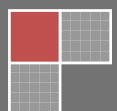


2009

poverty profile and trend in Cambodia

findings from the 2007 Cambodia Socio-Economic Survey (CSES)

This report provides updated poverty estimates for Cambodia using newly available data from the 2007 Cambodia Socio-Economic Survey (CSES). The report finds that poverty reduction observed over the previous decade (1994-2004) continued over the period 2004 to 2007. Over these three years, the poverty headcount index for Cambodia as a whole relative to the overall poverty line fell from 34.8% in 2004 to 30.1% in 2007. The decline in poverty during this period reflects substantial and statistically significant growth in real per capita household consumption (the measure of living standards used in Cambodia). This increase (averaging 21 percent for the population as a whole) was driven by rates of economic growth during these years that exceeded 10 percent per annum. The picture of welfare improvements amongst the bottom two quintiles is reinforced by improvements in a wide range of variables related to ownership of consumer durables, service delivery and human development outcomes. However, rapid economic growth between 2004 and 2007 has been associated not only with falling poverty but also with rising levels of inequality. The report concludes with some initial recommendations for future development of the methodology used to measure living standards and poverty in Cambodia.



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Poverty profile and trends in Cambodia, 2007

Findings from the Cambodia Socio-Economic Survey (CSES)

June, 2009

Poverty Reduction and Economic Management Sector Unit
East Asia and Pacific Region



Document of the World Bank

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ACRONYMS, ABBREVIATIONS AND KHMER TERMS

CPI	Consumer Price Index
CSES	Cambodia Socio-Economic Survey
DPT	Diphtheria, Pertussis and Tetanus
HIV	Human Immuno-deficiency Virus
<i>kru khmer</i>	Cambodian traditional healer
MCH	Mother and Child Health
MoP	Ministry of Planning
NGO	Non-Governmental Organization
NIS	National Institute of Statistics
NSDP	National Strategic Development Plan
ORS	Oral Rehydration Solution
PDR	People's Democratic Republic
PSU	Primary Sampling Unit
SCB	Statistical Capacity Building (Statistics Sweden project)
SESC	Socio-Economic Survey of Cambodia
SNEC	Supreme National Economic Council
WHO	World Health Organization

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Executive Summary

This report provides updated poverty estimates for Cambodia using newly available data from the 2007 Cambodia Socio-Economic Survey (CSES). A key objective of this exercise has been to prepare updated poverty estimates that are as comparable as possible with those previously prepared for 2004. This analysis of poverty trends over the period 2004-2007 was commissioned at the request of the Supreme National Economic Council and managed in close consultation with the Ministry of Planning, as an input to the Government's Mid-Term Review of its medium-term National Strategic Development Plan.

The report finds that poverty reduction observed over the previous decade (1994-2004) continued over the period 2004 to 2007. Over these three years, real per capita household consumption (the income measure used in this and in previous poverty profiles) increased and poverty decreased in all three geographical domains (Phnom Penh, Other Urban, Rural).¹ The poverty headcount index for Cambodia as a whole relative to the overall poverty line fell from 34.8% in 2004 (in villages included in the 2007 CSES sampling frame) to 30.1% in 2007. The estimated decrease in the poverty headcount relative to the food poverty line is considerably smaller (from 19.7% to 18.0%), reflecting more rapid inflation in food prices than in nonfood prices during this period. The fall in poverty headcounts relative both to the food poverty line and to the poverty line are statistically significant at the 0.05 level for Cambodia as a whole and for Rural areas (although relative to the food poverty line, the Rural estimate is significant at only the 0.10 level).

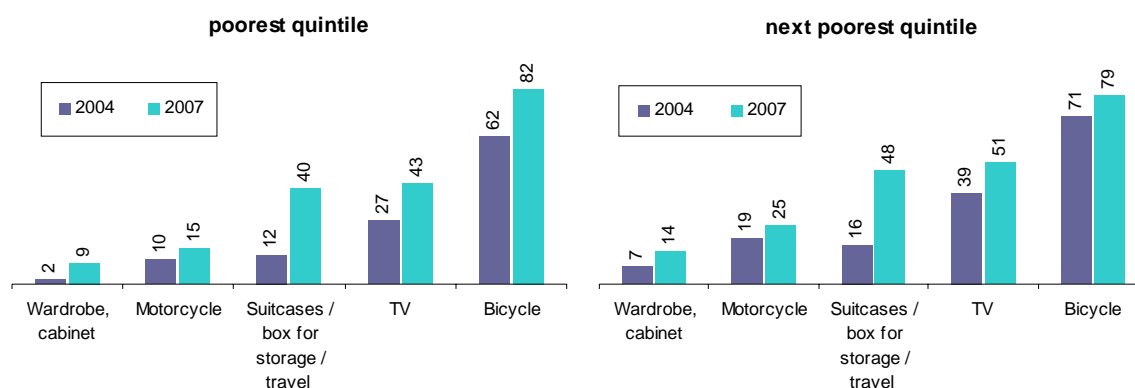
The decline in poverty during the period 2004-2007 reflects substantial and statistically significant growth in real per capita household consumption (the measure of living standards used in Cambodia). This increase (averaging 21 percent for the population as a whole) was driven by rates of economic growth during these years that exceeded 10 percent per annum. This rise in consumption is apparent, and statistically significant, in the poorest two quintiles (increases in real terms of 10.7 and 11.5 percent amongst the poorest and next poorest quintiles respectively) as well as in the median and upper quintiles.

The conclusion that poverty has continued to fall is supported by other indicators. These include changes in ownership of consumer durables amongst households in the bottom two quintiles (i.e. the poorest 40 percent of the population as ranked by per capita consumption), summarized in Figure 1. It is also supported by more gradual improvements in housing size and quality.

¹ Unfortunately, the relatively small sample size of the 2007 CSES (only 3,593 households in the calendar 2007 sample, compared to almost 12,000 households in the calendar year 2004 sample of the 2004 CSES) means that estimates could not be prepared for smaller geographical areas, such as zones or provinces.

Figure 1 Change in ownership of selected consumer durables amongst the bottom two quintiles, 2004-2007

(percentage of population in quintile living in a household with given item)



Source: 2004 and 2007 CSES.

The picture of welfare improvements amongst the bottom two quintiles is reinforced by improvements in a wide range of variables related to service delivery and human development outcomes. Gains are most notable in education, health and nutrition. Physical access to public services has improved, as measured in terms of average distances to the nearest health center or school; this, combined with an improved road network and rising real incomes, helps explain improving rates of school enrolment and health-seeking behavior. As a result, there is continued improvement in outcomes such as average levels of educational attainment and self-reported health status (Table 1).

Table 1 Change in accessibility, service delivery and health and education outcomes amongst the bottom two quintiles, 2004-2007 (selected indicators)

Indicator	poorest quintile			next poorest quintile		
	2004	2007	change (%)	2004	2007	change (%)
<i>access</i>						
average distance to nearest all-weather road (km)	1.9	1.0	-46%	1.2	1.2	-2%
average distance to nearest health center (km)	7.0	4.5	-36%	6.4	5.5	-15%
average distance to nearest primary school (km)	2.2	0.7	-71%	1.5	0.5	-66%
<i>service delivery / utilization</i>						
net primary enrollment ratio (ages 6-11)	65.8	78.1	19%	76.4	81.3	6%
net lower secondary enrollment ratio (age 12-14)	3.6	12.8	256%	10.8	20.1	86%
obtained health care (% of those reporting illness or injury in last four weeks)	61.7	71.8	16%	60.6	79.3	31%
<i>outcomes</i>						
highest grade completed, age 5+	2.2	3	36%	2.9	3.6	24%
good health relative to age (%)	11.3	16.1	42%	12.4	16.4	32%
illness or other health problems during last four weeks (%)	15.3	11.3	-26%	17.4	14.7	-16%

Source: 2004 and 2007 CSES.

However, rapid economic growth between 2004 and 2007 has been associated not only with falling poverty but also with rising levels of inequality. While all quintiles and all domains have experienced gains in real per capita consumption, the rate of this increase has varied quite widely. Poverty reduction would have been greater had real income growth not been so much higher in the richest quintile and in urban areas (especially Phnom Penh) than in less rich quintiles and Rural areas. Within the comparable sample frame, the overall Gini coefficient (a summary measure of inequality in which a value of zero signifies perfect inequality and a value of 1 signifies perfect inequality) for per capita consumption is estimated to have increased from 0.39 to 0.43 during the period 2004 to 2007 (although this increase is not statistically significant at the 0.05 level).

In addition to describing 2004-7 socio-economic trends, this report is intended to provide input into debates about the future of living standards and poverty measurement in Cambodia. The report makes the following preliminary recommendations for future poverty monitoring in Cambodia:

- New poverty lines and a new methodology for monitoring poverty should be developed because the existing poverty lines (developed on the basis of the data available in 1993/94 data) and poverty monitoring methodology (developed during the period 1996-1998 based on the limited data available at the time) are now substantially outdated.
- A technical group should be formed, under the leadership of the Government of Cambodia, to define new poverty lines and to identify an appropriate methodology for future poverty monitoring.
- The lists of food and (particularly) nonfood items for which prices are collected at the village level should be revised so that (i) the items can be found in village markets (it is difficult to find items such as a “radio-cassette” player in many contemporary markets) and (ii) these items are more representative of the current consumption patterns of the poor and near-poor. It is also recommended that the entire system of collecting village-level data (not limited to prices) should be carefully reviewed and improved to reduce the number of non-responses.
- Some minor modifications should be made in the way household consumption is defined and/or measured.
- Both recall and diary data should continue to be collected at least through the 2009 CSES and research should be carried out to evaluate the relative strengths and weaknesses of each type of data. This will allow a well-informed decision to be made about which data to use in future poverty monitoring.

Introduction²

This report provides updated poverty estimates for Cambodia using newly available data from the 2007 Cambodia Socio-Economic Survey (CSES) and the same methods previously used to develop poverty estimates for 2004.³ Baseline poverty estimates were prepared by the World Bank using data from the 1993/94 Socio-Economic Survey of Cambodia (SESC) (Prescott and Pradhan 1997). Updated poverty estimates were prepared subsequently using data from the 1997, 1999 and 2004 CSES (MOP 1998, 2000, Knowles 2005). The updated poverty estimates in this report can be used to monitor Cambodia's success in reducing poverty during the three years that have elapsed since the most recent poverty estimates for 2004 were prepared. They can also be useful for broadening and deepening our understanding of the changing dimensions of Cambodia's poverty in order to improve the effectiveness of poverty reduction and poverty monitoring efforts.

A key objective of this report has been to prepare updated poverty estimates that are as comparable as possible with the estimates prepared for 2004. This involves the following steps:

- The 2004 poverty lines are updated for inflation in food and nonfood prices during the period 2004-2007, using the same methods and types of data that were used to update the 1993/94 baseline poverty lines to 2004.
- New estimates of per capita household consumption are prepared that are as comparable as possible with the consumption estimates prepared in 2004
- The per capita consumption of each individual in the sample is compared to the updated poverty lines to identify the poor and to calculate the desired poverty indicators

The process of updating poverty estimates is seldom a simple exercise. However, this round of poverty estimates posed fewer conceptual problems than previous rounds, thanks to the efforts made by the National Institute of Statistics and its Statistics Sweden advisors to preserve a high degree of comparability between the questionnaires used in the 2004 and 2007 rounds of the CSES.

Section one describes briefly the 2007 CSES, which is the primary data source used in preparing these updated 2007 poverty estimates. Section two summarizes the work done to update the 2004 poverty lines for inflation. Section three presents estimates of household consumption, including estimated measures of income inequality (for example, estimates of Gini coefficients). Section four presents the updated poverty estimates. Section five presents an analysis of a wide range of socio-economic indicators that provide an independent source of information on poverty reduction during the period 2004-2007. Section six provides the report's conclusions and recommendations for future poverty monitoring.

² For relevant background information on Cambodia, as well as on the characteristics and causes of poverty, the interested reader is referred to the *2006 Cambodia Poverty Assessment* (World Bank 2006).

³ The author gratefully acknowledges very helpful comments on an earlier draft provided by Simon Appleton, Paul Glewwe, Sten Johanssen, Tim Conway and Neak Samsen. However, only the author is responsible for any remaining errors or omissions in this report.

1. The 2007 Cambodia Socio-Economic Survey

The 2007 Cambodia Socio-Economic Survey (CSES) is the latest in a series of multi-objective national household surveys that have been conducted by the National Institute of Statistics (NIS). Compared to the 2004 CSES, the 2007 CSES is a considerably smaller “interim” survey that has been conducted continually from October 2006 to the end of calendar year 2007 and that is expected to continue through calendar year 2008, following which a larger survey (the 2009 CSES), comparable in size to the 2004 CSES, is expected to be fielded. The 2007 CSES surveyed only 3,593 households during calendar year 2007 in 360 villages (i.e., about 300 households per month in about 30 villages)

The Household Questionnaire used in the 2007 CSES is also smaller, covering fewer topics, than the Household Questionnaire used in the 2004 CSES. However, it provides the same level of detail in the information needed to prepare updated poverty estimates. The Village Questionnaire that was administered in both the 2004 and 2007 CSES is largely unchanged.⁴

Although the 2007 CSES sample size is considerably smaller than that of the 2004 CSES, it is believed by those conducting the survey that the quality of the field work has improved significantly compared to the 2004 CSES because the interviewers and supervisors received more training than in the 2004 CSES. Although the poverty estimates presented in this report are based mainly on recall questions about household consumption, households (with the assistance of interviewers) also kept diaries of their income, consumption and expenditure during a full calendar month. Although the recall data refer in all cases to periods prior to the collection of the diary data, the fact that the survey teams reside in each surveyed village for a full month is likely to improve the quality of the recall data (Johansson 2008).

The 2007 CSES sample was selected from 37 strata in 21 of Cambodia’s 24 provinces in two or three steps, depending on the size of the village.⁵ The sampling frame included all but 25 of the 720 villages included in the calendar year 2004 sample of the 2004 CSES. First, 360 villages were selected from the 720 villages in the 37 strata using systematic random sampling (with over-sampling in the urban strata). Second, if the village was not large, 10 households were selected randomly from a list of all households in the village that was prepared by the interviewer team. If the village was large, a map showing the different segments in the village was prepared and one of the segments was selected randomly, and 10

⁴ One question was added in the section on Economy and Infrastructure (“Does the village have an internet café or any shop where people can get access to internet in the village?”), the numbering of a few questions was changed, the price of “other medicine” was dropped from the list of items for which village medicine prices were collected, and a few codes were changed in the section on Sales Prices of Agricultural Land in the Village.

⁵ Three of Cambodia’s 24 provinces do not have any rural areas (i.e., Kep, Sihanoukville and Pailin), so the maximum number of strata is 45 (the number of strata included in the 2004 CSES), i.e., 24 provinces (urban and rural) less 3. In addition, 8 other strata were excluded from the 2007 CSES sampling frame in order to make it possible for the three interviewer teams to be working no further than one province away from each other during any given month. The excluded strata, which include only 25 of the 720 villages (3.47%) included in the calendar year 2004 sample of the 2004 CSES, are Kandal province (urban), Mondol Kiri (urban and rural), Prey Veng (urban), Ratanak Kiri (urban and rural), Takeo (urban) and Pailin (urban). The sampling weights used in the analysis are “expanded” to cover the total population.

households were then selected randomly in a third step from a list of households in the selected segment prepared by the interviewer team.

The 2007 CSES is not self-weighting. Sample design weights have been prepared by Sten Bäcklund of Statistics Sweden following procedures described in Dalén (2006) and Isaksson (2007) and subsequently adjusted to reflect preliminary population counts from the 2008 population census (i.e., the weights cover the total population, not only the population included in the sampling frame). Unless otherwise noted, all estimates presented in this report are based on the calendar year 2007 sample of 3,593 households actually interviewed and are weighted to be representative of the Cambodian population. Because the data were collected during a 12-month period, with the sample villages distributed almost randomly throughout the period, the 2007 poverty estimates (like the 2004 estimates) are not expected to be affected by seasonality.

The 2007 CSES provides most of the data used to develop the estimates presented in this report. The data used include mainly recall data⁶ on household consumption obtained from the Household Questionnaire and data on village prices collected in the Village Questionnaire. The recall data on household consumption are collected in two modules in section 01 of the Household Questionnaire, one (section 1B) obtaining recall data on the consumption of 20 food, beverage and tobacco items during the past 7 days and the other (section 1C) obtaining recall data on the consumption of 16 nonfood items during varying reference periods. In both cases, the consumption data collected include separate items for cash expenditure and in-kind consumption (for example, the consumption of food produced at home). The food, beverage and tobacco module is exactly the same as that used in previous CSES rounds, including the 2004 CSES. The nonfood consumption module is new.⁷ Previously, many nonfood consumption items were obtained in various other sections of the Household Questionnaire (for example, Housing, Education and Health). However, in the 2007 CSES, they have been consolidated and put into a separate nonfood consumption module, which collects data for 16 items and that is included in Section 01.

Fortunately (from the standpoint of maintaining comparability with the 2004 estimates), the original questions on nonfood consumption that were in other sections of the Household Questionnaire have been retained in the 2007 CSES. In some cases, as discussed in Annex 3, there are significant differences between the recall data for the same (or similar) items that are collected in different sections of the Household Questionnaire. This means that the decision about which sources of data to use is nontrivial. In the interest of maintaining comparability with the 2004 estimates, data obtained from the original questions in sections other than section 01 are used as the source of consumption data in this report instead of data from the new questions in the nonfood module added to section 01.

⁶ Although recall data on all consumption items are available in the 2007 CSES, the estimates of household consumption used in this report are based on diary data for a few items for which recall data were not available in the 2004 CSES in the interest of maintaining comparability with the 2004 estimates. A detailed discussion of the estimates of household consumption used in this report is provided in Annex 3.

⁷ Actually, there was a small module with recall data for 6 nonfood items that was in the section on Durable Goods and Other Expenditures in the 2004 CSES Household Questionnaire. Accordingly, it is more accurate to say that this previously existing module was expanded to cover all nonfood consumption and shifted to section 01.

For the same reason, it was decided to use diary data for the nonfood categories for which diary data were used in preparing the 2004 estimates (i.e., transportation, communications, personal care, and expenditure on hotel accommodation), even though recall data on these items are also available in the 2007 CSES. Although there are a few minor differences between the 2004 and 2007 CSES in the questions used to obtain recall data on nonfood consumption (as discussed in Annex 3), it has been possible to maintain a high degree of comparability in both the types of data and in the methods used to estimate household consumption in 2004 and 2007.

The forms used to collect price data in the Village Questionnaire are essentially unchanged between the 2004 and 2007 CSES.⁸ Up to three prices were collected in each surveyed village (including “villages” in Phnom Penh and Other Urban areas) for 53 food, beverage and tobacco items and 39 nonfood items (including 10 medicines). The main problem with the village price data is that many items were not reported at all in many villages, particularly in the case of nonfood items. The non-reporting of nonfood prices has also worsened over time, as discussed in Annex 2. One problem is that the list of items has not been revised for many years, and several of the items for which prices are obtained are no longer in wide use (for example, radio-cassette players). The low rates of village price reporting, particularly of nonfood items, undoubtedly makes the poverty estimates less reliable in regions other than Phnom Penh (where a CPI is available and is used).⁹

Non-reporting was also a problem with some of the other village-level data. Although fewer than 10 villages failed to report most sections of the Village Questionnaire, 39 of 360 villages in the calendar year 2007 sample (of which 30 are in Phnom Penh) did not respond to section 2 of the Village Questionnaire (Economy and Infrastructure). As discussed in the concluding section of this report, revision of the list of items (and especially the list of nonfood items) for which village prices are obtained in the CSES is urgently needed, together with a careful review of the procedures currently used to collect all village-level data.

⁸ See footnote 4.

⁹ It would be possible to use currently available CPI price data for Other Urban areas as well as Phnom Penh, but this is not done in order to maintain comparability with the methods used in 2004.

2. Updating the 2004 poverty lines for inflation

Cambodia's poverty lines consist of a single national food poverty line (based on an unchanging reference food bundle) and three region-specific nonfood allowances. The Cambodia poverty lines are expressed as daily per capita levels of food and nonfood consumption in the current prices of each region (i.e., Phnom Penh, Other Urban and Rural).¹⁰ These poverty lines were developed more than ten years ago when preparing 1993/94 baseline poverty estimates (Prescott and Pradhan 1997). They have been subsequently updated for inflation when preparing poverty estimates for 1997, 1999 and 2004 (MOP 1998, 2000, Knowles 2005). The procedures used previously in updating the poverty lines for inflation have mostly used a methodology developed and described in Knowles (1998).¹¹

This section of the report discusses the procedures used to update the 2004 poverty lines for inflation during the period 2004-2007. The procedures used are exactly the same as those used to update the 1993/94 baseline poverty lines to 2004, as described in Knowles (2005).¹²

2.1 Updated food poverty lines

The food poverty lines for each region are based on the estimated cost of consuming a single national reference food bundle providing an average subsistence diet of 2,100 calories per day (i.e., averaged over persons of all ages and both sexes).¹³ The reference food bundle was designed to reflect the actual food consumption patterns of Cambodians in 1993/94 who consumed a diet yielding approximately 2,100 calories per day. It is based on the quantities of different foods consumed by persons in the middle per capita consumption quintile, as this was the first quintile that met the 2,100 calorie minimum. A single reference food bundle was used for all Cambodians.

The three-step procedure that is used to update the 2004 food poverty lines to 2007 was developed in 1998 under circumstances in which the village food price data had many limitations (as discussed in Knowles 1998).¹⁴ This same procedure was subsequently used to

¹⁰ Because Phnom Penh includes several rural villages, it would be technically more correct to refer to the Rural region as an Other Rural region. However, this report continues with the previous practice of referring to the "Other Rural" region simply as the Rural region.

¹¹ The nonfood allowances were updated for the 1999 poverty estimates using a different methodology (MOP 2000), as discussed in footnote 20.

¹² The village prices collected in the CSES are used to update the poverty lines in the Other Urban and Rural regions (the Phnom Penh poverty lines are updated using Phnom Penh CPI prices). One concern is that many villages did not report even one price for many items (particularly nonfood items), and evidence presented in Annex 1 and 2 indicate that village price reporting was nonrandom. Annex 4 presents an alternative set of poverty lines obtained using imputed prices in villages that did not report at least one price of a given item. The author is indebted to Paul Glewwe for suggesting the imputation procedure. However, the differences are very small (Table 76).

¹³ Minor corrections were made to the original baseline food poverty lines in 2000 (MOP 2000), and the corrected values are the ones used in this report as well as in 2004.

¹⁴ The main limitation was that the food items for which village prices were collected in the 1997 CSES were not well matched to the items in the 1993/94 reference food bundle. Another problem was that no price data were collected in the 1993/94 Socio-Economic Survey of Cambodia (SESC) used to develop the

update the baseline food poverty lines to 1999 and 2004 (MOP 2000, Knowles 2005), and the same procedure is used here in order to preserve comparability with the 2004 estimates. It involves the following three steps: (1) use the village food price data collected in the CSES in all three regions (i.e., Phnom Penh, Other Urban, Rural) and the quantity weights from the 1993/94 baseline reference food bundle to estimate spatial (regional) differences in food prices in 2004 and 2007, (2) estimate food price inflation in Phnom Penh using price data from the Phnom Penh CPI (which are considered to be more reliable than the village price data for Phnom Penh, in part due to frequent non-reporting in Phnom Penh) and quantity weights from the 1993/94 baseline reference food bundle, and (3) combine the temporal price index for Phnom Penh with the spatial price index to obtain temporal price indices for the remaining two regions.¹⁵ More detail is provided in Annex 1. The three-step procedure is admittedly cumbersome and is used here only in the interest of maintaining comparability with the previous poverty estimates. Alternative (one-step) estimates of food price inflation are also provided as well as some tests of key assumptions of the three-step procedure.

Table 2 presents estimates of average annual rates of inflation in food prices for the periods 1993/94 to 2004 and 2004-2007 (upper portion of the table) and three alternative food price indices for the period 2004-2007 (lower portion of the table) obtained using the three-step procedure. They indicate that the annual rate of inflation in food prices during the period 2004-2007 has been almost three times higher than the annual rate of inflation in food prices during the period 1993/94-2007. Consistent with the pattern observed during the earlier period, inflation in food prices has also been more rapid during the period 2004-2007 in Other Urban and Rural areas (i.e., there is a tendency for regional food prices to converge over time, probably due to improvements in transportation infrastructure leading to better market integration).

Table 2 also presents three food price indices for the period 2004-2007, each using different base values. The temporal price indices (2004 regional prices=100) can be used directly to update the 2004 food poverty lines for inflation during the period 2004-2007. The linked food price index for 2007 can be used to convert food consumption estimates in current Riel into constant Phnom Penh price estimates (2004 Phnom Penh prices=100) so that per capita food consumption estimates from all three regions can be combined with constant price per capita nonfood consumption estimates to form per capita consumption quintiles or to assess changes over time in measures of income inequality such as the Gini coefficient for Cambodia as a whole.

baseline poverty estimates. Only unit values were available for the 1993/94 baseline, and it was questionable whether these unit values would be directly comparable with the village food prices that were collected in the 1997 CSES (from which unit values could not be obtained).

¹⁵ A linked food price index for 2007 (2004 Phnom Penh prices=100) is obtained by multiplying the Phnom Penh temporal price index for 2007 (137.2) obtained from the CPI prices by the 2007 values of the spatial food price index obtained from the village food prices (i.e., 100.0, 93.0, 80.4). The regional temporal food price indices for 2007 are obtained by dividing each region's 2007 value of the linked food price index by the corresponding 2004 value.

Table 2. Estimated annual rates of inflation in food prices for two periods (1993/94-2004 and 2004-2007) and food price indices for the period 2004-2007

	1993/94-2004	2004-2007
Phnom Penh	4.2	11.1
Other urban	4.6	13.2
Rural	4.6	12.3
Food price indices		
	2004	2007
Spatial food price index (Phnom Penh=100)		
Phnom Penh	100.0	100.0
Other urban	88.0	93.0
Rural	77.9	80.4
Temporal food price index (2004 region=100)		
Phnom Penh	100.0	137.2
Other urban	100.0	145.0
Rural	100.0	141.4
Linked food price index (2004 Phnom Penh=100)		
Phnom Penh	100.0	137.2
Other urban	88.0	127.6
Rural	77.9	110.2

Source: Annex 1, Table 53.

Table 3 presents the updated food poverty lines for 2007 that are obtained by multiplying the food poverty lines for 2004 in column 1 by the 2007 values of the temporal price indices in Table 2. These updated food poverty lines can be used directly to estimate updated food poverty rates by comparing each person's per capita daily total household consumption in current Riel to the updated food poverty line for the region in which the person resides.

Table 3. Updated food poverty lines, 2004 and 2007

Region	2004*	2007*
Phnom Penh	1,782	2,445
Other urban	1,568	2,274
Rural	1,389	1,965

Source: see Annex 1, Table 54.

* in calendar year average prices

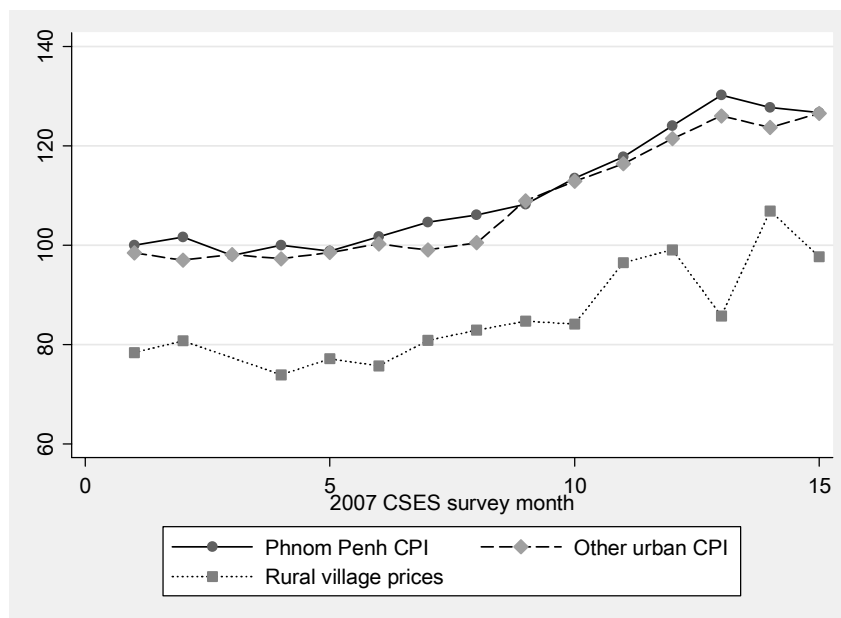
Since the 1999 CSES, the village food price data has provided sufficient coverage of the reference food bundle to support an alternative one-step estimation of food price inflation based on the village food prices alone. If the temporal price indices (2004 regional prices=100) are derived directly from the CSES village prices, the 2007 values are: 135.7 (Phnom Penh), 143.4 (Other urban) and 139.9 (Rural). These alternative estimates of food price inflation between 2004 and 2007 are quite similar to the corresponding estimates in Table 2, including their respective regional rankings. The validity of the three-step procedure used to develop the estimates presented in Table 2 rests on two key assumptions, i.e., (1) that

there is a close relationship between food price changes in Phnom Penh and those in Other Urban and Rural areas, and (2) that the CSES village prices provide accurate information about spatial differences in food prices between the three regions in the survey year, even if they may not provide accurate information about changes over time. The broad correspondence between the three-step and one-step estimates suggests that these assumptions are probably realistic, at least during the period 2004-2007 (a period of rapid inflation in food prices).

Figure 2 compares the Phnom Penh and Other Urban CPIs for food items during the full 15-month period of the 2007 CSES (i.e., October 2006 to December 2007). Unfortunately, since there is no rural CPI, it is not possible to compare the rural village prices with a CPI. However, Figure 2 also shows a food price index for Rural areas that is based on the CSES village prices for the eight food items for which village prices were reported in most survey months.¹⁶ Figure 2 shows that the three food price indices move together quite tightly, which is consistent with the first key assumption of the three-step procedure. However, although the CPI for Other Urban areas lies below the Phnom Penh CPI in most months, the difference between the two during calendar year 2007 is less than what is indicated by the spatial price index in Table 2 (i.e., 2.1% in the CPI versus 7% in Table 2). In other words, the CSES village food prices appear to overstate the spatial differences in food prices between Phnom Penh and Other Urban areas. One possible explanation for this finding is that the CPI for Other Urban areas is based on price data from only five large towns (i.e., Battambang, Sihanoukville, Siem Reap, Kampong Cham and Kandal), whereas the village price data also reflect prices in many smaller towns where food prices are probably more similar to rural food prices.

¹⁶ The CPI price indices in Figure 2 use the special reference food bundle quantity weights, as discussed in Annex 1 and base values equal to their respective 15-month means. The food price index for Rural areas (which has a base value equal to the 15-month mean in all three regions) is based on the following frequently reported food items (which are heavily weighted toward meat and fish, to the exclusion of fruit and vegetables): rice (quality No. 1), pork without fat, pork with fat, fresh beef, fresh chicken, fresh water mud fish, cat fish and duck eggs. Other food items were not reported either frequently enough to be included in a monthly price index or were only frequently reported during certain seasons.

Figure 2. Comparison of food price indices by region, October 2006 – December 2007



Source: Phnom Penh and Other Urban CPI (retrospective CPI described in Haglund 2008, using reference food bundle quantity weights); food price index for Rural areas (2007 CSES village prices for 8 items for which monthly values were regularly reported).

2.2 Updated nonfood allowances

The 1993/94 baseline nonfood allowances (one for each region) were estimated as the per capita daily nonfood consumption of persons whose total per capita household consumption is just equal to the food poverty line. This is a conservative nonfood allowance because it represents nonfood consumption that is at the expense of food consumption that could otherwise be used to achieve an average daily diet of 2,100 calories by consuming the reference food bundle.¹⁷ Although a single reference food bundle is used for all regions, the baseline nonfood allowances vary in their commodity composition.¹⁸ For example, in 1993/94, Phnom Penh households with levels of per capita nonfood consumption within 20% of the Phnom Penh nonfood allowance allocated more of their nonfood consumption to housing and utilities (and especially to rent) than corresponding households in either the Other Urban or Rural regions (Annex 1, Table 62).¹⁹

¹⁷ Although persons with total per capita consumption below the food poverty line would have to sacrifice some food consumption to purchase nonfood items, they would presumably substitute cheaper foods for more expensive foods within the reference food bundle.

¹⁸ For an explanation as to why this approach was used in the baseline estimates, see footnote 75.

¹⁹ Although the intention was to obtain different regional nonfood allowances that reflected regional differences in *average* nonfood price levels, the estimated nonfood allowances probably also reflect regional differences at the time in *relative* food/nonfood prices.

In order to update the different regional nonfood allowances for inflation, it is necessary to develop regional nonfood price indices similar to the food price index presented in Table 2 above.²⁰ The estimates of inflation in nonfood prices developed in this report (which are discussed in detail in Annex 2) are based on a three-step procedure similar to the procedure used to develop food price indices described in the preceding subsection. This three-step procedure was developed when preparing poverty estimates for 1997 because there were no 1993/94 baseline values of nonfood prices in Other Urban or Rural areas (the CPI was initially implemented in Phnom Penh only). The same procedure was used to update the 1993/94 baseline nonfood allowances to 1997 and 2004 (Knowles 1998, 2005). The three-step procedure is admittedly cumbersome and is used here only in the interest of maintaining comparability with the previous poverty estimates. Alternative (one-step) estimates of nonfood price inflation are also provided as well as some tests of key assumptions of the three-step procedure in the context of nonfood price inflation.

Although similar to the three-step procedure used to develop food price indices, the three-step procedure used to develop nonfood price indices is a bit more complicated because the nonfood commodity bundles incorporated into the nonfood allowances vary between regions. Step one of the three-step procedure involves using the data on village nonfood prices from the 2007 CSES to develop a spatial price index for 2007 (the corresponding index for 2004 is already reported in Knowles 2005), as was done for food prices. However, step two is slightly different. Phnom Penh CPI prices are used not only to develop a temporal price index for Phnom Penh (as was done with food prices) but also to develop two “special” temporal Phnom Penh price indices for the other two regions using region-specific weights based on the region-specific commodity bundles in each nonfood allowance. These “special” temporal price indices differ from the Phnom Penh temporal price index only in the different region-specific weights used. The temporal price indices (all based on Phnom Penh CPI prices) and the spatial price indices are used in the third step to obtain linked and temporal prices indices.²¹ The temporal price indices can be used directly to update the 2004 nonfood allowances to 2007, as was done with the food price indices.

Another complication in developing nonfood price indices is that no village prices were collected in the CSES for housing. However, data are collected from households on a broad array of housing characteristics and on either actual rent paid (very few households, especially in rural areas) or the household’s estimate of the monthly rent that would need to be paid for owner-occupied housing. In the course of preparing previous poverty estimates hedonic regression models have been estimated to provide a predicted monthly rental value for owner-occupied housing (which is an important component of the region-specific nonfood allowances, as indicated in Table 62) and to provide estimates of spatial and temporal differences in the cost of housing adjusted for quality differences. By including

²⁰ As mentioned previously, a different approach was used to update the nonfood allowances in preparing the 1999 poverty estimates (MOP 2000), i.e., similar regression models to those used to obtain the 1993/94 baseline estimates were re-estimated with the 1999 survey data. In effect, this procedure effectively substituted a new set of nonfood allowances for the baseline allowances.

²¹ A linked nonfood price index for 2007 (2004 Phnom Penh prices=100) is obtained by multiplying the 2007 values of the Phnom Penh temporal nonfood price indices (including the two “special” indices, i.e., 113.7, 99.8, 91.8) by the 2007 values of the spatial nonfood price index (i.e., 100.0, 88.6, 81.7). The temporal nonfood price indices for 2007 (2004 region prices=100) are obtained by dividing each region’s 2007 value of the linked nonfood price index by the corresponding 2004 value.

dummy variables for region in the hedonic regression model it is possible to estimate a spatial price index for housing in a given year. In 2007, the spatial price index for housing was estimated as: Phnom Penh (100.0), Other Urban (58.2, compared to 64.7 in 2004), and Rural (44.2, compared to 50.8 in 2004). The estimated spatial price index for housing can be combined with the village prices for other items to obtain overall spatial nonfood price indices. The details of this estimation process are described in Annex 2.

Table 4 provides estimates (obtained using the three-step procedure) of average annual rates of inflation in nonfood prices during two periods, 1993/94 to 2004 and 2004 to 2007 and three nonfood price indices for the period 2004-2007, i.e. a spatial price index with each year's Phnom Penh prices as the base, a temporal price index with each region's 2004 prices as the base and a linked nonfood price index with 2004 Phnom Penh prices as the base. These estimates indicate that inflation in nonfood prices (unlike in food prices) was at about the same annual rate during the period 2004-2007 as during the period 1993/94 to 2004. However, the estimates suggest that inflation in nonfood prices was more rapid in Phnom Penh during the latter period, reversing the pattern observed during the period 1993/94 to 2004. The estimated temporal nonfood price indices (2004 region prices=100) reflect the region-specific commodity compositions of the nonfood allowances, as previously explained (see Annex 2 for more details).

Table 4. Annual rates of inflation in nonfood prices by region for two periods (1993/94-2004 and 2004-2007) and regional nonfood price indices for the period 2004-2007

	1994-2004	2004-2007
Estimated annual rate (%) of inflation in nonfood prices		
Phnom Penh	3.8	4.4
Other urban	3.6	3.9
Rural	4.4	3.3
Nonfood price indices		
	2004	2007
Spatial nonfood price index (Phnom Penh prices=100)		
Phnom Penh	100.0	100.0
Other urban	89.1	87.8
Rural	83.2	80.7
Temporal nonfood price index (2004 region prices=100)		
Phnom Penh	100.0	113.7
Other urban	100.0	112.0
Rural	100.0	110.4
Linked nonfood price index (2004 Phnom Penh prices=100)		
Phnom Penh	100.0	113.7
Other Urban	89.1	99.8
Rural	83.2	91.8

Source: column 1 (Knowles 2005, Table 62); column 2 (Annex 1, Table 64).

These temporal price indices can be used directly to update the 2004 nonfood allowances for inflation during the period 2004-2007. The spatial price indices (Phnom Penh prices=100) reported in Table 4 reflect mainly the CSES village prices using a single set of weights

reflecting the 1993/94 composition of nonfood consumption among all households with per capita consumption within 20% of the nonfood allowance for the region in which they reside.²²

Table 5 presents the inflation-adjusted regional nonfood allowances and the overall poverty lines (i.e., the sum of the updated food poverty lines in Table 3 and the updated nonfood allowances).

Table 5. Updated nonfood allowances and overall poverty lines (current Riel per capita per day), 2004 and 2007

Region	2004*	2007*
Updated nonfood allowances (current Riel)		
Phnom Penh	569	647
Other Urban	384	430
Rural	364	402
Updated overall poverty line (= food poverty line + nonfood allowance)		
Phnom Penh	2,351	3,092
Other Urban	1,952	2,704
Rural	1,753	2,367

Source: column 1 (Annex 2, Table 55); column 2 (= product of column 1 with the corresponding regional nonfood price index in Table 4).

* in annual average prices

Alternative (one-step) estimates of nonfood price inflation during the period 2004-2007 can be obtained using only the CSES village price data. The procedures used to obtain these estimates are described in Annex 2. The resulting temporal price indices for 2007 (with 2004 regional prices=100) are: Phnom Penh (124.4), Other Urban (123.8), and Rural (128.1). When compared with the estimates in Table 4, these alternative temporal price indices indicate significantly higher inflation rates in nonfood prices. They also indicate that inflation during the period 2004-2007 was more rapid in Rural areas than in either Phnom Penh or Other Urban areas (in contrast to the temporal price indices in Table 4, which indicate that inflation was more rapid in Phnom Penh than in the other two regions). This is not very comforting. However, at least some of the difference may be due to the low rate of reporting of village nonfood prices in the 2007 CSES), which was highly selective.²³

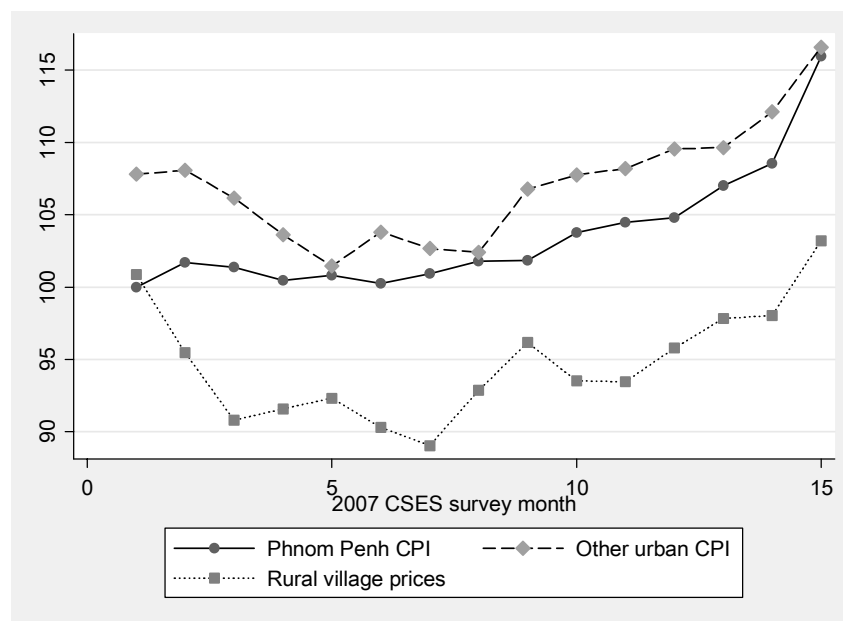
The price indices in Table 4 (and not those based only on village prices) are used to update the nonfood allowances in this report for two reasons: (1) to maintain comparability with the methods used in 2004 and (2) because the Phnom Penh CPI price data are believed to provide more reliable data on changes in nonfood prices over time than the CSES village

²² The spatial price indices reported in Table 4 are derived from the linked price index (for consistency) and therefore reflects not only the village prices but also the effect of the different regional commodity bundles on temporal inflation. By comparison, the 2007 spatial price index based only on the village prices (from Table 64, row b) is: Phnom Penh (100.0), Other Urban (88.63) and Rural (81.68).

²³ As discussed in Annex 2, village price reporting is closely related to factors such as the village's population size and whether or not it has a permanent market as well as the relative importance of the item in current consumption patterns. In the case of nonfood items, an important cause of non-reporting is that the item is no longer being widely consumed in a given village.

prices (particularly in light of the low rates of reporting of many nonfood prices, as discussed above). However, the validity of the three-step procedure used to obtain the temporal price indices reported in Table 4 rests once again on two key assumptions, i.e., (1) that there is a close relationship between nonfood price changes in Phnom Penh and those in Other Urban and Rural areas, and (2) that the village prices provide an accurate indication of spatial price differences in nonfood prices between regions in the year of the survey. Because there is now a CPI for Other Urban areas, it is possible to test these assumptions. Figure 3 compares the Phnom Penh and Other Urban nonfood CPIs during the full 15-month period of the 2007 CSES (i.e., October 2006 to December 2007).²⁴ Figure 3 also displays a nonfood price index for Rural areas based on only 7 nonfood items for which values were reported in every survey month, i.e., cigarettes, kerosene, bath soap, toothpaste, sandals (plastic), notebook and vitamin C.²⁵ Figure 3 shows that there is some positive correlation between the three nonfood price indices, but it is not as strong as that for the three food price indices in Figure 2. The village nonfood prices also tend to overstate the differences in nonfood prices between Phnom Penh and Other Urban areas according to the CPI, i.e., the spatial nonfood price index reported in Table 4 indicates a difference of 12.2 percentage points during calendar year 2007, whereas the CPI indicates a difference of only 2.6 percentage points during the same period. Again, this difference may be due to the selective under-reporting of village prices as well as to the fact that prices for the Other Urban CPI are collected in only five large towns, whereas the village price data are also collected in smaller towns.

