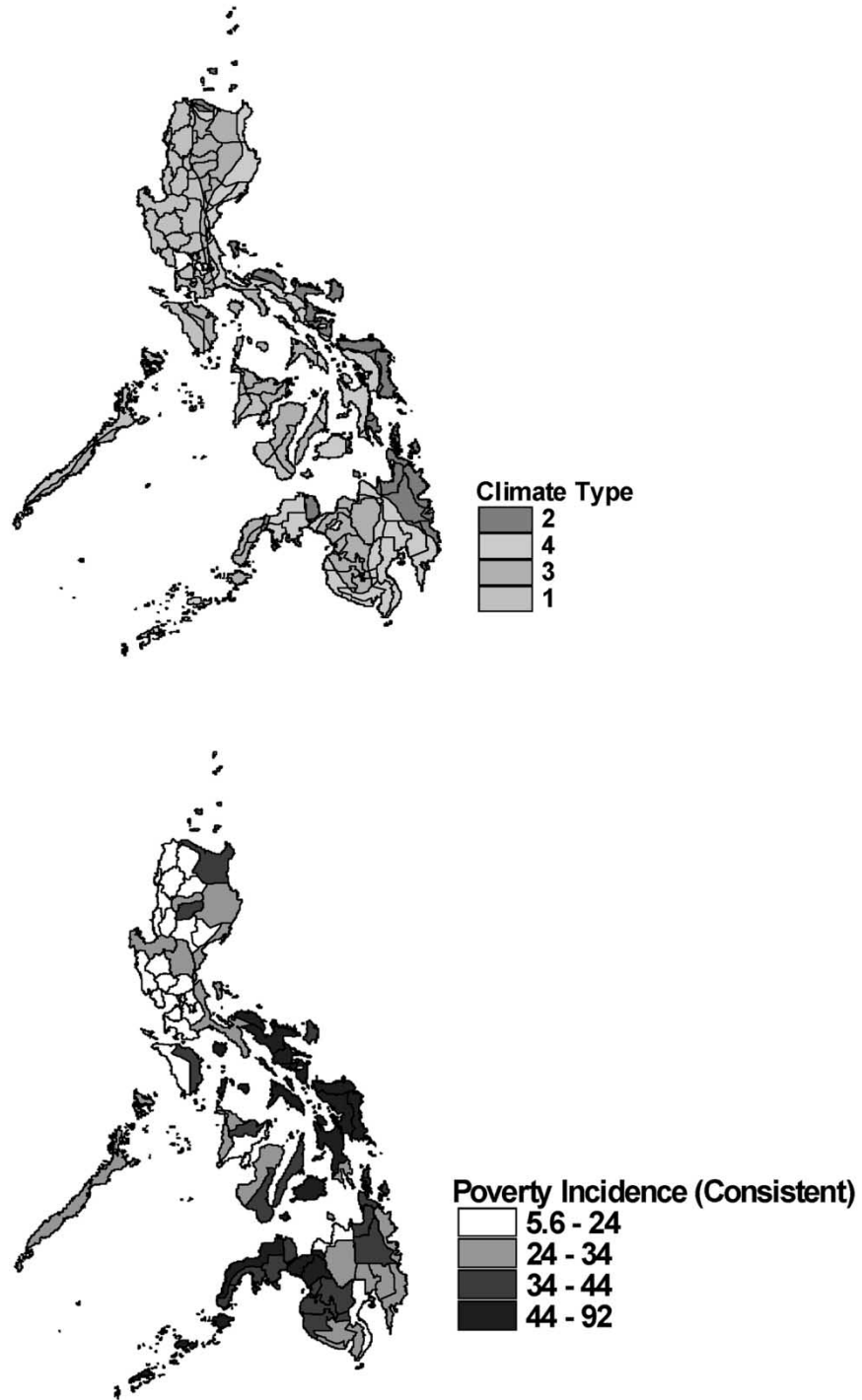
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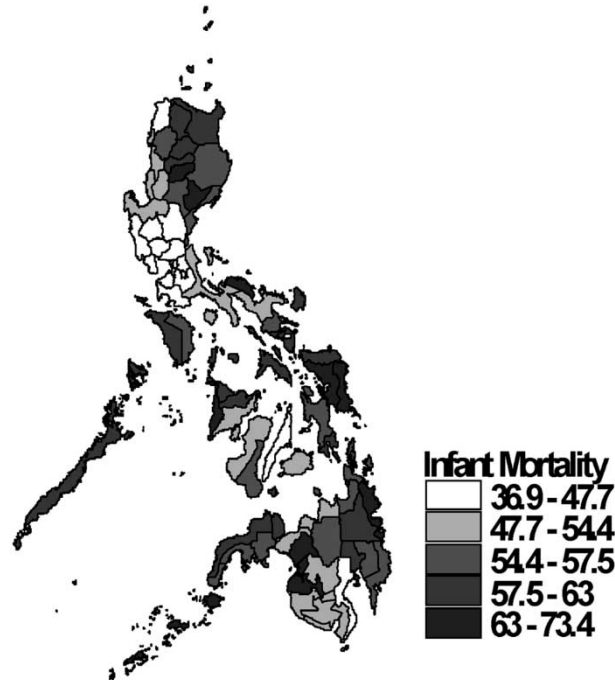FIGURE 1. Climate, poverty incidence and infant mortality.

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FIGURE 1. *Continued.*

6. A second socio-political factor is the fact of socio-cultural and armed conflict (Figures 3 and 4). Specifically, provinces in the former Muslim-Mindanao (Regions 9, 12 and ARMM), which have been involved in the Moro secessionists' armed struggle, are behind on all counts. Likewise for provinces with the highest concentration of IP population (i.e. those in the *Cordilleras*). The Moro and IP conflicts are, at their root, about political, economic and cultural self-determination. Interestingly, a history of communist insurgency in the 1980s has no significant bearing on subnational outcomes today.

7. Finally, broad spatial patterns remain unexplained. The whole of *Mindanao* (and not just Moro-contested areas) is lagging in education outcomes, while the *Visayas* in nutrition outcomes (Figures 4 and 5).

To conclude, a few policy implications present themselves. That climate matters seems obvious. Unfortunately, it is *not* apparent how subnational nuances in climate and weather conditions actually influence the design of public infrastructure and the allocation of funds. For instance, funds for the construction of one-classroom school-buildings for the countryside are controlled by the central government and are based on a standard design (e.g. about PhP 305 000.00 per classroom, or US$ 6000.00). However, an island province that experiences type 2 climate (with no dry season and very heavy rainfall from November to January) and very frequent typhoons would require different roofing materials, walling and window designs (to
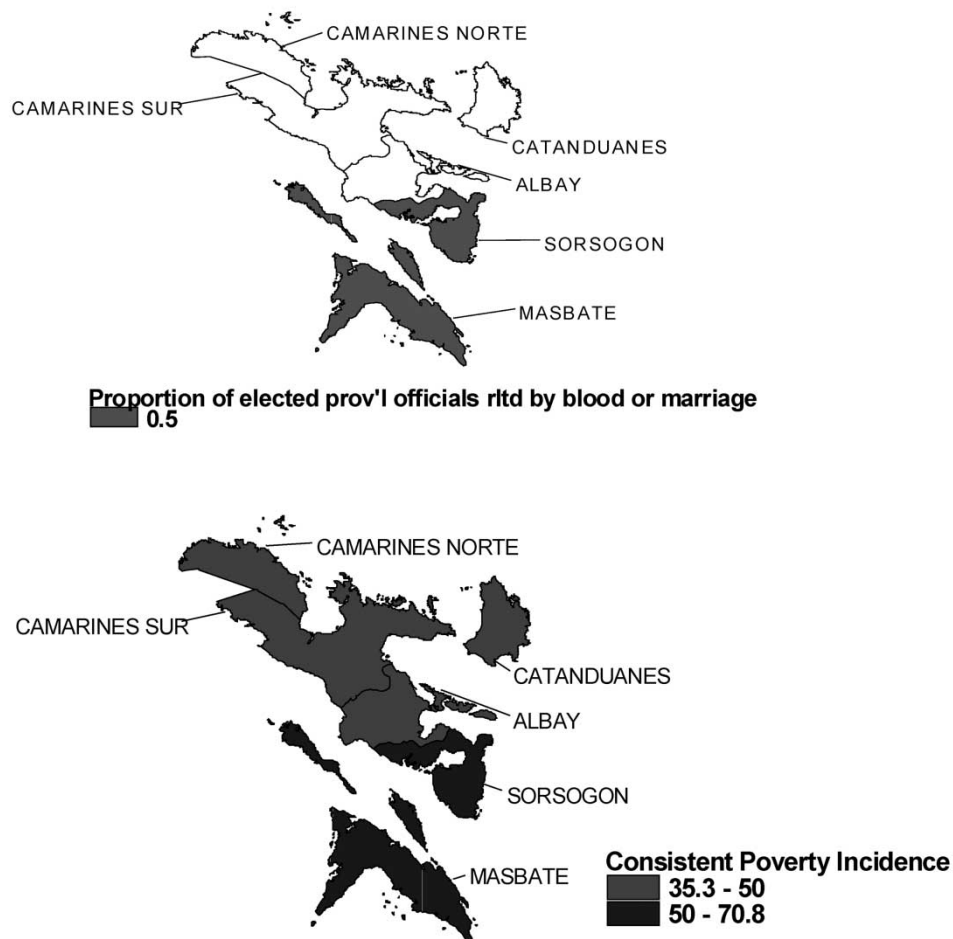
FIGURE 2. Dynasties and poverty incidence in Bicol (Region 5).

mitigate corrosion) as well as higher hauling and transport costs, or about 60-110% more per classroom.[26] Other centrally controlled budget allocations — for instance, the agricultural modernization budget that is divided equally among congressional districts regardless of geographic attributes — will probably have the same shortcomings.

The results on climate also highlight the importance of agricultural research and development and extension services. It is not clear whether and how technological interventions from the Department of Agriculture are adapted to local climate and geographical peculiarities or how these peculiarities figure into policy and planning exercises at the national level.[27] Balisacan and Pernia (2002), who earlier found 'typhoons' to have a statistically significant and negative effect on the poor, were silent on possible policy implications.