Figure 3. Comparison of nonfood price indices by region, October 2006–December 2007



Source: Phnom Penh and Other Urban CPI (retrospective CPI described in Haglund 2008, using weights for Phnom Penh reported in Table 63); nonfood price index for Rural areas based on village prices for 7 nonfood items (see text and footnote).

²⁴ The CPI price indices in Figure 3 use the special nonfood allowance weights for Phnom Penh presented in Annex 2, Table 63. The base values for the CPI price indices are their respective 15-month means.

²⁵ The base value of the Rural price index is the 15-month mean for all three regions.

3. Household consumption

The 2007 CSES collected calendar year 2007 data on household consumption from 3,593 households using two distinct methodologies, i.e., a set of recall questions (with two sources of information in some cases) and a calendar-month diary that was completed by respondents with the assistance of interviewers who remained in each sample village for one full calendar month. The consumption estimates in this report are prepared for the most part using recall data from the same sources used to prepare the 2004 estimates of household consumption. However, in order to maintain comparability with the 2004 estimates, diary data were used to estimate consumption for a few categories for which no recall data were collected in the 2004 CSES (i.e., transportation, communications, personal care and hotel accommodations).

No adjustments were made to the reported data apart from imputation of an estimated rental value for owner-occupied housing for a small percentage of sample households that did not report either actual nonzero rent paid or an estimated rental value for owner-occupied housing.²⁶ Consistent with the procedures used in preparing earlier poverty estimates, household consumption includes all expenditure on consumer durables (not an annual use value).²⁷ Overall, there is a high degree of comparability between the types and sources of data used to prepare the 2004 and 2007 consumption estimates. The few exceptions, which appear to be minor, are discussed in Annex 3, which describes in detail how the 2007 estimates of household consumption were developed.

3.1 Estimates by region

Table 6 and Figure 4 present sample means of per capita daily household consumption in both current and constant (2004 calendar year average annual Phnom Penh) prices by region for 2004 and 2007 (estimated standard errors, adjusted for the CSES complex sample designs, are reported in parentheses below each sample mean). In the case of 2004, Table 6 presents values both for the full calendar year 2004 sample and for the subsample of villages included in the 2007 CSES sampling frame. The data indicate that real per capita consumption increased between 2004 and 2007 in every region, although by considerably less in Rural areas. Moreover, the increases are statistically significant at the 0.05 level in Phnom Penh and in Cambodia as a whole, at the 0.10 level in Rural areas, but are not statistically significant at even the 0.10 level in Other Urban areas (Figure 4).²⁸ The data in Table 6 also indicate that restricting the 2004 sample to villages in the 2007 CSES sampling frame does not make much difference in the estimates.

²⁶ A total of 3,407 of the 3,593 households in the calendar year 2007 sample (94.1%) provided data on either rent actually paid or an estimated rental value for owner-occupied housing.

²⁷ Data to permit estimation of an annual use value were not available prior to the 2004 CSES.

²⁸ Within the panel of villages interviewed in both the 2004 and 2007 CSES, the increase in per capita household consumption between 2004 and 2007 is also insignificant at the 0.10 level in Other Urban areas.

Table 6. Sample means of per capita daily household consumption in current and constant prices (Riel, 2004 calendar year average Phnom Penh prices) by region, 2004 and 2007 (standard errors in parentheses)

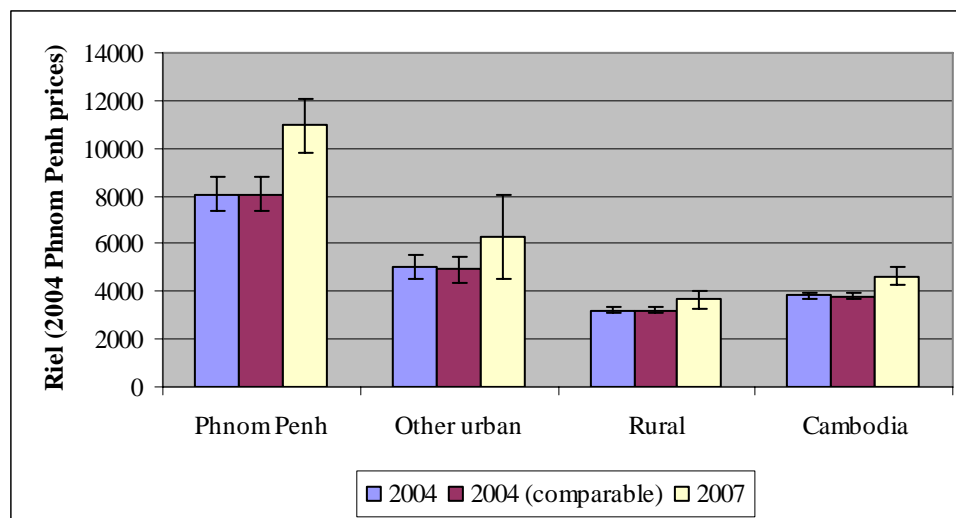
	2004	2004*	2007	% change 2004-2007 (col 3/col 2)
Per capita consumption per day (current Riel)				
Phnom Penh	8,067 (373)	8,067 (373)	13,324 (686)	+65.2
Other urban	4,424 (225)	4,365 (248)	6,976 (963)	+59.8
Rural	2,571 (53)	2,575 (54)	3,710 (175)	+44.1
Cambodia	3,238 (59)	3,224 (59)	4,964 (198)	+53.0
Per capita consumption per day (in constant 2004 calendar year average Phnom Penh prices)				
Phnom Penh	8,067 (373)	8,067 (373)	10,952 (583)	+35.8
Other urban	4,995 (254)	4,929 (279)	6,275 (899)	+27.3
Rural	3,214 (65)	3,218 (66)	3,649 (184)	+13.4
Cambodia	3,819 (67)	3,804 (68)	4,616 (192)	+21.4

Source: 2004 and 2007 CSES.

*sample limited to villages in the 2007 CSES sampling frame

Note: The constant price estimates presented in the lower half of the table are adjusted for inflation using the price indexes reported in Table 2 and Table 4. The standard errors are adjusted for sample stratification and clustering with the strata defined as the three regions (some of the 37 actual sample strata, i.e., the sampled urban-rural components of each province, have only one village).

Figure 4. Sample means of per capita daily household consumption in constant prices (Riel, 2004 calendar year average Phnom Penh prices) by region (showing 95% confidence intervals), 2004 and 2007



Source: Table 7.

3.2 Estimates of household consumption by per capita consumption quintile

The estimates of per capita household consumption in constant 2004 Phnom Penh prices can be used to form per capita consumption quintiles, dividing the population into five equal-sized groups ranked from poorest to richest in the level of their per capita consumption. By looking at how per capita consumption changed over time within each quintile it is possible to see to what extent the changes observed in overall per capita consumption were distributed equitably among the population. Table 7 and Figure 4 present estimates of the sample means (with standard errors in parentheses) of per capita consumption in both current and constant 2004 calendar year average Phnom Penh prices by per capita consumption quintile in 2004 and 2007. These estimates indicate that real per capita consumption increased significantly in all quintiles although the largest percentage increase occurred in the richest quintile (+30%).

Table 7. Sample means of per capita daily household consumption in current and constant prices (Riel, 2004 calendar year average Phnom Penh prices) by per capita consumption quintile, 2004 and 2007 (standard errors in parentheses)

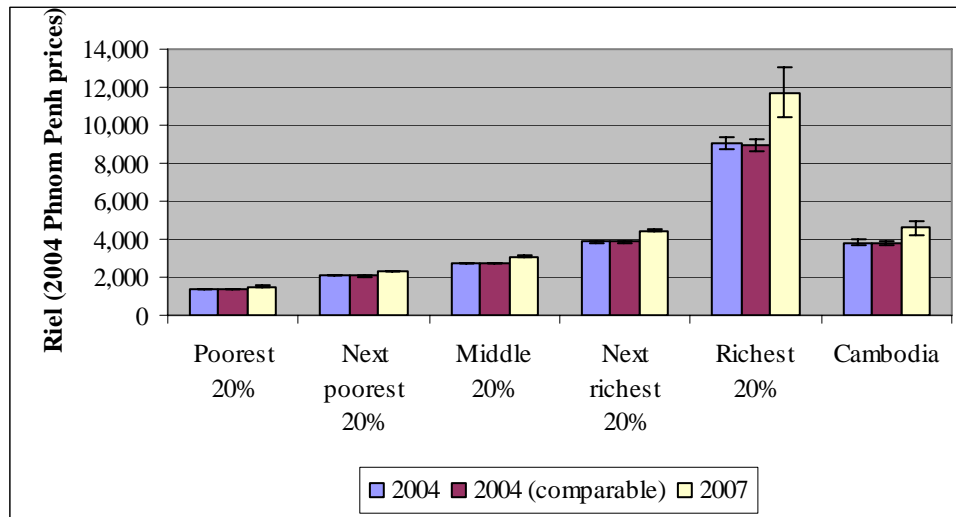
	2004	2004*	2007	% change 2004-2007 (col 3/col 2)
Per capita consumption per day (current Riel)				
Poorest 20%	1,107 (8)	1,106 (8)	1,608 (22)	+44.4
Next poorest 20%	1,660 (4)	1,656 (4)	2,407 (10)	+44.3
Middle 20%	2,231 (6)	2,224 (6)	3,227 (16)	+44.1
Next richest 20%	3,192 (14)	3,180 (14)	4,710 (36)	+47.1
Richest 20%	8,004 (152)	7,957 (154)	12,889 (640)	+61.0
Cambodia	3,238 (59)	3,224 (59)	4,964 (198)	+53.0
Per capita consumption per day (in constant 2004 calendar year average Phnom Penh prices)				
Poorest 20%	1,378 (9)	1,377 (9)	1,524 (21)	+10.7
Next poorest 20%	2,062 (4)	2,060 (4)	2,296 (8)	+11.5
Middle 20%	2,749 (5)	2,743 (5)	3,093 (12)	+12.7
Next richest 20%	3,860 (10)	3,852 (11)	4,458 (29)	+15.7
Richest 20%	9,046 (163)	8,990 (166)	11,723 (652)	+30.4
Cambodia	3,819 (67)	3,804 (68)	4,616 (192)	+21.4

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

It is interesting to compare these gains in real per capita consumption with those during the period 1993/94 to 2004 reported in Knowles (2005). Overall, the percentage gains during the period 2004-2007 (+21%) were about two-thirds the size of the percentage gains during the earlier period 1993/94-2004 (32%), despite that the earlier period was much longer (i.e., 10 years versus only 3 years). During the earlier 10-year period, real per capita consumption was estimated to have increased by only 8% in the poorest quintile, while it increased by 45% in the richest quintile. By comparison, the income gains during the period 2004-2007 have been more equitably distributed than during the period 1993/94 to 2004. The fact that the increases in current income between 2004 and 2007 (upper half of the table) were more equitably distributed than the increases in real income (lower half of the table) is due to the much higher rate of inflation in food prices than in nonfood prices during this period, which adversely affected the poorer quintiles more than the richer quintiles (refer to the shares of food consumption in total consumption by quintile in Table 7).

Figure 5. Sample means of per capita household consumption in constant prices (Riel, 2004 calendar year average Phnom Penh prices) by per capita consumption quintiles (showing 95% confidence intervals), 2004 and 2007



Source: Table 7.

3.3 *Estimated shares of food consumption in total household consumption*

According to Engel's Law (loosely interpreted), the proportion of total consumption allocated to food tends to decrease as the level of per capita consumption increases. In fact, the relationship between the food share and the level of per capita consumption is typically so tight that estimates of the food share are often used as a check on the accuracy of estimated changes in real per capita consumption over time. Table 8 presents the estimated shares of food consumption in total household consumption in both current and constant Riel (2004 calendar year average Phnom Penh prices).²⁹

²⁹ The first two columns in Table 8 are very similar in the top and bottom halves of the table. However, there are not identical because the consumption data used in the bottom half of the table reflect spatial price adjustments that are applied separately to food and nonfood consumption.

Table 8. Estimated shares (%) of food consumption in total household consumption in current and constant prices (Riel, 2004 calendar year average Phnom Penh prices) by region and by per capita consumption quintile, 2004 and 2007

	2004	2004*	2007
Food consumption as a share of total consumption (current Riel)			
Phnom Penh	42.87 (1.07)	42.87 (1.07)	42.94 (1.34)
Other urban	57.68 (0.86)	58.12 (0.87)	57.07 (1.55)
Rural	64.45 (0.37)	64.41 (0.37)	65.45 (0.60)
Cambodia	61.88 (0.33)	61.93 (0.34)	62.44 (0.56)
Poorest 20%	69.08 (0.49)	69.03 (0.50)	72.56 (0.85)
Next poorest 20%	67.41 (0.37)	67.39 (0.38)	68.63 (0.67)
Middle 20%	65.09 (0.38)	65.11 (0.39)	64.70 (0.86)
Next richest 20%	60.55 (0.50)	60.70 (0.50)	60.10 (0.82)
Richest 20%	47.29 (0.62)	47.31 (0.63)	46.14 (1.02)
Cambodia	61.88 (0.33)	61.93 (0.34)	62.44 (0.56)
Food consumption as a share of total consumption (constant Riel, 2004 calendar year average Phnom Penh prices)			
Phnom Penh	42.87 (1.07)	42.87 (1.07)	38.78 (1.30)
Other urban	57.95 (0.86)	58.39 (0.87)	51.51 (1.59)
Rural	65.80 (0.37)	65.76 (0.37)	61.61 (0.63)
Cambodia	63.00 (0.33)	63.06 (0.33)	58.40 (0.58)
Poorest 20%	70.16 (0.48)	70.12 (0.49)	68.77 (0.91)
Next poorest 20%	68.51 (0.36)	68.51 (0.37)	64.63 (0.74)
Middle 20%	66.31 (0.38)	66.35 (0.38)	60.60 (0.88)
Next richest 20%	61.76 (0.50)	61.90 (0.50)	55.99 (0.87)
Richest 20%	48.25 (0.62)	48.29 (0.63)	41.95 (1.00)
Cambodia	63.00 (0.33)	63.06 (0.33)	58.40 (0.58)

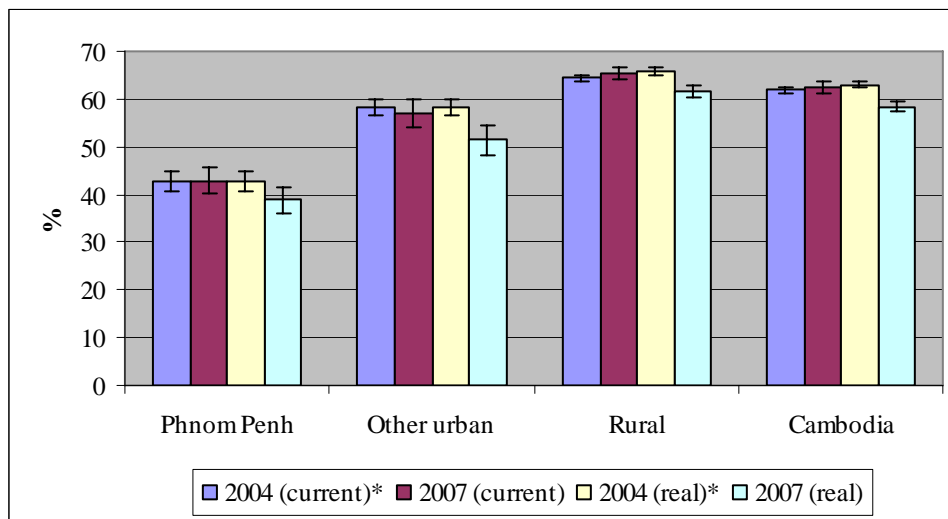
Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

These data show the expected inverse relationship between food shares and per capita household consumption in each year and regardless of whether household consumption is measured in current or real terms. However, the data in the top half of Table 8 (and in Figures 5 and 6) indicate that the food shares *increased* between 2004 and 2007 in current Riel in Cambodia as a whole, in all regions except Other Urban and in the poorest two quintiles, reversing a downward trend observed during the period 1993/94 to 2004 (Knowles 2005).

By contrast, the data in the bottom half of Table 8 indicate that food shares *decreased in real terms* between 2004 and 2007 in all regions and in all quintiles, including in the poorest two quintiles. What has likely happened is that Cambodian consumers at all income levels have responded to rising real income levels and rising relative prices of food by substituting nonfood consumption for food consumption, as evidenced by the declining food shares in real terms.³⁰ Such a shift does not necessarily imply that consumers consumed fewer calories in 2007 than they did in 2004 because consumers are also likely to have substituted cheaper foods with the same caloric value for more expensive foods as a response to higher food prices. According to the data in Table 8, the largest downward adjustments in real food consumption shares occurred in Other Urban and Rural areas (a smaller change is observed in Phnom Penh’s real food share) and in the richest four quintiles (a smaller change is observed in the poorest quintile).

Figure 6. Food consumption as a share (%) of total household consumption by region (with 95% confidence intervals), 2004-2007

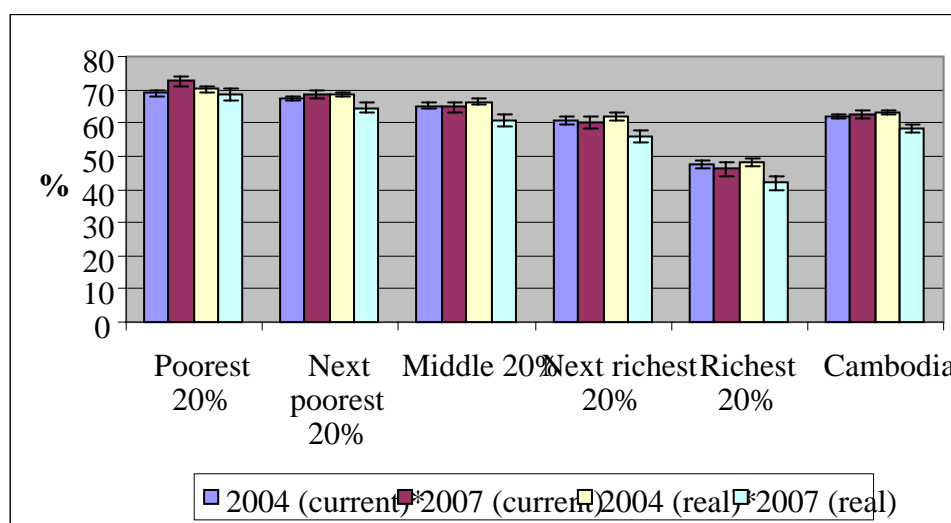


Source: Table 8.

* sample limited to villages in the 2007 CSES sampling frame.

³⁰ Unfortunately, it is not possible to separate out the income effect from the substitution effect, both of which cause the food share to decline in real terms, in the absence of an econometric analysis of data spanning several years.

Figure 7. Food consumption as a share (%) of total household consumption by per capita consumption quintile (with 95% confidence intervals), 2004-2007



Source: Table 8.

* sample limited to villages in the 2007 CSES sampling frame.

3.4 Estimates of overall inequality in per capita household consumption

Changes in poverty over time depend not only on changes in average levels of real per capita consumption but also on changes in the size distribution of per capita consumption. The estimates of the increases over time in real per capita consumption by quintile that are presented in Table 7 suggest that inequality in the distribution of per capita household consumption increased during the period 2004 to 2007. Table 9 presents estimates of the Gini coefficient³¹ for real per capita consumption by region in calendar years 2004 and 2007 (including for the comparable 2004 subsample of villages included in the 2007 CSES sampling frame). Estimated standard errors are also reported in parentheses under each estimated Gini coefficient.³²

The results in Table 9 and Figure 8 indicate that income inequality increased during the period 2004-2007, as expected. The overall Gini coefficient for Cambodia increased from 0.39 to 0.43 in a comparable sample of villages, although this estimated increase is not statistically significant at even the 0.10 level. Although income inequality in Phnom Penh is estimated to have decreased during this period, the estimated decrease is also not statistically significant. Similarly, neither the relatively large estimated increase in the Gini coefficient in

³¹ The Gini coefficient is the most commonly used summary measure of income inequality. It ranges in value from zero—corresponding to complete equality in the distribution of income—and one, which would signify complete inequality, i.e., all consumption or income received by a single individual.

³² The estimated standard errors in Table 9, which reflect clustered sampling, were obtained using the Stata add-in program “ineqerr” and are bootstrapped estimates obtained on the basis of 100 replications.

Other Urban areas nor the more moderate increase in Rural areas is statistically significant. Under these conditions, the relatively small 2007 CSES sample does not provide definitive information about changes in overall income inequality during this relatively brief period. Lorenz curves showing differences between regions in the size distribution of real per capita consumption in 2007 are presented in Figure 9, while Figures 9-12 show shifts in the Lorenz curves by region between 2004 and 2007.

Table 9. Estimated Gini coefficients (with estimated standard errors in parentheses) by region, 2004 and 2007

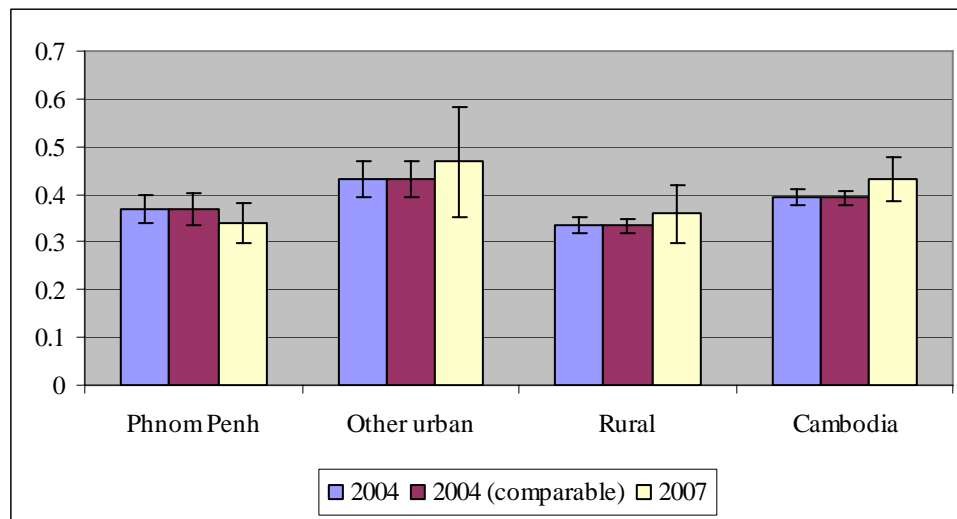
Region	2004	2004*	2007
Phnom Penh	0.369 (0.014)	0.367 (0.017)	0.340 (0.020)
Other urban	0.435 (0.016)	0.431 (0.019)	0.468 (0.060)
Rural	0.342 (0.010)	0.334 (0.007)	0.360 (0.031)
Cambodia	0.396 (0.008)	0.393 (0.008)	0.431 (0.024)

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

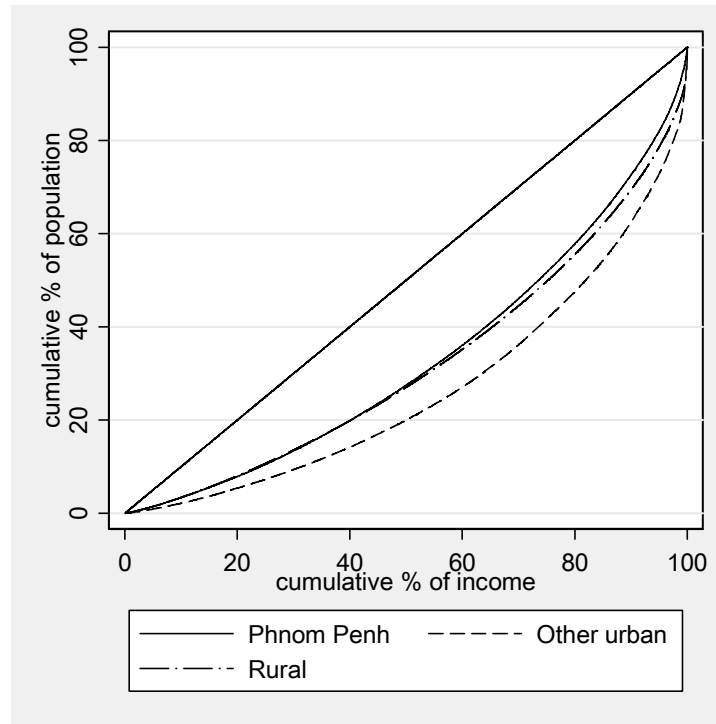
Note: the per capita consumption values used to calculate the Gini coefficients in columns 2 and 3 are in constant 2004 calendar year average Phnom Penh prices (i.e., adjusted for spatial variation in prices). The estimates reported in column 1 are taken directly from Knowles (2005).

Figure 8. Gini coefficients of income inequality by region (showing 95% confidence intervals), 2004 and 2007



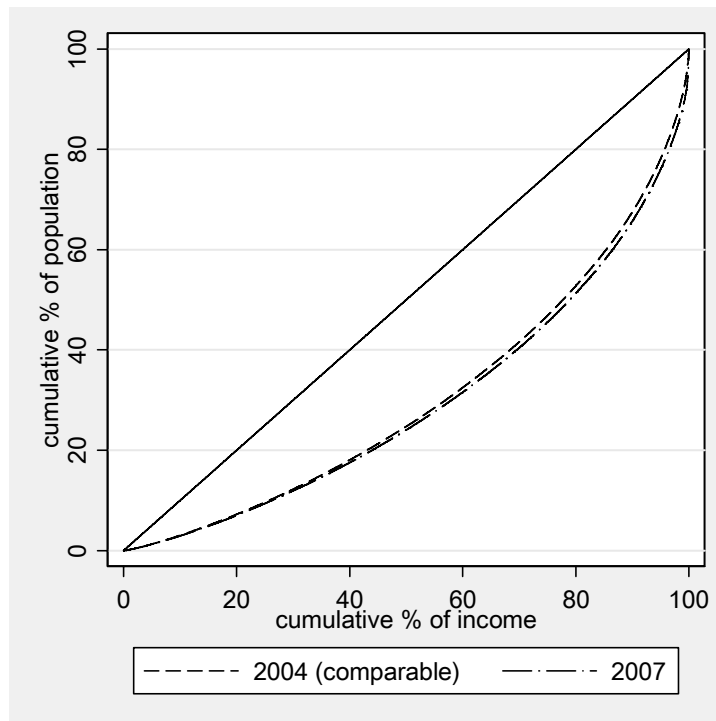
Source: 2004 and 2007 CSES.

Figure 9. Lorenz curves by region, 2007



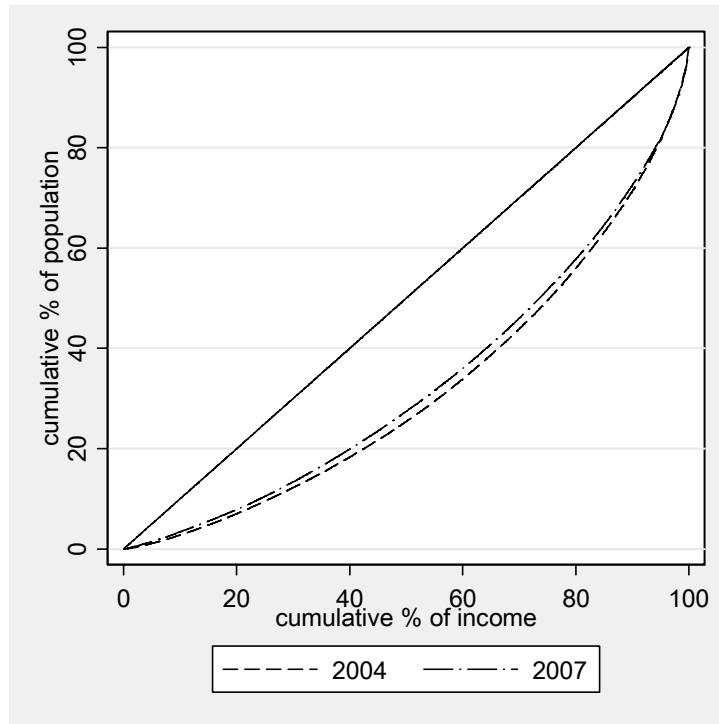
Source: 2007 CSES.

Figure 10. Changes in the Lorenz curve for Cambodia as a whole between 2004 and 2007



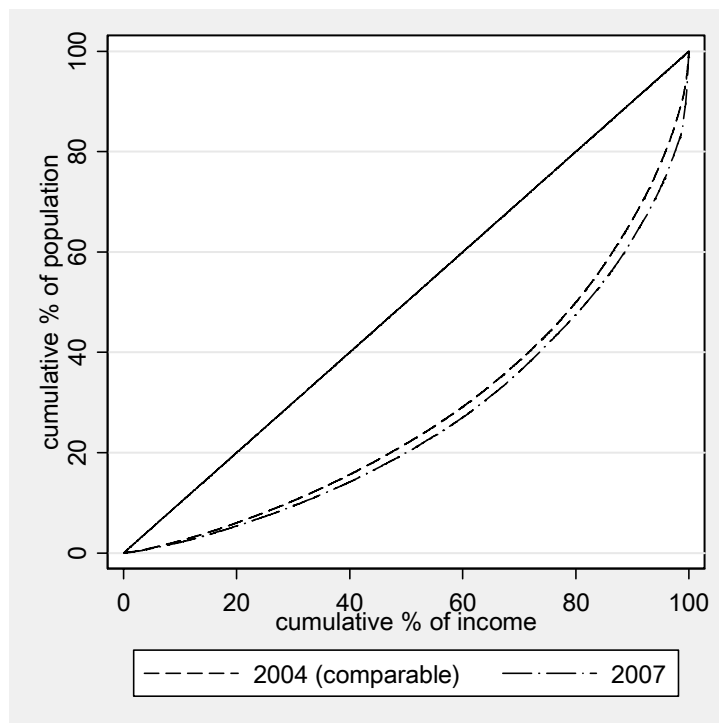
Source: 2004 and 2007 CSES.

Figure 11. Changes in the Lorenz curve in Phnom Penh, 2004 to 2007



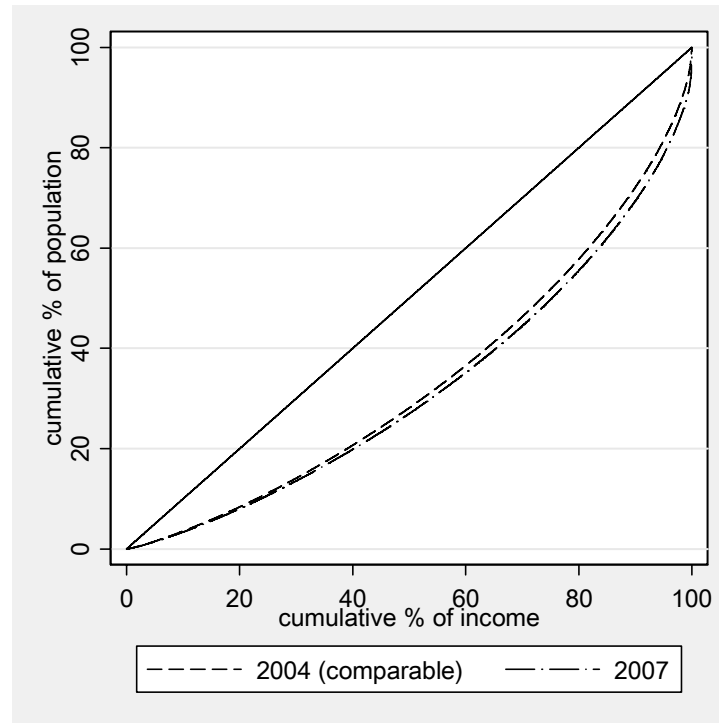
Source: 2004 and 2007 CSES.

Figure 12. Changes in the Lorenz curve in Other Urban areas, 2004 to 2007



Source: 2004 and 2007 CSES.

Figure 13. Changes in the Lorenz curve in Rural areas, 2004 to 2007



Source: 2004 and 2007 CSES.

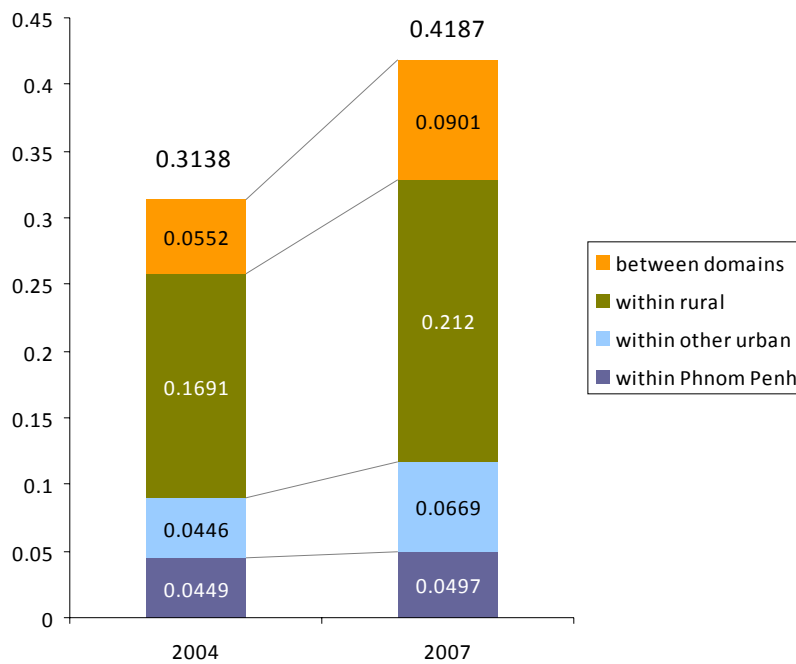
It is interesting to know the extent to which the increase in overall income inequality between 2004 and 2007 was due to changes in inequality *within* regions versus changes in mean levels of income *between* regions. Unfortunately, the Gini coefficient cannot be decomposed into within-region and between-region changes. However, the Theil index of income inequality has this useful property. Table 10 and Figure 14 show the decomposition of the Theil index by region for 2007 and for a comparable sample from 2004. These data indicate that increases in inequality within regions accounted for two-thirds of the increased inequality between 2004 and 2007, while increases inequality between regions accounted for the remaining one-third. Among regions, increases in inequality within Rural areas, with 63% of total household income in 2007, accounted for 41% of the total increase in inequality during this period, while increases within Other Urban areas, with 14% of total income, accounted for 21% of the total increase in income inequality. Increases in inequality within Phnom Penh, with 23% of total income, accounted for only 5% of the total increase in income inequality during this period.

Table 10. Decomposition of the Theil index of income inequality by region, 2004 and 2007

Component	2004 (comparable)	2007	Change	% distribution
Within regions				
Phnom Penh	0.0449	0.0497	0.0048	4.6
Other Urban	0.0446	0.0669	0.0223	21.3
Rural	0.1691	0.2120	0.0429	40.9
Between regions	0.0552	0.0901	0.0349	33.3
Total	0.3138	0.4187	0.1049	100.0

Source: 2004 and 2007 CSES.

Figure 14. Decomposition of the Theil index of income inequality by region, 2004 and 2007



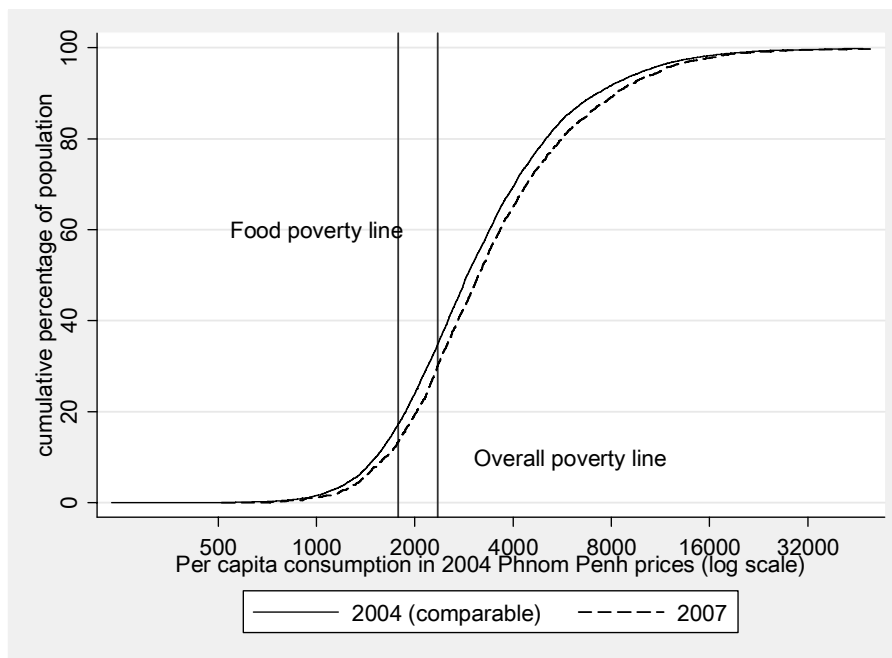
Source: 2004 and 2007 CSES.

4. Poverty estimates

Poverty measures are calculated in Cambodia by comparing the estimates of per capita daily consumption in current Riel for each individual in the sample to the updated poverty lines (Table 3 and Table 5) for the region in which each person resides. Three different poverty rates (in percentage terms) are calculated, i.e., the *poverty headcount index* (P_0), which is the percentage of the population with per capita consumption below the poverty line, the *poverty gap index* (P_1), which is the average percentage difference between a person's per capita consumption and the poverty line (with a zero value assigned to individuals above the poverty line), and the *poverty severity index* (P_2), which is the poverty gap squared before it is averaged over the population, thereby giving greater weight to larger poverty gaps.³³

Figure 15 shows the cumulative distributions in 2004 and 2007 of real per capita household consumption in 2004 Phnom Penh prices (i.e., the cumulative percentages of the population having incomes below the levels depicted on the X axis, which uses a logarithmic scale). Figure 15 also shows where the food poverty line and the overall poverty line in 2004 Phnom Penh prices intersect the cumulative distributions.

Figure 15. Cumulative distributions of per capita household consumption (Riel per day in 2004 Phnom Penh prices) in relation to the food poverty line and the overall poverty line, 2004 and 2007



Source: 2004 and 2007 CSES.

³³ These three poverty measures are of course the widely used poverty measures proposed by Foster, Greer and Thorbecke (1984), expressed in percentage terms. The poverty gap index indicates the percentage of total household consumption that would need to be redistributed with perfect targeting to eliminate poverty.

Figure 15 indicates that real per capita household consumption increased for all income segments during the period 2004 to 2007, as evidenced by a clear shift to the right in the cumulative distributions at all income levels (i.e., the cumulative distributions do not intersect). One important implication is that the poverty headcount index would be estimated to have decreased during this 3-year period for any conceivable poverty line (i.e., the estimated decrease in poverty during this period is robust with respect to the choice of a poverty line).

Table 11, Figure 16 and Figure 17 present poverty estimates by region for calendar years 2004 and 2007 in columns 1-3 as well as the estimated percentages of the poor in each region (columns 4-6 and in Figure 18). Estimates are provided both for the food poverty line and the overall poverty line (i.e., the food poverty line plus the nonfood allowance). Estimated standard errors are also reported in parentheses below each point estimate in columns 1-3.³⁴ The estimates for 2004 are provided both for the full calendar year sample (column 1) and for the subsample of villages in the 2007 CSES sampling frame (column 2).³⁵

The poverty estimates in Table 11 indicate that the poverty headcount index relative to the overall poverty line for Cambodia decreased from 34.8 % in 2004 (in comparable villages) to 30.1% in 2007. The poverty headcount index relative to the food poverty line for Cambodia also decreased during this period, but only from 19.7% in 2004 (in comparable villages) to 18.0%. The relatively rapid inflation in food prices during this period accounts for this difference. The results in Table 11 also indicate that the poverty headcount index, relative to both the overall poverty line and the food poverty line, decreased in every region, i.e., the decreases in poverty during the period 2004-2007 were balanced regionally. The same conclusions apply equally to the poverty gap and poverty severity indices.

Although the estimated changes between 2004 and 2007 in the poverty headcount index are statistically significant at the 5% level only in Phnom Penh when considered as two independent cross-section samples (Figure 16 and Figure 17), the changes in the poverty headcount index relative to the poverty line are statistically significant at the 0.05 level in Cambodia as a whole and in Rural areas when the sample is treated as a panel of 360 villages (see detailed discussion in Annex 4).³⁶

³⁴ The poverty estimates and their standard errors were estimated using the Stata add-in program “sepov”. The estimated standard errors are linearized estimates obtained from Stata’s “svy:mean” command and are designed to adjust for the complex sample designs of the CSES. However, they do not reflect the fact that the poverty lines are in this case also random variables, since they are updated in part on the basis of the CSES village prices, nor do they reflect the fact that the sample PSUs of the 2007 CSES are a subsample of the 2004 CSES sample PSUs. Additional poverty estimates are provided in Annex 4 that take both factors into account.

³⁵ Additional poverty estimates are provided in Annex 4, including comparable estimates for 1993/94, 2004 and 2007 based on villages in the 1993/95 SESC sampling frame (which included only 56% of rural villages), and estimates for the same 360 villages included in both the 2004 and 2007 CSES samples. These additional poverty estimates are broadly consistent with those presented in Table 11.

³⁶ In addition, the poverty headcount index relative to the food poverty line is statistically significant for Cambodia as a whole (Annex 4).