Geography should also make a difference in countryside development,

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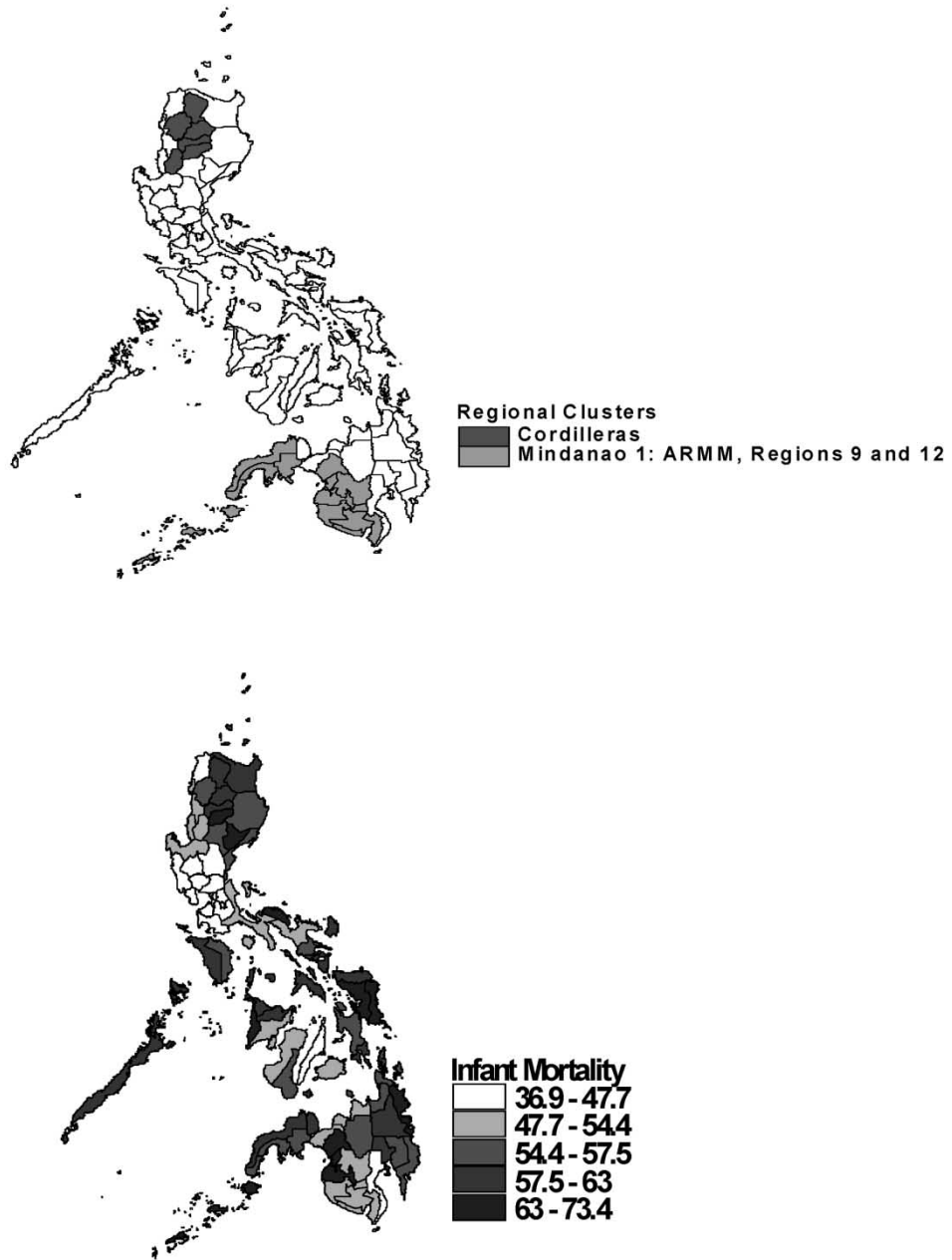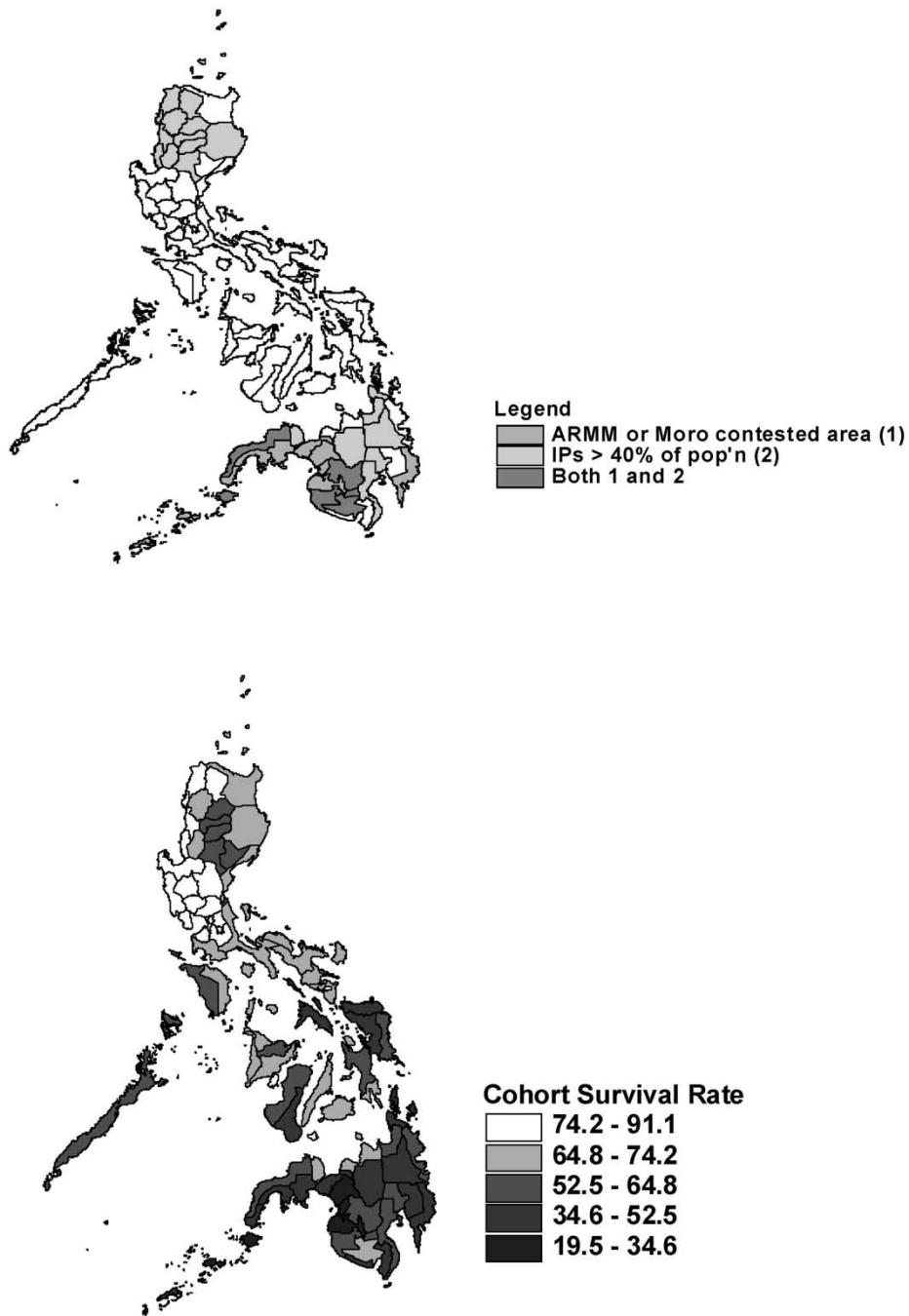FIGURE 3. Infant mortality in the Cordilleras and the former Muslim-Mindanao (Mindanao 1).

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FIGURE 4. Primary education completion in IP areas and whole Mindanao.
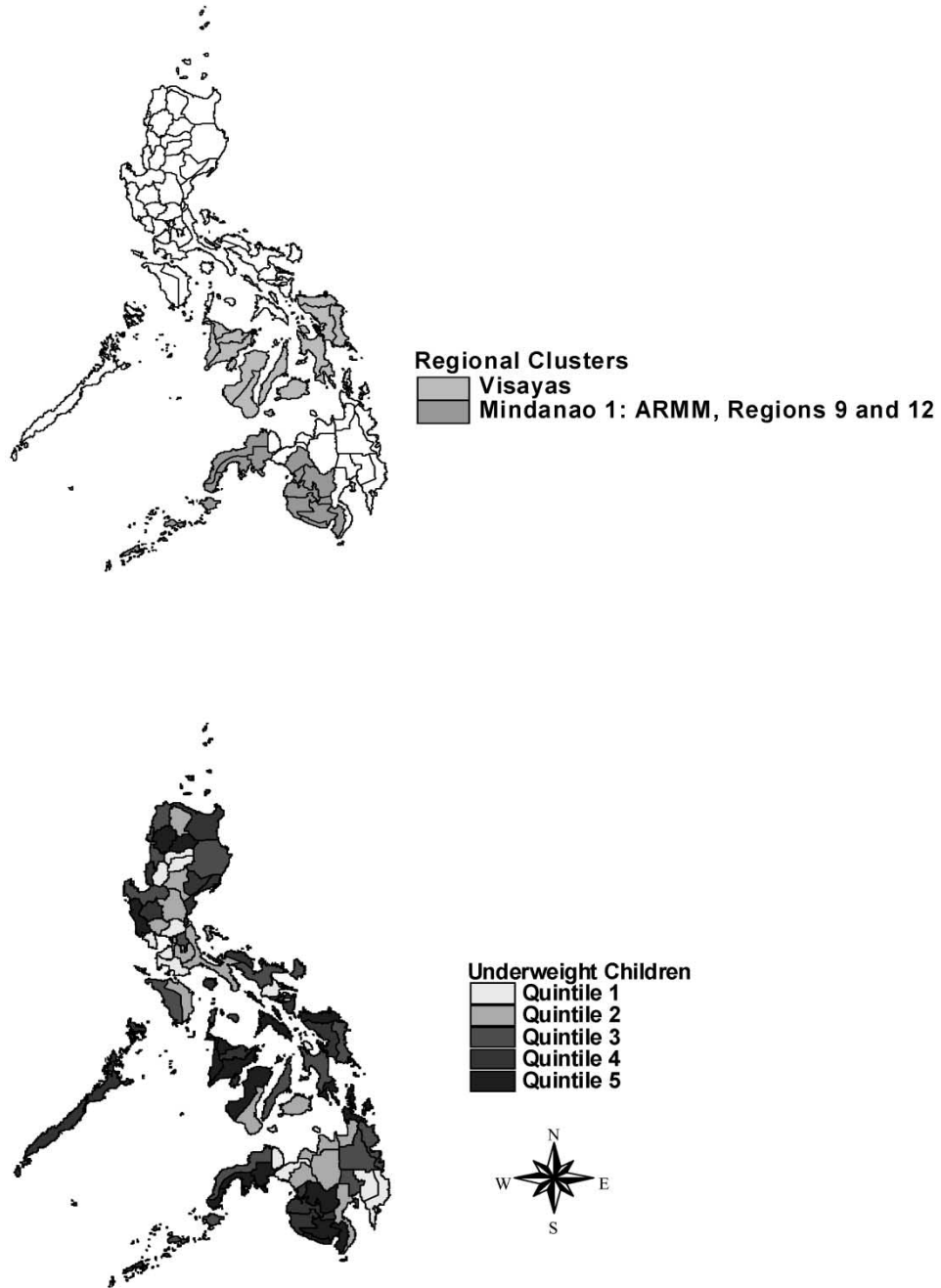
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FIGURE 5. Underweight children in Visayas and the former Muslim-Mindanao (Mindanao 1).