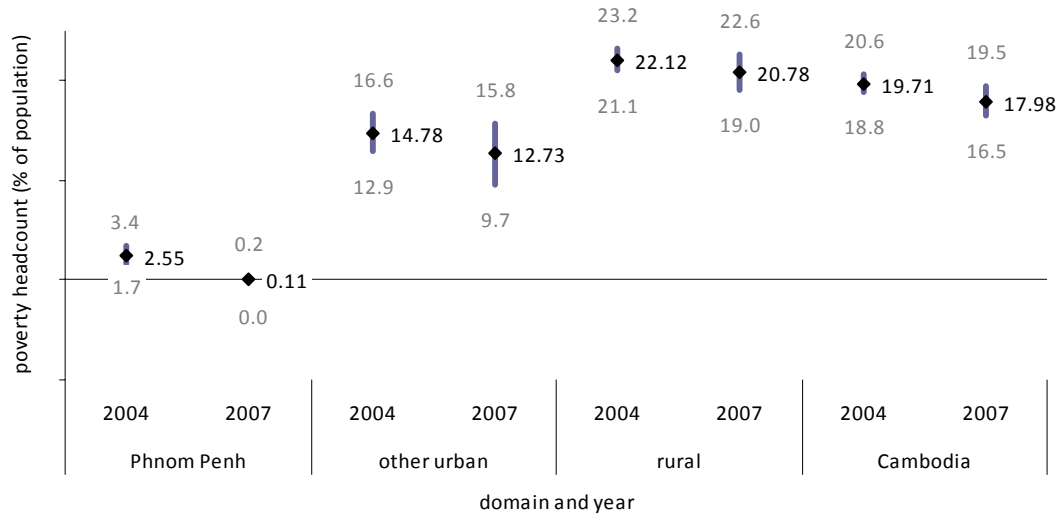
Table 11. Poverty estimates by region, 2004 and 2007 (estimated standard errors)

Poverty line	Domain	Poverty measure (estimated standard errors)			Population distribution of poverty measure			Total population distribution
		2004	2004*	2007	2004	2004*	2007	2008 (Census)
Poverty headcount		Poverty headcount index			% of all poor			% population
Food poverty line	Phnom Penh	2.55 (0.78)	2.55 (0.82)	0.11 (0.11)	1.1	1.1	0.1	9.9
	Other Urban	14.15 (1.61)	14.78 (1.86)	12.73 (3.06)	7.8	7.2	7.3	10.2
	Rural	22.23 (0.97)	22.12 (1.04)	20.78 (1.79)	91.1	91.6	92.7	79.8
	Cambodia	19.68 (0.81)	19.71 (0.89)	17.98 (1.49)	100.0	100.0	100.0	100.0
Poverty line	Phnom Penh	4.60 (0.99)	4.60 (1.07)	0.83 (0.52)	1.1	1.1	0.3	9.9
	Other Urban	24.73 (2.18)	25.78 (2.49)	21.85 (5.05)	7.8	7.2	7.5	10.2
	Rural	39.18 (1.13)	39.05 (1.22)	34.70 (2.07)	91.1	91.7	92.3	79.8
	Cambodia	34.68 (0.97)	34.78 (1.05)	30.14 (1.77)	100.0	100.0	100.0	100.0
Poverty gap		Poverty gap index			% of all poverty gaps			% population
Food poverty line	Phnom Penh	0.54 (0.24)	0.54 (0.25)	0.01 (0.01)	1.1	1.1	0.1	9.9
	Other Urban	3.28 (0.52)	3.52 (0.62)	3.18 (0.99)	7.8	7.2	7.3	10.2
	Rural	4.78 (0.28)	4.74 (0.30)	4.42 (0.52)	91.1	91.6	92.7	79.8
	Cambodia	4.25 (0.24)	4.26 (0.25)	3.87 (0.43)	100.0	100.0	100.0	100.0
Poverty line	Phnom Penh	1.23 (0.37)	1.23 (0.39)	0.08 (0.05)	1.1	1.1	0.3	9.9
	Other Urban	6.55 (0.75)	6.92 (0.89)	5.32 (1.44)	7.8	7.2	7.5	10.2
	Rural	10.17 (0.42)	10.12 (0.46)	8.31 (0.73)	91.1	91.7	92.3	79.8
	Cambodia	9.02 (0.36)	9.04 (0.39)	7.22 (0.61)	100.0	100.0	100.0	100.0
Poverty severity		Poverty severity index			% of all squared poverty gaps			% population
Food poverty line	Phnom Penh	0.21 (0.12)	0.21 (0.13)	0.00 (0.00)	1.1	1.1	0.3	9.9
	Other Urban	1.15 (0.23)	1.25 (0.28)	1.09 (0.41)	7.8	7.2	5.8	10.2
	Rural	1.56 (0.11)	1.55 (0.12)	1.43 (0.21)	91.1	91.6	93.9	79.8
	Cambodia	1.40 (0.10)	1.40 (0.18)	1.26 (0.18)	100.0	100.0	100.0	100.0
Food poverty line	Phnom Penh	0.49 (0.20)	0.49 (0.21)	0.01 (0.01)	1.1	1.1	0.7	9.9
	Other Urban	2.48 (0.37)	2.65 (0.44)	2.01 (0.64)	7.8	7.2	5.6	10.2
	Rural	3.76 (0.20)	3.73 (0.21)	2.95 (0.34)	91.1	91.7	93.7	79.8
	Cambodia	3.34 (0.17)	3.35 (0.18)	2.58 (0.28)	100.0	100.0	100.0	100.0

Source: 2004 and 2007 CSES.

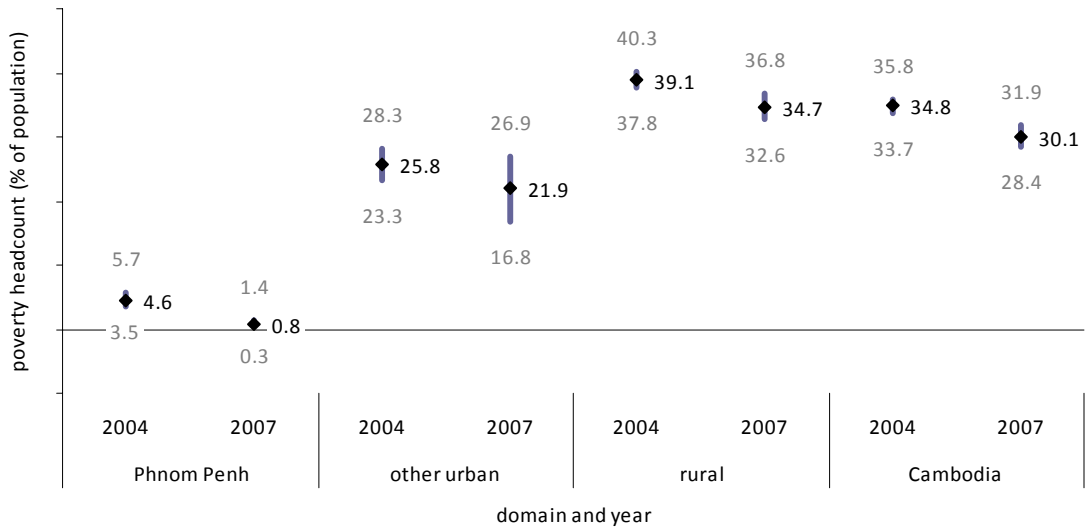
* limited to villages in the 2007 CSES sampling frame.

Figure 16. Poverty headcount indices relative to food poverty lines (showing 95% confidence intervals) by domain, 2004 and 2007



Source: 2004 and 2007 CSES.

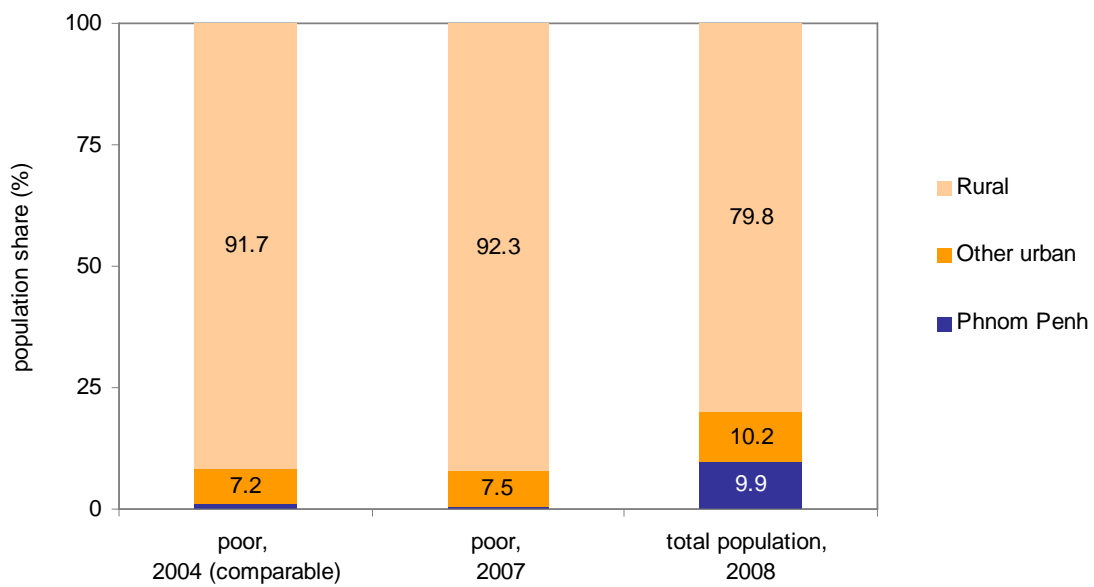
Figure 17. Poverty headcount indices relative to overall poverty lines (showing 95% confidence intervals) by region, 2004 and 2007



Source: 2004 and 2007 CSES.

Table 11 (columns 4-6) and Figure 18 present estimates of the percentage distribution of the poor population in 2004 and 2007 by region according to various definitions of “poor” (i.e., relative to the food poverty line or relative to the overall poverty line and according to the headcount, poverty gap or poverty severity measures) and compare them to the percentage distribution of the total population in 2008 (based on the preliminary count of the 2008 Population Census). These estimates indicate that the “poor” (according to any definition) are disproportionately concentrated in the Rural areas and became even more so during this period (i.e., the Rural share of the poor increased in all cases).

Figure 18. Regional shares of the poor in 2004 and 2007 (relative to the overall poverty line) compared to the total population (2008 Census)



Source: 2004 and 2007 CSES.

5. Socio-economic indicators

The multi-objective household surveys in Cambodia have collected data on a large number of socio-economic indicators other than household consumption. It is useful to examine these data for two reasons. Firstly, the data collected on many of these other indicators are generally considered to be more reliable than the data collected on household consumption or income. Because many of these other indicators (and particularly those related to housing characteristics and the ownership of consumer durables) are closely related to household income, trends in these indicators over time provide an independent source of information about the accuracy of the observed trends in per capita consumption and poverty. Secondly, poverty is considerably broader than income deprivation alone. Although low income is a reasonable proxy for many of the other dimensions of poverty, income poverty measures, such as those presented in section four above, do not necessarily cover all dimensions of poverty. For example, they may not adequately reflect differentials in the utilization of publicly subsidized services such as education and health care. Accordingly, this section of the report examines patterns and trends in a broad range of socio-economic indicators other than household income.

The tables showing values of indicators by quintile in 2004 and 2007 also show the ratio of the value in the middle quintile to that in the poorest quintile. Among those indicators that do vary substantially among quintiles, two patterns are common. The first and most common pattern is that the indicator either increases or decreases monotonically with income across all quintiles. However, a second pattern for some indicators is that they vary little among the poorest four quintiles but are sharply higher (or lower) in the richest quintile. These indicators are likely to be most sensitive to urban residence, since the percentage of urban residents is sharply higher in the richest quintile (see Table 36 and Table 37 below).

5.1 Housing, water and sanitation

Table 12 presents household-level indicators of housing, water and sanitation by per capita consumption quintile from the 2007 CSES, while Table 13 presents the same indicators from 2004 (with the sample limited to villages in the 2007 CSES sampling frame). Many of the indicators are either positively or negatively related to income and the relationships are mostly systematic (i.e., increase or decrease monotonically with income). By themselves these data indicate that the 2004 and 2007 CSES estimates of per capita consumption that are used to form the quintiles are at least highly correlated with a household's "permanent" income.³⁷ Given this report's focus on poverty, the differentials among the three poorest quintiles are of particular interest. Column 7 in both tables presents the ratio of the value of the indicator in the middle quintile to its value in the poorest quintile (column 1). This helps to identify indicators that vary substantially with income in the three poorest quintiles. Indicators are starred if the ratio is either 1.2 or above (i.e., strongly positively related to income) or 0.80 or below (i.e., strongly negatively related to income) and if all percentages in the poorest three quintiles are equal to 1.0 or above (because housing characteristics that are relatively rare in

³⁷ Were they not accurate (e.g., full of random measurement error) the observed differentials among quintiles would be small and erratic, which is definitely not the case in either Table 12 or Table 13.

the three poorest quintiles are of little interest to poverty analysis). The labels also indicate whether a given indicator is monotonically related to income either positively (+) or negatively (-) in the poorest three quintiles.

Table 12. Housing, water and sanitation indicators by per capita consumption quintile, 2007

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle: poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Rooms per capita (+)*	0.20	0.23	0.27	0.30	0.45	0.29	1.36
Living area (sq meters) per capita (+)*	5.71	6.85	8.32	9.71	15.95	9.31	1.46
Housing owned (-)	97.0	95.7	95.5	91.5	90.8	94.1	0.98
Roof - thatched (-)*	35.2	26.6	21.5	11.3	3.9	19.7	0.61
Roof - tiled*	24.2	29.9	29.3	35.2	26.4	29.0	1.21
Roof - galvanized iron or aluminum (+)*	37.2	37.5	44.6	45.5	41.3	41.2	1.20
Roof - concrete or fibrous cement*	3.1	5.5	4.4	7.8	28.3	9.8	1.43
Roof - other	0.3	0.5	0.2	0.2	0.2	0.3	0.89
Wall - bamboo (-)*	55.6	48.5	36.7	26.5	8.3	35.1	0.66
Wall - wood, plywood or log (+)*	38.6	41.8	54.5	54.6	43.9	46.7	1.41
Wall - concrete or fibrous cement*	1.9	1.6	3.9	12.4	44.2	12.8	2.08
Wall - other*	3.9	8.0	4.9	6.5	3.6	5.4	1.25
Floor - earth or clay	7.1	9.2	5.8	6.9	3.3	6.5	0.82
Floor - wood or bamboo(-)	86.9	86.3	85.7	75.0	42.7	75.3	0.99
Floor - cement*	3.1	2.4	6.2	7.6	9.7	5.8	2.00
Floor - parquet or polished wood (-)*	2.7	1.7	1.5	3.6	3.3	2.6	0.54
Floor - ceramic tiles (+)	0.0	0.0	0.8	6.6	40.5	9.6	
Floor - other	0.2	0.3	0.0	0.3	0.6	0.3	0.00
Water - piped or public tap (+)*	1.1	3.6	6.3	16.5	54.7	16.4	5.63
Water - tube or piped well	29.9	30.3	30.2	26.7	15.2	26.5	1.01
Water - protected or unprotected dug well*	34.5	24.7	25.2	19.5	9.2	22.6	0.73
Water - purchased (+)*	6.5	9.9	12.4	15.0	7.5	10.2	1.89
Water - other	27.9	31.5	25.9	22.4	13.4	24.2	0.93
Toilet - water sealed, connected to sewage or septic tank (+)*	7.7	10.9	19.6	35.0	76.9	29.9	2.55
Toilet - closed or open pit (+)*	2.6	3.7	4.7	4.8	2.0	3.6	1.84
Toilet - other (+)*	2.6	3.6	4.0	4.0	1.7	3.2	1.56
Toilet - open land or none (-)	87.2	81.7	71.7	56.2	19.5	63.3	0.82
Light - city power, generator or battery (+)*	40.5	53.4	57.1	77.6	94.3	64.6	1.41
Light - kerosene (-)*	58.9	45.8	39.6	22.0	5.6	34.4	0.67
Light - other (+)	0.6	0.8	3.3	0.3	0.1	1.0	5.82
Fuel - firewood (-)	99.0	96.8	93.9	80.8	40.0	82.1	0.95
Fuel - charcoal or firewood and charcoal (+)*	1.0	2.9	4.7	13.9	21.5	8.8	4.45
Fuel - gas or electricity (+)	0.0	0.3	1.4	5.1	38.4	9.0	
Fuel - other (+)	0.0	0.0	0.1	0.2	0.0	0.1	

Source: 2007 CSES.

Blank cells in column 7 are because the ratio cannot be calculated because the value in the poorest quintile is zero.

The data in Table 12 for 2007 shows that several indicators of housing, water and sanitation are both systematically and strongly related to income (either positively or negatively) in the three poorest quintiles. Indicators positively related to income include living area; galvanized

iron or aluminum roofing; outer walls made of wood, plywood or logs; both piped or public tap and purchased water sources; water-sealed toilets or toilets connected to a sewage system or septic tank as well as both closed or open pit toilets and “other” types of toilets; city power, generator or battery sources of lighting; and use of charcoal or firewood and charcoal for cooking fuel. Thatched roofing; outer walls of bamboo, thatch or leaves; parquet or polished wood floors; and kerosene as a lighting source are all negatively related to income. Most of these indicators were also systematically and strongly related to income in 2004 (Table 13), the exception being parquet or polished wood floors.

Table 13. Housing, water and sanitation indicators by per capita consumption quintile, 2004*

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Rooms per capita (+)*	0.19	0.22	0.25	0.29	0.40	0.27	1.29
Living area (sq meters) per capita (+)*	5.28	6.68	7.68	9.25	13.22	8.42	1.45
Housing owned	97.0	97.1	96.2	94.4	94.1	95.7	0.99
Roof - thatched (-)*	37.3	25.6	19.2	14.2	5.1	20.3	0.52
Roof - tiled (+)*	19.4	28.3	30.8	36.2	30.7	29.1	1.58
Roof - galvanized iron or aluminum (+)*	25.7	33.3	36.7	35.9	40.7	34.5	1.43
Roof - concrete or fibrous cement*	3.9	3.6	5.4	7.9	20.7	8.3	1.37
Roof - other (-)*	13.7	9.0	7.9	5.8	2.7	7.8	0.58
Wall - bamboo (-)*	38.2	33.4	29.4	21.9	9.5	26.5	0.77
Wall - wood, plywood or log (+)*	33.3	41.2	47.6	54.3	53.1	45.9	1.43
Wall - concrete or fibrous cement (+)	0.3	1.1	3.0	8.3	29.0	8.3	9.06
Wall - other (-)*	28.2	24.3	20.0	15.6	8.3	19.3	0.71
Floor - earth or clay	6.5	7.8	7.4	7.1	5.8	6.9	1.15
Floor - wood or bamboo (-)	82.6	81.2	79.1	70.6	48.1	72.3	0.96
Floor - cement (+)	0.7	1.7	2.8	7.3	10.2	4.5	4.09
Floor - parquet or polished wood (+)	7.7	7.8	7.8	9.7	11.3	8.9	1.01
Floor - ceramic tiles (+)	0.1	0.4	1.5	4.2	23.2	5.9	17.83
Floor - other*	2.4	1.2	1.3	1.1	1.4	1.5	0.56
Water - piped or public tap (+)*	1.8	2.4	3.9	10.7	36.0	10.9	2.25
Water - tube or piped well	25.3	29.2	29.2	28.4	21.5	26.7	1.15
Water - protected or unprotected dug well (-)*	41.3	33.2	29.3	24.9	17.5	29.3	0.71
Water - purchased (+)*	4.1	6.3	9.6	10.5	10.2	8.1	2.34
Water - other	27.5	28.9	28.0	25.5	14.8	24.9	1.02
Toilet - water sealed, connected to sewage or septic tank (+)*	3.5	7.4	12.9	26.9	58.6	21.9	3.66
Toilet - closed or open pit (+)*	1.3	2.2	2.3	3.2	2.7	2.3	1.76
Toilet - other (+)*	1.5	2.4	4.1	3.4	3.2	2.9	2.80
Toilet - open land or none (-)	93.7	88.0	80.6	66.6	35.4	72.9	0.86
Light - city power, generator or battery (+)*	19.0	30.4	43.1	56.9	81.4	46.2	2.27
Light - kerosene (-)*	79.2	68.4	56.0	42.6	18.3	52.9	0.71
Light - other (-)	1.8	1.2	0.9	0.5	0.3	0.9	0.52
Fuel - firewood (-)	97.2	96.5	92.0	83.4	52.0	84.2	0.95
Fuel - charcoal or firewood and charcoal (+)*	1.7	2.2	5.7	11.0	21.9	8.5	3.26
Fuel - gas or electricity (+)	0.2	0.3	1.2	4.6	24.4	6.1	6.64
Fuel - other (+)	0.8	1.0	1.1	1.1	1.7	1.1	1.35

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame

Table 14 shows the changes in selected housing, water and sanitation indicators between 2004 and 2007 in the poorest and next poorest quintiles. The indicators included in Table 14 are the indicators that are systematically related to income (either positively or negatively) in both Table 12 (2007) and Table 13 (2004) and that are starred in Table 12 (2007). The data in Table 14 indicate that 11 of the 14 indicators changed between 2004 and 2007 in the poorest quintile in the direction that would be expected with an increase in real household income, while 12 of the 14 indicators changed in the expected direction in the next poorest quintile.

Most of the unexpected changes involve either small percentage or small absolute changes and could easily be due simply to sampling errors. The exception is the large positive change in outer walls made of bamboo, thatch or leaves, which increased from 38% to 56% in the poorest quintile and from 33% to 49% in the next poorest quintile. Although such a change is extremely unlikely, it is difficult to pinpoint the reason for the unexpected responses. However, the fact that similar changes in the opposite direction occurred in the “wall-other” indicator suggests that the unexpected increase in this category between 2004 and 2007 was due either to changes in the questionnaire between 2004 and 2007³⁸ or to changes in the interpretation of the questionnaire by the interviewers.

Table 14. Changes in selected housing, water and sanitation indicators over time, 2004-07

Indicator (whether positively or negatively related to income in Table 12)	Poorest		Change 2004-2007 (%)	Next poorest		Change 2004-2007 (%)
	2004*	2007		2004*	2007	
Rooms per capita (+)	0.19	0.20	2.7	0.22	0.23	6.4
Living area (sq meters) per capita (+)	5.3	5.7	8.0	6.7	6.9	2.5
Roof - thatched (-)	37.3	35.2	-5.7	25.6	26.6	3.8
Roof - galvanized iron or aluminum (+)	25.7	37.2	45.1	33.3	37.5	12.5
Wall - bamboo (-)	38.2	55.6	45.7	33.4	48.5	45.2
Wall - wood, plywood or log (+)	33.3	38.6	16.0	41.2	41.8	1.6
Water - piped or public tap (+)	1.8	1.1	-36.1	2.4	3.6	53.8
Water - purchased (+)	4.1	6.5	58.6	6.3	9.9	56.1
Toilet - water sealed, connected to sewage or septic tank (+)	3.5	7.7	118.0	7.4	10.9	47.3
Toilet - closed or open pit (+)	1.3	2.6	98.5	2.2	3.7	70.0
Toilet - other (+)	1.5	2.6	74.2	2.4	3.6	51.7
Light - city power, generator or battery (+)	19.0	40.5	113.3	30.4	53.4	75.6
Light - kerosene (-)	79.2	58.9	-25.6	68.4	45.8	-33.1
Fuel - charcoal or firewood and charcoal (+)	1.7	1.0	-39.6	2.2	2.9	28.1

Source: 2004 and 2007 CSES.

* sample limited to villages in 2007 CSES sampling frame.

³⁸ Some seemingly minor changes were made in the codes listed in the questionnaire for the material used in a dwelling's outer walls between the 2004 and 2007 CSES rounds, i.e., “leaves” were added to the “bamboo, thatch” code and a new code (“clay/dung with straw”) was added, which was included in the “walls-other” category reported in Table 12.

5.2 Consumer durables

Both the 2004 and 2007 CSES collected data on household ownership of many consumer durables. Table 15 presents data on consumer durable ownership by per capita consumption quintile from the 2007 CSES, while Table 16 presents the same data from the 2004 CSES (limited to villages included in the 2007 CSES sampling frame). The data in both tables indicate that ownership of several items is closely related to household income. The same criteria as used to star and label the housing characteristics in Table 12 and Table 13 above are applied to the labels in Table 15 and Table 16. The most widely owned consumer durables in 2007 are radios, televisions, cell phones, video/VCD/DVD players/recorders, stereos, bicycles, motorbikes/motorcycles, suitcases/boxes for travel/storage, batteries, bed sets and wardrobes/cabinets. A few of these widely owned items are not starred, i.e., bicycles (ratio of middle to poorest is only 0.99), batteries (ratio is only 1.13). Most of the consumer durables whose ownership is systematically related to household income in the poorest three quintiles, i.e., the items labeled either (+) or (-), are positively related to household income. The sole exception is musical instruments (but with less than one percent of households owning these items in each of the three poorest quintiles). The data in Table 16 are mainly consistent with those in Table 15, although a few items that are starred in Table 15 are not starred in Table 16 (e.g., electric fans) because they were owned by less than one percent of households in 2004.

Table 15. Households (%) owning consumer durables by per capita consumption quintile, 2007

	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Air conditioner	0.0	0.0	0.0	0.2	8.0	1.6	
Batteries	60.9	72.9	69.0	64.3	30.7	59.5	1.13
Bed sets (bed, mattress) (+)*	15.7	18.9	23.4	36.5	69.8	32.9	1.49
Bicycle	81.8	79.4	81.4	76.8	67.9	77.4	0.99
Camera (+)	0.0	0.0	0.4	0.3	3.4	0.8	
Car (+)	0.0	0.0	0.7	1.1	16.6	3.7	
Cell phone (+)*	3.6	8.9	15.5	33.7	73.3	27.0	4.30
Computer (desktop / laptop)	0.0	0.0	0.0	0.5	14.5	3.0	
Dining set (table + chairs) (+)	0.8	2.1	4.0	6.9	36.4	10.0	5.06
Dishwasher	0.0	0.0	0.0	0.0	0.1	0.0	
Electric fan (+)*	1.4	1.7	8.0	19.2	63.2	18.7	5.77
Electric iron (+)	0.0	0.6	2.1	11.2	55.1	13.8	
Electric kitchen / gas stove (+)	0.3	1.1	3.7	13.7	54.6	14.7	11.44
Freezer	0.0	0.0	0.0	0.0	0.3	0.1	
Generator (+)	0.6	0.7	2.3	3.3	4.4	2.3	3.96
Jeep / van (+)	0.0	0.0	0.6	0.2	1.6	0.5	57.00
Motor boat (+)*	2.4	3.2	3.2	4.5	2.1	3.1	1.32
Motorcycle (+)*	14.8	24.5	34.3	51.0	74.7	39.8	2.32
Musical instruments (-)	0.5	0.3	0.2	0.7	2.8	0.9	0.31
Printer	0.0	0.0	0.0	0.0	2.8	0.6	
Radio (+)*	28.8	32.6	41.2	43.5	49.4	39.1	1.43
Refrigerator	0.1	0.0	0.1	0.7	22.5	4.7	2.00
Row boat (+)	9.3	9.9	9.5	9.8	4.5	8.6	1.02
Satellite dish	0.0	0.0	0.0	0.0	0.0	0.0	
Sewing machine (+)	0.8	3.1	4.8	7.5	20.8	7.4	5.76
Sofa set (+)	0.0	0.0	1.4	2.7	22.3	5.3	
Sports equipment	0.4	0.2	0.5	0.5	3.3	1.0	1.10
Stereo (+)*	12.8	14.4	19.4	21.6	38.7	21.4	1.52
Suitcases / box for storage / travel (+)*	40.3	48.4	51.5	58.8	66.6	53.1	1.28
Telephone	0.0	0.0	0.0	0.1	1.0	0.2	
Television (+)*	42.5	51.4	59.5	72.3	90.6	63.3	1.40
Vacuum cleaner	0.0	0.0	0.0	0.0	0.9	0.2	
Video / VCD / DVD player / recorder (+)*	8.5	11.1	17.1	29.2	53.6	23.9	2.01
Wardrobe, cabinet (+)*	8.8	13.5	21.0	37.0	72.1	30.5	2.39
Washing machine (+)	0.0	0.0	0.1	0.1	7.7	1.6	

Source: 2007 CSES.

Blank cells in column 7 are because the ratio cannot be calculated because the value in the poorest quintile is zero.

Table 16. Households (%) owning consumer durables by per capita consumption quintile, 2004*

Item	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Air conditioner (+)	0.1	0.2	0.2	0.6	4.4	1.1	2.00
Batteries (+)	59.6	66.4	70.2	63.9	42.9	60.6	1.18
Bed sets (bed, mattress) (+)*	13.6	17.6	25.2	38.3	61.9	31.3	1.85
Bicycle (+)	61.8	71.0	71.6	72.0	65.1	68.3	1.16
Camera (+)	0.5	0.9	1.2	1.5	8.6	2.5	2.40
Car (+)	0.1	0.4	0.6	1.6	12.7	3.1	6.00
Cell phone (+)	0.5	2.0	5.1	14.1	48.1	13.9	10.20
Computer (desktop /laptop) (+)	0.0	0.0	0.4	0.7	7.5	1.7	
Dining set (table + chairs) (+)	0.4	1.3	2.3	6.8	26.3	7.4	5.75
Dishwasher	0.0	0.0	0.0	0.0	0.0	0.0	
Electric fan (+)	0.7	1.1	5.0	13.2	45.6	13.1	7.14
Electric iron (+)	0.3	0.4	2.1	7.0	34.4	8.8	7.00
Electric kitchen / gas stove (+)	0.0	0.0	0.2	1.4	13.2	3.0	
Freezer (+)	0.0	0.0	0.1	0.0	0.2	0.1	
Generator (+)	0.6	1.1	1.4	2.9	5.1	2.2	2.33
Jeep / van (+)	0.0	0.0	0.3	0.5	2.2	0.6	
Motor boat (+)*	1.9	2.3	3.3	2.7	3.4	2.7	1.74
Motorcycle (+)*	10.3	19.2	25.5	39.7	62.1	31.3	2.48
Musical instruments	0.7	0.4	0.7	0.5	1.1	0.7	1.00
Printer	0.2	0.1	0.0	0.1	1.6	0.4	0.00
Radio (+)*	28.0	33.8	36.8	41.1	44.8	1.3	1.31
Refrigerator (+)	0.0	0.1	0.2	0.7	9.8	2.1	
Row boat (+)*	9.6	11.5	11.9	9.2	5.1	9.5	1.24
Satellite dish	0.5	0.5	0.3	0.6	0.9	0.6	0.60
Sewing machine (+)*	1.0	2.8	4.5	7.7	17.6	6.7	4.50
Sofa set (+)	0.2	0.3	1.1	2.4	13.9	3.6	5.50
Sports equipment	0.0	0.3	0.1	0.2	0.9	0.3	
Stereo (+)*	13.7	19.2	20.1	27.7	42.4	24.6	1.47
Suitcases / box for storage / travel (+)*	12.2	16.3	20.5	24.2	33.4	21.3	1.68
Telephone (+)	0.0	0.1	0.2	0.2	2.0	0.5	
Television (+)*	26.7	38.8	49.1	57.8	79.0	50.2	1.84
Vacuum cleaner	0.0	0.0	0.0	0.1	0.6	0.1	
Video / VCD / DVD player / recorder (+)	0.4	1.2	2.4	7.6	22.5	6.8	6.00
Wardrobe, cabinet (+)*	2.2	7.3	11.7	24.7	51.8	19.5	5.32
Washing machine	0.0	0.0	0.0	0.1	3.1	0.6	

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Blank cells in column 7 are because the ratio cannot be calculated because the value in the poorest quintile is zero.

Table 17 shows the changes in the percentage of households owning selected consumer durables between 2004 and 2007 in the poorest and next poorest quintiles. The 11 consumer durables included in Table 17 are those that are systematically related to income (either positively or negatively) in both Table 15 (2007) and Table 16 (2004) and that are starred in Table 15 (2007). The data in Table 17 indicate that ownership of 10 of the 11 consumer durables changed between 2004 and 2007 in the poorest quintile in the direction that would be expected with an increase in real household income, while ownership of 9 of the 11 items in the next poorest quintile changed as expected. The exceptions are stereos (-7% in the poorest quintile and -25% in the next poorest quintile instead of the expected positive change) and radios (-3 in the next poorest quintile instead of the expected positive change).

Most of the unexpected changes involve either small percentage or small absolute changes and so could easily be the result of sampling errors. However, the somewhat larger decrease in stereo ownership between 2004 and 2007, instead of the expected increase, may reflect a change in relative prices for entertainment substitutes, particularly given the corresponding large increases in the ownership of video/VCD/DVD players/recorders. Changing relative prices for entertainment substitutes may also explain the unexpected decrease in radio ownership. Overall, the data in Table 17 (like those in Table 14) are consistent with the estimated increases between 2004 and 2007 in real per capita consumption by quintile that are reported in Table 7.

Table 17. Households (%) in the two poorest quintiles owning selected consumer durables, 2004* and 2007

Item	Poorest quintile			Next poorest quintile		
	2004	2007	Change, 2004 -2007 (%)	2004	2007	Change, 2004 - 2007 (%)
Bed sets (bed, mattress) (+)	13.6	15.7	15.4	17.6	18.9	7.5
Cell phone (+)	0.5	3.6	618.0	2.0	8.9	343.5
Electric fan (+)	0.7	1.4	98.6	1.1	1.7	53.6
Motor boat (+)	1.9	2.4	28.4	2.3	3.2	37.4
Motorcycle (+)	10.3	14.8	43.4	19.2	24.5	27.5
Radio (+)	28.0	28.8	2.8	33.8	32.6	-3.5
Stereo (+)	13.7	12.8	-6.9	19.2	14.4	-24.9
Suitcases/box for storage/travel (+)	12.2	40.3	230.0	16.3	48.4	196.6
Television (+)	26.7	42.5	59.1	38.8	51.4	32.6
Video/VCD/DVD player/recorder (+)	0.4	8.5	2,030.0	1.2	11.1	827.5
Wardrobe, cabinet (+)	2.2	8.8	300.0	7.3	13.5	85.1

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

5.3 Village characteristics

Table 18 presents indicators for 2007 of selected characteristics of the villages (including urban villages) in which sample individuals reside by population-weighted per capita consumption quintile (village education and health indicators are discussed below). Table 19 presents the same indicators for 2004 (with the sample limited to villages included in the 2007 CSES sampling frame). Most of the indicators in Table 18 and Table 19 refer to percentages of the population in each quintile that reside in villages with a given characteristic. The remaining indicators refer to the mean value of a given characteristic in the village of residence of the population in each quintile (for example, the mean size of the village population or the mean distance to the nearest bus stop).

Again, the principal interest is in how the indicators vary in the three poorest quintiles. The labels of the indicators are starred if the ratio of the value of the indicator in the middle quintile to the value in the poorest quintile (column 7 in both tables) is either greater than or equal to 1.20 or less than or equal to 0.80 (i.e., if there is an arbitrarily large difference between the value of the indicator in the middle and poorest quintiles).³⁹ The labels also indicate if the values of the indicator are either monotonically increasing (+) or decreasing (-) in the poorest three quintiles.

The data in Table 18 indicate that the villages in which the poor reside (i.e., the two poorest quintiles) are disadvantaged in many respects. For example, the poor tend to reside in smaller villages with less access to electricity, gas, piped water and employment opportunities (i.e., presence of a large enterprise in the village) and with fewer amenities (for example, food shops, banks or loan credit units, permanent markets and shops selling fertilizer and other agricultural chemicals). On the other hand, villages in which the poor reside are relatively advantaged in a few characteristics, including the amount of agricultural land per capita in the village (including the amount of *irrigated* land per capita), the presence and number of both government and NGO development projects, and technical support to agriculture (for example, home visits by agricultural extension workers or training). Most of these same patterns are also observed in 2004 (Table 19).

³⁹ In addition, percentage indicators are starred only if the indicator is one percent or more in the three poorest quintiles.

Table 18. Selected characteristics of villages of residence by per capita consumption quintile, 2007

Indicator ^a	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Village population (+)*	1,118	1,392	1,463	1,750	2,935	1,734	1.31
Agricultural land (hectares)	232	273	251	271	196	246	1.08
Agricultural land per capita (hectares) (-)	0.21	0.20	0.17	0.15	0.07	0.14	0.83
Irrigated land (hectares)	54	84	59	67	38	61	1.10
Irrigated land per capita (hectares)	0.05	0.06	0.04	0.04	0.01	0.04	0.84
Distance to nearest bus stop (km)	21.42	18.36	19.86	13.36	6.15	15.82	0.93
Distance to nearest taxi stop (km) (+)*	3.76	5.59	7.78	3.88	1.52	4.51	2.07
Access to motorable road (%) ^b (+)	79.3	83.9	86.4	90.5	96.3	87.3	1.09
Access by 4-wheel drive vehicles (%)	93.8	91.5	94.0	94.7	98.7	94.6	1.00
Access to all-weather road (%) (+)	84.0	88.4	91.2	92.4	97.6	90.7	1.09
Distance to nearest all-weather road (km) ^c *	1.02	1.18	0.77	0.90	0.18	0.81	0.75
Households with electricity (%) (+)*	6.4	11.0	12.8	25.0	56.8	21.3	2.01
Households with piped water (%) (+)*	3.0	5.8	6.8	13.8	43.6	13.7	2.26
Distance to district headquarters (km)	13.91	12.20	12.80	11.45	6.30	11.49	0.92
Distance to provincial headquarters (km) (-)	45.42	41.60	40.17	34.18	22.08	37.16	0.88
Government development projects (%) (-)*	51.8	48.7	40.0	38.9	36.5	43.4	0.77
Number of government development projects	0.82	0.96	0.81	0.68	0.60	0.78	0.99
NGO development projects (%) (-)*	47.4	42.7	37.8	37.8	29.6	39.3	0.80
Number of NGO development projects (-)*	0.89	0.71	0.64	0.59	0.42	0.65	0.72
Large enterprise in village (%) (+)*	24.2	37.2	37.5	51.2	76.2	45.3	1.55
Public telephone in village (%) (+)	43.1	47.8	50.5	64.2	85.3	58.2	1.17
Access to electricity (%) (+)*	11.2	21.0	24.5	40.9	75.6	35.5	2.19
Access to gas (%) (+)*	3.7	6.1	11.8	21.2	57.0	20.8	3.16
Access to gasoline (%)*	28.3	26.3	36.0	42.3	78.6	42.9	1.27
Disaster during past 5 years (%) (-)	85.6	82.2	82.2	72.0	40.9	72.5	0.96
Awareness of children being recruited for work outside village (%) (+)	24.6	27.7	28.5	23.4	16.6	24.1	1.16
Technical support provided for agriculture (%) (-)	69.6	61.3	57.5	48.8	35.3	54.5	0.83
Amenities located in village of residence:							
Food shop (%) (+)*	8.8	14.0	17.9	26.8	55.5	24.6	2.03
Bank or loan credit unit (%)*	7.4	11.0	10.2	14.4	22.7	13.1	1.37
Agricultural extension worker (%)*	2.6	6.2	6.1	7.0	10.6	6.5	2.36
Permanent market (%)*	7.4	13.4	11.9	17.8	23.4	14.8	1.60
Shop selling fertilizer and other agro-chemicals (%) (+)*	11.9	18.9	19.8	24.6	16.4	18.3	1.67
Distance (km) to nearest amenity (assumed to be zero for villages with amenity located in village):							
Food shop (km) (-)	10.24	8.87	8.66	6.21	3.39	7.47	0.85
Bank or loan credit unit (km)	13.94	11.82	14.05	9.26	4.40	10.70	1.01
Agricultural extension worker (km)	25.43	20.20	21.71	15.67	13.08	19.22	0.85
Permanent market (km)	11.39	9.98	11.76	7.10	3.20	8.68	1.03
Shop selling fertilizer and other agro-chemicals (km)	10.33	9.09	11.12	6.23	4.40	8.23	1.08

Indicator ^a	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Availability in village of legally accessible common resources:							
Land for cultivation (%)	35.9	39.8	39.4	27.0	13.3	31.1	1.10
Firewood/charcoal for collection (%)	21.1	25.5	22.7	24.6	12.4	21.3	1.07
Timber for house construction (%) (-)*	2.6	2.0	1.0	1.5	1.1	1.6	0.37
Fish from lake/river (%) (-)	45.0	44.8	42.3	38.3	25.0	39.1	0.94
Bamboo (%)	3.7	6.3	4.3	3.6	3.0	4.2	1.16
Open land for grazing animals (%)*	13.3	18.9	16.9	14.7	6.5	14.1	1.27
Fruits available for picking (%)*	1.1	2.0	1.5	3.1	1.0	1.7	1.41
Wild animals to hunt (%) (+)	0.9	1.5	1.4	1.9	2.2	1.6	1.55

Source: 2007 CSES.

* see text for explanation

^a percentage of population in a given quintile residing in villages with a given characteristic or mean value of a given characteristic in the village of residence.

^b a motorable road is an all-weather road suitable for use by a car, van or bus as well as by 4-wheel drive vehicles.

^c distance assumed to be zero in villages with all-weather road.

Table 19. Selected characteristics of villages of residence by per capita consumption quintile, 2004

Indicator ^a	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Village population (+)*	1,207	1,350	1,596	1,898	2,699	1,746	1.32
Agricultural land (hectares) (+)	258	287	283	245	161	247	1.10
Agricultural land per capita (hectares) (-)	0.21	0.21	0.18	0.13	0.06	0.14	0.83
Irrigated land (hectares) (+)*	40	49	53	43	31	43	1.31
Irrigated land per capita (hectares)	0.03	0.04	0.03	0.02	0.01	0.02	0.99
Distance to nearest bus stop (km)	21.41	21.87	19.72	18.09	11.84	18.61	0.92
Distance to nearest taxi stop (km) (-)	7.70	7.48	6.53	6.45	3.61	6.37	0.85
Access to motorable road (%) (+) ^b	87.6	89.4	90.0	89.6	93.5	90.0	1.03
Access by 4-wheel drive vehicles (%) (-)	93.9	93.7	93.6	93.2	95.1	93.9	1.00
Access to all-weather road (%)	91.0	91.9	91.4	92.2	95.0	92.3	1.01
Distance to nearest all-weather road (km) ^c (-)*	1.89	1.21	0.98	0.98	0.86	1.18	0.52
Households with electricity (%) (+)*	5.0	6.9	11.4	20.9	48.1	18.3	2.27
Households with piped water (%) (+)*	2.5	3.6	5.8	11.7	35.6	11.7	2.36
Distance to district headquarters (km) (-)	13.45	12.44	11.62	11.30	8.08	11.39	0.86
Distance to provincial headquarters (km)(-)	41.86	40.88	38.77	35.71	24.29	36.35	0.93
Government development projects (%)	38.4	38.6	38.3	37.0	39.0	38.2	1.00
No. of government development projects (+)	0.66	0.69	0.70	0.66	0.66	0.67	1.06
NGO development projects (%) (+)	28.6	31.4	31.7	30.7	26.9	29.9	1.11
Number of NGO development projects	0.59	0.67	0.64	0.58	0.44	0.58	1.09
Large enterprise in village (%) (+)*	25.4	30.6	36.0	40.7	58.0	38.1	1.42
Public telephone in village (%) (+)*	25.2	33.0	37.2	45.4	62.6	40.6	1.48
Access to electricity (%) (+)*	14.4	19.1	25.1	36.6	58.8	30.7	1.74
Access to gas (%) (+)*	6.3	10.6	15.8	25.6	47.1	21.0	2.50
Access to gasoline (%) (+)	69.8	77.5	82.3	84.9	85.7	80.0	1.18

Indicator ^a	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Disaster during past 5 years (%) (-)	90.0	90.1	88.0	83.7	64.7	83.4	0.98
Awareness of children being recruited for work outside village (%)	26.3	26.0	26.3	26.0	21.7	25.3	1.00
Technical support for agriculture (%)	52.9	53.2	50.5	43.0	31.2	46.2	0.96
Amenities located in village of residence:							
Food shop (%) (+)*	7.8	9.5	15.8	23.3	45.6	20.3	2.02
Bank or loan credit unit (%) (+)*	8.8	9.1	11.0	10.7	13.5	10.6	1.25
Agricultural extension worker (%)	5.9	4.7	6.8	5.9	7.8	6.2	1.14
Permanent market (%) (+)*	7.2	7.7	10.9	14.2	24.2	12.8	1.51
Shop selling fertilizer and other agro-chemicals (%) (+)*	10.5	13.7	16.4	18.9	21.9	16.1	1.56
Distance (km) to nearest amenity (assumed to be zero for villages with amenity located in village)							
Food shop (km) (-)	9.44	9.30	8.11	7.01	3.54	7.50	0.86
Bank or loan credit unit (km) (-)*	16.13	14.38	12.63	11.86	7.80	12.69	0.78
Agricultural extension worker (km) (-)	21.50	20.96	18.88	18.51	13.24	18.68	0.88
Permanent market (km) (-)*	10.32	8.82	7.53	6.81	3.73	7.46	0.73
Shop selling fertilizer and other agro-chemicals (km) (-)*	10.52	9.26	8.12	7.59	4.85	8.13	0.77
Availability in village of legally accessible common resources:							
Land for cultivation (%)	35.5	32.7	33.1	33.3	25.2	32.0	0.93
Firewood/charcoal for collection (%) (-)	20.2	18.6	18.0	16.8	11.1	17.1	0.89
Timber for house construction (%) (+)*	1.5	2.7	3.6	4.2	2.4	2.9	2.44
Fish from lake/river (%)	37.9	37.6	38.1	36.5	26.9	35.6	1.01
Bamboo (%)	7.6	5.7	6.3	7.1	2.7	5.9	0.83
Open land for grazing animals (%)*	24.3	18.6	19.3	17.8	12.6	18.7	0.80
Fruits available for picking (%)	5.3	5.4	4.9	5.8	3.1	4.9	0.93
Wild animals to hunt (%) (+)*	1.7	2.3	2.4	2.3	1.1	2.0	1.40

Source: 2004 CSES.