physical or spatial planning. For instance, public policy is to disperse industries equitably to the countryside, intended, among others, to reverse rapid rural–urban migration patterns. The efficacy of such policies should be reviewed in view of, say, the possible inherent locational advantages of certain areas. This does not mean to imply a simple *geographical determinism*, however. Commercial ports and roads, especially in tandem with human capital investments, have a positive effect on outcomes and are possible policy handles, as are irrigation inputs and agrarian reform (Balisacan and Pernia, 2002).

It is also important to consider geographical nuances when undertaking intra-country comparisons or benchmarking exercises. For instance, Thailand is often selected a comparator country for the Philippines. Perhaps these exercises should explicitly account for differences in Thailand's climate, socio-political institutions and other geographic attributes.

Regarding the marginalization of provinces comprising the former Muslim Mindanao and the Cordilleras, clearly this is an urgent matter — and one that has no easy solution. Recognition for each one's culture, history and institutions was embodied in the 1987 Philippine Constitution, which provided for their 'autonomy', but executing these provisions have been less than successful: Muslim Mindanao remains at war and the Cordillerans have twice rejected enabling laws proposed to them, claiming these fail to capture what they envision for themselves. While peace for the south and consensus in the north continue to be pursued, perhaps public programs that are still centrally controlled (such as basic education and public health programs) should be evaluated for their compatibility with the culture of these two peoples.

Finally, the results on local political dynasties invite further study. Specifically, a more detailed typology of political dynasties is called for to better understand how the complex patrimonial and inter-generational nature of Philippine politics hinders or helps human development outcomes on the national and local levels.

Acknowledgements

Notes

1 Philippine Progress Report on the MDG, UNDP Manila, 2002.
2 Having said this, intertemporal comparisons of 'urban' and 'rural' population trends based on census data are misleading. The identification into urban/rural areas is done at the *barangay* level and is contingent on the presence of a minimum set of infrastructures and establishments in the *barangay*. This means that the list of *barangays* classified as urban or rural changes from census to census. When comparing population trends intertemporally, therefore, one is essentially comparing different sets of *barangays*.
3 National Framework for Physical Planning for 2001–2030. The following section on climate is likewise taken from this document.

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4 National Objectives on Health, 2000.

5 Cultural Center of the Philippines (1994). The Summer Institutes of Languages estimated 171 different languages in the Philippines, three of which were extinct. The same number represents the number of cultural entities that speak these languages.

6 This section is based on Asian Development Bank (2002).

7 Armed Forces of the Philippines. Decrease in influence is attributed to the end of the 20-year Marcos dictatorship in 1986, the promulgation of an Agrarian Reform Law in 1987, and the dismantling of the US bases in 1991.

8 In general, they are understood as a situation where two or more members of the same family, say within the third or fourth degree of consanguinity or affinity, simultaneously occupy elective office with the same overlapping local constituency. For instance, a provincial governor and a district representative have overlapping constituencies. A city mayor and a district representative from the same province would not have overlapping constituencies if the city is not within the congressional district.

9 More detailed tables and maps (by province) are available from the authors by request. E-mail: csmonsod@zpdee.net or jducanes@yahoo.com.

10 We quote 1991 official poverty figures with caution, however, since provincial level estimates based on Family Income and Expenditure Surveys prior to 1997 are not statistically reliable.

11 The official approach, which evaluates poverty using current income and representative food menus evaluated at local prices, tends to yield poverty lines that are not consistent; that is, the standard of living implied varies for each region as well as over time (e.g. estimates of food/non-food thresholds tend to be higher for the economically more progressive regions/areas than for the economically backward regions/areas). Moreover, food thresholds tend to rise with improvements in overall living standards. The 'consistent' poverty lines, on the other hand, make use of current consumption expenditure rather than current income as a broad indicator of household welfare and impose consistency in the construction of absolute poverty lines, an approach resembling that of Ravallion (1994). See Balisacan (2001) for the construction of 'consistent' poverty lines.

12 Food and Nutrition Research Institute, 1998. According to the Department of Health and MIMAP (1999), external circumstances such as the 1997 financial crisis followed by the 1998 El Niño phenomena played a significant role in the deteriorating nutrition status.

13 The disparity in education outcomes between women across levels of income or urbanity rather than between women and men *per se* may merit greater concern. For instance, literacy rates of urban women were 15 percentage points higher than that of rural women in 1994 (or 83.9% to 68.8%, respectively.)

14 Based on the provincial data from the Department of Health. Unfortunately, there are not a few cases where reports for provinces/cities are either unavailable or incomplete. For instance, in 1993, with the exception of one, no province in ARMM was reported. For this reason, the figures on maternal mortality should be read with caution.

15 Based on progress made on percentage of births attended by skilled personnel.

16 National Demographic and Health Survey, 1998.

17 Balisacan and Pernia's series of province-level data was constructed from the Family Income and Expenditure Survey (FIES) for 1985, 1988, 1991, 1994 and 1997. However, this approach may be questioned since the FIES sampling frame was not designed for provincial-level estimates until 1997.

18 As described earlier, four climate types span the country: type 1, with distinct dry (November–April) and wet (May–October) seasons; type 2, with no dry season and a very pronounced maximum rain period from December to January; type 3, whose seasons are not very pronounced, with a short dry season and no very pronounced maximum rain period; and type 4, with rainfall evenly distributed throughout the year.

19 Or what could be considered the 'urbanizing' population.

20 Philippine Human Development Report, 2000.

21 The actual number of armed insurgents is classified data.

22 The complete regression results are available from the authors on request.

23 In the preceding model, the IP variable was significant but with the 'wrong' sign, most

probably because of the poor quality of the IP data. For most provinces, National Commission on Indigenous People figures for 1989 and 1996 are curiously equal. Also, figures for some provinces appear implausible: in two provinces, the IP population is greater than total population as reported by the National Statistics Office. We thus interpret 'Luzon 2' or the Cordillera variable as representing the effect of the IP factors.

24 For per-capita income, the Moro variable is significant but of the wrong sign. This may be due to interaction effects with the Mindanao 1 variable (three provinces differentiate the Moro variable and Mindanao 1) and/or Dynasty variable (where the highest degree of dynasty is found in an ARMM province.) This same odd result will show up in the infant mortality and safe water regressions.

25 The disadvantage of Muslim Mindanao remains even when we remove regional dummy variables.

26 Cost estimates from the office of the Representative from Batanes province.

27 Based on our brief encounters with the government agencies concerned, it would seem that incremental budget increases to better maintain land and soil data as well as to speed up research on the impact of climactic conditions on productivity and epidemiology would be in order.

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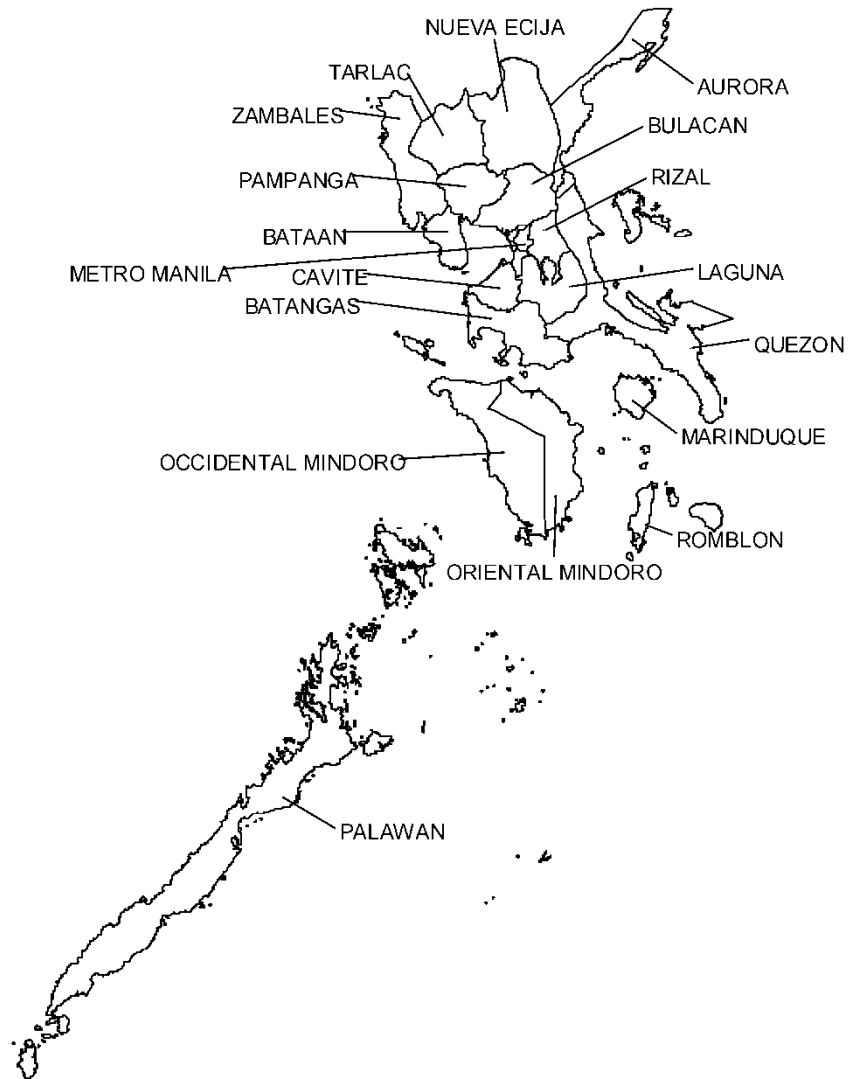
Appendix 1