Note: sample limited to villages in the 2007 CSES sampling frame.

* see text for explanation

^a percentage of population in a given quintile residing in villages with a given characteristic or mean value of a given characteristic in the village of residence.

^b a motorable road is an all-weather road suitable for use by a car, van or bus as well as by 4-wheel drive vehicles.

^c distance assumed to be zero in villages with all-weather road.

Table 20 shows the changes between 2004 and 2007 for the two poorest quintiles in selected “income-sensitive” indicators (i.e., those exhibiting monotonic increases or decreases in the poorest three quintiles in 2004 and 2007 and that are starred in 2007). These changes reflect the distribution of community improvements during this three-year period. However, unlike the corresponding changes in housing characteristics and consumer durable ownership, the changes in Table 20 are not necessarily related to changes in real per capita household income during this period.⁴⁰ These data indicate that only 4 of the 8 of the income-sensitive

⁴⁰ For example, if every household’s real per capita income were to have doubled between 2004 and 2007 but without any community improvements, there would be no change in most of the village indicators.

indicators changed in the expected direction (all positive, as indicated in Table 20) in the poorest quintile, whereas 7 of 8 changed in the expected direction in the next poorest quintile. These data suggest that the distribution of community improvements during the period 2004-2007 favored the next poorest quintile more than the poorest quintile.

Table 20. Changes in selected village characteristics between 2004 and 2007 in the two poorest per capita consumption quintiles

Indicator	Poorest quintile			Next poorest quintile		
	2004	2007	Change (%)	2004	2007	Change (%)
Village population (+)	1,207	1,118	-7.4	1,350	1,392	3.1
Households with electricity (%) (+)	5.0	6.4	27.6	6.9	11.0	58.8
Households with piped water (%) (+)	2.5	3.0	22.7	3.6	5.8	63.5
Large enterprise in village (%) (+)	25.4	24.2	-4.6	30.6	37.2	21.6
Access to electricity (%) (+)	14.4	11.2	-22.5	19.1	21.0	10.4
Access to gas (%) (+)	6.3	3.7	-40.6	10.6	6.1	-42.4
Food shop (%) (+)	7.8	8.8	12.4	9.5	14.0	47.4
Shop selling manure and agro-chemicals (%) (+)	10.5	11.9	13.3	13.7	18.9	38.6

Source: Table 18, Table 19.

* sample limited to villages in the 2007 CSES sampling frame.

Table 21 presents selected village education and health indicators by population-weighted per capita consumption quintile in 2007, while Table 22 presents the same indicators for 2004. Most of the indicators refer to the percentage of the population in each quintile that resided in a village with a given characteristic in 2007. The remaining indicators refer to the mean value of a given characteristic in the village of residence of the population in each quintile (for example, the mean distance to the nearest primary school). The criteria used to star an indicator or to indicate whether it is positively (+) or negatively (-) related to income are the same as those used in Table 18 and Table 19.

The data in Table 21 indicate that the villages in which the poor reside (i.e., the two poorest quintiles) tend to have less favorable access to education and health services. Differences are particularly sharp for location of lower and upper secondary schools in the village and in access to most types of health facilities and modern health providers. On the other hand, the poor have better access to adult literacy programs, to some types of traditional health providers, to MC and family planning programs and to iodine deficiency programs. The data in Table 21 indicate that reported cases of HIV are more numerous even in relation to population size in relatively prosperous villages (although there is very likely substantial under-reporting of HIV cases in these data). Most of these same patterns were also observed in 2004 (Table 22). However, notable improvements between 2004 and 2007 occurred with respect to distance of poor villages to the nearest primary, lower secondary and upper secondary schools and to the nearest communal health center and trained midwife.

Table 21. Selected village education and health indicators by p.c. consumption quintile, 2007

Indicator ^a	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Primary school in village (%)	49.8	62.2	56.6	51.5	42.6	52.5	1.14
Distance to nearest primary school (km)	0.65	0.53	0.58	0.55	0.51	0.56	0.89
Lower secondary school in village (%) (+)*	8.5	12.5	16.5	16.6	16.7	14.2	1.94
Distance to nearest lower secondary school (km) (-)	4.82	4.34	4.20	3.66	2.38	3.87	0.87
Upper secondary school in village (%) (+)*	1.1	3.3	4.5	7.8	10.4	5.4	4.20
Distance to nearest upper secondary school (km)	13.36	12.65	13.70	9.15	5.11	10.79	1.03
Adult literacy program in village (%) (-)	18.4	18.6	17.6	15.0	9.0	15.7	0.96
Health providers located in village of residence:							
Private clinic (%) (+)*	3.0	7.9	9.0	15.9	37.0	14.6	2.96
Dedicated drug shop (%) (+)*	3.0	5.8	7.4	14.4	39.6	14.0	2.49
Other shop selling drugs (%)*	25.2	38.7	35.5	33.9	27.6	32.2	1.41
Health center (%) (+)*	7.1	11.4	12.2	14.3	13.6	11.7	1.71
Referral (or district) hospital (%) (+)*	1.1	1.6	5.2	1.7	3.6	2.7	4.57
Provincial hospital (%) (+)	0.1	0.1	0.3	0.1	1.1	0.3	1.95
National hospital (%) (+)	0.0	0.0	0.4	0.7	6.2	1.5	
Private hospital (%) (-)	1.1	1.1	1.0	3.0	8.9	3.0	0.88
Doctor (%) (+)*	3.6	4.6	6.3	13.5	51.1	15.9	1.73
Nurse (%) (+)	28.3	30.5	32.4	40.3	55.4	37.4	1.14
Trained midwife (%) (+)*	27.8	37.3	40.1	47.8	46.0	39.8	1.44
Traditional birth attendant (%)	72.8	73.5	70.9	58.5	34.7	62.0	0.97
<i>Kru khmer</i> (traditional healer) (%)	63.4	69.6	66.0	60.0	41.3	60.0	1.04
Other traditional practitioner (%)	47.0	39.6	40.8	32.8	24.6	36.9	0.87
Distance (km) to nearest health provider (assumed to be zero in villages in which a given type of provider is located):							
Private clinic (km)	18.34	14.08	16.68	10.57	5.99	13.15	0.91
Dedicated drug shop (km)	15.43	13.24	15.36	10.02	4.89	11.79	1.00
Other shop selling drugs (km)	8.19	7.64	10.33	7.20	7.63	8.20	1.26
Communal health center (km) (+)*	4.45	5.49	7.16	4.05	2.45	4.72	1.61
Referral (or district) hospital (km)*	18.15	13.61	13.62	11.86	6.97	12.84	0.75
Provincial hospital (km) (-)	46.64	45.56	42.86	35.89	21.39	38.46	0.92
National hospital (km)	124.96	118.87	126.02	118.35	98.30	117.32	1.01
Private hospital (km) (-)*	113.94	76.96	71.32	66.46	51.69	76.00	0.63
Doctor (km)	15.38	13.84	16.73	11.28	5.29	12.50	1.09
Nurse (km) (+)*	5.06	5.84	7.73	3.87	1.93	4.88	1.53
Trained midwife (km) (-)*	4.76	3.91	3.57	3.16	1.73	3.42	0.75
Traditional birth attendant (km)	1.96	1.09	2.18	1.54	2.82	1.92	1.12
<i>Kru khmer</i> (traditional healer) (km) (+)*	2.02	2.02	2.43	1.73	1.93	2.03	1.21
Other traditional practitioner (km)*	4.11	7.52	6.50	6.57	4.66	5.88	1.58
Immunization program in village (%) (+)	40.5	40.1	39.3	40.5	47.5	41.6	0.97
MCH/family planning program in village (%) (-)	51.3	47.2	42.1	43.7	42.4	45.3	0.82
HIV testing in village (%) (+)	24.1	26.5	26.8	28.5	42.4	29.7	1.11
Iodine deficiency program in village (%) (-)*	45.9	43.4	36.3	34.8	45.0	41.1	0.79
HIV cases in village (%)	38.2	45.4	43.4	49.5	64.6	48.3	1.14
Number of HIV cases per 1,000 persons	1.10	1.26	1.08	1.44	1.71	1.32	0.98

Source: 2007 CSES

^a percentage of population in a given quintile residing in villages with a given characteristic or mean value of a given characteristic in the village of residence.

Table 22. Selected village education and health indicators by p.c. consumption quintile, 2004*

Indicator ^a	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Primary school in village (%) ^a (+)	51.2	54.4	56.4	56.6	47.9	53.3	1.10
Distance to nearest primary school (km)	2.22	1.54	2.02	1.65	0.93	1.68	0.91
Lower secondary school in village (%) (+)*	8.6	10.2	12.2	13.5	13.9	11.7	1.42
Distance to nearest lower secondary school (km) (-)*	6.68	5.17	4.61	4.12	2.73	4.67	0.69
Upper secondary school in village (%) (+)*	3.2	3.5	4.4	4.9	5.2	4.2	1.37
Distance to nearest upper secondary school (km) (-)*	15.25	12.29	11.08	9.97	7.05	11.14	0.73
Adult literacy program in village (%)	19.6	21.5	19.4	18.0	14.6	18.6	0.99
Health provider located in village of residence:							
Private clinic (%) (+)*	8.2	9.2	11.4	15.5	28.6	14.5	1.39
Dedicated drug shop (%) (+)*	4.4	5.1	10.0	16.5	30.2	12.9	2.26
Other shop selling drugs (%) (+)*	23.2	26.1	31.5	35.1	35.5	30.1	1.36
Communal health center (%)*	9.0	8.8	12.1	14.0	12.4	11.2	1.35
Referral (or district) hospital (%) (+)*	1.4	2.3	2.9	3.7	2.9	2.7	2.06
Provincial hospital (%)	0.2	0.2	0.6	1.0	1.3	0.7	2.77
National hospital (%)	0.0	0.0	0.0	0.0	0.7	0.1	
Private hospital (%)	0.3	0.6	1.0	1.7	4.6	1.6	2.96
Doctor (%) (+)*	4.2	5.9	10.2	15.8	35.8	14.3	2.42
Nurse (%)	29.6	29.5	33.5	38.9	48.5	35.7	1.13
Trained midwife (%) (+)*	28.2	32.8	38.5	38.2	44.5	36.2	1.36
Traditional birth attendant (%) (-)	76.1	72.0	68.9	62.8	44.9	65.4	0.91
<i>Kru khmer</i> (traditional healer) (%)	59.8	62.5	61.6	57.5	46.2	57.5	1.03
Other traditional practitioner (%) (-)	46.8	45.2	43.4	37.8	28.7	40.4	0.93
Distance (km) to nearest health provider (assumed to be zero in villages in which a given type of provider is located):							
Private clinic (km) (-)*	16.08	13.58	12.30	11.66	7.77	12.30	0.76
Dedicated drug shop (km) (-)*	13.48	11.65	9.59	8.60	5.02	9.76	0.71
Other shop selling drugs (km) (-)*	7.48	6.61	5.69	5.25	3.29	5.72	0.76
Communal health center (km) (-)	7.00	6.44	6.41	5.55	5.88	6.26	0.92
Referral (or district) hospital (km) (-)	15.59	13.43	12.70	11.94	8.87	12.53	0.81
Provincial hospital (km) (-)	41.34	40.95	38.70	35.93	25.08	36.44	0.94
National hospital (km) (-)	147.55	126.52	119.65	106.14	87.38	117.59	0.81
Private hospital (km) (-)*	92.61	72.36	64.00	57.12	41.49	65.66	0.69
Doctor (km) (-)*	16.80	14.38	13.51	11.59	7.31	12.75	0.80
Nurse (km) (-)*	7.58	6.73	5.82	5.32	3.56	5.85	0.77
Trained midwife (km) (-)	6.26	5.75	5.55	5.56	3.32	5.33	0.89
Traditional birth attendant (km) (+)*	1.12	1.39	1.79	2.29	4.11	2.09	1.60
<i>Kru khmer</i> (traditional healer) (km) (+)*	2.27	2.64	2.76	3.60	3.87	3.03	1.21
Other traditional practitioner (km) (+)*	4.28	5.30	5.84	7.59	5.67	5.73	1.36
Immunization program in village (%) (+)	38.5	39.3	40.4	39.0	37.9	39.0	1.05
MCH/family planning program in village (%) (+)*	23.2	28.1	34.2	34.7	32.5	30.5	1.47
HIV testing in village (%) (+)*	16.8	18.4	20.0	24.2	37.1	23.2	1.20
Iodine deficiency program in village (%) (+)*	27.7	32.3	36.5	37.4	42.2	35.2	1.32
HIV cases in village (%) (+)*	33.7	41.0	44.6	49.4	52.2	44.1	1.32
Number of HIV cases per 1,000 persons (+)*	0.78	0.94	0.99	1.14	1.15	1.00	1.27

Source: 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

^a percentage of population in a given quintile residing in villages with a given characteristic or mean value of a given characteristic in the village of residence.

Table 23 shows the changes between 2004 and 2007 in selected “income-sensitive” education and health indicators (i.e., those exhibiting monotonic increases or decreases in the poorest three quintiles in both years and that are starred in 2007). These changes reflect the distribution of community improvements in access to education and health services during this three-year period. Unlike the corresponding changes in housing characteristics and consumer durable ownership, however, there is no reason to believe these changes are related to changes in real per capita household income.⁴¹ These data indicate that 8 of 11 of the income-sensitive education and health indicators changed in the expected direction (+ or -, as indicated in Table 23) in the poorest quintile, whereas only 4 of 11 changed in the expected direction in the next poorest quintile. These data suggest that the distribution of community improvements in access to education and health services during the period 2004 to 2007 favored the poorest quintile more than the next poorest quintile. This contrasts with the results for the other village indicators in Table 20, but is perhaps not surprising, given that most of the indicators in Table 23 are heavily influenced by government policy, whereas most of the indicators in Table 20 are mainly determined by market forces.

Table 23. Changes in selected village education and health indicators between 2004 and 2007 in the two poorest per capita consumption quintiles

	Poorest quintile			Next poorest quintile		
	2004	2007	Change (%)	2004	2007	Change (%)
Lower secondary school in village (%) (+)	8.6	12.5	45.0	10.2	12.5	22.6
Upper secondary school in village (%) (+)	3.2	3.3	2.6	3.5	3.3	-6.2
Private clinic (%) (+)	8.2	7.9	-4.3	9.2	7.9	-14.5
Dedicated drug shop (%) (+)	4.4	5.8	30.2	5.1	5.8	13.4
Referral (or district) hospital (%) (+)	1.4	1.6	11.1	2.3	1.6	-32.9
Doctor in village (%) (+)	4.2	4.6	8.3	5.9	4.6	-22.9
Trained midwife in village (%) (+)	28.2	37.3	32.2	32.8	37.3	14.0
Distance to private hospital (km) (-)	92.6	77.0	-16.9	72.4	77.0	6.4
Distance to trained midwife (km) (-)	6.3	3.9	-37.6	5.8	3.9	-32.0
Distance to <i>kru khmer</i> (traditional healer) (km) (+)	2.3	2.0	-10.9	2.6	2.0	-23.2
Iodine deficiency program in village (%) (-)	27.7	43.4	56.6	32.3	43.4	34.4

Source: Table 21, Table 22.

* sample limited to villages in the 2007 CSES sampling frame.

⁴¹ See footnote 40.

5.4 Other socio-economic characteristics

In addition to data on housing, consumer durables, and village characteristics, both the 2004 and 2007 CSES collected data on a broad range of household and individual-level socio-economic characteristics. Most of these data are comparable between the two surveys (the few exceptions are noted below), and there are only a few variables for which data were collected in 2004, but not in 2007.⁴² This section of the report presents data on a selected set of socio-economic indicators, including both their values by per capita consumption quintile in 2004 and 2007 and changes in their values between 2004 and 2007 in the two poorest quintiles.

All of the indicators presented in the tables below are population-weighted, including the household-level indicators. This means that the indicators refer to the characteristics of the *population* in a given quintile, not to the characteristics of *households* in the quintile. For example, the correct interpretation of the values for the first indicator in Table 24 below (“Owns or operates agricultural land (%)”) is that 89% of the population in the poorest quintile are in households that own or operate some agricultural land—and not that 89% of the poorest *households* have this characteristic.

Another feature of the indicators reported in this section is that they are “un-conditional” unless otherwise indicated. For example, in Table 24, the second indicator refers to the number of plots of land owned or operated by the households to which the population in each quintile belongs. This indicator is “un-conditional” in the sense that it refers to the mean number of plots owned by the total population in each quintile, and not to the mean value among the population in households *that own or operate land* (i.e., not conditional on land ownership or operation). The corresponding conditional indicator can be obtained in most cases by dividing the values of an unconditional indicator by the values of another indicator in the table (often the preceding indicator), in this case, by the first indicator, i.e. the percentage of the population in each quintile that are in households that own or operate some agricultural land. However, some of the indicators *are* conditional, and this is usually obvious from the definition of the indicator. For example, the fourth indicator in Table 24 is the “Median value of land per hectare owned or operated (Riel 000).” This indicator is clearly conditional on the ownership or operation of some agricultural land because the indicator would not be defined otherwise (the denominator would be zero).

The relationships depicted in the tables between the indicators and per capita consumption are only two-way (bivariate) relationships and may therefore be due to the indicator’s correlation with other factors that are also correlated with income, such as education or urban-rural residence. Only multivariate analysis can help to disentangle these kinds of relationships. In addition, some of the observed relationships with per capita consumption may be due to unobserved factors (“unobserved” in the sense that they are not in the 2004 CSES data set) that are also correlated with income. Unfortunately, the role played by such unobserved factors cannot be easily revealed even by multivariate analysis.

⁴² In particular, data on fertility and mortality were not collected in the 2007 CSES because of its small sample size.

5.4.1 Household-level characteristics

Table 24 presents household-level indicators referring to household sources of income or livelihood in 2007, while Table 25 presents the same indicators for 2004 (with the sample limited to villages included in the 2007 CSES sampling frame). In Cambodia, agricultural land is a particularly important source of income and livelihood for the rural population. The first 11 indicators refer to agricultural land owned or operated by the household, while an additional 6 indicators refer to agricultural activities that are not necessarily related to the ownership or operation of land. These indicators show that agriculture is a particularly important activity in the poorer quintiles. For example, in 2007, 89% of the population in the poorest quintile is in households owning or operating agricultural land, compared to 39% in the richest quintile.

Some of this difference undoubtedly reflects differences in the urban-rural composition of the population in each quintile (Table 36 and Table 37). However, it also reflects that relatively rich rural residents tend to be employed in non-agricultural activities (for example, government workers) or to own or operate non-agricultural enterprises. Importantly, the data indicate that among those who do own or operate agricultural land, the median value of the land per hectare owned or operated (as estimated by the respondent) is almost twice as high in the richest quintile than in the poorest.

Surprisingly, the percentage of the population in households that own, as distinct from merely operate, agricultural land is higher in the poorest three quintiles than in the two richest quintiles. However, among those who do own their land, security of tenure increases with the level of per capita household consumption. For example, only 30% of the population in the poorest quintile is in a household with owned land that is secured by a title, compared to 44% in the richest quintile. In this sense, as well as in other areas discussed below, the poor are clearly more vulnerable than the rich.

Another insight provided by these agriculture-related indicators is that the poor depend heavily on access to common resources to pursue such activities as fishing, collecting firewood, foraging or hunting wild animals. The differentials among quintiles in the indicators relating to these activities are some of the sharpest in the table.

In addition to agriculture, the data in Table 24 and Table 25 indicate that household operation of one or more businesses and receipt of remittances (both domestic and foreign, but especially foreign) increases systematically with per capita household consumption. However, the fact that businesses and remittances are more important as sources of income or livelihood for the rich does not necessarily imply that they are unimportant as sources of income for the poor. For example, businesses may provide additional income security for the poor by providing a source of income that is not as sensitive to variations in weather. Remittances may also help to buffer poor households against crop failures and other events that cause short-term fluctuations in rural incomes. More in-depth analysis is needed to explore these relationships.

Table 24. Household sources of income or livelihood by per capita consumption quintile, 2007

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Owns or operates agricultural land (%)	89.1	85.1	83.7	72.0	39.1	73.8	0.94
Number of plots owned or operated	1.77	1.78	1.64	1.56	0.87	1.52	0.92
Median area of land owned or operated (square meters)	9,000	9,000	9,900	6,000	0	6,380	1.10
Median value of land per hectare owned or operated (Riel 000)	4,000	4,750	5,000	8,229	9,000	5,480	1.25
Land owned as % of land owned or operated ^a	94.0	93.5	93.8	87.6	83.6	91.5	1.00
Land secured by any type of document as % of land owned ^a	47.6	57.3	54.4	63.2	74.3	57.1	1.14
Land secured by government title as % of land owned ^a	29.5	36.0	35.4	43.0	44.2	36.4	1.20
Land can be used as collateral for loan as % of land owned or operated ^a	84.3	81.6	77.6	84.6	80.2	81.8	0.92
Grows crops (%)	88.4	84.3	80.8	66.4	32.9	70.5	0.91
Number of wet season crops grown	1.59	1.48	1.34	1.20	0.62	1.25	0.84
Number of dry season crops grown	0.37	0.50	0.45	0.54	0.31	0.43	1.22
Raises livestock (%)	88.8	86.8	83.2	71.6	37.2	73.5	0.94
Raises fish (%)	3.9	2.3	3.6	4.1	3.9	3.6	0.92
Owns fish pond (%)	3.4	1.6	3.1	3.5	3.4	3.0	0.92
Catches fish/seafood (%)	75.2	66.1	58.9	41.6	17.0	51.7	0.78
Collects firewood or other forest products (%)	91.3	86.6	78.3	62.6	25.2	68.8	0.86
Forages or hunts wild animals (%)	46.2	43.0	44.7	28.7	12.5	35.0	0.97
Operates one or more businesses (%)	23.4	23.9	32.2	43.2	56.5	35.8	1.38
Number of businesses operated	0.2	0.3	0.4	0.5	0.7	0.4	1.55
Owns buildings used for any purpose (%)	96.9	97.3	96.5	93.9	92.0	95.3	1.00
Number of buildings owned	0.97	0.97	0.97	0.96	0.93	0.96	1.00
Received domestic remittances during past 12 months (%)	16.7	20.1	18.9	19.3	15.9	18.2	1.13
Received foreign remittances during past 12 months (%)	1.7	2.0	4.1	4.2	6.6	3.7	2.45
Value of remittances received from domestic sources during past 12 months (Riel)	62,324	66,878	91,628	128,630	251,792	120,209	1.47
Value of remittances received from foreign sources during past 12 months (Riel)	16,576	13,204	35,264	85,893	278,680	85,864	2.13

Source: 2007 CSES.

^a both the numerator and denominator of this indicator refer to the reported value of land.

Table 25. Household sources of income or livelihood by per capita consumption quintile, 2004*

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Owens or operates agricultural land (%)	83.1	85.1	80.9	72.3	48.0	73.9	0.97
Number of plots owned or operated	1.46	1.61	1.63	1.44	0.94	1.42	1.11
Median area of land owned or operated (square meters)	8,000	9,000	7,700	5,000	0	6,000	0.96
Median value of land per hectare owned or operated (Riel 000)	1,893	2,320	2,667	3,000	3,913	2,500	1.41
Land owned as % of land owned or operated ^a	93.0	93.3	92.4	92.4	88.2	92.2	0.99
Land secured by any type of document as % of land owned ^a	36.7	51.3	61.2	58.2	63.8	53.1	1.66
Land secured by government title as % of land owned ^a	14.3	22.3	24.2	23.4	29.2	22.0	1.69
Land can be used as collateral for loan as % of land owned or operated ^a	78.9	81.9	79.3	76.8	74.9	78.7	1.01
Grows crops (%)	81.0	82.3	77.7	68.5	42.2	70.3	0.96
Number of wet season crops grown	1.30	1.35	1.34	1.14	0.71	1.17	1.03
Number of dry season crops grown	0.28	0.43	0.46	0.44	0.29	0.38	1.61
Raises livestock (%)	83.3	85.9	81.1	73.8	47.7	74.4	0.97
Raises fish (%)	1.5	3.2	3.4	3.3	2.7	2.8	2.23
Owens fish pond (%)	1.0	2.1	2.1	2.2	1.9	1.9	2.22
Catches fish/seafood (%)	72.8	69.0	59.1	44.5	22.3	53.5	0.81
Collects firewood or other forest products (%)	92.6	89.5	81.1	65.5	34.5	72.6	0.88
Forages or hunts wild animals (%)	30.3	26.2	21.4	16.2	9.0	20.6	0.70
Operates one or more businesses (%)	24.5	31.8	36.3	44.5	58.5	39.1	1.48
Number of businesses operated	0.3	0.4	0.4	0.6	0.8	0.5	1.47
Owens buildings used for any purpose (%)	97.0	97.1	96.4	94.4	93.9	95.8	0.99
Number of buildings owned	0.98	0.98	0.98	0.96	0.96	0.97	1.00
Received domestic remittances during past 12 months (%)	12.5	11.5	13.1	11.5	11.4	12.0	1.05
Received foreign remittances during past 12 months (%)	2.9	3.6	4.2	5.3	8.2	4.9	1.45
Value of remittances received from domestic sources during past 12 months (Riel)	44,522	39,306	33,996	40,607	91,723	50,030	0.76
Value of remittances received from foreign sources during past 12 months (Riel)	26,288	35,791	52,096	84,525	200,090	79,744	1.98

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

^a both the numerator and denominator of this indicator refer to the reported value of land.

Table 26 shows changes in household sources of income or livelihood between 2004 and 2007 in the two poorest per capita consumption quintiles. These data indicate that the observed changes in several indicators are consistent with real income growth in the two poorest quintiles during this period (and particularly in the poorest quintile). For example, the percentage of land secured by title increased from 14% to 30% in the poorest quintile and from 22% to 36% in the next poorest quintile, while the number of plots owned or operated, their median size and median value also increased. Both the percentage of the

population living in households receiving domestic remittances and the value of domestic remittances per household also increased substantially between 2004 and 2007 in both quintiles (although this was partially offset by decreases in the receipt of foreign remittances).⁴³ On the other hand, it is difficult to know which direction of change is consistent with real income growth in several other indicators that are inversely related to per capita consumption in a given year (for example, the percentage of households owning or operating agricultural land, the percentage raising livestock or the percentage collecting firewood).

Table 26. Changes in household sources of income or livelihood between 2004 and 2007

Indicator	Poorest quintile			Next poorest quintile		
	2004*	2007	Change (%)	2004*	2007	Change (%)
Owens or operates agricultural land (%)	83.1	89.1	7.2	85.1	85.1	0.0
Number of plots owned or operated	1.46	1.77	21.2	1.61	1.78	10.3
Median area of land owned or operated (square meters)	8,000	9,000	12.5	9,000	9,000	0.0
Median value of land per hectare (Riel 000)	1,893	4,000	111.3	2,320	4,750	104.7
Land owned as % of land owned or operated ^a	93.0	94.0	1.0	93.3	93.5	0.2
Land secured by paper as % of land owned ^a	36.7	47.6	29.4	51.3	57.3	11.7
Land secured by title as % of land owned ^a	14.3	29.5	105.6	22.3	36.0	61.6
Land can be used as collateral for loan as % of land owned or operated ^a	78.9	89.9	14.0	81.9	87.9	7.4
Grows crops (%)	81.0	88.4	9.1	82.3	84.3	2.4
Number of wet season crops grown	1.30	1.59	22.5	1.35	1.48	9.4
Number of dry season crops grown	0.28	0.37	29.0	0.43	0.50	17.5
Raises livestock (%)	83.3	88.8	6.6	85.9	86.8	1.0
Raises fish (%)	1.5	3.9	155.8	3.2	2.3	-28.4
Owens fish pond (%)	1.0	3.4	256.7	2.1	1.6	-25.6
Catches fish/seafood (%)	72.8	75.2	3.3	69.0	66.1	-4.2
Collects firewood or other forest products (%)	92.6	91.3	-1.4	89.5	86.6	-3.3
Forages or hunts wild animals (%)	30.3	46.2	52.4	26.2	43.0	64.1
Operates one or more businesses (%)	24.5	23.4	-4.5	31.8	23.9	-25.0
Number of businesses operated	0.3	0.2	-16.6	0.4	0.3	-29.8
Owens buildings used for any purpose (%)	97.0	96.9	-0.1	97.1	97.3	0.3
Number of buildings owned	0.98	0.97	-0.7	0.98	0.97	-0.2
Received domestic remittances during past 12 months (%)	12.5	16.7	34.0	11.5	20.1	75.1
Received foreign remittances during past 12 months (%)	2.9	1.7	-43.5	3.6	2.0	-44.3
Value of remittances received from domestic sources during past 12 months (Riel)	44,522	62,324	40.0	39,306	66,878	70.1
Value of remittances received from foreign sources during past 12 months (Riel)	26,288	16,576	-36.9	35,791	13,204	-63.1

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

^a both the numerator and denominator of this indicator refer to the reported value of land.

⁴³ As previously mentioned, the values of household remittances shown in the table are unconditional (i.e., averaged over all households). The average values of remittances received by households receiving remittances can be calculated by dividing the unconditional values by the percentage of households receiving remittances. For example, in the poorest quintile, the mean conditional value of domestic remittances per household (i.e., the mean value among households receiving domestic remittances) increased from 356,176 Riel in 2004 to 373,198 Riel in 2007 (i.e., by 4.8%).

Table 27 presents indicators of the general welfare and security of Cambodian households in 2007, while Table 28 presents the same indicators for 2004. Most of these indicators refer to household vulnerabilities, such as indebtedness, malnutrition and starvation, violence and theft, and accidents. The general pattern is that the poor are significantly more vulnerable than the rich in most of these areas. For example, even if the mean value of outstanding loans is almost twice as high among the rich as among the poor, more of the poor reside in households with some debt, and the ratio of outstanding debts to per capita household consumption is higher among the poor than among the rich (since the ratio of real per capita consumption in the richest to the poorest quintile is greater than seven in both 2004 and 2007, as indicated in Table 7 above).

Table 27. Indicators of general household welfare and security by per capita consumption quintile, 2007

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Able to borrow (%)	69.5	68.5	79.9	82.5	87.9	77.7	1.15
Has one or more loans outstanding (%)	46.0	49.9	40.7	36.2	22.4	39.0	0.88
Number of loans outstanding	0.48	0.54	0.43	0.37	0.24	0.41	0.90
Value of outstanding loans (Riel)	524,237	516,111	523,301	623,376	923,774	622,071	1.00
Used iodized salt yesterday (%)	63.4	60.4	66.5	70.1	89.4	70.0	1.05
Enough food during past 12 months (%)	90.3	88.7	91.7	95.5	97.9	92.8	1.02
Number of weeks starved during past 12 months	0.44	0.54	0.48	0.16	0.08	0.34	1.08
Feel safe from crime and violence in neighborhood of residence (%)	55.5	50.7	55.8	53.9	58.0	54.8	1.01
Can rely on local police for protection (%)	46.1	52.1	51.6	51.7	53.5	51.0	1.12
Victim of theft/robbery during past 12 months (%)	1.6	4.1	1.4	5.3	2.8	3.0	0.88
Number of thefts/robberies during past 12 months	0.016	0.041	0.014	0.056	0.034	0.032	0.88
Victim of accident during past 12 months (%)	5.4	7.0	6.4	6.7	10.5	7.2	1.17
Number of accidents during past 12 months	0.076	0.091	0.087	0.078	0.141	0.095	1.15

Source: 2007 CSES.

Table 28. Indicators of general household welfare and security by per capita consumption quintile, 2004*

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Able to borrow (%)	76.5	82.3	84.1	84.1	87.4	82.9	1.10
Has one or more loans outstanding (%)	48.9	46.7	46.0	39.6	30.1	42.2	0.94
Number of loans outstanding	0.52	0.50	0.50	0.42	0.32	0.45	0.95
Value of outstanding loans (Riel)	239,841	292,693	330,709	429,718	852,803	429,107	1.38
Used iodized salt yesterday (%)	11.9	16.7	22.8	31.1	52.6	27.2	1.91
Enough food during past 12 months (%)	64.9	73.9	78.6	82.5	91.5	78.3	1.21
Number of weeks starved during past 12 months	3.51	2.16	1.79	1.38	0.61	1.89	0.51
Feel safe from crime and violence in neighborhood of residence (%)	50.8	57.4	59.5	58.2	61.2	57.4	1.17
Can rely on local police for protection (%)	49.4	51.5	53.4	51.5	51.9	51.5	1.08
Victim of theft/robbery during past 12 months (%)	2.5	3.3	3.7	4.6	5.8	4.0	1.50
Number of thefts/robberies during past 12 months	0.025	0.034	0.039	0.048	0.062	0.042	1.53
Victim of accident during past 12 months (%)	4.1	4.7	6.3	6.7	7.4	5.9	1.52
Number of accidents during past 12 months	0.046	0.052	0.070	0.074	0.083	0.065	1.53

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 29 shows changes in indicators of general household welfare and security between 2004 and 2007 in the two poorest per capita consumption quintiles. These data indicate mixed improvement in these indicators during this period, with a more consistent pattern of improvement registered by the population in the poorest quintile than by the population in the next poorest quintile. The implications of the observed changes in the various indebtedness indicators for general household welfare and security are ambiguous. The percentage of the population in households with one or more loans outstanding decreased by 6% in the poorest quintile, versus an increase of 7% in the next poorest quintile. Similarly, the number of loans outstanding decreased by 8% in the poorest quintile, versus an increase of 7% in the next poorest quintile. Both quintiles reported a decrease in perceived ability to borrow (-9% in the poorest quintile and -17% in the next poorest quintile), and a substantial increase in the value of outstanding loans (+119% in the poorest quintile and +76% in the next poorest quintile).

The pattern of change is less ambiguous in the case of food security and nutrition. Large increases were reported by both quintiles in the percentage of the population that used iodized salt on the previous day (+431% in the poorest quintile and +262% in the next poorest) and in the percentage of the population residing in households reporting that they had enough food to eat during the past 12 months (+39% in the poorest quintile and +20% in the next poorest quintile), while a substantial decrease was reported in the mean number of weeks household members starved during the past 12 months (-87% in the poorest quintile and -75% in the next poorest quintile).

According to the data in Table 29, the population in the poorest quintile benefited from a perceived increase in security from crime and violence during the period 2004 to 2007, whereas the population in the next poorest quintile experienced the opposite. For example,

there was a 9% increase in the population in the poorest quintile who reported that they felt safe from crime in violence in their neighborhood, versus a 12% decrease in the next poorest quintile. Similarly, there was a 36% decrease in the percentage of the population in the poorest quintile that was reportedly a victim of theft or robbery during the past 12 months, versus an increase of 22% in the next poorest quintile. In contrast, both quintiles reported substantial increases in their exposure to accidents during this period.

Table 29. Changes in indicators of general household welfare and security from 2004 to 2007

Indicator	Poorest quintile			Next poorest quintile		
	2004	2007	Change (%)	2004	2007	Change (%)
Able to borrow (%)	76.5	69.5	-9.2	82.3	68.5	-16.8
Has one or more loans outstanding (%)	48.9	46.0	-5.8	46.7	49.9	6.9
Number of loans outstanding	0.52	0.48	-8.2	0.50	0.54	7.2
Value of outstanding loans (Riel)	239,841	524,237	118.6	292,693	516,111	76.3
Used iodized salt yesterday (%)	11.9	63.4	431.4	16.7	60.4	262.1
Enough food during past 12 months (%)	64.9	90.3	39.1	73.9	88.7	19.9
Number of weeks starved during past 12 months	3.51	0.44	-87.4	2.16	0.54	-74.8
Feel safe from crime and violence in neighborhood of residence (%)	50.8	55.5	9.4	57.4	50.7	-11.7
Can rely on local police for protection (%)	49.4	46.1	-6.7	51.5	52.1	1.2
Victim of theft/robbery during past 12 months (%)	2.5	1.6	-36.1	3.3	4.1	22.3
Number of thefts/robberies during past 12 months	0.025	0.016	-37.5	0.034	0.041	18.7
Victim of accident during past 12 months (%)	4.1	5.4	30.7	4.7	7.0	49.0
Number of accidents during past 12 months	0.046	0.076	65.0	0.052	0.091	75.4

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 30 presents selected indicators referring to the characteristics of heads of household in 2007, while Table 31 presents the same indicators for 2004. Several of these head of household characteristics either do not vary systematically among quintiles or the variations are relatively small. Examples are age, sex, marital status, ethnicity, current employment, unemployment and hours worked, as well as indicators of self-reported health status and disability. However, all indicators related to education vary sharply and systematically with per capita household consumption. Some employment indicators also vary among quintiles, i.e., those related to desire for more hours of work, employment in agriculture, and status as a paid employee. It is tempting to conclude from the sharp quintile differentials in the education indicators that additional schooling is the *cause* of the observed differentials in the employment indicators. This is probably true to some extent, but the observed quintile differentials probably overstate the poverty reduction benefits of additional schooling per se. The reason is that additional schooling tends also to be positively correlated with unobserved genetic endowments, such as intelligence, and with parents' schooling. Adults with more schooling are also more likely to have been raised (and continue to reside) in geographically favored areas and to have been raised in relatively prosperous households (for example, see the village education indicators in Table 21 above or the individual schooling indicators for children in Table 39 below).

Table 30. Selected characteristics of heads of household by p.c. consumption quintile, 2007

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle: poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Age (years)	44.4	44.9	45.1	45.2	48.4	45.6	1.01
Female (%)	16.6	16.2	19.2	19.1	20.2	18.3	1.15
Married (%)	83.4	82.9	83.3	82.9	81.9	82.9	1.00
Ethnic minority (%)	2.8	2.3	2.1	1.7	2.0	2.2	0.76
Attended school (%)	68.2	74.9	77.1	83.3	91.4	79.0	1.13
Literate (%)	62.9	70.4	73.6	78.7	90.4	75.2	1.17
Can speak English or French (%)	0.4	1.0	2.9	5.1	20.3	5.9	7.17
Secondary schooling or above (%)	16.0	22.1	24.9	29.3	55.0	29.5	1.55
Highest school grade completed	3.3	4.0	4.3	4.9	7.4	4.8	1.28
Currently employed, age 10+ (%)	91.7	92.2	93.3	91.3	86.5	91.0	1.02
Hours worked during the past week (%)	45.2	46.0	46.5	47.1	50.4	47.0	1.03
More hours wanted (%)	8.8	10.9	8.4	7.6	3.8	7.9	0.96
Currently unemployed, age 10+ (%)	0.0	0.4	0.1	0.0	0.0	0.1	3.68
Main job is in agriculture (%)	64.8	67.0	62.1	48.9	20.0	52.6	0.96
Main job is as a paid employee (%)	22.5	21.3	21.7	23.9	38.5	25.4	0.96
Has one or more disabilities (%)	4.6	7.5	6.7	6.2	5.7	6.1	1.47
Number of disabilities	0.06	0.08	0.09	0.08	0.08	0.08	1.55
Health status relatively good for age (%)	20.7	19.1	16.2	20.3	16.7	18.6	0.78
Health status relatively poor for age (%)	15.2	15.0	14.9	15.5	16.2	15.4	0.98

Source: 2007 CSES.

Table 31. Selected characteristics of heads of household by p.c. consumption quintile, 2004*

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle: poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Age (years)	43.5	44.6	45.2	45.7	46.8	45.2	1.04
Female (%)	17.3	16.1	17.1	17.5	18.4	17.3	0.99
Married (%)	84.0	84.3	83.9	84.3	83.4	84.0	1.00
Ethnic minority (%)	3.3	4.0	4.0	3.7	2.5	3.5	1.21
Attended school (%)	60.3	70.6	75.1	79.3	86.0	74.2	1.25
Literate (%)	55.6	65.9	70.3	75.9	85.2	70.6	1.26
Can speak English or French (%)	0.9	1.4	2.2	4.6	14.7	4.8	2.43
Secondary schooling or above (%)	15.4	22.6	25.3	33.5	49.8	29.3	1.64
Highest school grade completed	2.9	3.6	4.0	4.7	6.4	4.3	1.38
Currently employed, age 10+ (%)	90.1	88.5	89.7	88.9	87.3	88.9	1.00
Hours worked during the past week (%)	42.6	43.1	43.1	45.4	46.8	44.2	1.01
More hours wanted (%)	13.0	14.0	12.4	9.5	5.9	11.0	0.95
Currently unemployed, age 10+ (%)	0.3	0.6	0.1	0.2	0.3	0.3	0.48
Main job is in agriculture (%)	63.8	61.8	58.2	47.1	24.5	51.1	0.91
Main job is as a paid employee (%)	21.8	19.4	18.1	24.1	35.7	23.7	0.83
Has one or more disabilities (%)	10.5	10.1	10.4	8.5	8.0	9.5	1.00
Number of disabilities	0.13	0.12	0.12	0.10	0.09	0.11	0.95
Health status relatively good for age (%)	13.7	15.4	16.4	16.7	16.5	15.7	1.19
Health status relatively poor for age (%)	18.6	18.9	20.6	18.8	15.8	18.5	1.11

Source: 2004 CSES.

* sample limited to villages in the 2007 sampling frame.

Table 31 presents changes in selected characteristics of household heads between 2004 and 2007 in the poorest and next poorest quintiles. These data are again consistent with real income growth in the two poorest quintiles during this period. Notably, there has been significant improvement in several education indicators (i.e., ever attended school, literacy and highest grade of schooling completed), employment indicators (i.e., hours worked, more hours wanted, paid employee status) and health and nutrition indicators (i.e., disabilities and self-reported health status).