Philippine administration map

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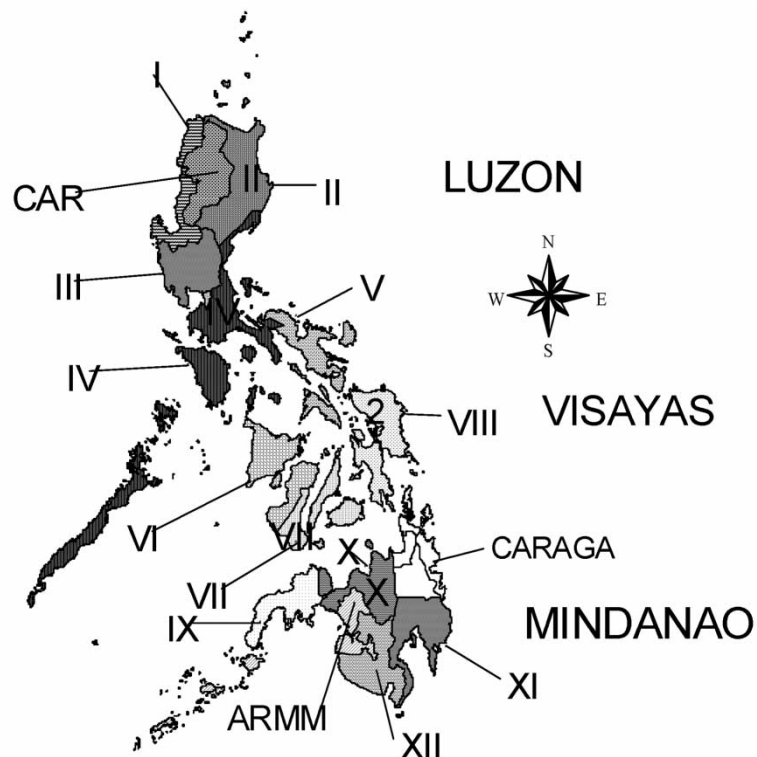
Metro Manila, Region III and Region IV provinces

Appendix 2

TABLE A1. Rate of progress: poverty incidence (consistent methodology)

Region	Province	Baseline (1990 or closest to 1990)[a]	Current level (2000 or latest year with data)	Target by 2015	Average rate of progress (1990–2000)	Required rate of progress (2001–2015)	Ratio of average rate to required rate ($\lambda = f/g$)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	
	Philippines	34.3	27.5	17.2	−0.8	−0.7	1.1
National Capital Region	Metro Manila	5.9	5.6	3.0	0.0	−0.2	0.2
4a	Aurora	25.4	27.4	12.7	0.2	−1.0	999
4a	Batangas	33.0	16.3	16.5	−1.8	*	*
4a	Cavite	9.7	10.9	4.8	0.1	−0.4	999
4a	Laguna	5.0	7.7	2.5	0.3	−0.3	999
4a	Quezon	28.8	29.3	14.4	0.1	−1.0	999
4a	Rizal	5.1	10.5	2.6	0.6	−0.5	999
4b	Marinduque	58.1	48.8	29.0	−1.0	−1.3	0.8
4b	Occidental Mindoro	10.2	23.4	5.1	1.5	−1.2	999
4b	Oriental Mindoro	44.5	42.0	22.3	−0.3	−1.3	0.2
4b	Palawan	31.6	25.4	15.8	−0.7	−0.6	1.1
4b	Romblon	71.3	74.4	35.7	0.3	−2.6	999
9	Basilan	67.1	63.0	33.5	−0.4	−2.0	0.2
11	Davao Norte	55.0	27.3	27.5	−3.1	*	*
11	Davao Sur (with Davao City)	53.8	18.8	26.9	−3.9	*	*
11	Davao Oriental	71.7	28.3	35.9	−4.8	*	*
11	So. Cotabato (with Gen. Santos City)	56.7	29.9	28.3	−3.0	−0.1	28.3
ARMM	Lanao del Sur	42.6	48.1	21.3	0.6	−1.8	999
ARMM	Maguindanao	29.9	36.2	14.9	0.7	−1.4	999
ARMM	Sulu	37.5	92.0	18.7	6.1	−4.9	999
ARMM	Tawi-Tawi	24.7	75.3	12.3	5.6	−4.2	999

4a, mainland provinces; 4b, island provinces; * already attained target; 999, condition worsening rather than getting closer to target.

[a] Baseline year is 1991.

Likelihood that target will be achieved is: high if $\lambda \geqslant 1.0$; fair if $0.67 \leqslant \lambda < 1.0$; low if $\lambda < 0.67$.

Base data: National Statistics Office.

Philippines' Progress towards MDGs

TABLE A2. Rate of progress: percent with no access to safe drinking water

Region	Province	Baseline (1990 or closest to 1990)[a]	Current level (2000 or latest year with data)	Target by 2015	Average rate of progress (1990–2000)	Required rate of progress (2001–2015)	Ratio of average rate to required rate ($\lambda = f/g$)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	
	Philippines	26.3	21.5	13	−0.53	−0.57	0.9
	Metro Manila	10.5	14.9	5.3	0.5	−0.6	999
3	Bataan	3.5	2.6	1.8	−0.1	−0.1	1.7
3	Bulacan	6.5	6.0	3.3	−0.1	−0.2	0.3
3	Nueva Ecija	1.1	0.1	0.6	−0.1	*	*
3	Pampanga	2.0	0.0	1.0	−0.2	*	*
3	Tarlac	1.6	0.9	0.8	−0.1	0.0	10.6
3	Zambales	12.7	20.2	6.3	0.8	−0.9	999
ARMM	Lanao del Sur	82.9	71.0	41.5	−1.3	−2.0	0.7
ARMM	Maguindanao	69.2	53.9	34.6	−1.7	−1.3	1.3
ARMM	Sulu	70.9	69.6	35.4	−0.1	−2.3	0.1
ARMM	Tawi-Tawi	95.3	81.9	47.7	−1.5	−2.3	0.7

*Already attained target; 999, condition worsening rather than getting closer to target.

[a] Baseline year is 1991.

Likelihood that target will be achieved is: high if $\lambda \geqslant 1.0$; fair if $0.67 \leqslant \lambda < 1.0$; low if $\lambda < 0.67$.