Table 32. Changes in selected characteristics of household heads from 2004 to 2007 in the two poorest per capita consumption quintiles

Indicator	Poorest quintile			Next poorest quintile		
	2004	2007	Change (%)	2004	2007	Change (%)
Age (years)	43.5	44.4	2.0	44.6	44.9	0.7
Female (%)	17.3	16.6	-3.6	16.1	16.2	0.4
Married (%)	84.0	83.4	-0.8	84.3	82.9	-1.7
Ethnic minority (%)	3.3	2.8	-15.6	4.0	2.3	-41.5
Attended school (%)	60.3	68.2	13.2	70.6	74.9	6.1
Literate (%)	55.6	62.9	13.1	65.9	70.4	6.9
Can speak English or French (%)	0.9	0.4	-55.6	1.4	1.0	-27.3
Secondary schooling or above (%)	15.4	16.0	3.9	22.6	22.1	-2.1
Highest school grade completed	2.92	3.34	14.1	3.63	3.99	9.8
Currently employed, age 10+ (%)	90.1	91.7	1.8	88.5	92.2	4.2
Number of hours worked during the past week (%)	42.6	45.2	6.2	43.1	46.0	6.7
More hours wanted (%)	13.0	8.8	-32.7	14.0	10.9	-22.1
Currently unemployed, age 10+ (%)	0.3	0.0	-87.5	0.6	0.4	-38.0
Main job is in agriculture (%)	63.8	64.8	1.6	61.8	67.0	8.4
Main job is as a paid employee (%)	21.8	22.5	3.4	19.4	21.3	10.1
Has one or more disabilities (%)	10.5	4.6	-56.3	10.1	7.5	-25.6
Number of disabilities	0.127	0.055	-56.5	0.120	0.083	-31.4
Health status relatively good for age (%)	13.7	20.7	51.1	15.4	19.1	23.9
Health status relatively poor for age (%)	18.6	15.2	-18.3	18.9	15.0	-20.7

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 33 presents indicators referring to the size and composition of sample households in 2007, while Table 34 presents the same indicators for 2004. These data show that both household size and composition vary systematically among per capita consumption quintiles. Household size is smaller among richer quintiles, which also have lower dependency burdens (i.e., lower ratios of children under 15 and elderly aged 60+ to the number of working-age adults). The education composition of households also varies markedly among quintiles. For example, only 11% of adults (aged 15+) in the poorest quintile have some secondary schooling in 2007, compared to 46% in the richest quintile. Interestingly, the education differentials are more marked among females than among males, suggesting that additional female schooling contributes more to per capita household consumption than additional male schooling. However, as indicated above, these observed relationships are not

necessarily causal, but may instead reflect other observed and unobserved past and present characteristics of females with more schooling.

Table 33. Selected indicators of household composition by per capita consumption quintile, 2007

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Household size	6.42	5.84	5.43	5.24	5.32	5.65	0.85
Children under 15 (%)*	42.8	38.5	34.3	32.6	26.2	35.3	0.80
Children under 5 (%)	11.5	10.9	8.8	9.0	7.7	9.7	0.77
Working-age adults, 15-59 (%)	52.7	55.8	60.6	61.6	66.7	59.1	1.15
Male working-age adults (%)	25.1	27.4	29.3	30.1	31.8	28.6	1.17
Female working-age adults (%)	27.6	28.4	31.3	31.6	34.9	30.6	1.13
Dependency burden	89.9	79.4	65.1	62.2	49.9	69.1	0.72
Literate adults, 15+ (%)	36.2	44.0	49.2	53.9	66.1	49.2	1.36
Male literate adults (%)	20.7	24.6	26.3	28.6	32.9	26.3	1.27
Female literate adults (%)	15.5	19.4	22.9	25.4	33.2	22.9	1.48
Secondary-educated adults (%)	11.0	15.3	19.8	26.8	45.8	23.1	1.80
Male secondary-educated adults (%)	7.0	9.4	12.0	15.8	24.9	13.5	1.71
Female secondary-educated adults (%)	4.0	5.9	7.7	11.0	21.0	9.6	1.95
Mean school grades completed by adults	3.42	4.07	4.45	5.21	7.51	4.93	1.30
Mean school grades completed, male adults	4.20	4.92	5.28	6.06	8.72	5.83	1.26
Mean school grades completed, female adults	2.63	3.22	3.68	4.39	6.45	4.07	1.40

Source: 2007 CSES.

* The percentages in this table refer to percentages of all household members.

Table 34. Selected indicators of household composition by per capita consumption quintile, 2004*

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Household size	6.60	6.05	5.69	5.38	5.22	5.79	0.86
Children under 15 (%)**	45.6	41.3	38.1	33.1	28.7	37.8	0.84
Children under 5 (%)	12.3	10.0	9.5	8.6	7.2	9.6	0.78
Working-age adults, 15-59 (%)	51.0	54.0	56.5	60.7	65.0	57.0	1.11
Male working-age adults (%)	24.0	25.6	27.4	28.9	31.1	27.2	1.14
Female working-age adults (%)	27.0	28.4	29.1	31.8	33.9	29.8	1.08
Dependency burden	96.2	85.2	76.9	64.8	53.9	75.4	0.80
Literate adults, 15+ (%)	29.7	38.6	43.4	51.0	61.3	43.9	1.46
Male literate adults (%)	16.8	21.1	24.0	27.2	31.5	23.7	1.43
Female literate adults (%)	12.9	17.5	19.3	23.7	29.8	20.2	1.51
Secondary-educated adults (%)	6.9	11.9	15.1	23.0	37.7	18.1	2.18
Male secondary-educated adults (%)	4.8	7.9	9.8	14.0	21.6	11.2	2.05
Female secondary-educated adults (%)	2.1	4.1	5.3	8.9	16.1	7.0	2.47
Mean school grades completed by adults	2.77	3.54	3.95	4.63	6.38	4.25	1.42
Mean school grades completed, male adults	3.53	4.37	4.85	5.66	7.61	5.20	1.37
Mean school grades completed, female adults	2.10	2.80	3.12	3.72	5.36	3.42	1.49

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

** the percentages in this table refer to percentages of all household members.

Table 35. Change in selected indicators of household composition from 2004 to 2007 in the two poorest per capita consumption quintiles

Household composition Indicator	Poorest quintile			Next poorest quintile		
	2004	2007	Change (%)	2004	2007	Change (%)
Household size	6.60	6.42	-2.8	6.05	5.84	-3.5
Children under 15 (%)**	45.6	42.8	-6.0	41.3	38.5	-6.7
Children under 5 (%)	12.3	11.5	-6.5	10.0	10.9	8.6
Working-age adults, 15-59 (%)	51.0	52.7	3.3	54.0	55.8	3.2
Male working-age adults (%)	24.0	25.1	4.5	25.6	27.4	7.0
Female working-age adults (%)	27.0	27.6	2.2	28.4	28.4	-0.1
Dependency burden	96.2	89.9	-6.6	85.2	79.4	-6.8
Literate adults, 15+ (%)	29.7	36.2	21.9	38.6	44.0	13.9
Male literate adults (%)	16.8	20.7	23.1	21.1	24.6	16.2
Female literate adults (%)	12.9	15.5	20.3	17.5	19.4	11.0
Secondary-educated adults (%)	6.9	11.0	58.6	11.9	15.3	28.2
Male secondary-educated adults (%)	4.8	7.0	47.1	7.9	9.4	19.8
Female secondary-educated adults (%)	2.1	4.0	84.3	4.1	5.9	44.6
Mean school grades completed by adults	2.77	3.42	23.6	3.54	4.07	15.1
Mean school grades completed by male adults	3.53	4.20	18.9	4.37	4.92	12.5
Mean school grades completed by female adults	2.10	2.63	25.3	2.80	3.22	15.1

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

** the percentages in this table refer to percentages of all household members.

5.4.2 Individual-level characteristics

Table 36 presents selected individual-level demographic indicators by per capita consumption quintile for 2007, while Table 37 presents the same indicators for 2004 (with the sample limited to villages included in the 2007 CSES sampling frame). Unlike the demographic indicators for heads of household, several of the individual-level demographic indicators vary considerably and systematically across per capita consumption quintiles. For example, the estimated mean age of the population increases more sharply with per capita consumption than the mean age of heads of households (compare with Table 30). Although there is practically no variation among quintiles in the percentage of the population that is female, both women in child-bearing ages (15-49) and married persons (and persons living together) as a percentage of the population in each quintile increase systematically with the level of per capita consumption. In contrast, the percentage of single persons in the population of each quintile decreases systematically with per capita consumption. The data in Table 37 also indicate that the percentage of inter-district migrants increases with per capita consumption, while the percentage of persons aged 5+ who have always resided in the same village decreases sharply with per capita consumption.⁴⁴ Not surprisingly, the percentage of

⁴⁴ Some of these demographic relationships may be driven by other indicators, for example, the inverse relationship between per capita consumption and the % of persons aged 5+ who have always resided in the same village is probably driven by the strong inverse relationship between per capita consumption and the % of children under 15 in the household (e.g., Table 33). It is also difficult to separate cause from effect in some cases, for example, between the number of women of child-bearing age, the % married, and the number of children under 15.

urban residents increases monotonically across per capita consumption quintiles, increasing most sharply in the richest quintile.

Table 36. Selected individual-level demographic indicators by per capita consumption quintile, 2007

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Age (years)	22.8	24.5	25.9	27.0	29.7	26.0	1.14
Female (%)	52.0	50.6	52.1	51.7	53.6	52.0	1.00
Women in child-bearing ages 15-49 (%)	25.1	25.4	28.2	28.3	30.4	27.5	1.12
School-age children, ages 6-17 (%)	35.1	31.7	30.8	27.9	22.0	29.5	0.88
Single (%)	61.4	57.6	54.2	51.9	49.9	55.0	0.88
Married or living together (%)	32.3	35.7	38.6	40.2	41.7	37.7	1.20
Widowed (%)	5.3	5.4	5.6	6.7	6.8	6.0	1.06
Divorced or separated (%)	1.0	1.3	1.6	1.3	1.6	1.3	1.53
Absent from household (%)	7.4	4.0	4.2	2.9	3.7	4.5	0.57
Months absent	0.29	0.11	0.12	0.08	0.08	0.13	0.41
Always resided in village, age5+ (%)	65.8	61.6	58.5	54.4	38.6	55.6	0.89
Inter-district migrant during past 5 years, age 5+ (%)	3.6	6.6	5.6	8.2	11.1	7.0	1.57
Urban resident, de jure (%)	7.2	7.2	9.1	18.2	53.5	19.1	1.25

Source: 2007 CSES.

Table 37. Selected individual-level demographic indicators by per capita consumption quintile, 2004*

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Age (years)	21.8	23.6	25.2	26.9	28.3	25.2	1.16
Female (%)	51.7	52.1	51.9	51.9	52.3	52.0	1.00
Women in child-bearing ages 15-49 (%)	24.9	25.4	25.9	27.8	29.6	26.7	1.04
School-age children, ages 6-17 (%)	37.0	35.4	32.3	28.5	26.1	31.9	0.87
Single (%)	63.9	60.4	57.1	53.4	52.3	57.4	0.89
Married or living together (%)	30.4	33.8	36.1	39.8	40.4	36.1	1.19
Widowed (%)	4.9	5.1	5.9	6.0	6.3	5.6	1.21
Divorced or separated (%)	0.8	0.7	0.8	0.8	1.1	0.9	1.03
Absent from household (%)	5.3	3.9	3.8	3.4	3.9	4.1	0.71
Months absent	0.17	0.13	0.10	0.08	0.08	0.11	0.60
Always resided in village, age5+ (%)	82.6	80.4	75.5	70.2	54.4	72.5	0.91
Inter-district migrant during past 5 years, age 5+ (%)	4.4	4.4	5.7	7.8	11.9	6.9	1.31
Urban resident, de jure (%)	7.0	7.7	9.7	12.6	35.4	14.5	1.39

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 38 shows changes in the same selected individual-level demographic indicators between 2004 and 2007 in the two poorest quintiles. These data indicate that there were increases during this period in average age, marriage, widowhood, divorce or separation, absence from the household at the time of interview, and (in the poorest quintile only) in the number of months absent.⁴⁵ Changes in the migration-related indicators during this period present a mixed picture. The percentage of persons aged 5+ who have always resided in the same village decreased by over 20% in both the poorest and next poorest quintiles (suggesting increased migration during this period), whereas the percentage of inter-district migrants during the past 5 years decreased in the poorest quintile (by 19%) but increased in the next poorest quintile (by 48%).

Table 38. Changes in selected individual-level demographic indicators between 2004 and 2007 in the two poorest per capita consumption quintiles

Indicator	Poorest quintile			Next poorest quintile		
	2004	2007	Change (%)	2004	2007	Change (%)
Age (years)	21.8	22.8	4.4	23.6	24.5	3.8
Female (%)	51.7	52.0	0.7	52.1	50.6	-2.9
Women in child-bearing ages 15-49 (%)	24.9	25.1	0.7	25.4	25.4	0.1
School-age children, ages 6-17 (%)	37.0	35.1	-5.1	35.4	31.7	-10.3
Single (%)	63.9	61.4	-4.0	60.4	57.6	-4.6
Married or living together (%)	30.4	32.3	6.4	33.8	35.7	5.6
Widowed (%)	4.9	5.3	8.3	5.1	5.4	6.6
Divorced or separated (%)	0.8	1.0	25.6	0.7	1.3	84.4
Absent from household (%)	5.3	7.4	38.8	3.9	4.0	2.7
Months absent	0.17	0.29	74.0	0.13	0.11	-12.3
Always resided in village, age 5+ (%)	82.6	65.8	-20.4	80.4	61.6	-23.4
Inter-district migrant during past 5 years, age 5+ (%)	4.4	3.6	-18.5	4.4	6.6	48.0
Urban resident, de jure (%)	7.0	7.2	3.8	7.7	7.2	-6.5

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 39 presents selected individual-level education and employment indicators by per capita consumption quintile, while Table 40 presents the same indicators for 2004. These data indicate that there are sharp, systematic differences among quintiles in all of the schooling indicators (except in the gross primary enrollment ratio), regardless of whether they refer to current enrollment of the school-age population, to completed schooling among the general population or to current or previous participation in nonformal classes. The differentials in net enrollment ratios among quintiles are all more marked than those in

⁴⁵ The data on the population absent from households at the time of the interview are not directly comparable between the 2004 and 2007 CSES. The 2004 CSES asked whether each household member was absent from home at present, whereas the 2007 CSES asked whether each household member “has been present all days last week.” The data on the number of months absent should be comparable between the two surveys, although some adjustment is needed because the 2007 CSES asked “how many weeks” the person was absent during the past 12 months, while the 2004 CSES asked “how many months” the person was absent.

gross enrollment ratios (although the differentials in the gross ratios are also quite marked at the secondary level).⁴⁶ This difference reflects the tendency of poorer children to begin their schooling at a later age (and probably also a tendency for them to repeat grades more often, particularly at the primary level, judging from the very high gross enrollment ratios observed at the primary level). In addition to marked differentials in enrollment ratios, there are similarly marked differentials in household expenditure on schooling per enrolled child at each level of schooling. The individual-level employment indicators in Table 39 exhibit similar patterns to the corresponding indicators for heads of household in Table 30.

Table 39. Selected individual-level education and employment indicators by per capita consumption quintile, 2007

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Currently enrolled in school, age 5+ (%)	31.2	30.8	29.7	29.9	28.4	30.0	0.95
Grade in which currently enrolled	3.8	4.4	4.9	5.5	7.4	5.2	1.28
Highest grade completed, age 5+	3.0	3.6	4.0	4.6	6.8	4.4	1.33
Gross primary enrollment ratio (ages 6-11)	122.5	133.8	129.4	126.7	122.5	127.2	1.06
Net primary enrollment ratio (ages 6-11)	78.1	81.3	81.4	81.2	87.4	81.2	1.04
Gross lower secondary enrollment ratio (age 12-14)	37.0	52.6	73.0	86.5	93.5	66.4	1.97
Net lower secondary enrollment ratio (age 12-14)	12.8	20.1	29.7	36.0	51.4	28.6	2.33
Gross upper secondary enrollment ratio (age 15-17)	7.7	17.3	21.2	41.5	86.5	33.1	2.76
Net upper secondary enrollment ratio (age 15-17)	3.3	5.2	6.9	16.4	40.0	13.5	2.11
Education expenditure per child enrolled in primary school (Riel p.a.)	22,944	35,606	38,142	57,594	225,820	60,080	1.66
Education expenditure per enrolled child enrolled in lower secondary school (Riel p.a.)	62,836	85,372	93,556	186,935	399,364	183,005	1.49
Education expenditure per enrolled child enrolled in upper secondary school (Riel p.a.)	92,238	160,712	227,689	333,172	626,154	421,991	2.47
Ever attended school, age 5+ (%)	55.9	63.8	69.0	73.1	84.4	69.4	1.23
Ever attended nonformal class (%)	2.3	1.8	3.8	4.9	12.5	5.1	1.65
Currently attending nonformal class (%)	0.5	0.5	1.7	2.4	8.4	2.8	3.34
Literate, age 5+ (%)	73.6	77.4	79.9	83.7	90.6	81.2	1.09
Speaks English or French, age 10+ (%)	0.4	1.2	3.1	5.7	20.2	6.5	7.95
Currently employed, age 10+ (%)	76.4	78.5	75.9	75.1	67.9	74.6	0.99
Number of hours worked during past week	39.4	40.0	41.2	41.6	46.2	41.7	1.05
Main job is in agriculture (%)	71.4	75.2	70.0	57.9	27.5	60.5	0.98
Main job is as a paid employee (%)	24.2	18.3	18.9	21.7	32.7	23.0	0.78
Number of jobs, age 10+	0.79	0.86	0.83	0.83	0.72	0.80	1.05
Currently unemployed, age 10+ (%)	0.5	0.4	0.2	0.4	1.0	0.5	0.32

Source: 2007 CSES.

⁴⁶ The gross enrollment ratios are calculated separately for each quintile as the total number of pupils in each quintile currently attending a given level of schooling divided by the number of children in the quintile in the appropriate age group (e.g., ages 6-11 in the case of primary schooling). The net enrollment ratios are calculated similarly, except only pupils in the appropriate age group are included in the numerator.

Table 40. Selected individual-level education and employment indicators by per capita consumption quintile, 2004*

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Currently enrolled in school, age 5+ (%)	30.0	31.8	30.6	28.8	31.6	30.6	1.02
Grade in which currently enrolled	3.4	3.9	4.3	5.0	7.0	4.8	1.27
Highest grade completed, age 5+	2.2	2.9	3.3	4.0	5.7	3.7	1.50
Gross primary enrollment ratio (ages 6-11)	119.4	133.6	138.9	140.8	135.0	132.5	1.16
Net primary enrollment ratio (ages 6-11)	65.8	76.4	80.3	82.1	86.3	76.9	1.22
Gross lower secondary enrollment ratio (ages 12-14)	20.3	35.1	42.0	65.0	89.3	47.7	2.07
Net lower secondary enrollment ratio (ages 12-14)	3.6	10.8	12.7	21.8	36.3	15.8	3.57
Gross upper secondary enrollment ratio (age 15-17)	4.6	7.6	14.5	22.5	53.2	20.2	3.14
Net upper secondary enrollment ratio (ages 15-17)	1.4	2.7	5.2	6.9	24.7	8.1	3.76
Education expenditure per child enrolled in primary school (Riel per year)	14,459	20,640	28,702	50,370	117,777	40,589	1.99
Education expenditure per child enrolled in lower secondary school (Riel per year)	33,009	53,079	70,878	133,169	327,929	159,866	2.15
Education expenditure per child enrolled in upper secondary school (Riel per year)	85,946	122,522	170,734	220,019	516,769	352,758	1.99
Ever attended school, age 5+ (%)	41.1	52.5	57.3	63.8	75.0	57.9	1.39
Ever attended nonformal class (%)	0.6	0.6	0.8	1.9	4.3	1.7	1.39
Currently attending nonformal class (%)	0.2	0.1	0.3	0.9	2.3	0.8	1.72
Literate, age 5+ (%)	63.3	73.2	76.0	79.4	86.9	75.9	1.20
Speaks English or French, age 10+ (%)	0.5	0.8	1.7	3.4	12.6	4.0	3.34
Currently employed, age 10+ (%)	74.2	75.1	76.2	74.9	69.0	73.8	1.03
Number of hours worked during the past week	36.9	37.0	38.1	40.5	42.5	39.1	1.03
Main job is in agriculture (%)	72.3	72.7	67.9	57.2	33.6	60.5	0.94
Main job is as a paid employee (%)	19.3	16.0	16.2	19.3	27.0	19.5	0.84
Number of jobs, age 10+	0.86	0.88	0.90	0.88	0.79	0.86	1.05
Currently unemployed, age 10+ (%)	0.5	0.6	0.4	0.6	0.9	0.6	0.82

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 41 presents changes in selected individual-level education and employment indicators between 2004 and 2007 in the two poorest quintiles. These data indicate that most education indicators improved during this period in both quintiles (and to a greater extent in the poorest quintile than in the next poorest quintile).⁴⁷ Reported household out-of-pocket expenditure per child enrolled in school shows a slightly complex pattern: during this period, costs for enrolment in primary and upper secondary school increased more rapidly for the next poorest quintile than for the poorest (as might be expected), whereas at lower secondary level the increase in costs was faster amongst the poorest. The patterns of change in the employment indicators are similar to those observed for heads of household (compare to Table 31).

⁴⁷ The data on the number of grades completed is not directly comparable between the 2004 and 2007 CSES beyond grade 12. The 2007 CSES asked directly the number of years of schooling completed by each household member, whereas the 2004 CSES asked only the “level” of schooling completed beyond grade 12.

Table 41. Changes in selected individual-level education and employment indicators between 2004 and 2007 in the two poorest quintiles

Indicator	Poorest quintile			Next poorest		
	2004	2007	change (%)	2004	2007	change (%)
Currently enrolled in school, age 5+ (%)	30.0	31.2	4.0	31.8	30.8	-3.4
Grade in which currently enrolled	3.4	3.8	11.9	3.9	4.4	11.6
Highest grade completed, age 5+	2.2	3.0	35.2	2.9	3.6	21.9
Gross primary enrollment ratio (ages 6-11)	119.4	122.5	2.6	133.6	133.8	0.2
Net primary enrollment ratio (ages 6-11)	65.8	78.1	18.6	76.4	81.3	6.5
Gross lower secondary enrollment ratio (ages 12-14)	20.3	37.0	82.3	35.1	52.6	49.8
Net lower secondary enrollment ratio (ages 12-14)	3.6	12.8	259.4	10.8	20.1	85.3
Gross upper secondary enrollment ratio (ages 15-17)	4.6	7.7	67.0	7.6	17.3	128.5
Net upper secondary enrollment ratio (ages 15-17)	1.4	3.3	139.3	2.7	5.2	92.3
Education expenditure per child enrolled in primary school (Riel per year)	14,459	22,944	59	20,640	35,606	73
Education expenditure per child enrolled in lower secondary school (Riel per year)	33,009	62,836	90	53,079	85,372	61
Education expenditure per child enrolled in upper secondary school (Riel per year)	85,946	92,238	7	122,522	160,712	31
Ever attended school, age 5+ (%)	41.1	55.9	35.8	52.5	63.8	21.6
Ever attended nonformal class (%)	0.6	2.3	300.5	0.6	1.8	187.2
Currently attending nonformal class (%)	0.2	0.5	208.6	0.1	0.5	280.2
Literate, age 5+ (%)	63.3	73.6	16.2	73.2	77.4	5.8
Speaks English or French, age 10+ (%)	0.5	0.4	-20.5	0.8	1.2	41.4
Currently employed, age 10+ (%)	74.2	76.4	2.9	75.1	78.5	4.4
Number of hours worked during the past week	36.9	39.4	6.6	37.0	40.0	8.1
Main job is in agriculture (%)	72.3	71.4	-1.3	72.7	75.2	3.6
Main job is as a paid employee (%)	19.3	24.2	25.4	16.0	18.3	14.5
Number of jobs, age 10+	0.86	0.79	-7.9	0.88	0.86	-1.9
Currently unemployed, age 10+ (%)	0.5	0.5	14.3	0.6	0.4	-35.9

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 42 presents individual-level indicators referring to the health status of the general population in 2007 by per capita consumption quintile, while Table 43 presents the same indicators for 2004 (with the sample limited to villages included in the 2007 CSES sampling frame). These data indicate that there is no systematic relationship between self-reported health status or disability and per capita consumption. Moreover, higher percentages of the population in the richer quintiles report a recent illness or health problem in both 2004 and 2007 (in 2007, 18% in the richest quintile versus 11% in the poorest quintile).

However, the tendency of richer and/or better-educated persons to report more frequent illnesses and health problems has been encountered in many other household surveys (Strauss and Thomas 1998). It is sometimes explained by the possibility that the rich and better educated are more sensitive to poor health as a problem rather than treating it as a common feature of their daily life and, additionally, by the possibility that the more frequent contacts of the rich with health providers (which is also supported by the data in Table 42 and Table 43) may make them more aware of their health problems.

Table 42. Selected individual-level health indicators by per capita consumption quintile, 2007

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Good health relative to age (%)	16.1	16.4	14.7	16.9	16.5	16.1	0.91
Poor health relative to age (%)	8.5	8.3	9.7	9.8	9.4	9.1	1.14
One or more disabilities (%)	3.5	3.7	3.8	4.0	3.8	3.7	1.10
Number of disabilities	0.05	0.05	0.05	0.05	0.05	0.05	1.09
Illness or other health problems during past 4 weeks (%)	11.3	14.7	16.5	16.4	18.3	15.4	1.46
Obtained health care for reported health problem (%)	71.8	79.3	83.5	86.2	90.8	83.3	1.16
Hospitalized in connection with reported health problem (%)	3.5	2.1	3.5	4.2	5.1	3.8	1.00
Number of days hospitalized	4.65	5.62	5.29	3.67	8.09	5.76	1.14
Health expenditure in connection with reported health problem (Riel)	7,546	13,015	18,587	27,371	59,628	27,426	2.46
Annual health expenditure per capita (Riel)	11,362	25,225	40,135	58,524	143,450	55,582	3.53
Use mosquito net while sleeping (%)	94.8	96.5	98.0	98.0	95.4	96.6	1.03
Use mosquito net treated with insecticide during past 12 months	4.4	4.3	4.6	5.9	4.2	4.7	1.05
Daily smoker, age 15+ (%)	20.2	20.9	20.7	17.6	10.8	17.8	1.02
Thinks smoking is dangerous to one's health, age 15+ (%)	88.2	89.7	89.3	91.8	92.9	90.5	1.01
Ever tested for HIV, age 15+ (%)	4.1	4.5	6.4	8.7	14.3	8.0	1.55
Exposed to injury-causing violence during past 12 months (%)	1.4	0.7	0.8	0.7	0.1	0.8	0.59
Number of plates of rice eaten yesterday	2.58	2.78	2.80	2.79	2.77	2.75	1.08

Source: 2007 CSES.

The data in Table 42 indicate that the rich not only utilize healthcare more intensively than the poor, but they also spend more on each episode of illness (almost 8 times as much, according to the data in Table 42). On an annual basis, the population in the richest quintile spends about Riel 143 thousand per capita on health care (about US \$36 at the 2007 exchange rate), compared to only about Riel 11 thousand per capita (about \$3) by the population in the poorest quintile (the average annual out-of-pocket spending on healthcare by the total population is about Riel 56 thousand per capita, or about \$14). Unlike the data on healthcare expenditure collected in the 2004 CSES (Table 43), which are “conditional” on a reported illness or health problem during the past 4 weeks (i.e., no information on healthcare expenditure was collected for persons who did not report an illness or other health problem during the past 4 weeks), the data on health care expenditure collected in the 2007 CSES include expenditure on preventive health services and on medications and supplies purchased for chronic conditions that are adequately controlled. It is therefore all the more surprising that the data in Table 43 indicate an overall decrease in out-of-pocket expenditure on health care between 2004 and 2007 (although the decrease is confined to the richest quintile).

Table 42 also presents several indicators related to preventive health. These data indicate that most Cambodians (97%) report sleeping under a mosquito net and that differences among quintiles in the use of a bed net are also small. However, very few Cambodians (only 5%) report sleeping under an insecticide-treated bed net, without systematic differences among quintiles. This result is surprising, given the proven effectiveness of insecticide-treated bed nets as a malaria-control measure and the fact that malaria is prevalent in most Cambodian provinces. The data also indicate that the prevalence of daily smoking is almost 50% higher in the poorest quintile than in the richest quintile, despite the fact that the percentage of the population in the poorest quintile who think smoking is dangerous to one's health is only slightly lower than that in the richest quintile (88% versus 93%). The percentage of persons aged 15 and above who report ever having been tested for HIV is more than three times higher in the richest quintile than in the poorest quintile (14% versus 4%), while the population in the poorest quintile reports having been exposed to injury-causing violence during the past 12 months several times more often than the population in the richest quintile (1.4% versus 0.1%).

Table 43. Selected individual-level health indicators by per capita consumption quintile, 2004*

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Good health relative to age (%)	11.3	12.4	13.2	12.3	13.5	12.5	1.17
Poor health relative to age (%)	10.0	11.0	11.1	12.0	10.6	11.0	1.11
One or more disabilities (%)	3.9	4.4	4.5	4.5	4.3	4.3	1.14
Number of disabilities	0.05	0.05	0.05	0.05	0.05	0.05	1.14
Illness or other health problems during past 4 weeks (%)	15.3	17.4	18.6	20.3	20.2	18.4	1.22
Obtained health care for reported health problem (%)	61.7	60.6	63.9	68.5	76.1	66.6	1.03
Hospitalized in connection with reported health problem (%)	1.5	1.2	2.3	3.5	6.0	3.0	1.52
Number of days hospitalized	4.96	6.23	5.18	4.13	7.02	5.77	1.04
Health expenditure in connection with reported health problem (Riel)	4,949	7,944	13,187	20,180	70,398	24,904	2.66
Annual health expenditure per capita (Riel)	9,830	17,949	31,927	53,364	185,241	59,471	3.25
Use mosquito net while sleeping (%)	89.9	94.9	95.7	95.7	96.8	94.6	1.06
Use mosquito net treated with insecticide during past 12 months	3.0	2.4	2.9	3.6	3.5	3.1	0.99
Daily smoker, age 15+ (%)	24.9	23.7	23.3	21.3	14.2	21.2	0.94
Thinks smoking is dangerous to one's health, age 15+ (%)	82.7	85.2	86.4	87.9	92.1	87.1	1.04
Ever tested for HIV, age 15+ (%)	2.0	2.5	3.9	5.2	11.1	5.3	1.93
Exposed to injury-causing violence during past 12 months (%)	1.7	1.4	0.9	0.8	0.6	1.1	0.53
Number of plates of rice eaten yesterday	2.46	2.56	2.71	2.76	2.71	2.64	1.10

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 44 presents changes in selected individual-level health indicators between 2004 and 2007 in the poorest two quintiles. These data indicate that almost all of these health indicators improved in both the poorest and next poorest quintiles during this period. The exceptions are the two indicators of out-of-pocket expenditure on health care, which increased in both quintiles despite substantial reductions in the richest quintile during the same period (Table 42 and Table 43).

Table 44. Changes in selected individual-level health indicators between 2004 and 2007 in the poorest two quintiles

Indicator	Poorest quintile			Next poorest quintile		
	2004	2007	Change (%)	2004	2007	Change (%)
Good health relative to age (%)	11.3	16.1	42.3	12.4	16.4	32.2
Poor health relative to age (%)	10.0	8.5	-15.2	11.0	8.3	-24.3
One or more disabilities (%)	3.9	3.5	-11.7	4.4	3.7	-15.8
Number of disabilities	0.05	0.05	-4.0	0.05	0.05	-14.6
Illness or other health problems during past 4 weeks (%)	15.3	11.3	-25.8	17.4	14.7	-15.6
Obtained health care for reported health problem (%)	61.7	71.8	16.3	60.6	79.3	30.8
Hospitalized in connection with reported health problem (%)	1.5	3.5	133.1	1.2	2.1	69.1
Number of days hospitalized	4.96	4.65	-6.2	6.23	5.62	-9.8
Health expenditure in connection with reported health problem (Riel)	4,949	7,546	52.5	7,944	13,015	63.8
Annual health expenditure per capita (Riel)	9,830	11,362	15.6	17,949	25,225	40.5
Use mosquito net while sleeping (%)	89.9	94.8	5.5	94.9	96.5	1.7
Use mosquito net treated with insecticide during past 12 months	3.0	4.4	48.4	2.4	4.3	83.1
Daily smoker, age 15+ (%)	24.9	20.2	-18.6	23.7	20.9	-11.7
Thinks smoking is dangerous to one's health, age 15+ (%)	82.7	88.2	6.7	85.2	89.7	5.2
Ever tested for HIV, age 15+ (%)	2.0	4.1	104.1	2.5	4.5	80.8
Exposed to injury-causing violence during past 12 months (%)	1.7	1.4	-19.7	1.4	0.7	-50.4
Number of plates of rice eaten yesterday	2.46	2.58	5.0	2.56	2.78	8.7

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 45 presents selected maternal and child health indicators by per capita consumption quintile for 2007, while Table 46 presents the same indicators for 2004 (with the sample limited to villages included in the 2007 CSES sampling frame). Both the 2004 and 2007 CSES collected anthropometric data (i.e., data on height and weight) for children under 6. The data in Table 45 indicate that more than one-half (51%) of children under 5⁴⁸ were moderately stunted in 2007 (i.e., height-for-age z-scores less than two standard deviations below the 2006 WHO standards), while 28% of children under 5 were severely stunted

⁴⁸ Although both the 2004 and 2007 CSES collected anthropometric data for children under 6, the standard anthropometric indicators are defined for children under 5.

(more than three standard deviations below the WHO standards).⁴⁹ According to these data, the prevalence of moderate (severe) stunting in 2007 was 34% (30%) higher among children in the poorest quintile than among children in the richest quintile. According to the data in Table 45, the prevalence of moderately low weight for age is considerably lower than that of moderate stunting (27% versus 51% for stunting). Moreover, the differences among quintiles are relatively small in the case of both moderately and severely low weight-for-age, a marked departure from the situation in 2004 (Table 46). The dramatic changes in both the patterns and levels of the weight for age indicators, despite continued high rates of stunting, raises questions about the reliability of the anthropometric and/or the age data in the 2004 and 2007 CSES.⁵⁰

Table 45 also presents several indicators of preventive health among mothers and children. The differences in these indicators across quintiles are relatively small in most cases. In contrast, most of these same indicators exhibited systematic variation among quintiles favoring the rich in 2004 (Table 46). One exception is the percentage of children under two who have never been vaccinated, which was 12% in the poorest quintile in 2007 versus only 2% in the richest quintile (i.e., a sharper difference in 2007 than in 2004).

Table 45. Selected maternal and child health indicators by per capita consumption quintile, 2007

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Height for age, children <5 (% z-scores<-2)	55.2	51.1	53.8	48.2	41.3	50.7	0.9
Height for age, children <5 (% z-scores<-3)	31.4	28.3	31.1	24.4	24.1	28.3	0.9
Weight for age, children <5 (% z-scores<-2)	27.5	24.8	27.7	28.4	24.9	26.7	1.0
Weight for age, children <5 (% z-scores<-3)	10.8	12.3	8.7	12.9	6.7	10.6	1.0
Weight for height, children <5 (% z-scores<-2)	10.3	12.9	14.1	11.7	14.7	12.5	1.2
Weight for height, children <5 (% z-scores<-3)	5.9	4.2	4.9	4.5	8.3	5.4	0.9
Child under 5 given vitamin A (%)	90.2	94.0	95.0	91.3	93.5	92.7	1.0
Child aged 1-5 suffers from night blindness (%)	3.6	1.1	2.5	1.2	3.9	2.4	0.7
Child under 2 first given breast milk to drink (%)	80.5	79.5	76.5	76.5	76.0	78.2	1.0
Number of hours delay before initiating breastfeeding of child under 2	7.5	9.8	8.8	7.1	7.6	8.2	1.1
Child under 2 has vaccination card (%)	81.2	79.3	86.5	90.6	89.3	84.6	1.0
Child under 2 received 3 DPT doses (%)	72.5	65.7	71.7	74.1	64.2	69.8	1.0
Child under 2 never vaccinated (%)	11.9	11.8	3.6	2.6	1.7	7.1	0.6
Mother of child under 2 had night blindness during pregnancy (%)	2.3	3.7	1.6	1.7	0.0	2.1	0.9

Source: 2007 CSES.

⁴⁹ Z-scores were calculated using the WHO Anthro program (WHO 2006) and procedures described in O'Donnell et al. (2006) and excluding observations outside the ranges recommended by WHO.

⁵⁰ The 2005 Cambodia Demographic and Health Survey (NIPH, NIS, and ORC Macro 2006) obtained quite different estimates of child malnutrition (and especially of low height for age and low weight for age) that vary more sharply across wealth quintiles than the estimates in Table 45 vary across per capita consumption quintiles. The patterns observed in the 2005 CDHS are more similar to those in neighboring low-income countries (for example, Vietnam).

Table 46. Selected maternal and child health indicators by per capita consumption quintile, 2004*

Indicator	Per capita consumption quintile					Cambodia	Ratio, middle to poorest
	Poorest	Next poorest	Middle	Next richest	Richest		
Height for age, children <5 (% z-scores<-2)	62.0	57.7	59.6	56.3	53.2	58.2	0.96
Height for age, children <5 (% z-scores<-3)	41.5	36.4	39.0	36.9	35.0	38.1	0.94
Weight for age, children <5 (% z-scores<-2)	50.4	46.1	41.0	38.4	31.4	42.6	0.81
Weight for age, children <5 (% z-scores<-3)	23.2	19.4	18.6	17.9	12.8	18.9	0.80
Weight for height, children <5 (% z-scores<-2)	15.8	15.2	13.3	13.0	11.9	14.1	0.84
Weight for height, children <5 (% z-scores<-3)	5.9	7.2	4.1	6.0	5.4	5.7	0.69
Child under 5 given vitamin A (%)	77.8	81.7	82.8	84.8	87.0	82.3	1.06
Child aged 1-5 suffers from night blindness (%)	1.4	3.1	2.1	2.3	2.6	2.2	1.51
Child under 2 first given breast milk to drink (%)	28.7	30.0	32.0	32.8	36.5	31.5	1.12
Number of hours delay before initiating breastfeeding of child under 2	30.0	27.7	25.5	25.6	20.8	26.5	0.85
Child under 2 has vaccination card (%)	77.3	82.0	82.3	85.3	86.5	82.1	1.06
Child under 2 received 3 DPT doses (%)	56.8	61.4	61.4	61.5	67.8	61.2	1.08
Child under 2 never vaccinated (%)	16.1	12.7	13.0	8.1	9.5	12.3	0.81
Mother of child under 2 had night blindness during pregnancy (%)	4.0	4.5	3.2	3.6	2.8	3.7	0.79

Source: 2004 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

Table 47 presents changes in selected maternal and child health indicators between 2004 and 2007 in the two poorest quintiles. These data indicate that there were significant improvements in most of these indicators during this period in both quintiles (and particularly in the poorest quintile).⁵¹ The few exceptions observed may reflect relatively large sampling errors in the 2007 CSES due to the small number of children under age 5 (and especially under age 2) in the sample.⁵²

⁵¹ However, the relatively large percentage increase in the percentage of children aged 1-5 reported to be suffering from night blindness in the poorest quintile is not statistically significant at the 0.05 level and is practically offset by the decrease observed in the next poorest quintile, which is statistically significant at the 0.10 level.

⁵² There are only 667 children under two in the 2007 CSES sample and only 1,607 children under five.

Table 47. Changes in selected maternal and child health indicators between 2004 and 2007 in the two poorest quintiles

Indicator	Poorest quintile			Next poorest quintile		
	2004	2007	Change (%)	2004	2007	Change (%)
Height for age, children <5 (% z-scores<-2)	62.0	55.2	-10.9	57.7	51.1	-11.6
Height for age, children <5 (% z-scores<-3)	41.5	31.4	-24.3	36.4	28.3	-22.2
Weight for age, children <5 (% z-scores<-2)	50.4	27.5	-45.4	46.1	24.8	-46.2
Weight for age, children <5 (% z-scores<-3)	23.2	10.8	-53.2	19.4	12.3	-36.6
Weight for height, children <5 (% z-scores<-2)	15.8	10.3	-35.2	15.2	12.9	-14.8
Weight for height, children <5 (% z-scores<-3)	5.9	5.9	1.3	7.2	4.2	-41.5
Child under 5 given vitamin A (%)	77.8	90.2	15.9	81.7	94.0	15.1
Child aged 1-5 suffers from night blindness (%)	1.4	3.6	162.3	3.1	1.1	-63.4
Child under 2 first given breast milk to drink (%)	28.7	80.5	180.9	30.0	79.5	164.5
No. of hours delay before initiating breastfeeding of child under 2	30.0	7.5	-74.9	27.7	9.8	-64.8
Child under 2 has vaccination card (%)	77.3	81.2	5.0	82.0	79.3	-3.4
Child under 2 received 3 DPT doses (%)	56.8	72.5	27.6	61.4	65.7	7.0
Child under 2 never vaccinated (%)	16.1	11.9	-25.9	12.7	11.8	-7.7
Mother of child under 2 had night blindness during pregnancy (%)	4.0	2.3	-42.1	4.5	3.7	-17.7

Source: 2004 and 2007 CSES.

* sample limited to villages in the 2007 CSES sampling frame.

6. Conclusions and recommendations for further poverty monitoring

This report provides updated poverty estimates for Cambodia using newly available data from the 2007 Cambodia Socio-Economic Survey (CSES). A key objective of this report has been to prepare updated poverty estimates that are as comparable as possible with the estimates prepared previously for 2004. The resulting estimates indicate that poverty has continued to decrease in Cambodia in all three regions (i.e., Phnom Penh, Other urban, Rural) during the period 2004-2007.⁵³ The poverty headcount index for Cambodia as a whole relative to the overall poverty line has decreased from 34.8% in 2004 (in villages included in the 2007 CSES sampling frame) to 30.1% in 2007. The estimated decrease in the poverty headcount index relative to the food poverty line is considerably smaller (i.e., from 19.7% to 18.0%), reflecting the more rapid inflation in food prices than in nonfood prices during this period. This decrease in poverty reflects statistically significant increases in real per capita consumption in two of three regions (Other Urban is the exception), in Cambodia as a whole and in all income quintiles that were sufficient in magnitude to counteract the effects of a substantial increase in income inequality during the same period (i.e., the overall Gini coefficient is estimated to have increased from 0.39 to 0.43 in a comparable sample of villages).

The relatively rapid inflation in food prices during this period (i.e., 37% in Phnom Penh, when weighted by the reference food bundle used to develop the food poverty line) has also resulted in an *increase* during this period in the share of total household consumption allocated to food (when measured in current prices), reversing previous trends. However, when measured in constant prices, the food share has continued to decrease during the period 2004-2007.

Several of the estimated changes between 2004 and 2007 are not statistically significant (for example, the estimated increases in the Gini coefficient and the estimated changes in the food shares), reflecting the relatively small sample size of the 2007 CSES (3,593 households in the calendar year 2007 sample, compared to almost 12,000 households in the calendar year 2004 sample of the 2004 CSES). However, the estimated decreases in the poverty headcount index relative both to the food poverty line and to the poverty line are statistically significant at the 0.05 level for Cambodia as a whole and for Rural areas (although relative to the food poverty line, the Rural estimate is significant at only the 0.10 level).

The conclusion that poverty has continued to decrease during this period is further supported by the statistically significant increases in real per capita consumption in the poorest two quintiles as well by observed changes in housing characteristics, ownership of consumer durables and in a wide range of socio-economic variables (most notably those related to education, health and nutrition).

⁵³ Unfortunately, the relatively small sample size of the 2007 CSES (only 3,593 households in the calendar 2007 sample, compared to almost 12,000 households in the calendar year 2004 sample of the 2004 CSES) means that estimates could not be prepared for other standard geographical units, such as “zones” or provinces.

As in previous poverty profiles, this report concludes with some recommendations for future poverty monitoring in Cambodia. The most important recommendation, which was made previously (Knowles 2005), is that it is now time to develop a new set of poverty lines and to revise the currently used methodology for monitoring poverty in Cambodia. This recommendation is independent of whether it is ultimately decided to use recall or diary data to estimate household consumption. Considerably better data are currently available in Cambodia for poverty monitoring than existed at the time the currently used poverty lines and poverty measurement methods were developed (Prescott and Pradhan 1997 and Knowles 1998). More importantly, Cambodia is developing rapidly, and both the 1993/94 poverty lines and the survey instruments that are oriented to providing the information required for updating them are now considerably outdated.

No specific recommendations are made about how new poverty lines should be defined or which methodology should be used to monitor poverty in the future. However, the following general principles are recommended: (1) the new methodology should be simple, (2) it should be broadly consistent if possible with the previous methodology and with poverty monitoring methods used in neighboring countries, such as Vietnam and Lao PDR, and (3) the choices and decisions ultimately made should be evidenced-based.

This report does not make any recommendations concerning the relative desirability of using recall versus diary data to measure household consumption. The ultimate decision should be based on a careful empirical analysis of their relative strengths and weaknesses, including cost. At this point, it would appear that the recall data and diary data are measuring somewhat different quantities (although there is a need to determine whether the sharp differences observed in the 2004 CSES between the two methods for specific items, as reported in Johansson (2005), continue to be observed in the 2007 CSES).

However, the *differences* by commodity group between the two types of data *at a given point in time* are less important for poverty monitoring than whether the two distinct data sources provide a similar picture on the evolution of poverty *over time*. It is entirely possible that both types of data yield consistent estimates of poverty *change* over time even if they yield somewhat different estimates at any given point in time. When comparing estimates based on recall data with those based on diary data, it is critically important to use the same poverty lines and methodologies (to the extent possible) to avoid comparing apples and oranges. For the time being (and continuing at least through the 2009 CSES), the author agrees with the recommendation made by Johansson (2005 and 2008) that both recall and diary data should continue be collected. Not only is the marginal cost of doing so relatively small (assuming that diary data will be collected in any case), but the potential information gains are substantial in terms of learning more about the relative poverty monitoring strengths and weaknesses of these two types of data.

One set of specific recommendations concerns the price data that are used to update the poverty lines for inflation. The continued downward trend over time in the reporting of nonfood prices (which is documented in Annex 2 of this report) underlines the need to improve the system currently used to collect village price data. The recent improvements in the urban CPIs are a welcome development for poverty monitoring. However, the CPIs

cover only large urban markets, while most of Cambodia's poor reside in the rural areas.⁵⁴ Under these circumstances, the information obtained in the household surveys about rural prices will continue to be an important input to poverty monitoring. In the case of food prices, there are two distinct sources of price data, i.e., the unit values obtained from the diary and the directly observed prices in up to three markets that are recorded in the CSES Village Questionnaire. There are conceptual differences and relative strengths and weaknesses between these two types of "price" data, and these differences may be affected by the presence of inflation. It is critically important, therefore, to assess how each source of price data "tracks" the urban CPI price data as well as how they "track" each other. Unfortunately, due to large quality differences in many nonfood items that are not recorded in the diary, it is not practical to calculate unit values for nonfood items from the diary data and use them to develop nonfood price indexes. Accordingly, in rural areas and in small towns, the CSES village data are the only source of information about spatial differences in nonfood prices between urban and rural areas.

Improvement in the currently used procedures to collect village price data is urgently needed. Firstly, it is important to ensure that the list of nonfood items for which village prices are obtained is current, i.e., reflects the items available in local markets (including in particular markets in rural villages and small towns that are not covered by the CPI). Secondly, consideration should be given to collecting price data in neighboring villages in cases where there is no (or only a small) market in a sample village. Thirdly, more training and closer monitoring and supervision need to be provided in connection with the collection of the village-level data (including but not limited to prices).⁵⁵

An important unresolved issue with regard to prices is how best to estimate both spatial differences and changes over time in the rental value of housing, which accounts for a significant share of nonfood consumption in all three regions. In the interest of maintaining comparability with the 2004 estimates, this report has continued to use hedonic regression models to estimate these differences. However, the regression models used, which do not provide for possible interaction between time and location and housing characteristics, have been criticized by the Statistics Sweden team in several papers that have proposed various alternative methods for holding the quality of housing constant (Dalén 2005, Johansson and Bäcklund 2005). The author is also uncomfortable with the methods currently used (as well as with the alternatives proposed by Statistics Sweden). The possibility of obtaining estimates using matching techniques was mentioned in Knowles (2005). Evaluation of these and other possible alternatives is needed so that this issue can be decided as an important component of a new poverty monitoring methodology.

This report also recommends some changes in the way household consumption is defined and/or measured in any revised poverty monitoring methodology, regardless of whether diary or recall data are used. Firstly, inclusion of expenditure on housing maintenance and repair in household consumption (including when estimated rental values are used) was introduced in the baseline poverty estimates (Prescott and Pradhan 1997) and has been

⁵⁴ The urban CPI for Phnom Penh and several major towns are now used to develop a CPI for "Cambodia," as well as for Phnom Penh and for the "Provinces," but it is still unclear how well the urban CPI tracks rural price changes.

⁵⁵ As mentioned in section one, for example, 39 of 369 sample villages (including 30 villages in Phnom Penh) did not respond at all to section 2 of the Village Questionnaire (Economy and Infrastructure).

continued (including in this report, in the interest of maintaining comparability with the 2004 estimates). However, it may be reasonable to assume that estimated household rental values (i.e., the values estimated and reported by respondents) include the cost of maintenance and minor repairs, so that this second item should not be included separately in household consumption when estimated rental values are used. However, any expenditure on maintenance and minor repairs reported by households actually paying rent (but not including households paying zero rent for which a rent is imputed) should be included in consumption.

Secondly, it is recommended that the estimated rental value question that has been added to the housing section (section 04) be retained and used to impute a rental value for housing not owned but for which zero rent is paid.⁵⁶ Consistent with the previously used methodology, predicted values from an estimated regression are used in this study to impute a rental value only for dwellings for which no estimated rental value is reported. Alternatively, a predicted value from an estimated regression could be used to impute a rental value for all dwellings. Such a procedure has the likely advantage of eliminating a lot of random noise in the estimated (self-reported) rental values. However, using a predicted value based on a regression of the log estimated (self-reported) rental value on housing characteristics confronts the nontrivial problem of retransforming the predicted log rental values into consistent estimates in the original metric (Mullahy 1998, Manning and Mullahy 2001). This has been done very simply (and incorrectly) in this and in the previous Cambodia poverty profiles, i.e., by using the exponential of the predicted log value as the imputed value. Preferred and simple alternatives are available if there is no heteroskedasticity in the log distribution (for example, the “smearing” technique). However, the retransformation problem becomes nontrivial if there is heteroskedasticity, which is likely in this case. Under these circumstances, it may be desirable to use an imputed rental value obtained from regression analysis for as few households as possible.

Thirdly, it is recommended that recall data on education and medical care expenditure continue to be collected in the special education and health modules. In the case of medical care, the 2007 CSES questionnaire is an improvement over the 2004 CSES because the expenditure data are not limited to persons reported to have been ill or injured during the past 4 weeks (i.e., the expenditure data are no longer “conditional” on a reported illness). However, the questions on education expenditure also need some fine tuning. Firstly, it is incorrect to collect education data only for persons aged 5 and above, as this neglects expenditure on preschool education, which is likely to become an increasingly important item in household education expenditure, particularly in urban Cambodia. Secondly, the expenditure data are currently collected only for persons who are *currently* enrolled in school (question 7), *currently* taking private lessons after school (question 10) or *currently* attending non-formal classes (question 13)—and they are collected for the “past school year.” Data on education expenditure should instead be collected for *all* household members, regardless of their age or current school attendance, and they should be collected for the “last 12 months” (not for the less precise “past school year”). The proposed change in the reference period will sacrifice a measure of comparability with the 2004 and 2007 CSES, but it is a small enough price to pay to correct these problems.

⁵⁶ Although data on estimated rental values are also collected in the Construction module of the Household Questionnaire (section 08), the information there is limited to housing owned by the household.

Lastly, it is recommended that the Government give careful consideration to whether or not it wants to continue preparing poverty estimates on the basis of relatively frequent surveys with relatively small samples. On the one hand, it is desirable to monitor poverty at more frequent intervals than, say, every five years because this reduces the possibility that poverty estimates will be available only in atypical years. On the other hand, since the expected change in poverty indicators is relatively small in a period as short as three years and since the confidence intervals are relatively wide with smaller samples, there is a risk that the results could be misleading and controversial. In particular, it is sometimes difficult for politicians, journalists and the public at large, who are used to dealing only with point estimates, to understand the significance of sampling errors and confidence intervals. Assuming that annual surveys are needed for national accounts purposes, one possibility would be to conduct a larger survey every three years to obtain reliable national and regional poverty estimates (i.e., larger than the annual surveys but not large enough to provide reliable zonal/provincial estimates) and to conduct a survey large enough to obtain reliable zonal/provincial estimates every six years (instead of every five years)

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Annex 1. Updating the food poverty line for inflation

The original 1993/94 food poverty lines (Prescott and Pradhan 1997) have been updated for inflation several times, most recently in connection with the preparation of the 2004 poverty estimates (Knowles 2005). The same procedures are used to update the food poverty lines from calendar year 2004 to calendar year 2007. In the first step, CSES data on village food prices are used to estimate the cost of the reference food bundle in each region using quantity weights obtained from the 1993/94 reference food bundle. In the second step, Phnom Penh consumer price index (CPI) food prices are used to estimate the percentage increase in the cost of the reference food bundle in Phnom Penh, again using the quantity weights from the reference food bundle (not the standard CPI weights). In the third step, the estimates obtained in the first step for all three regions are multiplied by the estimated increase in Phnom Penh food prices obtained in the second step. This procedure is equivalent to using Phnom Penh CPI prices to estimate a temporal price index for Phnom Penh (2004=100) and using a spatial food price index based on the village food prices (i.e., a price index for each region with current year Phnom Penh prices=100) to obtain the temporal price indices for the remaining two regions.

This admittedly cumbersome procedure was developed in 1998 to update the food poverty line because the food items for which village food prices were collected in the 1997 CSES did not match well with the food items in the reference food bundle (Knowles 1998). Although this problem was corrected in the 1999 CSES, the same three-step procedure has been applied in all previous poverty estimates (including this report) in the interest of comparability (and partly also because of a belief that the Phnom Penh CPI provides a more accurate measure of inflation in food prices than the CSES village price data).

The first step in updating the food poverty line is to use the village food price data collected in the 2007 CSES Village Questionnaire to estimate the cost of the reference food bundle in each region in 2007 (the corresponding estimates for 2004 are reported in Knowles 2005). The 2007 CSES collected village price data for the same 53 “food” prices for which village price data were collected in the 2004 CSES. In fact, only 51 of the 53 prices are for food items (two of the items are tobacco products). Of the 51 food items, only 46 can be used to construct a spatial food price index (these 46 food items are listed in Table 51).⁵⁷ Up to three prices for each item were collected in each village, although typically fewer than three prices were obtained and no food prices were collected in many villages.

Table 48 presents some indicators on the extent of village food price reporting (all 51 food items) in both the 2004 CSES and the 2007 CSES (the data in Table 48 refer to 15 survey months in both cases). These data show that the mean and median number of prices collected per village is well short of the theoretical maximum of 153 prices per village (i.e., $3 \times 51 = 153$). In fact, a significant percentage of villages did not report any food prices, with the highest proportion of villages not reporting any food prices in Phnom Penh (15% in the

⁵⁷ Three of the four salt prices collected are superfluous (only that for granulated, non-iodized salt is used in constructing the spatial food price index). In addition, the village prices for “ordinary paddy” and “soy bean” are not used because neither item is in the 1993/94 reference food bundle.

2004 CSES and 13% in the 2007 CSES). The mean number of food prices reported per village is highest in Other Urban villages (a mean of 68 prices per village in both the 2004 and 2007 CSES), followed by Rural villages (49 prices in both the 2004 and 2007 CSES) with Phnom Penh villages reporting the fewest food prices (43 prices in the 2004 CSES and 45 in the 2007 CSES). According to the data in Table 48, the pattern of village food price reporting in the 2007 CSES is broadly similar to the pattern in the 2004 CSES. The main difference is a sharp reduction in the percentage of Other Urban villages that did not report any food prices between the 2004 and 2007 CSES (from 9% in 2004 to only 1% in 2007).

Table 48. Reporting of village food prices in the 2004 CSES and 2007 CSES (15-month data)

Indicator	Phnom Penh		Other Urban		Rural	
	2003-2004	2006-2007	2003-2004	2006-2007	2003-2004	2006-2007
Potential maximum number of prices reported per village	153	153	153	153	153	153
Mean number of food prices reported per village	43.4	44.5	68.0	68.1	49.3	49.3
Median number of prices reported per village	30.5	36	48.5	63	40	42
10 th percentile	0	0	3	14	5	10
90 th percentile	106	111	150	132	126	102
% of villages not reporting any prices	14.7	13.0	9.4	1.2	7.7	7.0
Item reported by the smallest number of villages in each region	Ordinary paddy	Whiskey	Whiskey	Whiskey	Whiskey	Beer
Number of villages reporting that item	16	8	52	3	44	15
Item reported by the largest number of villages in each region	Soy sauce, MSG	Duck egg	Duck egg	Duck egg	MSG	Duck egg
Number of villages reporting that item	93	76	176	82	466	237
Number of villages surveyed ^a	116	92	212	85	572	273

Source: 2003/04 and 2007 CSES.

^a 90 villages were surveyed twice in the 2007 CSES, i.e., in Oct-Dec 2006 and Oct-Dec 2007.

Table 49 presents data on the number of food prices reported by villages in the 2007 CSES by item (i.e., the 46 items used to construct the spatial food price index, as discussed above) and by region. The data indicate that more than 10 prices were reported for most food items in every region in the calendar year 2007 sample. The exceptions are rice cakes (only 9 prices reported in Phnom Penh), fresh duck (only 8 prices reported in Phnom Penh), and whiskey (10 or fewer prices reported in every region).

Table 49. Number of village food prices reported by item and by region, 2007

Item	Phnom Penh	Other urban	Rural	All regions
Rice	33	38	46	117
Broken rice	27	44	96	167
Corn on the cob	14	23	46	83
Rice cakes	9	24	35	68
Fermented rice noodles	11	40	77	128
White rice noodles	12	30	46	88
Num Pang	20	36	45	101
Pork without fat	30	47	139	216
Pork with fat	30	46	151	227
Fresh Beef	28	39	75	142
Fresh Chicken	17	37	69	123
Fresh Duck	8	33	47	88
Freshwater Mud fish large	20	38	104	162
Cat Fish (Andeng)	18	46	116	180
Cheese fish Prahok	21	50	161	232
Dried fish	11	38	54	103
Chicken egg	53	38	68	159
Duck egg	62	61	193	316
Peanuts	34	56	170	260
Mung bean	20	35	117	172
Mung bean sprouts	26	41	94	161
Trakun	32	53	160	245
Cabbage	33	49	148	230
Cucumber	33	57	176	266
Ridge gourd	24	46	108	178
Green gourd	30	54	160	244
Eggplant	15	45	105	165
Tomatoes	26	51	142	219
Potatoes	20	33	41	94
Sweet potatoes	12	35	80	127
Onions	33	48	132	213
Garlic	47	61	188	296
Banana	29	47	147	223
Papaya	21	37	91	149
Lime	32	57	172	261
Vegetable oil	47	41	106	194
Salt	38	36	120	194
Fish sauce	52	50	161	263
Soy sauce	61	47	134	242
Palm vinegar	11	15	43	69
Glutamate/MSG	56	57	169	282
Sugar (brown palm)	42	52	176	270
Sweetened condensed milk	26	27	80	133
Alcohol (whiskey)	7	2	10	19
Rice wine	56	58	190	304
Beer	14	11	11	36
Totals	1,301	1,909	4,999	8,209

Source: 2007 CSES.

Incomplete reporting of village food prices may be due to several factors. Table 50 presents the results of regression analysis of village food price reporting. Column 1 presents the results of a probit analysis of *whether* the price of an individual food item was reported in a given village. The sample includes one observation for each of the 46 food items in the reference food bundle in each village.⁵⁸ The explanatory variables include dummy variables indicating whether the village is an Other Urban or Rural village (location in Phnom Penh is the omitted category), a dummy variable indicating whether there is a permanent market in the village, the village population size (as reported in the CSES Village Questionnaire), the weight of the individual food item in the 1993/94 reference food bundle and a set of dummy variables indicating the month in which the village was surveyed (October 2006 is the omitted category). The estimates reported in column 1 are the estimated marginal effects (evaluated at the sample means) in the case of continuous variables and the estimated effect of a change from zero to one in the case of dummy variables.

The results indicate that the price of a food item is significantly more likely to be reported in Other Urban areas (as compared to Phnom Penh), in villages with a permanent market, in villages with a larger population and if the item has a larger weight in the reference food bundle. The dummy variables referring to the month in which the village was surveyed are jointly insignificant at the 0.05 level, implying that there is no seasonal factor in the reporting of individual food prices.

Columns 2-4 of Table 50 report the results of ordinary least-squares estimation of regression models explaining the *number* of food prices reported per village. The results reported in columns 2 and 3 were obtained using data from the 2007 CSES, whereas the results in column 4 were obtained using data from the 2004 CSES (reported earlier in Knowles 2005). One would expect the results in columns 2 and 3 to be similar to those in column 1 (and particularly those in column 2, where the model also includes dummy variables for survey months). Indeed, the results in columns 1-3 are similar in terms of signs and significance levels, except that the dummy variables referring to the month in which the village was surveyed are jointly significant at the 0.01 level in column 2, whereas they are not significant in column 1. It is not clear what accounts for this difference. The left-side (“dependent”) variable in the regressions reported in columns 2-4 is a count variable, with a distribution that is skewed to the right and truncated at zero (Figure 19). However, re-estimation of the model as a Poisson or negative binomial regression model does not qualitatively change the results (unreported regressions obtainable on request from the author).

⁵⁸ The maximum possible sample size is 20,700, i.e., the 46 food items listed in Table 49 multiplied by 450, the number of sample villages in the full 15-month sample. However, the actual sample size available for the regression analysis is reduced to 20,194 due to unreported values of village characteristics in several villages.

Table 50. Regression analysis of the factors related to village food price reporting (15-month samples)

	Whether a given price is reported in a given village, 2006/07	Number of food prices reported per village		
		Model with month of interview 2006/07	Model without month of interview 2006/07	Model without month of interview 2003/04
	(1)	(2)	(3)	(4)
Other urban village	0.235 (4.54)**	31.668 (4.17)**	30.434 (4.07)**	21.664 (4.46)**
Rural village	0.128 (3.53)**	10.254 (2.23)*	10.570 (2.56)*	11.675 (2.72)**
Permanent market in village	0.194 (5.88)**	29.019 (5.05)**	25.610 (4.42)**	31.340 (6.91)**
Village population size	0.000 (3.17)**	0.003 (6.23)**	0.003 (7.87)**	0.004 (5.80)**
Weight in reference food bundle	0.001 (4.75)**			
Month of interview (dummy variables)	Not reported	Not reported*		
Constant		25.350 (2.82)**	32.108 (8.93)**	28.562 (6.86)**
Number of observations	20,194	438	438	886
R-squared	0.05 ^a	0.31	0.24	0.16

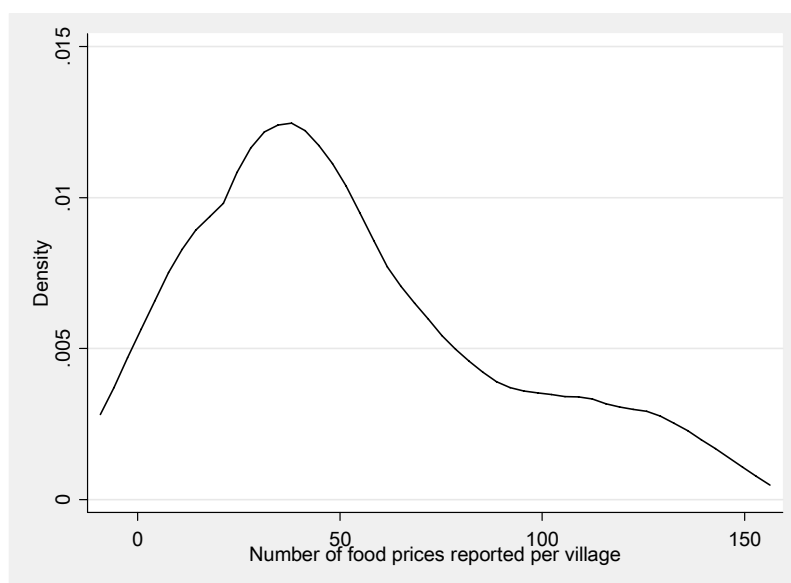
Source: columns 1-3 (2007 CSES); column 4 (Knowles 2005).

Robust z statistics in parentheses (standard errors adjusted for clustered sampling in column 1)

* significant at 5%; ** significant at 1%

^a pseudo R-squared reported by Stata version 9.2.

Figure 19. Kernel density of the number of food prices reported per village, 2006/07



Source: 2007 CSES.

The regression results reported in Table 50 indicate that there is clearly geographical selectivity in the reporting of village price data. The implications of this selectivity are complex.⁵⁹ However, its effects can be minimized (as in 2004) by using the *mean* of the up-to-three reported prices as the reported price for each village (rather than using each of the reported prices as a separate observation). In order to minimize the influence of village outliers, median (rather than mean) prices are calculated for each item in each region from the village mean prices, using the household sampling weights.

Table 51 presents the information needed to complete step one of the process of updating the food poverty lines. Column 1 presents the reference food bundle quantity weights for the 46 food items. These weights have been scaled to reflect the fact that the 1993/94 reference food bundle provided 2,298 calories instead of the desired 2,100 and converted to reflect the fact that the units used when collecting data on village food prices are different in many cases (usually by a factor of 10) from those used in the reference food bundle. Columns 2-7 list the median village prices for each of the 46 food items by region and for both calendar years 2004 and 2007.⁶⁰ By cross-multiplying each column of median prices by the weights in column 1 and summing down the rows one obtains an estimate of the cost of this “basket” of 46 items in calendar years 2004 and 2007 in each region.⁶¹ These estimates are reported in row at the bottom of Table 51. According to estimates reported previously in Knowles (2005), which are reproduced in row b at the bottom of Table 51, the 46 food items listed in Table 51 account for 67.3%, 68.0% and 70.1% respectively of the total cost of the reference food bundle in Phnom Penh, Other Urban and Rural areas. Dividing through row a by row b yields estimates of the cost of the full 1993/94 reference food bundle in 2004 and 2007 prices, which are reported in row c of Table 51. Temporal and spatial price indices are calculated from the estimates reported in row c and are reported in rows d and e.

⁵⁹ For example, does the unavailability of a local price for an item indicate that people must travel to another village to purchase the item (in which case, the local price for the item should at least in theory include the additional costs of transportation and time involved), or are the items produced mainly for home consumption or for local trade only on a barter basis?

⁶⁰ For more information, see Table 58 and surrounding text in Knowles (2005).

⁶¹ The 46 items account for 87.3% of the *calories* in the 1993/94 reference food bundle. For more information, see Table 57 and related text in Knowles (2005).

Table 51. Estimated cost by region of the 1993/94 reference food bundle in calendar year 2004 and 2007 prices (based on CSES village prices)

CSES item	Converted & scaled quantity weight (*1000)	Phnom Penh		Other urban		Rural	
		2004	2007	2004	2007	2004	2007
Rice	107.723	1,150	1,400	1,050	1,600	1,000	1,400
Broken rice	286.379	1,000	1,300	900	1,300	800	1,200
Corn on the cob	3.036	2,000	3,000	1,733	2,000	1,000	1,500
Rice cakes	6.617	1,000	1,500	800	1,000	500	1,000
Fermented rice noodles	8.464	800	1,200	800	1,067	700	1,000
White rice noodles	0.478	1,700	1,800	1,500	2,000	1,500	2,000
Num Pang	6.470	400	500	300	500	300	500
Pork without fat	3.751	10,000	15,000	10,000	12,500	9,000	12,000
Pork with fat	12.980	8,500	12,000	7,000	9,000	7,000	9,000
Fresh Beef	3.306	14,000	18,000	11,667	15,000	11,000	15,000
Fresh Chicken	7.087	9,000	15,000	7,667	12,667	6,750	10,000
Fresh Duck	0.890	7,000	8,000	5,500	8,333	5,000	8,000
Freshwater Mud fish large	3.010	6,800	12,000	6,167	8,333	6,000	7,333
Cat Fish (Andeng)	10.505	6,000	8,000	5,833	7,000	5,000	6,000
Cheese fish Prahok	12.934	2,500	4,000	3,000	3,900	3,000	3,000
Dried fish	3.913	17,000	20,000	13,000	21,667	12,000	17,333
Chicken egg	7.282	300	400	300	400	300	400
Duck egg	89.424	400	500	400	450	350	400
Peanuts	0.834	3,500	5,000	3,000	5,000	3,000	4,917
Mung bean	1.346	2,600	4,000	2,400	3,133	2,400	3,500
Mung bean sprouts	2.649	1,000	1,200	1,000	1,500	1,000	1,300
Trakun	36.318	300	500	100	200	100	100
Cabbage	16.582	1,300	2,200	1,267	2,067	1,200	1,867
Cucumber	16.406	1,000	1,400	800	1,200	800	1,067
Ridge gourd	7.570	800	1,200	600	1,233	500	950
Green gourd	12.162	600	1,000	700	1,000	500	800
Eggplant	6.709	1,000	1,450	800	1,500	700	1,000
Tomatoes	6.015	1,500	2,000	1,500	2,167	1,000	2,000
Potatoes	0.263	2,533	3,000	2,700	3,000	2,000	2,500
Sweet potatoes	8.555	1,000	1,200	533	1,000	500	700
Onions	0.157	2,000	2,500	2,000	2,500	1,800	2,067
Garlic	4.253	2,367	3,200	2,433	4,000	2,400	4,000
Banana	40.740	900	1,500	700	1,450	600	1,067
Papaya	9.525	1,000	1,500	800	1,167	500	700
Lime	38.754	100	100	100	133	100	100
Vegetable oil	0.368	3,300	4,500	3,200	4,767	3,350	4,667
Salt	15.151	300	500	350	467	300	400
Fish sauce	14.910	1,500	1,500	1,400	1,533	1,000	1,500
Soy sauce	3.967	1,300	1,433	1,300	1,500	1,200	1,367
Palm vinegar	0.434	1,000	900	800	1,000	600	700
Glutamate/MSG	7.635	2,800	3,750	2,700	3,767	2,650	3,700
Sugar (brown palm)	18.286	1,417	2,100	1,400	2,100	1,400	2,000
Sweetened condensed milk	1.037	1,767	2,200	1,800	2,200	1,800	2,200
Alcohol (whiskey)	9.470	3,500	3,500	2,500	3,500	2,500	3,500
Rice wine	5.008	1,400	1,500	1,133	1,400	1,000	1,200
Beer	0.118	5,000	4,800	4,000	7,000	2,500	1,500
a. Cost of the reference "basket" of 46 items in current Riel		1,197.8	1,625.0	1,064.8	1,526.8	971.2	1,358.4
b. Total cost/calories represented by the "basket" of 46 items as a percentage of the total cost/calories in the 1993/94 reference food bundle		67.34%	67.34%	68.04%	68.04%	70.06%	70.06%
c. Estimated cost of the full reference food bundle in current Riel		1,779	2,413	1,565	2,244	1,386	1,939
d. Temporal price index (2004 region prices=100)			135.7		143.4		139.9
e. Spatial price index (2007 Phnom Penh prices=100)			100.0		93.0		80.4

The second step in the process of updating the food poverty lines for inflation involves using the Phnom Penh CPI to estimate by how much the cost of the 1993/94 reference food bundle increased between calendar years 2004 and 2007. This involves using the 74 reference food bundle items that are also in the Phnom Penh CPI⁶² to calculate a special “CPI” based only on these 74 food items using the quantity weights from the reference food bundle instead of the normal CPI weights.⁶³ Again, the reference food bundle quantity weights are scaled (as described above) and converted to reflect the different units used in the CPI. Table 52 lists the converted and scaled quantity weights together with calendar year average prices from the CPI data base.⁶⁴ The cost of the CPI bundle of 74 food items in 2004 and 2007 is reported in row a at the bottom of Table 52. Row b presents the implied temporal price index (2004 Phnom Penh prices=100), and row c reports the ratio of the CPI-based temporal price index for 2007 from row b to the corresponding temporal price index based on Phnom Penh village prices (row d, column 3 in Table 51). The difference between the two price indices, which are based on independent sets of Phnom Penh food price data, is relatively small.

⁶² According to estimates reported in Knowles (2005), these 74 items accounted for 82.6% of the calories in the (scaled) reference food bundle in 1993/94.

⁶³ The regular CPI weights are based on the consumption shares of the total Phnom Penh population in 2004.

⁶⁴ Because of the rapid inflation during the second half of 2007, the geometric mean of the monthly CPI prices is used as the average price in 2007.

Table 52. Estimated cost in Phnom Penh of 74 items from the 1993/94 reference food bundle in calendar year 2004 and 2007 prices (based on the CPI)

Reference food bundle/CPI item	Converted & scaled quantity weight (*1000)	Average CPI price	
		calendar year 2004	calendar year 2007
Rice, quality no.1 White, Phaka kanhey, Battambang	107.723	1,205	1,638
Rice, quality no.2 White, Neang-Menh, Battambang	286.379	968	1,374
Bread (pnum pan) 30cm, Khmer	6.47	300	359
Fermented rice noodles, Coil, Khmer	8.464	874	1,234
White rice, Fiber type, Khmer	0.478	1,684	2,190
Yellow noodles, 60grams-pack, Mama,Thai	19.253	502	504
Biscuits, Assorted, 800g, container, Thai	0.036	11,851	10,799
Rice cakes, medium, Khmer	6.617	1,906	2,855
Pork, without fat, Pure meat	3.751	10,045	12,768
Pork, with fat, Khmer	12.98	7,073	9,918
Fresh Beef, No.1	3.306	13,517	17,676
Fresh Chicken, No. 1, plucked	7.087	8,749	13,363
Roasted pork, Sasiv	0.021	13,162	19,564
Mud fish, (large) 1 fish =1kg	3.01	8,316	12,041
Mud fish, (small) 3 pieces of fish =1kg	34.349	6,944	9,307
Cat fish, Andeng fish	10.505	6,767	9,528
Sea fish, small, Plathou fish, Kampot	2.204	4,800	6,435
Shrimps, Medium size, Kampot	0.1	13,442	19,856
Crabs, Kdam Ses, sea crab, Kampot	5.828	12,703	17,406
Smoked fish, Riel fish, small	49.316	640	1,165
Cheese fish	12.934	2,943	3,488
Dried fish, Chhdor fish, big	3.913	13,886	22,161
Canned fish, (sardines) Three ladies, 250g, can, Thai	1.623	1,012	1,352
Dried shrimps, Medium-sized, Kampot	0.048	21,605	28,083
Chicken eggs, Fresh, medium	7.282	246	328
Duck's eggs, Fresh, medium	89.424	345	433
Fermented eggs	3.527	357	474
Condensed milk (sweetened) Alaska, 397g, can, Thai	0.978	1,872	2,305
Powdered (baby) Dumex, Singapore	0.064	21,998	30,087
Vegetable oil/soybean oil	0.184	7,559	9,596
Pork fat	5.797	2,305	3,716
Banana, ripe, medium, Cambodia	40.74	860	1,462
Oranges, Posat, medium, Battambang	1.514	5,520	7,071
Pineapple, ripe, Vietnam	6.38	894	1,146
Lime ripe, medium, Khmer	38.754	100	122
Papaya ripe	9.525	1,654	1,865
Garlic, medium, Vietnam	4.253	2,439	3,297
Tamarind, dried with seed	6.29	2,227	2,328
Coconut, (Matured) Medium, Khmer	7.575	989	1,460
Peanuts, medium, no shell, Cambodian	0.834	2,796	4,505
Trakun (Watercress, marsh cabbage)	14.527	1,019	1,316
Onion leaves	0.846	1,714	2,428
Cabbage leaves	16.582	1,244	1,866
Lettuce, spinach	3.297	1,969	3,000
Cauliflower White	0.463	3,858	4,510

Reference food bundle/CPI item	Converted & scaled quantity weight (*1000)	Average CPI price	
		calendar year 2004	calendar year 2007
Tomatoes, medium size, ripe	6.015	1,554	2,102
Bell peppers, sweet Green, big	0.203	3,337	3,282
Ridge gourd, Green, 30cm long	7.57	1,245	1,334
Bitter gourd, Green, medium size	1.236	1,773	2,094
Cucumbers, Green,medium size	16.406	1,041	1,379
Onions, White, Medium size	0.157	1,956	2,311
White gourd	12.162	1,146	1,272
Potatoes, Medium	0.263	2,512	2,657
Sweet potatoes Red, medium	8.555	949	1,254
Traov, Medium	3.49	1,541	2,183
Green gram	1.346	2,262	3,263
Bean sprouts, Short	2.649	966	1,148
Long green beans	2.815	1,449	1,960
Short green beans	0.07	1,963	2,672
Cucumber pickles	1.024	2,026	2,527
Granulated sugar, (refined) white, No.1, Thai	4.296	1,376	1,978
Brown Sugar, Cambodian	18.286	1,385	1,992
Hard candies, Fruit, Thai	0.313	1,859	2,230
Ice tube	21.202	500	531
Soy sauce Cow, Cambodian	3.967	1,339	1,358
Fish sauce No.1, Kampot	19.875	1,629	1,636
Salt, Powder, white	15.151	530	554
Ground black pepper	0.619	12,861	12,463
Monosodium glutamate, seasoning Spoon, Thai	7.635	2,668	3,781
Ginger, medium	0.306	4,085	3,482
Instant coffee, Nescafe, Thai	0.138	11,462	11,877
Tea, leaves/ dust, Vietnam	0.794	11,616	11,289
Beer, Angkor, Cambodia	0.118	4,052	4,059
Beer, Tiger, Singapore	0.038	2,940	2,987
a. Cost of the "basket" of 74 CPI items from the reference food bundle in current Riel		1631.7	2238.6
b. Temporal price index (2004 Phnom Penh prices=100)		100.0	137.2
c. Ratio of the CPI-based temporal price index for 2007 from row b to the village price-based temporal price index for 2007 from row d, column 3 of Table 51			1.0113

Source: Phnom Penh CPI retrospective data base (Haglund 2008).

Table 53 presents estimated annual average rates of inflation⁶⁵ in food prices for two periods (i.e., 1993/94 to 2004 and 2004-2007) and three alternative food price indices for 2004 and 2007. The values for 2004 in column 1 are from Knowles (2005). The spatial price index for 2007 (2007 Phnom Penh prices=100) is obtained directly from row e of Table 51. The temporal price indices for each region (2004 region prices=100) are obtained by multiplying the estimated increase in the cost of the reference food bundle based on village prices (Table 51, row d) by the ratio of the estimated increase between 2004 and 2007 in the cost of the CPI food bundle in Phnom Penh (Table 52, row b, column 3) to the estimated increase in

⁶⁵ The average annual inflation rate is calculated as the average geometric growth rate in reference food bundle weighted food prices between 2004 and 2007.

the cost of the reference food bundle in Phnom Penh based on the village prices (Table 51, row d, column 2). This ratio (1.0113) is reported in Table 52, row c, column 3. For example, the 2007 temporal price index for the Other Urban region is equal to $143.4 \times 1.0113 = 145.0$. The linked food price index (2004 Phnom Penh=100) is obtained by multiplying the values of the spatial price index for 2004 in column 1 by the corresponding values of the 2007 temporal price index in column 3 (for example, the 2007 linked food price index for the Other Urban region is $(88.0 \times 145.0) / 100 = 127.6$).

Table 53. Estimated annual rates of inflation in food prices and food price indices

Estimated annual rate (%) of inflation in food prices	1993/94-2004	2004-2007
Phnom Penh	4.2	11.1
Other urban	4.6	13.2
Rural	4.6	12.3
Food price indices	2004	2007
Spatial price index (Phnom Penh=100)		
Phnom Penh	100.0	100.0
Other urban	88.0	93.0
Rural	77.9	80.4
Temporal price index (2004 region=100)		
Phnom Penh	100.0	137.2
Other urban	100.0	145.0
Rural	100.0	141.4
Linked food price index (2004 Phnom Penh=100)		
Phnom Penh	100.0	137.2
Other urban	88.0	127.6
Rural	77.9	110.2

Source: column 1 (Knowles 2005); column 2 (Table 51, Table 52 and as explained in the text).

Table 53 presents food poverty lines by region updated for inflation between 2004 and 2007. The food poverty lines for 2007 (column 2) were obtained by multiplying the 2004 food poverty lines (column 1) by the regional temporal price indices from Table 53.

Table 54. Updated food poverty lines, 2004 and 2007

Region	2004	2007
Phnom Penh	1,782	2,445
Other urban	1,568	2,274
Rural	1,389	1,965

Source: column 1 (Knowles 2005); column 2 (column 1 adjusted using the unrounded temporal price index in Table

Annex 2. Updating the nonfood allowances for inflation

Table 55 presents the original 1993/94 nonfood allowances estimated by Prescott and Pradhan (1997) and the same nonfood allowances updated for inflation between 1993/94 and 2004 reported in Knowles (2005). This annex discusses how the updated 2004 nonfood allowances were further updated for inflation during the period 2004-2007. The procedures used are the same as those used to update the original 1993/94 nonfood allowances to 2004 (Knowles 2005) and are also similar to those used to update the 2004 food poverty lines to 2007 (Annex 1). A nonfood price index is developed in three steps. Firstly, data on village nonfood prices collected in the 2007 CSES are used to develop a spatial nonfood price index for 2007 that is comparable to the one developed for 2004. Secondly, Phnom Penh CPI nonfood price data are used to develop a temporal nonfood price index for Phnom Penh during the period 2004-2007 as well as “special” temporal nonfood price indices for Other Urban and Rural areas that are also based on Phnom Penh CPI prices but that use region-specific weights (as discussed below). Thirdly, temporal nonfood price indices for the remaining two regions are developed using the spatial price index for 2007 together with the special temporal price indices.

This admittedly cumbersome three-step procedure to update the nonfood allowances for inflation was developed because of the absence of 1993/94 baseline data on nonfood prices. It is used in this report to maintain comparability with previous poverty estimates. However, alternative estimates of inflation in nonfood prices during the period 2004 to 2007 based on the CSES village prices are also presented in this annex for comparison.

Table 55. Nonfood allowances (Riel per capita per day) by region, 1993/94 and 2004

Region	1993/94	2004
Phnom Penh	393	569
Other Urban	269	384
Rural	236	364

Source: Knowles (2005).

Data on village prices for 41 nonfood items were collected in the 2007 CSES Village Questionnaire (i.e., 29 items from the nonfood price list, 10 items from the medicine price list, and 2 tobacco items from the food price list). These items are listed in

Table 61 below and are the same nonfood items for which village prices were collected in the 2004 CSES (except for an “other medicine” item that was dropped from the 2007 CSES Village Questionnaire). Up to three prices were collected for each nonfood item in each village, although typically fewer than three prices were obtained in most villages. Table 56 presents some indicators of village nonfood price reporting in both the 2004 and 2007 CSES. These data indicate that the mean and median number of prices collected per village is well short of the theoretical maximum of 123 prices per village in 2007 (3 x 41 = 123) and 126 prices per village in 2004 (3 x 42 = 126, including the unspecified “other” medicine price). In fact, a significant percentage of villages did not report any nonfood prices (about 8% of the villages in Phnom Penh and Rural villages, but only 2% in Other Urban villages). In fact, according to the data in Table 56, nonfood price reporting is still more frequent in Other Urban villages than in either Phnom Penh or Rural villages.

Table 56. Reporting of village nonfood prices in the 2007 CSES (15 months)

Indicator	Phnom Penh		Other urban		Rural	
	2003/04	2006/07	2003/04	2006/07	2003/04	2006/07
Potential maximum number of prices reported per village	126	123	126	123	126	123
Mean number of prices reported per village	25.2	20.8	44.3	29.2	31.7	18.5
Median number of prices reported per village	18	14	27	22	20	15
10 th percentile	0	3	4	7	2	3
90 th percentile	51	45	111	57	81	39
% of villages not reporting any prices	12.1	8.7	9.0	2.4	8.0	8.4
Item reported by the smallest number of villages in each region	Cotton netting	Radio-cassette player	Cotton netting, radio cassette player	Radio-cassette player	Radio cassette player	Rifampicin (medicine)
Number of villages reporting that item	10	2	35	4	26	2
Item reported by the largest number of villages in each region	Bath soap	Bath soap	Bath soap	Toothpaste	Kerosene	Bath soap
Number of villages reporting that item	97	81	178	80	495	235
Number of villages surveyed	116	^a 92	212	^a 85	572	^a 273

Source: 2004 CSES.

^a 90 villages were surveyed twice in the 2007 CSES, i.e., in Oct-Dec 2006 and Oct-Dec 2007.

Table 57 presents data on the number of nonfood prices reported by villages in the 2007 CSES by item (41 items) and by region. The data indicate that there are many nonfood items for which fewer than 10 prices were reported in a given region. This contrasts with the reporting of food prices (Table 49), where only 3 food items have 10 or fewer prices reported in any region.

Table 57. Number of village nonfood prices reported by item and by region, 2007

Item	Phnom Penh	Other urban	Rural	All regions
Cigarettes (local, pack of 20)	63	60	189	312
Pipe tobacco (strong fibrous, 100 mg)	20	40	157	217
Kerosene (liter)	32	55	179	266
Gasoline (liter)	28	49	130	207
Detergent (kg)	61	48	146	255
Bath soap (1 cake)	65	60	192	317
Toothpaste (1 tube)	64	62	188	314
Cotton netting (meter)	4	12	4	20
Ready-made mosquito net	10	24	19	53
Cotton cloth (meter)	5	13	11	29
Synthetic cloth (meter)	4	12	13	29
Shirts (ready made)	10	21	24	55
Trousers (ready made)	8	20	22	50
Skirt (ready made)	5	14	11	30
Sleeping mat	5	17	19	41
Sandals (plastic)	21	40	68	129
Rain coat	19	25	33	77
Light bulbs (1 bulb)	6	18	14	38
Porcelain rice bowl	3	14	8	25
Aluminum saucepan	3	16	15	34
Plastic basin	6	20	37	63
Thermos flask	5	16	21	42
Cement (50 kg)	6	11	21	38
Iron rods (kg)	2	7	6	15
Bicycle inner tube	5	12	33	50
Bicycle tire	6	11	28	45
Writing pad (20 ruled sheets)	10	7	5	22
Notebook (100 ruled sheets)	43	37	81	161
Textbook (1 book)	19	14	7	40
Radio receiver	4	9	10	23
Radio cassette player	2	4	2	8
Tetracycline (capsule)	22	16	42	80
Ampicillin (capsule)	25	18	39	82
Penicillin (vial)	19	17	27	63
Aspirin (pill)	13	18	43	74
Vitamin C	40	33	71	144
Rifampicin (pill)	3	7	2	12
Co-trimoxazol (pill)	18	14	11	43
Paracetamol (pill)	21	24	59	104
ORS (packet)	22	24	32	78
Multi-vitamin (pill)	26	19	22	67
Totals	753	958	2,041	3,752

Source: 2007 CSES.