Base data: National Statistics Office.

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TABLE A3. Rate of progress: adjusted cohort survival rate (adjusted for participation)

Region	Province	Baseline 1993 (1990 or closest to 1990)[a]	Current level (2000 or latest year with data)[b]	Target by 2015	Average rate of progress (1990–2000)	Required rate of progress (2001–2015)	Ratio of average rate to required rate ($\lambda = f/g$)
	Philippines	65.8	65.3	80	−0.08	0.9	999
	Metro Manila	86.4	78.2	80	−1.37	0.1	999
3	Bataan	82.6	88.0	80	0.90	*	*
3	Bulacan	79.4	82.1	80	0.45	*	*
3	Nueva Ecija	72.9	77.9	80	0.84	0.1	6.5
3	Pampanga	73.9	77.4	80	0.59	0.2	3.7
3	Tarlac	78.7	79.4	80	0.12	0.0	3.3
3	Zambales	69.5	77.9	80	1.41	0.1	10.8
4a	Aurora	67.3	68.2	80	0.15	0.7	0.2
4a	Batangas	60.7	72.8	80	2.01	0.5	4.4
4a	Cavite	75.2	86.1	80	1.82	*	*
4a	Laguna	76.2	80.3	80	0.68	*	*
4a	Quezon	56.3	70.2	80	2.32	0.6	3.8
4a	Rizal	97.7	83.6	80	−2.36	*	*
9	Basilan	36.6	34.3	80	−0.38	2.9	999
9	Zamboanga Del Norte	57.0	52.5	80	−0.76	1.7	999
9	Zamboanga Del Sur	52.4	50.5	80	−0.31	1.8	999
Caraga	Agusan Norte	62.3	62	80	−0.06	1.1	999
Caraga	Agusan Sur	59.7	49.2	80	−1.75	1.9	999
Caraga	Surigao Norte	38	34.6	80	−0.56	2.8	999
Caraga	Surigao Sur	58.1	55	80	−0.52	1.6	999
ARMM	Lanao Del Sur	24.4	19.5	80	−0.82	3.8	999
ARMM	Maguindanao	38.1	27.6	80	−1.75	3.3	999
ARMM	Sulu	35.1	29.7	80	−0.90	3.1	999
ARMM	Tawi-Tawi	34.6	42.8	80	1.37	2.3	0.6

[a] For school year 1993−1994.

[b] For school year 1999−2000.

4a, mainland provinces; * already attained target; 999, condition worsening rather than getting closer to target.

Likelihood that target will be achieved is: high if $\lambda \geqslant 1.0$; fair if $0.67 \leqslant \lambda < 1.0$; low if $\lambda < 0.67$.

Base data: Department of Education.

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Philippines' Progress towards MDGs

TABLE A4. Rate of progress: infant mortality rate

Region	Province	Baseline (1990 or closest to 1990)	Current level (2000 or latest year with data)[a]	Target by 2015	Average rate of progress (1990–2000)	Required rate of progress (2001–2015)	Ratio of average rate to required rate ($\lambda = f/g$)
	Philippines	57.0	49	19.0	− 1.6	− 1.5	1.1
	Metro Manila	45.8	36.9	15.3	− 1.8	− 1.1	1.6
3	Bataan	48.6	45.8	16.2	− 0.6	− 1.5	0.4
3	Bulacan	43.8	40.9	14.6	− 0.6	− 1.3	0.4
3	Nueva Ecija	47.1	43.2	15.7	− 0.8	− 1.4	0.6
3	Pampanga	41.8	41.1	13.9	− 0.1	− 1.4	0.1
3	Tarlac	44.7	43.4	14.9	− 0.3	− 1.4	0.2
3	Zambales	51.2	47.6	17.1	− 0.7	− 1.5	0.5
4a	Aurora	58.4	56.6	19.5	− 0.4	− 1.9	0.2
4a	Batangas	46.3	44.3	15.4	− 0.4	− 1.4	0.3
4a	Cavite	48.5	46.7	16.2	− 0.4	− 1.5	0.2
4a	Laguna	49.4	47.2	16.5	− 0.4	− 1.5	0.3
4a	Quezon	51.8	50.9	17.3	− 0.2	− 1.7	0.1
4a	Rizal	47.0	45.1	15.7	− 0.4	− 1.5	0.3
8	Eastern Samar	79.7	65.7	26.6	− 2.8	− 2.0	1.4
8	Leyte	63.4	55.9	21.1	− 1.5	− 1.7	0.9
8	Northern Samar	79.0	63.0	26.3	− 3.2	− 1.8	1.7
8	Western Samar	80.4	66.8	26.8	− 2.7	− 2.0	1.4
8	Southern Leyte	64.2	57.7	21.4	− 1.3	− 1.8	0.7
ARMM	Lanao del Sur	70.6	66.1	23.5	− 0.9	− 2.1	0.4
ARMM	Maguindanao	73.4	67.9	24.5	− 1.1	− 2.2	0.5
ARMM	Sulu	76.7	71.4	25.6	− 1.0	− 2.3	0.5
ARMM	Tawi-Tawi	78.8	73.4	26.3	− 1.1	− 2.4	0.5

[a] 1995.

4a, mainland provinces.

Likelihood that target will be achieved is: high if $\lambda \geqslant 1.0$; fair if $0.67 \leqslant \lambda < 1.0$; low if $\lambda < 0.67$.

Base data: Flieger and Cabigon (1994, 1999).