Incomplete reporting of village price data may be due to several factors. Table 58 presents results of regression analysis of village nonfood price reporting. Column 1 presents results of

a probit analysis of *whether* the price of an individual nonfood item was reported in a given village. The estimation sample includes one observation for each of the 41 nonfood prices in each village.⁶⁶ Explanatory variables include dummy variables indicating whether the village is an Other Urban or Rural village (Phnom Penh is the omitted category), a dummy variable indicating whether there is a permanent market in the village, village population (as reported in the Village Questionnaire), the weight of the individual nonfood item in the 1993/94 nonfood allowance commodity bundle, and a set of dummy variables indicating the month in which the village was surveyed (October 2006 is the omitted category).

The estimates reported in column 1 of Table 55 are the estimated marginal effects of continuous variables (evaluated at the sample means) and the estimated effect of a change from zero to one in the case of dummy variables. They indicate that village nonfood price reporting is significantly more likely in Other Urban villages, in villages with a permanent market and in villages with larger populations. The likelihood that the price of an individual nonfood item is reported is also positively related to the weight of the item in the 1993/94 nonfood allowance commodity bundles. However, the estimated coefficients of the group of dummy variables referring to the month in which the village was surveyed are jointly insignificant at the 0.05 level.

Columns 2-4 of Table 58 report the results of ordinary least-squares estimation of regression models explaining the *number* of nonfood prices reported per village. The results reported in columns 2 and 3 were obtained using data from the 2007 CSES, while the results in column 4 were obtained using data from the 2004 CSES (reported previously in Knowles 2005). One would expect the results in columns 2 and 3 to be similar in signs and significance levels to those in column 1 (and particularly those in column 2, where the model also includes dummy variables for survey months). Indeed, the results in columns 1-3 are similar, except that the dummy variables referring to the month in which the village was surveyed are jointly significant at the 0.01 level in column 2, whereas they are not jointly significant at the 0.05 level in column 1. It is unclear what accounts for this difference, although a similar difference was observed in the regression analysis of village food price reporting in Annex 1 (compare to Table 3). The left-side (“dependent”) variable in the regressions reported in columns 2-4 is a count variable, with a distribution that is highly skewed to the right and truncated at zero (Figure 20). However, re-estimation of the model as a Poisson or negative binomial regression model does not qualitatively alter the results (unreported regressions obtainable from the author on request).

The regression results reported in Table 58 indicate clearly that there is geographical selectivity in the reporting of village nonfood price data. The implications of this selectivity are complex, as previously noted.⁶⁷ However, the effects of this selectivity can be minimized (as in 2004) by using the mean of up to three reported prices as the reported price for each village (rather than using the individual reported prices). In order to minimize the influence of village outliers, median (rather than mean) prices are calculated for each item in each region from the village mean prices, using the household sampling weights.

⁶⁶ The maximum sample size is 18,450 (i.e., 41 nonfood items * 450 villages in the 15-month sample). However, the actual sample size available for the regression analysis is reduced to 17,999 due to unreported village characteristics in several villages.

⁶⁷ See footnote 59 above.

Table 58. Regression analysis of the factors related to village nonfood price reporting, 2003/04 and 2006/07 (15 months)

	Whether a given price is reported in a given village, 2006/07	Number of nonfood prices reported per village		
		Model with month of interview 2006/07	Model without month of interview 2006/07	Model without month of interview 2003/04
	(1)	(2)	(3)	(4)
Other urban village	0.129 (3.10)**	12.448 (3.53)**	12.288 (3.40)**	16.534 (4.21)**
Rural village	-0.014 (0.52)	0.536 (0.27)	0.839 (0.47)	11.173 (3.22)**
Permanent market in village	0.142 (4.67)**	11.103 (3.93)**	8.820 (2.97)**	21.356 (5.82)**
Village population size	0.000 (5.48)**	0.002 (7.98)**	0.003 (9.11)**	0.004 (6.63)**
Weight in nonfood allowance commodity bundle	14.268 (32.72)**			
Month of interview (dummy variables)	Not reported	Not reported**		
Constant		11.125 (2.49)*	12.754 (7.79)**	12.847 (3.81)**
Number of observations	17,999	439	439	886
R-squared	0.17 ^a	0.42	0.36	0.15

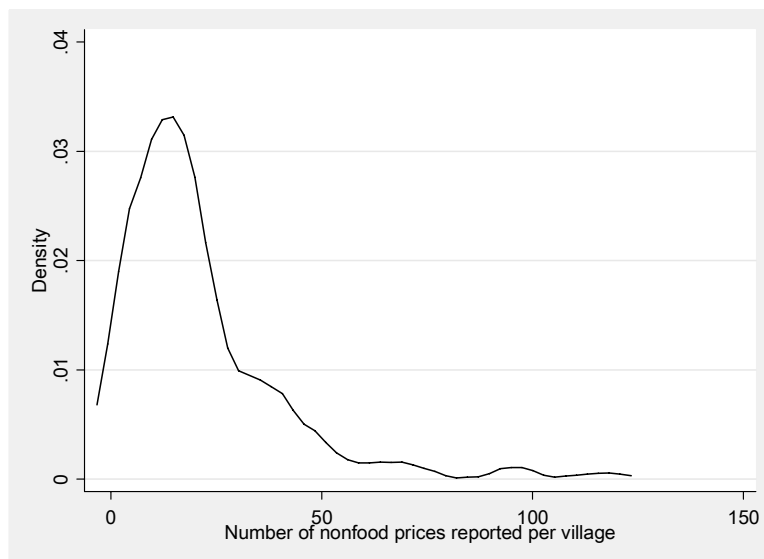
Source: columns 1-3 (2007 CSES); column 4 (Knowles 2005)

Robust z statistics in parentheses (standard errors adjusted for clustered sampling in column 1)

* significant at 5%; ** significant at 1%

^a pseudo R-squared reported by Stata version 9.2

Figure 20. Kernel density of the number of nonfood prices reported per village, 2006/07



Source: 2007 CSES.

Because no village-level data were collected on the cost of housing in the 2007 CSES, the first step in developing a spatial nonfood price index for 2007 is to estimate the differences by region in the cost of housing. This is done using regression analysis to develop a hedonic price index of housing rental values. The left-side variable in the regression model is the natural logarithm⁶⁸ of either the monthly housing rent actually paid by a household (which applies to only a few hundred households) or the monthly rental value of owner-occupied housing that was estimated and reported by most sample households. The right-side variables include a large number of variables referring to housing characteristics (described in Knowles 2005),⁶⁹ dummy variables referring to Other Urban and Rural locations (location in Phnom Penh is the omitted category) and a variable referring to the date of interview (i.e., the year, including fractions of a year, minus 1960). The estimation sample is limited to calendar year 2004 or 2007 and to households that reported monthly rental values of two million Riel or less (equivalent to about US\$ 500).⁷⁰ Table 59 lists both the unweighted and weighted sample means of the variables used in both the 2004 and 2007 hedonic regression analysis. These data indicate that most of the housing characteristics are similar in 2004 and 2007 (particularly when the samples are weighted), although there is evidence of improvement in housing quality between 2004 and 2007 in some areas (for example, in source of water, type of toilet used, and in the use of electric lighting).

⁶⁸ The natural logarithm of the reported monthly rental value is used as the left-side variable because the distribution of reported rental values is highly skewed. Transformation to a log value results in a variable with a distribution that is similar to a normal distribution. The log transformation automatically excludes observations with zero reported rent from the estimation sample (i.e., households that do not own their housing, but that reported paying zero rent for their housing). This is desirable because these observations contain misleading information on rental values, and their inclusion in the sample would bias the regression estimates. The estimated regression function is used to impute a rental value for these households when calculating household consumption, as discussed in Annex 3.

⁶⁹ The omitted categories of the dummy variables are the “other” category in most cases (see Knowles 2005 for details). Both the 2004 and 2007 CSES collected data on both the primary and secondary material used in walls, roofs and floors. Only the primary material was considered in calculating the housing characteristics used in the regression analysis. Both the 2004 and 2007 CSES also collected information on the household’s main source of drinking water during both the dry and wet seasons. Only the dry season information was used in calculating the water supply indicators used in the regression analysis (many households listed rainwater as their main source of drinking water during the wet season).

⁷⁰ This was also done when preparing the 2004 estimates in order to avoid extreme values influencing the estimated regression.

Table 59. Sample means of variables used in hedonic regression analysis of housing rental values, 2004 and 2007

Variable	Unweighted		Weighted	
	2004 (1)	2007 (2)	2004 (3)	2007 (4)
Monthly rent (natural log)	10.11708	10.81473	10.0460	10.5180
Number of rooms	1.3386	1.4566	1.3179	1.3609
Living area (sq. meters)	43.4801	46.1336	42.5348	43.3875
Owner occupied	0.9853	0.9455	0.9870	0.9622
Roof (thatched)	0.2117	0.1650	0.2187	0.2073
Roof (tiled)	0.2706	0.2542	0.2777	0.2874
Roof (galvanized iron or aluminum)	0.3482	0.4304	0.3417	0.4106
Roof (concrete or fibrous cement)	0.0873	0.1465	0.0753	0.0915
Wall (bamboo)	0.2752	0.3119	0.2840	0.3698
Wall (wood, plywood or log)	0.4442	0.4375	0.4409	0.4558
Wall (concrete or fibrous cement)	0.0874	0.2001	0.0709	0.1200
Floor (earth or clay)	0.0750	0.0659	0.0749	0.0717
Floor (wood or bamboo)	0.7179	0.6710	0.7377	0.7541
Floor (cement)	0.0453	0.0695	0.0429	0.0585
Floor (parquet or polished wood)	0.0819	0.0297	0.0814	0.0241
Floor (ceramic tiles)	0.0642	0.1577	0.0480	0.0885
Water (piped or public tap)	0.1158	0.2649	0.0945	0.1536
Water (tube or piped well)	0.2735	0.2361	0.2799	0.2675
Water (protected or unprotected dug well)	0.2874	0.1896	0.2990	0.2321
Water (purchased)	0.0793	0.1007	0.0775	0.1016
Toilet (water sealed, connected to sewage or septic tank)	0.2190	0.3968	0.1938	0.2872
Toilet (closed or open pit)	0.0232	0.0289	0.0232	0.0329
Toilet (open land or none)	0.7284	0.5340	0.7550	0.6440
Light (city power, generator or battery)	0.4514	0.6938	0.4320	0.6282
Light (kerosene)	0.5407	0.2997	0.5594	0.3586
Cooking fuel (firewood)	0.8363	0.7115	0.8598	0.8270
Cooking fuel (charcoal or firewood and charcoal)	0.0858	0.1282	0.0756	0.0875
Cooking fuel (gas or electricity)	0.0661	0.1591	0.0528	0.0845
Date of interview (=year + fraction of calendar year-1960)	44.4649	47.4931	44.4682	47.4886
Other urban location	0.1436	0.1721	0.1032	0.0966
Rural location	0.7763	0.6320	0.8295	0.8173
N	11,066	3,399	11,066	3,399

Source: 2004 and 2007 CSES.

Note: The estimation samples are calendar year samples and are restricted to households reporting monthly rental values of less than 2 million Riel (approximately US\$500).

The estimated hedonic regressions are reported in Table 59 for both 2004 and 2007 and using both unweighted samples (columns 1-2) and weighted samples (columns 3-4). Sample weighting was not done in developing the 2004 poverty estimates, so in the interest of maintaining comparability between the methods used in 2004 and 2007 the estimates of spatial differences in monthly rental values that are included in the 2007 spatial price index are based on the unweighted regression estimates reported in column 2. The regression results for both 2004 and 2007 (weighted and unweighted) indicate that rental values are significantly lower in Other Urban and Rural areas than in Phnom Penh. The estimated coefficients of the Other Urban and Rural dummy variables in column 2 (i.e., -0.541 and -0.816 in column 2) imply that rental values in Other Urban areas were 58.2% of Phnom Penh rental values in 2007 (compared to 64.7% in 2004) and that rental values in Rural areas were 44.2% of Phnom Penh rental values in 2007 (compared to 50.8% in 2004).⁷¹ In principle, these estimated differences in monthly rental values between regions refer to housing of the same quality.⁷²

There are many other differences in the estimated coefficients between 2004 and 2007. One important difference concerns the dummy variable indicating whether the housing is owner-occupied. In 2004, this variable was highly significant, indicating that the estimated rental values reported by households owning their own housing were about 54% higher (holding other characteristics constant) and suggesting the presence of considerable bias in the absolute level of reported rental values in the 2004 CSES. The estimated coefficient of this same variable is statistically insignificant in 2007, suggesting that the previous bias may not be present in the 2007 CSES. It is unclear what explains the many other differences in the estimated coefficients between 2004 and 2007, which are generally robust with respect to whether or not the sample is weighted. However, they do raise questions about whether the regression model is correctly specified.

⁷¹ These percentages (which are in fact the relevant spatial price indices) are obtained by taking the antilog of the estimated coefficients and multiplying the result by 100.

⁷² It is implicitly assumed that multiple regression analysis is an appropriate statistical method for holding housing quality constant in this context, even in cases where the characteristics of the housing may differ substantially, as for example, between rented and owner-occupied housing or between urban and rural areas. An alternative statistical method that appears appealing, at least conceptually, in this context is matching, i.e., examining differences in the rental values between regions in dwellings that are appropriately “matched.” (using either propensity score matching or some other approach to matching as discussed, for example, in Heckman, Ichimura and Todd 1997 and Imbens 2004).

Table 60. Hedonic estimates of spatial differences in housing rental values, 2004 and 2007

Variable	Unweighted		Weighted	
	2004 (1)	2007 (2)	2004 (3)	2007 (4)
Number of rooms	0.201 (9.17)**	0.187 (5.40)**	0.188 (7.79)**	0.138 (3.57)**
Living area (sq. meters)	0.003 (5.36)**	0.005 (3.13)**	0.003 (5.30)**	0.005 (3.47)**
Owner occupied	0.434 (4.29)**	0.064 (0.85)	0.437 (4.13)**	-0.091 (0.90)
Roof (thatched)	-0.142 (2.16)*	-0.263 (0.94)	-0.145 (2.13)*	-0.148 (0.48)
Roof (tiled)	0.456 (7.39)**	0.034 (0.13)	0.444 (6.96)**	0.148 (0.49)
Roof (galvanized iron or aluminum)	0.293 (5.00)**	-0.123 (0.47)	0.297 (4.93)**	0.017 (0.06)
Roof (concrete or fibrous cement)	0.475 (6.99)**	0.011 (0.04)	0.478 (6.64)**	0.118 (0.39)
Wall (bamboo)	0.114 (2.25)*	-0.176 (1.87)	0.110 (2.00)*	-0.197 (1.72)
Wall (wood, plywood or log)	0.288 (6.56)**	0.024 (0.27)	0.307 (6.39)**	0.028 (0.26)
Wall (concrete or fibrous cement)	0.607 (8.14)**	0.305 (2.89)**	0.584 (7.94)**	0.346 (2.40)*
Floor (earth or clay)	0.023 (0.21)	-0.443 (2.61)**	0.024 (0.21)	-0.110 (0.59)
Floor (wood or bamboo)	0.172 (1.66)	-0.164 (1.14)	0.177 (1.66)	0.159 (0.98)
Floor (cement)	0.182 (1.63)	-0.123 (0.84)	0.214 (1.88)	0.150 (0.87)
Floor (parquet or polished wood)	0.189 (1.58)	0.031 (0.20)	0.227 (1.84)	0.327 (1.76)
Floor (ceramic tiles)	0.272 (2.20)*	0.165 (1.23)	0.332 (2.68)**	0.535 (3.24)**
Water (piped or public tap)	0.155 (2.06)*	0.020 (0.15)	0.169 (2.17)*	0.018 (0.13)
Water (tube or piped well)	-0.052 (0.96)	-0.036 (0.42)	-0.071 (1.29)	-0.038 (0.46)
Water (protected or unprotected dug well)	-0.132 (2.34)*	-0.127 (1.46)	-0.137 (2.37)*	-0.140 (1.63)
Water (purchased)	-0.039 (0.47)	-0.174 (1.64)	-0.030 (0.28)	-0.177 (1.62)
Toilet (water sealed, connected to sewage or septic tank)	0.254 (3.53)**	0.055 (0.29)	0.255 (3.53)**	0.109 (0.80)
Toilet (closed or open pit)	0.020 (0.20)	-0.061 (0.30)	0.023 (0.22)	0.073 (0.42)
Toilet (open land or none)	-0.229 (3.35)**	-0.274 (1.46)	-0.220 (3.26)**	-0.237 (1.83)
Light (city power, generator or battery)	0.172 (0.88)	0.199 (0.88)	0.207 (1.06)	0.005 (0.02)
Light (kerosene)	-0.074 (0.38)	0.010 (0.05)	-0.034 (0.17)	-0.186 (0.92)
Cooking fuel (firewood)	-0.043 (0.26)	0.029 (0.24)	-0.027 (0.15)	-0.042 (0.30)
Cooking fuel (charcoal or firewood and charcoal)	0.311 (1.86)	0.396 (3.22)**	0.328 (1.75)	0.341 (2.10)*
Cooking fuel (gas or electricity)	0.476 (2.76)**	0.483 (3.70)**	0.488 (2.56)*	0.362 (2.24)*
Date of interview (=year + fraction of calendar year-1960)	0.044 (0.54)	0.150 (1.37)	0.042 (0.47)	0.268 (2.18)*
Other urban location	-0.436 (5.08)**	-0.541 (4.39)**	-0.423 (4.86)**	-0.510 (3.05)**
Rural location	-0.678 (7.31)**	-0.816 (5.89)**	-0.684 (7.08)**	-0.836 (5.56)**
Constant	7.422 (2.08)*	3.813 (0.73)	7.432 (1.88)	-1.768 (0.30)
Number of observations	10,958	3,340	10,958	3,340
R-squared	0.50	0.67	0.47	0.52

Source: 2004 and 2007 CSES (the results in column 1 were previously reported in Knowles 2005).

Robust t statistics in parentheses

* significant at 5%; ** significant at 1%

Table 61 presents the data used to calculate a spatial nonfood price index for 2007, i.e., the village price data collected in the 2007 CSES for villages surveyed during calendar year 2007, except in the case of housing rent, where the estimates are based on the regression results in column 2 of Table 59. The single set of commodity weights used in calculating the spatial price index is based on the 1993/94 average consumption patterns of all sample households with per capita daily consumption within 20% of their region-specific nonfood allowances.⁷³

A few nonfood items for which village prices were collected receive a zero (or near-zero) weight in the spatial price index:

- In the case of cement, the zero weight reflects the fact that none of the sample households with nonfood consumption within 20% of the nonfood allowances reported any expenditure on this item in 1993/94.
- In the case of plastic basin and radio-cassette player, the weights are only approximately zero (i.e., zero to four decimal places only).
- In the case of vitamin C tablets, the 2004 CSES village questionnaire asked for the price of this item as a unit of 100 pills. However, many of the responses appeared to refer to the price of one pill, and it was not clear how to distinguish between responses corresponding to the correct or incorrect units. Accordingly, prices for vitamin C were not used in calculating the spatial nonfood price index for 2004, and they are therefore given a weight of zero in calculating the spatial nonfood price index for 2007.
- A similar problem arose in the case of pipe tobacco in both the 2004 and 2007 CSES. The CSES Village Questionnaire indicates that the price should refer to a unit of 100 milligrams. However, many responses appear to be for a unit of one kilogram (which is the unit used in the CPI). Fortunately, it was possible to distinguish the responses for the valid units from those for the invalid units in these cases.⁷⁴

⁷³ These are the same commodity weights used to develop a spatial price index for 2004 (Knowles 2005). The relatively wide 20% bandwidth was chosen in order to obtain a sufficiently large sample size because the number of sample households in the neighborhood of the nonfood allowance is limited (particularly in Phnom Penh).

⁷⁴ Reported village prices of pipe tobacco above 4,000 Riel were divided by 10 in both the both the 2004 and 2007 CSES.

Table 61. Spatial price index for nonfood items based mainly on CSES village prices, 2007

Item	2007 Phnom Penh median price (Riel)	^a Weight	Commodity price indices (Phnom Penh=100)		
			Phnom Penh	Other urban	Rural
Cigarettes (local, pack of 20)	1,000	0.0400	100.00	100.00	100.00
Pipe tobacco (strong fibrous, 100 mg)	1,000	0.0410	100.00	96.67	100.00
Kerosene (liter)	3,100	0.0337	100.00	103.23	98.92
Gasoline (liter)	4,000	0.0086	100.00	95.00	95.00
Detergent (kg)	3,600	0.0318	100.00	103.70	100.00
Bath soap (1 cake)	1,000	0.0043	100.00	100.00	100.00
Toothpaste (1 tube)	1,000	0.0097	100.00	100.00	100.00
Cotton netting (meter)	12,000	0.0001	100.00	100.00	108.33
Ready-made mosquito net	18,500	0.0037	100.00	97.30	75.68
Cotton cloth (meter)	3,500	0.0004	100.00	45.71	42.86
Synthetic cloth (meter)	4,500	0.0003	100.00	54.07	88.89
Shirts (ready made)	14,000	0.0147	100.00	86.90	71.43
Trousers (ready made)	14,000	0.0195	100.00	107.14	85.71
Skirt (ready made)	24,000	0.0082	100.00	100.00	62.50
Sleeping mat	22,000	0.0056	100.00	81.82	68.18
Sandals (plastic)	4,400	0.0028	100.00	94.70	111.36
Rain coat	1,500	0.0003	100.00	200.00	110.00
Light bulbs (1 bulb)	1,300	0.0000	100.00	115.38	192.31
Porcelain rice bowl	1,200	0.0002	100.00	150.00	161.11
Aluminum saucepan	12,000	0.0003	100.00	70.83	75.00
Plastic basin	5,000	0.0000	100.00	140.00	140.00
Thermos flask	12,000	0.0002	100.00	100.00	125.00
Cement (50 kg)	14,000	0.0000	100.00	107.14	114.29
Iron rods (kg)	2,200	0.0025	100.00	113.64	106.06
Bicycle inner tube	2,500	0.0046	100.00	180.00	152.00
Bicycle tire	3,667	0.0080	100.00	245.45	231.82
Writing pad (20 ruled sheets)	1,500	0.0125	100.00	66.67	66.67
Notebook (100 ruled sheets)	800	0.0125	100.00	93.75	87.50
Textbook (1 book)	2,500	0.0055	100.00	100.00	100.00
Radio receiver	16,000	0.0001	100.00	93.75	75.00
Radio cassette player	120,000	0.0000	100.00	20.83	20.83
Tetracycline (capsule)	100	0.0043	100.00	200.00	200.00
Ampicillin (capsule)	200	0.0043	100.00	133.33	112.50
Penicillin (vial)	400	0.0043	100.00	50.00	75.00
Aspirin (pill)	200	0.0143	100.00	50.00	66.67
Vitamin C	1,000	0.0000	100.00	200.00	200.00
Rifampicin (pill)	400	0.0043	100.00	125.00	100.00
Co-trimoxazol (pill)	200	0.0043	100.00	125.00	100.00
Paracetamol (pill)	200	0.0143	100.00	50.00	50.00
ORS (packet)	300	0.0143	100.00	100.00	100.00
Multi-vitamin (pill)	100	0.0143	100.00	100.00	100.00
Monthly housing rent ^b	240,000	0.1332	100.00	58.22	44.22
Totals/sums of cross-products		0.4831	48.31	42.82	39.46
2007 Spatial price index (Phnom Penh=100)			100.00	88.63	81.68

Source: 2007 CSES Village Questionnaire for most items; column 2 of for monthly housing rent.

^a weights are based on the 1993/94 nonfood consumption patterns of all sample households with per capita nonfood consumption within 20% of the nonfood allowance for the region in which they reside.

^b column 1 is the median reported monthly rental value for Phnom Penh households; the index values in columns 4-5 are based on the estimated regression coefficients of the Other Urban and Rural dummy variables in column 2 of Table 59.

The second step in developing a nonfood price index involves the use of Phnom Penh CPI price data to develop a temporal nonfood price index for Phnom Penh as well as “special” temporal price indices for Other Urban and Rural areas that are also based on Phnom Penh CPI prices but that use region-specific weights. The three nonfood allowances originally developed by Prescott and Pradhan (1997) for 1993/94 represent different bundles of nonfood commodities in each region.⁷⁵ The regional nonfood price indices that are used to update the nonfood allowances for inflation should therefore reflect the different bundles of nonfood commodities in each regional nonfood allowance, i.e., the average commodity composition of the nonfood consumption of households whose nonfood consumption is in the “neighborhood” of each region’s nonfood allowances. The commodity composition of each region’s 1993/94 nonfood allowance is presented in Knowles (2005) and is reproduced in Table 62 below, with “neighborhood” defined as the subsample of households having per capita nonfood consumption within 20% of the nonfood allowance for the region in which the household resides. These data indicate that there is significant variation between regions in the commodity composition of the nonfood allowances.⁷⁶

Table 62. Composition (%) of nonfood consumption by region among households with per capita nonfood consumption within 20% of the nonfood allowance, 1993/94

Item	Region		
	Phnom Penh	Other Urban	Rural
Clothing	9.3	11.4	14.3
Housing and utilities	44.3	36.7	33.1
Rent (including imputed rent of owner-occupied housing)	23.4	16.7	12.3
Housing maintenance and utilities	20.9	20.0	20.8
Household furnishings and household operations	4.5	5.5	6.2
Medical care	8.7	11.7	11.2
Transportation and communications	6.2	5.7	5.7
Recreation and education	4.8	4.3	3.9
Recreation and entertainment	0.0	0.4	0.1
Education	4.8	4.0	3.8
Personal care	6.7	7.2	6.9
Tobacco products	10.3	10.9	10.1
Miscellaneous ^a	5.3	6.5	8.6
Totals	100.0	100.0	100.0
Total household nonfood consumption (current Riel per month), 1993/4	81,243	55,315	48,258
N	81	172	540

Source: Knowles (2005), Table 64.

^a includes consumption related to special household occasions (e.g., weddings), household cash and in-kind gifts and charity, loans to non-household members, and expenditure on insurance premiums, real estate taxes and fees (e.g., registration of vehicles), repayment of principal and interest on debts and deposits of money in banks.

⁷⁵ In the absence at the time of information on the spatial variation of nonfood prices, an estimated regression model was used to obtain region-specific estimates of the level of per capita nonfood consumption when per capita consumption is just equal to the food poverty line. Although the expectation was that the different regional estimates would mainly reflect regional price differences in nonfood prices, they may also reflect regional differences in the ratio of food to nonfood prices.

⁷⁶ This variation is discussed in more detail in Knowles (2005).

Table 63 (columns 1-2) presents the 2004 and 2007 values of the Phnom Penh CPI for 10 nonfood commodity categories (October-December 2006=100).⁷⁷ The weights in columns 3-5 of Table 63 are the region-specific commodity composition shares of the nonfood allowances that are reported in Table 62. The 2004 and 2007 CPI index values in columns 1-2 are cross multiplied by the region-specific weights in columns 3-5 and summed across the 10 commodity categories (the sums of these cross products are reported in the next to bottom row of Table 63). The resulting sums of cross products are used to calculate the temporal price indices (calendar year 2004 Phnom Penh prices=100) that are reported in the bottom row of Table 63. These three temporal price indices are all based on Phnom Penh prices (i.e., the same Phnom Penh CPI values in columns 1 and 2 are used to calculate all three indices) and therefore vary only slightly, and only because of the different commodity group weights that are used for each region. According to Table 63, inflation in Phnom Penh nonfood prices was considerably more moderate during the period 2004-2007 than the corresponding inflation in food prices (i.e., 14% versus 37%).

Table 63. Temporal price indices for each region based on Phnom Penh CPI prices, 2004-2007

Category	Phnom Penh CPI price indices for commodity groups		Region-specific commodity weights		
	2004	2007	Phnom Penh	Other urban	Rural
Clothing	91.98	100.23	0.0928	0.1142	0.1433
Housing and utilities	85.33	103.89	0.4431	0.3673	0.3309
Household furnishings and household operations	93.53	102.15	0.0448	0.0548	0.0616
Medical care	98.58	102.83	0.0867	0.1170	0.1123
Transportation and communications	86.50	102.04	0.0619	0.0574	0.0568
Recreation and entertainment	98.86	97.45	0.0000	0.0036	0.0008
Education	101.05	103.37	0.0478	0.0398	0.0382
Personal care	92.44	106.59	0.0669	0.0723	0.0694
Tobacco	99.64	100.09	0.1030	0.1087	0.1006
Miscellaneous	94.86	106.96	0.0529	0.0648	0.0861
Temporal nonfood price indices (2004 Phnom Penh CPI prices=100) ^a			113.72	112.64	112.40

Source: columns 1-2 (Phnom Penh CPI, October-December 2006=100); columns 3-5, rows 1-10 (Table 62).

^a obtained by multiplying and summing the Phnom Penh CPI values in columns 1-2 for each commodity category by the corresponding region-specific weights in columns 3-5 and dividing the resulting sums of cross-products for 2007 by the sums of cross-products for 2004 (and multiplying by 100).

All three of the temporal price indices reported in the bottom row of Table 63 are based on Phnom Penh prices (despite the use of different regional weights in calculating the indices). They would be valid temporal price indices for the other two regions only if their nonfood prices increased at the same rate as nonfood prices in Phnom Penh. However, this is not assumed to be the case. Instead temporal price indices are developed for the other two regions by multiplying the “special” temporal price indices in the bottom row of Table 63 by the spatial price indices reported in the bottom row of Table 61. The resulting nonfood price

⁷⁷ The values in columns 1 and 2 are the geometric means of the monthly CPI values in the retrospective CPI data base described in Haglund (2008).

indices for 2007 (2004 Phnom Penh prices=100) are presented in row d of Table 64. These price indices are comparable to the previously estimated price indices for 2004 that are presented in row a of Table 64 (2004 Phnom Penh prices=100). By dividing the index values in row d by those in row a, one obtains a set of region-specific temporal nonfood price indices with base values equal to regional prices in 2004. These regional price indices (reported in row f of Table 64) can be used directly to update the 2004 nonfood allowance for inflation during the period 2004-2007.⁷⁸

Table 64. Calculation of nonfood price indices for 2007

Nonfood price index	Phnom Penh	Other Urban	Rural
a. 2004 nonfood price index (2004 Phnom Penh=100, row e of Table 83 in Knowles 2005)	100.00	89.12	83.20
b. 2007 spatial nonfood price index based on village prices (2007 Phnom Penh=100) from Error! Not a valid result for table.	100.00	88.63	81.68
c. 2007 temporal price index for Phnom Penh using region-specific weights (2004 Phnom Penh=100), Table 63	113.72	112.64	112.40
d. 2007 nonfood price index (2004 Phnom Penh=100) (d=b*c/100)	113.72	99.83	91.81
e. 2007 spatial price index (2007 Phnom Penh=100) (e=100*d/(row c, column 1))	100.00	87.78	80.73
f. 2007 nonfood price index (2004 region prices=100) (f=100*d/a)	113.72	112.02	110.35

Source: see text and formulas in table.

The cumbersome three-step procedure used to develop nonfood price indices presented in Table 64 was used to update the 1993/94 nonfood allowances for inflation between 1993/94 and 2004 because of the lack of 1993/94 baseline data on nonfood prices outside of Phnom Penh. However, the 2004 and 2007 CSES include comparable village data on nonfood prices. It is useful to develop estimates of inflation in nonfood prices by region based only on the information obtained in the CSES (i.e., not using the CPI) and to compare the resulting estimates to those in Table 64. However, in order to prepare such estimates, it is necessary to obtain an estimate of inflation in housing rental values between 2004 and 2007 because no information on housing rental values is collected at the village level in the CSES.

This is done by re-estimating a hedonic regression model using a pooled and weighted sample of households from both the 2004 and 2007 CSES. The results are presented in Table 65. They indicate that there was considerable inflation in housing rental values during the period 2004-2007. The estimated average annual rate of inflation in housing rentals during this period was estimated to be 7.7% in Phnom Penh, 7.0% in Other Urban areas, and 10.4% in rural areas.⁷⁹ By comparison, the Phnom Penh CPI indicates that housing rental prices increased at an annual rate of 6.8% during this period. These two independent estimates of the rate of inflation in housing rentals in Phnom Penh during the period 2004-2007 (7.7% and 6.8%) are sufficiently close to provide some comfort.

⁷⁸ The nonfood allowances cannot be updated for inflation using a standard price index because the commodity bundles in each regional nonfood allowance are different. Accordingly, the region-specific nonfood price indices in row f of Table 64 should be used, each of which reflects the region-specific bundle of nonfood commodities in each region's nonfood allowance.

⁷⁹ These estimates of the annual average growth rate were obtained by taking the antilog of the estimated coefficient of the date-of-interview variable in Table 65.

Table 65. Hedonic estimates of the rate of inflation in housing rental values, 2004 to 2007

	Phnom Penh (1)	Other urban (2)	Rural (3)
Number of rooms	0.187 (6.55)**	0.213 (4.52)**	0.113 (3.39)**
Living area (sq. meters)	0.003 (3.10)**	0.005 (2.92)**	0.005 (6.06)**
Owner occupied	0.489 (6.15)**	0.094 (0.74)	-0.293 (2.76)**
Roof (thatched)	-0.244 (0.74)	-0.131 (0.75)	-0.014 (0.20)
Roof (tiled)	0.299 (1.33)	0.276 (1.53)	0.381 (5.30)**
Roof (galvanized iron or aluminum)	-0.084 (0.39)	0.029 (0.17)	0.299 (4.45)**
Roof (concrete or fibrous cement)	0.104 (0.49)	0.344 (1.94)	0.374 (4.70)**
Wall (bamboo)	0.022 (0.09)	0.237 (2.30)*	0.033 (0.58)
Wall (wood, plywood or log)	0.070 (0.48)	0.392 (4.79)**	0.230 (4.08)**
Wall (concrete or fibrous cement)	0.222 (1.50)	0.901 (4.78)**	0.475 (4.16)**
Floor (earth or clay)	-0.314 (1.80)	-0.118 (0.82)	0.056 (0.42)
Floor (wood or bamboo)	-0.172 (1.34)	-0.006 (0.05)	0.317 (2.59)**
Floor (cement)	-0.057 (0.41)	-0.082 (0.59)	0.330 (2.38)*
Floor (parquet or polished wood)	0.041 (0.32)	0.020 (0.15)	0.462 (3.14)**
Floor (ceramic tiles)	0.080 (0.69)	0.257 (1.18)	0.860 (5.11)**
Water (piped or public tap)	0.477 (2.27)*	0.249 (1.85)	-0.161 (1.26)
Water (tube or piped well)	-0.011 (0.04)	0.041 (0.33)	-0.078 (1.29)
Water (protected or unprotected dug well)	0.323 (1.37)	-0.156 (1.48)	-0.176 (3.15)**
Water (purchased)	-0.164 (0.92)	-0.088 (0.66)	-0.143 (1.67)
Toilet (water sealed, connected to sewage or septic tank)	0.426 (2.90)**	0.170 (0.83)	0.059 (0.56)
Toilet (closed or open pit)	0.314 (0.97)	-0.004 (0.02)	-0.050 (0.40)
Toilet (open land or none)	-0.241 (1.44)	-0.139 (0.60)	-0.290 (3.03)**
Light (city power, generator or battery)	-0.581 (1.47)	0.187 (0.69)	0.077 (0.39)
Light (kerosene)	-0.670 (1.74)	-0.027 (0.10)	-0.128 (0.69)
Cooking fuel (firewood)	-0.783 (2.73)**	-0.213 (1.22)	-0.056 (0.26)
Cooking fuel (charcoal or firewood and charcoal)	-0.813 (2.98)**	0.309 (1.70)	0.217 (0.94)
Fuel (gas or electricity)	-0.661 (2.41)*	0.326 (1.60)	0.379 (1.61)
Date of interview (year + fraction of calendar year)	0.074 (3.38)**	0.068 (2.54)*	0.099 (5.93)**
Constant	8.326 (7.12)**	6.451 (5.24)**	5.108 (6.04)**
Number of observations	1743	2446	11422
R-squared	0.49	0.57	0.31

Robust t statistics in parentheses

* significant at 5%; ** significant at 1%

Alternative estimates of nonfood price inflation during the period 2004-2007 are obtained using the village price information in Table 61 for 2007 together with the corresponding data for 2004 presented in Knowles (2005, Table 80). However, different values of rental housing are used in this exercise. In 2004, the weighted sample median monthly rental values are used (i.e., 200,000 Riel in Phnom Penh, 40,000 Riel in Other Urban areas, and 20,000 Riel in Rural areas). In 2007, these values are updated based on the estimates of annual rates of inflation obtained from the estimated regressions reported in Table 65 (i.e., 249,714 Riel in Phnom Penh, 49,052 Riel in Other Urban areas, and 26,916 Riel in Rural areas). The resulting temporal price indices for 2007 (with 2004 regional prices=100) are 124.4 for Phnom Penh, 123.8 for Other Urban areas, and 128.1 for Rural areas.

These temporal price indices indicate significantly higher inflation rates than the corresponding indices in row f of Table 64. They also indicate that inflation was more rapid in Rural areas than in either Phnom Penh or Other Urban areas (in contrast to the indices in Table 64, which indicate that inflation was more rapid in Phnom Penh than in the other two regions). However, it is recalled that many village nonfood prices were not reported (especially in 2007) and that non-reporting was highly selective (i.e., more likely in smaller villages without a permanent market and less likely in Other Urban areas).

Annex 3. Household consumption

The purpose of this annex is to describe how the estimates of household consumption used in this report were prepared with data from the 2007 CSES. The objective in preparing the 2007 consumption estimates has been to use the same type of data and estimation methods that were used previously to develop the household consumption estimates with the 2004 CSES (described in Knowles 2005). To a large extent, this objective has been met. The 2007 CSES provides data on household consumption for a total of 4,888 households (3,593 interviewed during calendar year 2007, with the remaining 895 households interviewed during the period October-December 2006).

Estimates of household consumption can be obtained from two distinct sources within the 2007 CSES, i.e., from the monthly diaries of household income, expenditures and consumption that were completed for all households and from “recall” questions about household consumption similar to those used in the 1997, 1999 CSES and 2004 CSES (the 1993/94 SESC consumption data were also recall data, but for a much more detailed set of consumption items).⁸⁰

As with previous CSES rounds, the consumption data use a variety of different reference periods. Accordingly, reference to consumption data “for calendar year 2007” really means consumption data collected from households *interviewed* during calendar year 2007. The reference period of the actual consumption data is relatively close to the interview date in some cases (for example, the data on food, beverage and tobacco consumption, the data on housing, utilities and medical care expenditure as well as the diary data) but can refer back in time 12 months or more before the interview date in other cases (for example, data on education expenditure or expenditure on recreation, personal effects and special occasions). This implies that at least some of the “calendar year 2007” consumption data actually refer in part to calendar year 2006.⁸¹ Consistent with previous practice, no effort is made to treat consumption data that may actually refer to calendar year 2006 differently from consumption data that actually refer to calendar year 2007.

The expenditure data in the 2007 CSES, as in previous CSES rounds, include (at least in principle) all expenditure on consumer durables during the reference period. Prior to the 2004 CSES, no data were collected on consumer durables that would support an estimate of their annual use value. Accordingly, the nonfood allowances and measures of household consumption used in preparing the previous poverty estimates include expenditure on consumer durables during the reference period as part of household consumption instead of an estimated annual use value, as in many other poverty studies.

There are several differences in the recall questions for nonfood expenditure items between the household questionnaire used in the 2004 CSES and those used in the 2007 CSES (as

⁸⁰ As discussed below and in Knowles (2005), recall data were available for most consumption items in the 2004 CSES, but diary data had to be used for a few items.

⁸¹ Some of the data on education expenditure in the 2007 CSES refer to the “past school year.” If interpreted literally, some of the calendar year education expenditure could have been made during calendar year 2005.

well as some differences between the household questionnaire used during the last quarter of 2006 and that used during calendar year 2007). Most importantly, data on expenditure for several items that were previously available only in other questionnaire modules (for example, in the housing, construction, education or health modules) have been added to a new nonfood expenditure module (section 1C).

This new nonfood expenditure module also collects data on three consumption categories for which only diary data were previously available, i.e., expenditure on transportation, communications, and personal care. The newly added items in section 1C include: (1) house rent (house rent, rental value of rent-free housing, rental value of owner-occupied housing, hotel charges, and house maintenance and repair), (2) water charges, (3) fuel and power (kerosene, electricity, LPG etc., but excluding wood fuel), (4) wood fuel (firewood, charcoal), (5) medical care (doctors' fees, other medical services, drugs, hospital charges, other medical supplies, etc.), (6) transportation (personal transport equipment, operation of transport equipment, maintenance and repair of equipment, fees for public transport, moving fee, driving lessons, etc.), (7) communications (postage stamps, fax and telephone charges, cell phones, phone cards, internet charges, etc.), (8) personal care (soap, toothpaste, razor, sanitary napkins, haircut, manicure, etc.), and (9) education (school fees, textbooks, private tutoring charges, etc.). Fortunately, all of these items have been *added* to the questionnaire; they have not replaced the corresponding questions in the 2004 CSES questionnaire. This means that 2007 estimates can be prepared in most cases with the same types of data used in 2004.

A second questionnaire difference between the 2004 and 2007 CSES rounds is that separate questions have been added for some items that were previously included in a broader expenditure category. For example, a separate question on the salaries of domestic servants has been added in section 1C, whereas this item was previously included in the broader category of expenditure on "Furnishings and household equipment and operation." Similarly, a separate question on gambling expenditure has been added in section 1C, whereas this item was previously included in the broader category of expenditure on "Recreation" (although "gambling" was not actually listed among the items included in this category in the 2004 CSES questionnaire).

Thirdly, the reference period for the "Furnishings and household equipment and operation" category was changed from the "last 6 months" in the 2004 CSES to the "last 12 months" in the 2006 and 2007 CSES questionnaires. Fourthly, and probably of no real significance, the expenditure category described in the 2004 CSES questionnaire as "special occasions, as funerals, weddings, parties, rituals, cash gifts, charity, etc." was given the name of "Miscellaneous items" in the 2006 and 2007 CSES questionnaires (with the same items listed).

Lastly, it is noted that there are some differences between the housing module (section 4) that was used during the last quarter of 2006 and that used during calendar year 2007. Fortunately, the difference affects only the numbering of some of the questions.

Table 66 compares the sources of data in the 2007 and 2004 CSES used to prepare the estimates of household consumption that are used in this report as well as the reference period for each source and the assumptions made concerning the number of days in each

reference period (i.e., the conversion factors used to convert the raw consumption data, which refer to different reference periods, to daily estimates). The detailed consumption categories used in the 1993/94 SESC serve as the reference point for defining the various categories of household consumption presented in Table 66. These 1993/94 SESC categories also continue to be used to describe the various CSES recall categories in the 2007 CSES questionnaire (usually in the form of a list of items in parentheses following the name of each broader consumption category).

Table 66. Comparison of the sources of data used to develop estimates of household consumption in the 2007 and 2004 CSES

Consumption category	2007 CSES			2004 CSES		
	Source of information	Reference period	Number of days in reference period (conversion factor)	Source of information	Reference period	Number of days in reference period (conversion factor)
1. Food & beverages	Household questionnaire, section 1B: questions 1-16, 18-20 (excludes tobacco)	Last 7 days	7	Household questionnaire, Section 1D: questions 1-16, 18-20 (excludes tobacco)	Last 7 days	7
2. Clothing & footwear	Household questionnaire, section 1C, question 9	Last 6 months	182.5	Household questionnaire, Section 7B, question 1	Last 6 months	182.5
3. Housing & utilities						
3.1 Housing & house maintenance						
3.1.1 Rent/accommodation						
Actual rent paid	Household questionnaire, section 4, question 25a (2007) or question 27a (2006)	Last month	30.4	Household questionnaire, Section 3, question 28	Last month	30.4
Estimated rent (for households not paying rent)	Household questionnaire, section 8, question 6 for owner-occupied housing, and an imputed value (based on regression analysis) for housing not owned but for which no rent was paid	Month	30.4	Household questionnaire, Section 8, question 6 for owner-occupied housing and an imputed value (based on regression analysis) for housing not owned but for which no rent was paid	Month	30.4
Hotel/accommodation charges	Diary, items 6210, 6211	Calendar month	Number of days in calendar month	Diary, items 9407, 9415	Calendar month	Number of days in calendar month
3.1.2 Housing maintenance & repairs	Household questionnaire, section 4, question 26 (2007) or question 28 (2006)	Last month	30.4	Household questionnaire, Section 3, question 29	Last month	30.4
3.2 Utilities						
3.2.1 Water & sanitation						
Water charges	Household questionnaire, section 4, question 16 (2007) or question 17 (2006)	Last month	30.4	Household questionnaire, Section 3, question 17	Last month	30.4
Sewage & waste water disposal	Household questionnaire, section 4, question 20 (2007) or question 21 (2006)	Last month	30.4	Household questionnaire, Section 3, question 21	Last month	30.4
Garbage collection	Household questionnaire, section 4, question 21 (2007) or question 22 (2006)	Last month	30.4	Household questionnaire, Section 3, question 22	Last month	30.4

Consumption category	2007 CSES			2004 CSES		
	Source of information	Reference period	Number of days in reference period (conversion factor)	Source of information	Reference period	Number of days in reference period (conversion factor)
3.2.2 Fuel/power for cooking & lighting						
3.2.2.1 Non-wood fuels						
Electricity	Household question, section 4, question 23a (2007) or question 24a (2006)	Last month	30.4	Household questionnaire, Section 3, question 24a	Last month	30.4
Gas	Household question, section 4, question 23b (2007) or question 24b (2006)	Last month	30.4	Household questionnaire, Section 3, question 24b	Last month	30.4
Kerosene	Household question, section 4, question 23c (2007) or question 24c (2006)	Last month	30.4	Household questionnaire, Section 3, question 24c	Last month	30.4
Battery	Household question, section 4, question 23f (2007) or question 24f (2006)	Last month	30.4	Household questionnaire, Section 3, question 24f	Last month	30.4
3.2.2.2 Wood fuels						
Firewood	Household question, section 4, question 23d (2007) or question 24d (2006)	Last month	30.4	Household questionnaire, Section 3, question 24d	Last month	30.4
Charcoal	Household question, section 4, question 23e (2007) or question 24e (2006)	Last month	30.4	Household questionnaire, Section 3, question 24e	Last month	30.4
3.2.2.3 Other fuels	Household question, section 4, question 23g (2007) or question 24g (2006)	Last month	30.4	Household questionnaire, Section 3, question 24g	Last month	30.4
4. Household furnishings and household operations				Household questionnaire, Section 7B, question 2	Last 6 months	182.5
Furniture, furnishings and household equipment and operation	Household questionnaire, section 1C, question 10	Last 12 months	365			
Domestic salaries	Household questionnaire, section 1C, question 11	Last 12 months	365			
5. Medical care	Household questionnaire, section 14, question 13 (for all household members reporting illness, injury or other health problem during the past 4 weeks).	Past 4 weeks	28	Household questionnaire, Section 14, question 12 (for all household members reporting illness, injury or other health problem during the past 4 weeks)	Past 4 weeks	28
6. Transportation and communications		Diary, items 5010-5180	Calendar month	Diary, items 7111-8081	Calendar month	Number of days in calendar month
7. Recreation				Household questionnaire, Section 7B, question 3	Last 12 months	365
7.1 Recreation (excluding gambling)	Household questionnaire, section 1C, question 12	Last 12 months	365			
7.2 Gambling	Household questionnaire, section 1C, question 15	Last 12 months	365			

Consumption category	2007 CSES			2004 CSES		
	Source of information	Reference period	Number of days in reference period (conversion factor)	Source of information	Reference period	Number of days in reference period (conversion factor)
8. Education	Household questionnaire, Section 2, questions 15a-15h (total is given in question 15h for each household member aged 5+)	Past school year	365	Household questionnaire, Section 2, questions 14a-14h (total is given in question 14h for each household member aged 5+)	Past school year	365
9. Personal care & personal effects						
9.1 Personal care	Diary, items 6220-6250	Calendar month	Number of days in calendar month	Diary, items 9513-9721, 9805, 9813	Calendar month	Number of days in calendar month
9.2 Personal effects	Household questionnaire, Section 1C, question 14	Last 12 months	365	Household questionnaire, Section 7B, question 4	Last 12 months	365
10. Tobacco	Household questionnaire, Section 1B, question 17	Last 7 days	7	Household questionnaire, Section 1D, question 17	Last 7 days	7
11. Miscellaneous (including special occasions)	Household questionnaire, Section 1C, question 16	Last 12 months	365	Household questionnaire, Section 7B, question 5	Last 12 months	365

Source: 2007 and 2004 CSES Household Questionnaires.

One interesting feature of the 2007 CSES is that recall data on some of the same items of nonfood consumption were collected in different parts of the questionnaire, making it possible to compare the responses. Table 67 lists these items and their different sources of data.

Table 67. Nonfood consumption items for which information is obtained in more than one place in the 2007 CSES household questionnaire

Item	Section 1C	Other source
House rent (includes rental values of rent-free and owner-occupied housing, house maintenance and repair, and hotel accommodation)	Question 1	<i>House rent</i> : section 4 (questions 25a & 25b in 2007 and questions 27a & 27b in 2006) and section 8 (question 6). Estimated rental values are assumed to include the cost of maintenance & minor repairs <i>Hotel accommodation</i> : Diary
Water charges	Question 2	Section 4, question 16 (2007) or question 17 (2006)
Fuel and power (excluding wood fuels)	Question 3	Section 4, questions 23a-c, f, g (2007) or questions 24a-c, f, g (2006)
Wood Fuel (firewood & charcoal)	Question 4	Section 4, questions 23d, e (2007) or questions 24d, e (2006)
Medical care	Question 5	Section 14, question 13
Education	Question 13	Section 2, questions 15a-h

Source: 2007 CSES Household Questionnaire.

Table 68 compares the recall data on household consumption by item and by region (in current Riel per day) from different sections of the household questionnaire as well as

comparing several items for which there were no recall data available in the 2004 CSES to the diary data for these items (i.e., items for which diary data had to be used in calculating household consumption in 2004). For purposes of this comparison (but not when calculating household consumption for use in this report), the “house rent and maintenance” category does not include a separate item for “maintenance and minor repairs,” and the “medical care” category includes all reported expenditure on medical care, not only that reported for individuals who were ill, injured or had another health problem during the past 4 weeks. In both cases, this should make the reported expenditure more comparable to that in section 1C. These data indicate that there is broad consistency between the data from different sources in the case of some items (for example, house rent and maintenance, water charges, fuel and power and wood fuel), a little less consistency in the case of education, and marked inconsistency in the case of medical care, transportation, communication and personal care. The substantial differences in some cases imply that significantly different poverty estimates might be obtained if different sources were used for the data on household consumption.

Table 68. Household consumption by item (current Riel per day), comparing data from Section 1C of the household questionnaire with data from alternative sources, 2007

Item	Source	Region			Cambodia
		Phnom Penh	Other urban	Rural	
House rent (including maintenance and hotel charges)	Section 1C	19,474	4,708	1,340	3,320
House rent (including maintenance and hotel charges)* ^a	Section 4, 8	19,526	4,332	1,363	3,307
Water charges	Section 1C	964	281	67	170
Water charges*	Section 4	963	282	67	170
Fuel & power	Section 1C	4,577	1,318	481	936
Fuel & power*	Section 4	4,118	1,108	399	807
Wood fuel	Section 1C	471	454	141	201
Wood fuel	Section 4	474	450	141	201
Medical care	Section 1C	2,480	1,709	1,452	1,571
Medical care* ^b	Section 14	1,247	874	655	730
Transportation	Section 1C	1,315	1,719	276	512
Transportation*	Diary	3,265	2,860	1,605	1,879
Communications	Section 1C	1,999	780	231	446
Communications*	Diary	676	249	62	136
Education	Section 1C	3,155	978	225	565
Education *	Section 2	3,005	1,234	293	632
Personal care	Section 1C	806	467	249	321
Personal care*	Diary	385	248	127	163

Source: 2007 CSES.

Note: starred items are those used in calculating household consumption in this report.

^a “housing and maintenance” expenditure in this table does not include a separate item for maintenance and minor repairs (see text); however, this item is included when calculating total household consumption for use in this report (to preserve comparability with the 2004 CSES estimates).

^b “medical care” expenditure in this table is not limited to persons reporting illness, injury or other health problem during the past 4 weeks (see text); however, medical care expenditure incurred by persons not reporting illness, injury or other health problem during the past 4 weeks is excluded when calculating total household consumption for use in this report (to preserve comparability with the 2004 CSES estimates).

In the case of this report, the choice between the alternative sources is dictated by the objective stated above of preparing estimates that are as comparable as possible to the estimates prepared for 2004 as described in Knowles (2005), i.e., the starred items in Table 68 are the ones used to prepare the estimates of household consumption used in this report. In most cases, an argument can be made that the starred items are likely to be more reliable either because they are based on more detailed data (e.g., education, health, fuel) or because the data are collected along with other related data in special questionnaire modules (water charges, garbage collection, waste disposal, fuel). Although a detailed analysis of the differences between the alternative sources of consumption data is beyond the scope of this report, some analysis was done to assess the relative reliability of the two alternative sources of recall data on medical care expenditure, as described below.

Table 69 presents the results of regression analysis (unweighted) of the two alternative sources of data on expenditure on medical care. The results in columns 1 and 2 are based on individual-level data on medical care expenditure collected in the special health module (section 14), while the results in columns 3 and 4 are based on household-level data collected in the new nonfood consumption module (section 1C). For the purposes of this comparison, the data on medical care expenditure in columns 1 and 2 include medical care expenditure reported for all household members, even if they were not reported to have been ill, injured or to have had any other health problem during the past 4 weeks.⁸² The regression analysis uses the two-step function that is often used to analyze expenditure on medical care (Cameron and Trivedi 2005). The first step (columns 1 and 3) involves estimating a probit function predicting whether or not a household reported nonzero medical care expenditure during the reference period (i.e., the past 4 weeks in columns 1 and 2 and the past month in columns 3 and 4). The second step (columns 2 and 4) involves estimating a regression function explaining the variation in positive reported medical care expenditure, with the left-side (dependent) variable expressed as a natural log (to transform the highly skewed expenditure variable into one with a distribution that more closely approximates a normal distribution). The explanatory variables are various household-level indicators of disabilities, illness and medical care calculated from the data in the questionnaire's health module.

One would expect both sets of expenditure indicators to be closely (and similarly) associated with the explanatory variables. This appears to be the case for the individual-level data from the health module (columns 1-2), but it appears to be less true for the household-level data collected in section 1C (columns 3-4). One possible explanation for these results is that the data collected in section 1C include expenditure extending beyond the reference period of one month. Another possibility that is also consistent with the data is that households that had some medical expenditure during the past month reported that expenditure but that at least some households that did not have any medical care expenditure during the past month reported the amount that they spend on medical care in an average month rather than reporting zero expenditure. This would explain why the proportion of households reporting nonzero medical care expenditure is considerably higher with the data collected in section 1C than with the data collected in the special health module (the population-weighted

⁸² The estimates of medical care expenditure used in calculating the household consumption estimates used in this report are limited to medical care expenditure of individuals who were reportedly ill, injured or had another health problem during the past 4 weeks because this was the only information that was collected in the 2004 CSES.

proportions are 68% and 42% respectively). The idea that the expenditure reported in section 1C represents a monthly average rather than an actual monthly expenditure (at least for many households) is also consistent with the strongly positive association between the reported level of expenditure and household size in column 4, whereas there is no significant relationship in column 2.

Table 69. Regression analysis of alternative sources of data on household expenditure on medical care, 2007

	Data from health module		Data from Section 1C	
	Whether household reported nonzero expenditure (1)	Natural log of nonzero expenditure (2)	Whether household reported nonzero expenditure (3)	Natural log of nonzero expenditure (4)
Total number of reported disabilities of household members	-0.018 (0.44)	0.101 (1.90)	0.028 (1.77)	-0.035 (0.82)
Number of household members reporting illness, injury or other health problem during the past 4 weeks	0.510 (7.37)**	-0.096 (1.30)	0.110 (3.97)**	-0.024 (0.40)
Number of household members who could not do their usual activities during the past 4 weeks due to illness, injury or other health problem	0.088 (0.72)	0.172 (1.92)	-0.089 (2.00)*	0.005 (0.05)
Number of days of usual activities lost during the past 4 weeks by household members due to illness, injury or other health problem	0.021 (1.46)	0.045 (5.19)**	0.010 (2.29)*	0.025 (1.82)
Number of household members seeking care during the past 4 weeks for any health problem	0.669 (8.76)**	0.353 (5.11)**	0.074 (2.39)*	0.134 (2.00)*
Number of household members hospitalized during the past 4 weeks	-0.195 (1.15)	0.744 (1.88)	0.078 (1.19)	0.287 (0.98)
Number of nights household members were hospitalized during the past 4 weeks	0.063 (1.62)	0.115 (2.98)**	-0.018 (2.49)*	0.029 (0.85)
Household size	-0.002 (0.25)	-0.008 (0.46)	0.006 (1.40)	0.064 (4.01)**
Other urban location ^a	0.050 (0.69)	-0.448 (3.22)**	0.099 (2.07)*	-0.533 (4.18)**
Rural location ^a	-0.009 (0.21)	-0.785 (6.41)**	0.069 (1.80)	-0.754 (7.31)**
Constant		9.767 (71.15)**		6.812 (57.07)**
Number of observations	3,592	1,525	3,592	2,395
R-squared	0.76 ^b	0.24	0.09 ^b	0.07

Robust z statistics in parentheses (adjusted for clustered sampling)

* significant at 5%; ** significant at 1%

^a location in Phnom Penh is the omitted category.

^b pseudo R-squares reported by Stata version 9.2.

Note: The households observations are unweighted.

Although comparable data are available in most cases and have been used to prepare the estimates of household consumption based on the 2007 CSES, there are some differences in the case of nonfood items due to the questionnaire changes discussed above. Firstly, the reference period for expenditure on “Furniture, furnishings, and household equipment and operation” is the “last 12 months” in the 2007 CSES, whereas it was the “last 6 months” in the 2004 CSES. In addition, this same category does not include expenditure on “domestic salaries” in the 2007 CSES (as it did in the 2004 CSES) because a separate question was used

to collect expenditure on “domestic salaries” in section 1C of the 2007 CSES household questionnaire. Similarly, the expenditure category for “recreation” does not include expenditure on “gambling” in the 2007 CSES, as it did in the 2004 CSES (although it was not explicitly listed as an item under the “recreation” category), because a separate question was used to collect expenditure on “gambling” in the 2007 CSES.

Table 70 presents the distribution of estimated household consumption (in current Riel) in calendar year 2007 by commodity category, while Table 71 presents the corresponding distribution for 2004. Daily consumption totals (in current Riel, household-weighted) are given at the bottom of the tables, together with the estimated percentage of total food consumption that is in the form of home-produced food. The data for 2007 in Table 70 show important differences in regional consumption patterns, with the consumption patterns of the Phnom Penh population usually at one extreme and those of the Rural population usually at the other extreme and those of the Other Urban population in-between. A similar pattern was observed in 2004 (Table 71).

Interestingly, the share of food consumption in total household consumption increased between 2004 and 2007, suspending the longer term downwards trend in the food share observed between 1993/94 and 2004 (Knowles 2005) and probably reflecting the more rapid inflation in food prices during this period than in nonfood prices (Annexes 1 and 2).⁸³ Conversely, the share of housing and utilities in total consumption declined in all three regions between 2004 and 2007, as did the shares of medical care and education. The decline in medical care’s share is consistent with the longer-term trend (possibly reflecting more effective preventive health care and increased utilization of more cost-effective curative care), whereas the decline in education’s share reverses a sharp increase that was observed in education’s share between 2004 and 2007. Although many factors may have contributed to the declining shares of medical care and education in total household consumption (for example, increases in public expenditure for education and health), the fact that fertility has been decreasing in recent years has probably also contributed to the observed declines.

⁸³ The proportions of food consumption in total household consumption in Table 70 and Table 71 are not directly comparable with the mean food shares reported in Table 8. The proportions in Table 70 and Table 71 are correctly interpreted as the proportions of total food consumption in total household consumption and are therefore more heavily influenced by the consumption patterns of richer households which account for a disproportionately high share of total household consumption. The average food shares reported in Table 8 are averaged across individual households and are not disproportionately influenced by the shares of richer households. Accordingly, the average shares of food consumption reported in Table 8 are considerably higher than the proportions reported in Table 70 and Table 71 (because the food share tends to be considerably lower in richer households).

Table 70. Distribution (%) of household consumption in current Riel by commodity category, 2007

Category	Region			Cambodia
	Phnom Penh	Other urban	Rural	
Food & beverages	38.2	47.0	58.1	51.4
Cereal products	4.9	9.4	14.9	11.5
Clothing & footwear	2.2	2.2	3.0	2.7
Housing & utilities	37.9	19.4	12.3	19.9
Housing (rent + house maintenance)	29.3	13.9	8.9	14.9
Rent	28.5	12.4	7.7	13.7
House maintenance & repairs	0.6	1.4	1.2	1.1
Utilities	8.6	5.4	3.4	5.0
Household furnishings and household operations	1.6	1.0	0.7	1.0
Medical care	1.8	2.5	3.7	3.0
Transportation & communications	5.8	9.0	9.4	8.4
Transportation	4.8	8.3	9.1	7.8
Communications	1.0	0.7	0.3	0.6
Recreation & entertainment	2.3	4.1	1.3	1.9
Education	4.4	3.6	1.6	2.6
Personal care & effects	1.5	2.9	2.0	2.0
Personal effects	0.9	2.1	1.3	1.3
Personal care	0.6	0.7	0.7	0.7
Tobacco products	0.4	1.7	1.5	1.2
Miscellaneous	3.9	6.7	6.4	5.8
Totals (%)	100.0	100.0	100.0	100.0
Total household consumption per day (current Riel)*	68,048	34,552	17,731	23,959
% home-produced food in total food consumption	0.4	6.9	23.6	17.0

* weighted by households

Table 71. Distribution (%) of household consumption in current Riel by broad expenditure category, 2004

Category	Region			Cambodia
	Phnom Penh	Other Urban	Rural	
Food & beverages	36.2	47.4	58.6	52.2
Cereal products	6.0	10.2	16.6	13.4
Clothing & footwear	2.4	2.6	2.9	2.8
Housing & utilities	38.7	28.0	18.7	24.3
Housing (rent + house maintenance)	30.8	20.7	12.5	17.6
Rent	27.8	16.1	8.3	13.6
House maintenance & repairs	3.0	4.6	4.2	4.0
Utilities	7.9	7.3	6.2	6.7
Household furnishings and household operations	0.6	0.8	0.7	0.6
Medical care	4.8	4.2	5.4	5.1
Transportation & communications	4.2	5.4	3.1	3.7
Recreation & entertainment	1.5	1.1	0.7	1.0
Education	7.0	3.2	1.6	2.9
Personal care & effects	1.0	1.9	1.3	1.3
Personal effects	0.3	0.4	0.2	0.3
Personal care	0.7	1.4	1.1	1.0
Tobacco products	0.7	1.3	1.9	1.5
Miscellaneous	3.0	4.2	5.2	4.6
Totals (%)	100.0	100.0	100.0	100.0
Total household consumption per day (current Riel)*	42,994	22,493	12,674	16,118
% home-produced food in total food consumption	1.3	10.5	25.7	20.1

Source: 2004 CSES.

* weighted by households

Detailed information about the calculation of household consumption for each category is provided below. As a general observation, however, the data in the 2007 CSES are considerably “cleaner” (i.e., free of clearly incorrect values due to data entry errors).

Food and beverage consumption. Data on food consumption during the last 7 days were obtained for 19 items from the “food, beverages and tobacco” module of the household questionnaire (section 1B), which includes separate questions for the value of purchased food, the imputed value of home-produced food (as well as food consumption in the form of wages in kind, gifts, and free collections) and for the total consumption of each food item.⁸⁴ Total household food consumption was calculated as the simple sum of the 19 food categories and converted into a daily per capita value by dividing this sum by the product of 7 and the number of household members.

Clothing and footwear consumption. Data on clothing and footwear consumption during the last 6 months, including “tailored clothes, ready-made clothes, rain clothes, underwear, baby clothes, diapers, hats, shoes, boots, etc.” were obtained from the new “recall non-food expenditures” module (section 1B), with separate questions for the value of consumption of

⁸⁴ Data on tobacco consumption, a nonfood item, were also obtained in this section of the questionnaire (question number 17) for the same 7-day reference period.

purchased items, the imputed value of “in-kind expenditure or gifts given away,” and total “expenditure” (instead of total “consumption”).⁸⁵ It was assumed that households that did not report any clothing and footwear expenditure during the reference period (226 households in the calendar year 2007 sample) had zero consumption of this category. The resulting household consumption figure was converted into a daily per capita value by dividing by the product of 182.5 and the number of household members.

Housing and utilities. This is by far the most complex consumption category. Data on actual rent paid were obtained from the housing section of the household questionnaire (section 4). Only 118 households in the calendar year 2007 sample reported values of rent actually paid (4 households that indicated that their dwelling was rented did not report their actual rent). Most households (91.3%) indicated that they owned their dwellings. In addition, 189 households in the calendar year 2007 sample indicated that their house was not owned but that they paid zero rent, while 5 households reported an “other” ownership status (3 households) or did not respond to the question (2 households). In the construction module (section 8), households reporting owner-occupied housing were asked to estimate the rental value of their dwellings.⁸⁶ Excluding households that reported that their owned dwellings were at least partly rented out (56 households) and 2 households that reported owning two dwellings, 3,289 of the remaining 3,293 households reporting owner-occupied housing reported an estimated rental value (with no zero rental values reported). When combined with the data for 118 households on rent actually paid, a total of 3,407 of the 3,593 households in the calendar year 2007 sample (94.1%) provided data on either rent actually paid or an estimated rental value for owner-occupied housing.

A rental value was imputed for the remaining households based on the estimated regressions reported in Table 72. The left-hand-side (dependent) variable is the natural logarithm of the reported actual or estimated monthly rental value (which has the effect of excluding households reporting rental values of zero from the estimation sample). The right-hand-side (explanatory) variables are the same as those used in Table 59, with the addition of one variable (household size). As was done in 2004, the estimation sample is restricted to households in the calendar year 2007 sample reporting rental values of less than 2 million Riel per month (about \$US500), which has the effect of excluding 50 households from the estimation sample. The household observations are also unweighted, as was done in 2004.

Two alternative model specifications are used, one (in column 1) that includes the dwelling’s living area (in square meters) and another (in column 2) that does not include this variable. This is done for two reasons. Firstly, the living area variable is frequently not reported, so it is useful to have an alternative imputed value for households not reporting living area.

Secondly, the predicted value from the estimated regression with living area included does not “perform” as well (in terms of its correlation with the reported rental value) as the predicted value from the regression without living area included for dwellings with large

⁸⁵ Similar wording was used in the questionnaires of previous CSES rounds (as well as in the 1993/94 SESC), the data should at least be consistent in this regard.

⁸⁶ Households were also asked to estimate the rental value of their housing in the housing module in a question that was added to the 2004 CSES housing module. However, this information was not used in calculating the household consumption variable used in this report because the objective was to use the same type of data and methods used in 2004.

living areas (possibly due to non-sampling errors, but also because large dwellings have unusual characteristics). Accordingly, the retransformed predicted value from the estimated regression in column 1 is used for households reporting living areas of less than 500 square meters (which is a very large dwelling). The retransformed predicted value from the regression in column 2 is used for households reporting living areas of 500 meters or larger and for households not reporting living area.

Table 72. Hedonic regression used to impute a rental value in the case of residences not owned but for which zero rent is paid, 2007

	Natural logarithm of reported actual rent or estimated rental value	
	(1)	(2)
Number of rooms	0.176 (5.21)**	0.247 (10.17)**
Living area (sq. meters)	0.004 (3.13)**	
Owner occupied	0.042 (0.56)	0.076 (0.97)
Roof (thatched)	-0.275 (0.98)	-0.265 (1.06)
Roof (tiled)	0.028 (0.10)	0.127 (0.53)
Roof (galvanized iron or aluminum)	-0.137 (0.52)	-0.107 (0.46)
Roof (concrete or fibrous cement)	-0.000 (0.00)	0.047 (0.20)
Wall (bamboo)	-0.177 (1.88)	-0.181 (1.89)
Wall (wood, plywood or log)	0.020 (0.22)	0.032 (0.36)
Wall (concrete or fibrous cement)	0.305 (2.89)**	0.329 (3.07)**
Floor (earth or clay)	-0.433 (2.55)*	-0.427 (2.55)*
Floor (wood or bamboo)	-0.164 (1.13)	-0.150 (1.05)
Floor (cement)	-0.117 (0.80)	-0.083 (0.58)
Floor (parquet or polished wood)	0.026 (0.17)	0.050 (0.32)
Floor (ceramic tiles)	0.169 (1.25)	0.227 (1.70)
Water (piped or public tap)	0.028 (0.22)	0.079 (0.61)
Water (tube or piped well)	-0.030 (0.35)	-0.036 (0.42)
Water (protected or unprotected dug well)	-0.122 (1.40)	-0.128 (1.46)
Water (purchased)	-0.166 (1.55)	-0.156 (1.44)
Toilet (water sealed, connected to sewage or septic tank)	0.047	0.074

	Natural logarithm of reported actual rent or estimated rental value	
	(1)	(2)
	(0.25)	(0.38)
Toilet (closed or open pit)	-0.085 (0.41)	-0.063 (0.30)
Toilet (open land or none)	-0.285 (1.50)	-0.277 (1.44)
Light (city power, generator or battery)	0.152 (0.67)	0.124 (0.54)
Light (kerosene)	-0.024 (0.11)	-0.058 (0.26)
Fuel (firewood)	-0.022 (0.19)	0.021 (0.19)
Fuel (charcoal or firewood and charcoal)	0.355 (3.03)**	0.399 (3.38)**
Fuel (gas or electricity)	0.459 (3.70)**	0.548 (4.46)**
Time (fraction of calendar year)	0.154 (1.40)	0.155 (1.40)
Other urban location	-0.525 (4.32)**	-0.463 (3.87)**
Rural location	-0.795 (5.77)**	-0.727 (5.36)**
Household size	0.033 (3.99)**	0.039 (4.57)**
Constant	3.605 (0.69)	3.420 (0.65)
Number of observations	3,340	3,382
R-squared	0.67	0.66

Source: 2007 CSES (calendar year 2007 sample).

* indicates statistical significance at the 0.05 level (the estimated standard errors have been adjusted for the effects of clustered sampling).

Retransformation from the predicted log value to the original metric is achieved simply by taking the exponential of the predicted log value (i.e., which is a consistent estimator of the conditional median, but a biased estimator of the conditional mean). Alternative methods, such as the “smearing” technique proposed by Duan,⁸⁷ are preferable, but the simple exponential retransformation is used here because it was the technique used previously by Knowles (2005). The bias in the imputed mean values is evident in Table 73, which compares the means and medians of the imputed rental values to the means and medians of the reported values. Downward bias is also evident in the variance of the imputed values in Figure 21, which compares the kernel density of the imputed values to the kernel density of the reported values. The saving grace is that the imputed value of house rental is used for relatively few households (i.e., less than 200 of the 3,593 households in the 2007 calendar year sample).

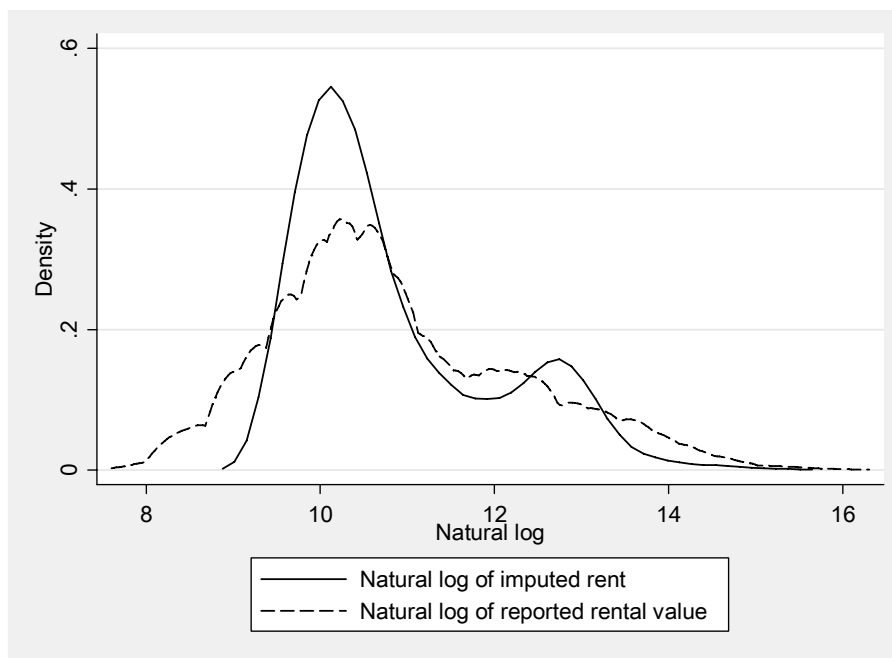
⁸⁷ However, as Mullahy (1998) and Manning and Mullahy (2001) have point out, the “smearing” loses its consistency when heteroskedasticity is present, as is likely to be the case here. When heteroskedasticity is present, consistent retransformation becomes a nontrivial exercise.

Table 73. Comparison of the means and medians of reported and imputed housing rental values (Riel per month) by region, 2007

Region	Means		Medians	
	Reported rental values	Imputed rental values	Reported rental values	Imputed rental values
Phnom Penh	626,645	424,250	320,000	328,757
Other urban	134,774	81,313	50,000	54,007
Rural	48,261	34,194	30,000	25,158
Cambodia	182,538	121,861	40,000	34,532

Source: 2007 CSES.

Figure 21. Kernel densities of imputed and reported rental values of owner-occupied housing, 2007



Source: 2007 CSES.

The rental component of housing consumption is completed by adding in an estimate of the value of household expenditure on hotel and other forms of accommodation other than rented and owner-occupied housing.⁸⁸ Data on this item are obtained from the diary. Thirty-one households reported a nonzero value for this item, and there were no apparent irregularities in the reported values. The value of this item in the remaining households was assumed to be equal to zero. Because the estimated value of this item was based on diary data, its value was divided by the product of the actual number of days in the calendar month in which the diary data were collected and the number of household members before being added to the previously calculated rental value variable.

⁸⁸ This is one of the four components of the housing “rent” category as defined in the 1993/94 SESC.

In addition to rent, the housing consumption category includes expenditure on housing maintenance and minor repairs, data on which were obtained for the last month from the housing section of the household questionnaire (section 4). In the calendar year 2007 sample, 129 households reported nonzero values of expenditure on house maintenance and repair during the last month, 3,451 households reported zero expenditure and 13 households did not report their expenditure. The unreported values were assumed to be zero.⁸⁹ In addition, one reported expenditure of 40 million Riel (about \$10,000) was recoded to zero because it was considered to be too large an expenditure to be classified as maintenance or minor repairs (as opposed to a construction expenditure that should have been reported in section 8).⁹⁰ This item was divided by the product of 30.4 and the number of household members before being added to rent to obtain the per capita daily value of housing consumption.

The last step in the process of estimating housing and utilities consumption involves the estimation of utilities consumption, data on which were collected for the last month in the housing section of the household questionnaire (section 4). The separate items recorded include water charges, charges for sewage collection and disposal, and garbage collection charges (3 items) and consumption of fuel and power (5 items, i.e., expenditure on electricity, LPG, kerosene, batteries, and other energy) and wood fuel (2 items, i.e., expenditure on wood and charcoal). Unreported values of these items were recoded to zero. Their sum was divided by the product of 30.4 and the number of household members before being added to the estimate of per capita daily housing consumption (including expenditure on maintenance and minor repairs) to obtain a per capita daily estimate of housing and utilities consumption.

Including expenditure on maintenance and minor repairs in the estimate of household consumption of housing and utilities is probably incorrect. However, it has been done in the previous poverty estimates because it was included in household consumption in the initial 1993/94 poverty estimates (Prescott and Pradhan 1997), and it is done here in order to obtain estimates of household consumption that are consistent with the 2004 estimates. However, it may be reasonable to assume that most of the cost of housing maintenance and minor repairs is included in household rent, regardless of whether it is actual rent paid or an estimated rental value. Although some expenditure on maintenance and repair may be made by renters, it is presumably quite small. For example, in the calendar year 2007 data, only one of the 122 households paying rent for their dwelling reported nonzero expenditure on housing maintenance and minor repairs.

Household furnishings and household operations. Data on the consumption of “furnishings and household equipment and operation (curtain, household appliances, cooking utensils, servant’s salary, etc.” were collected in the new nonfood expenditure module (section 1C) for a reference period of “the last 12 months” (not “the last 6 months,” as in 2004). Most

⁸⁹ The practice of recoding unreported consumption and expenditure responses to zero has been adhered to in all of the previous poverty estimates. Prior to the 1997 CSES, unreported values were recoded to zero before the data were released (for example, there are no non-responses in either the 1993/94 or 1996 SESC). It is also likely that some undocumented imputation was also done prior to the release of these data sets (as well as in the 1999 CSES). However, there are no imputed values in either the 1997 or 2004 CSES.

⁹⁰ The next largest reported expenditure was 4.92 million Riel (about \$1,230).

households reported consumption of this category (2,782 of 3,593 households in the calendar year 2007 sample). As previously mentioned, this category does not include expenditure on domestic salaries, household expenditure on which was obtained in a separate question (with 85 households reported such expenditure). After assigning a zero value for this item to households that did not report any consumption in both categories, these two items were summed and converted into a daily per capita value by dividing by the product of 365 days and the number of household members.

Medical care. The data on medical care expenditure during the past 4 weeks were obtained from one question in the health module (section 14) of the household questionnaire. The question asks how much in total was spent on medical care during the past 4 weeks. The question was asked for every household member, not only for those who reported an illness, injury or other health problem during the past 4 weeks (as in the 2004 CSES). However, to maintain comparability with the 2004 estimates of household consumption, medical care expenditure was limited to those who were reported ill, injured or who had another health problem during the past 4 weeks (16.2% of individuals). The data on medical care spending are therefore “conditional” on reported morbidity and under-estimate the actual level of household spending on medical care (they do not include, for example, spending on preventive care or on chronic conditions that were being adequately controlled). In calculating total household expenditure on medical care it was assumed that medical expenditure was zero for individuals not reporting any expenditure on medical care during the past 4 weeks (as well as for individuals not reported ill, injured and who did not have another health problem during the same period). The individual expenditures were summed over all household members and divided by the product of 28 (the number of days in the 4-week reference period) and the number of household members to obtain an estimate of per capita daily expenditure on medical care.

Transportation & communications. Consistent with the methods used to calculate household consumption in 2004, the diary data on the consumption of transportation and communications services were used instead of the recall data obtained in the new nonfood expenditure module (section 1C). This consumption category includes all expenditure during the reference period on transportation equipment, including purchases of cars and motorbikes. The relevant diary entries (2,012 for transportation and 558 for communication—values for other households were assumed to be zero) were summed by household and divided by the product of the actual number of days in the calendar month in which the diary data were collected and the number of household members to obtain an estimate of per capita daily consumption of transportation and communications services.

Recreation. Data on the consumption of “recreation (entertainment services, recreational goods and supplies, tourist travel)” during the last 12 months were collected in the new nonfood expenditure module (section 1C). Slightly less than one-half (46.3%) of households in the calendar year 2007 sample reported expenditure on this category, which does not include expenditure on “gambling” in the 2007 CSES. Only 271 households (7.5%) reported expenditure on gambling. These two items were summed, with households not reporting expenditure on either item assigned a value of zero. The resulting sum was converted into a daily per capita value by dividing it by the product of 365 days and the number of household members.

Education. Data on household spending on education during the “past school year” were collected in the Education section of the household questionnaire (Section 2) for all household members age 5+ who are *currently* “in the school system,” “taking private lessons after school,” or “attending nonformal classes.” Data on education expenditure were only obtained for individuals that met these criteria, so that the reported expenditure probably understates actual household expenditure on education (it would not include, for example, expenditure on pre-school or expenditure for those who completed their schooling during the past school year).⁹¹ Although expenditure data were collected for several items of education expenditure (i.e., school fees, tuition, textbooks, other school supplies, allowances for children attending school away from home, transportation expenses and gifts), only the reported total expenditure variable was used (in fact, there were no cases when the total expenditure variable did not equal the sum of the individual expense items after unreported items were recoded to zero). The individual totals were summed over the individuals in each household (after assigning a value of zero to household members for whom education expenses were reported during the past school year) and divided by the product of 365 days and the number of household members to obtain an average per capita daily expenditure on education.

Personal care and effects. Consistent with the methods used to calculate household consumption in 2004, the diary data were used to obtain an estimate of expenditure on personal care, while recall data collected in the nonfood expenditure module (1C) were used to obtain an estimate of expenditure on personal effects. The relevant diary entries were summed by household and divided by the product of the actual number of days in the calendar month in which the diary data were collected and the number of household members in order to convert them into estimates of daily per capita consumption of personal care. A value of zero was assigned for this item to households that did not report any personal care consumption in the diary (890 households). Only 979 of 3,593 households (27.2%) in the calendar year 2007 sample reported nonzero expenditure on “personal effects (costume/gold jewelry, handbags, wallets, wristwatch, clocks, umbrellas)” during the last 12 months in the nonfood expenditure module (section 1C). A value of zero was assigned to the non-reporting households, and the resulting value was divided by the product of 365 days and household size to obtain an estimate of per capita daily consumption of personal effects. This was added to the corresponding estimate for personal care to obtain an estimate of per capita daily expenditure on personal care and personal effects.

Tobacco. Data on the value of tobacco consumption during the past 7 days were collected in the food consumption section of the household questionnaire (section 1B). After recoding the reported value to zero for households not reporting any expenditure on tobacco products during the past 7 days (53.7% of households in the calendar year 2007 sample), the resulting value was divided by the product of 7 days and the number of household members to obtain an estimate of per capita daily consumption of tobacco products.

⁹¹ It is surprising, therefore, that the household-level question on education expenditure “during the last 12 months” in section 1C (although using a different reference period), which presumably was interpreted to apply to all household members, yielded responses that are consistently lower than those yielded by the sum of the individual-level data (refer back to Table 68).

Miscellaneous. Data on household “consumption” in connection with “special occasions, as funerals, weddings, parties, rituals, cash gifts, charity etc” during the last 12 months were collected in the new nonfood expenditure module (section 1C). Although some of these items are clearly not part of household consumption as it is usually defined, the inclusion of these items is consistent with the definition of household consumption in the baseline 1993/94 poverty estimates (Prescott & Pradhan 1998) as well as with the subsequent poverty estimates prepared for 1997, 1999 and 2004 (MOP 1998, MOP 2000, Knowles 2005). After assigning a zero value to households not reporting any consumption of this item (only 1.1% of households in the calendar year 2007 sample) the responses were divided by the product of 365 days and household size to obtain an estimate of per capita daily “consumption” of miscellaneous items.

Annex 4. Additional poverty estimates

This annex presents and discusses alternative poverty estimates prepared using different samples or alternative methods. These additional poverty estimates include:

- 2007 poverty estimates for households in villages included in the 1993/94 sampling frame (for comparability with previously obtained 1993/94 estimates) and 2004 poverty estimates prepared for households *in the same villages* as those in the 2007 CSES sample
- Poverty estimates using an algorithm suggested by Paul Glewwe to impute missing village prices
- Poverty estimates treating poverty lines as random variables instead of fixed in repeated sampling (because the poverty lines depend partially on the village prices)
- Estimates of changes in the poverty headcount index between 2004 and 2007 from the panel of villages included in both calendar year 2004 and 2007 samples

Poverty estimates for additional samples

Table 74 presents comparable 2007 estimates of the poverty headcount index for 1993/94, 2004 and 2007. These estimates are directly comparable because they are based on random samples of the villages included in the sampling frame of the 1993/94 Socio-Economic Survey of Cambodia (SESC).⁹² They indicate that the poverty headcount index, which decreased in Cambodia as a whole as well as in all regions between 1993/94 and 2004, continued to decrease between 2004 and 2007 in Cambodia as a whole and in all regions except the Other Urban region (relative to the poverty line). For Cambodia as a whole, the poverty headcount index is estimated to have decreased from 39.0% in 1993/94 to 28.0% in 2004 and to 24.7% in 2007 (compared to the 2007 national poverty estimate of 30.1%). However, most of the estimated standard errors are larger for the 2007 estimates in Table 74 than for the corresponding estimates in Table 11 because the 2007 sample in Table 74 is limited to villages included in the 1993/94 SESC sampling frame, i.e., 2,475 (69%) of the 3,593 households in the full 2007 CSES sample.

⁹² As discussed in Knowles (2005), the 1993/94 SESC sampling frame included only 56% of the country's rural villages (and 65% of rural households) because, at the time, the remaining villages were either controlled by the Khmer Rouge or were considered too insecure to be surveyed.

Table 74. 2007 Poverty estimates for villages in the 1993/94 SESC sampling frame

Region	1993/94 SESC (full sample)	2004 CSES (villages in the 1993/94 SESC sampling frame)	2007 CSES (villages in the 1993/94 SESC sampling frame)
Food poverty line			
Phnom Penh	6.19 (1.78)	2.55 (0.78)	0.11 (0.11)
Other urban	19.63 (2.42)	12.50 (1.97)	12.02 (3.72)
Rural	21.95 (1.58)	16.66 (0.97)	16.25 (1.63)
Cambodia	20.00 (1.29)	14.18 (0.80)	13.12 (1.27)
Poverty line			
Phnom Penh	11.39 (2.11)	4.60 (0.99)	0.83 (0.52)
Other urban	36.62 (3.09)	20.54 (2.61)	21.75 (6.21)
Rural	43.12 (1.90)	33.66 (1.36)	30.57 (2.25)
Cambodia	39.00 (1.57)	27.97 (1.17)	24.67 (1.83)
N	5,578	7,596	2,475

Source: columns 1-2 (Table 15, Knowles 2005), column 3 (2007 CSES).

Table 75 presents additional 2004 estimates of the poverty headcount index for households in the *same villages* as those included in the 2007 CSES sample, i.e., for the panel of villages included in both the 2004 and 2007 CSES.⁹³ Like the estimates for villages in the 2007 CSES sampling frame in Table 11 (column 2), these estimates indicate that the poverty headcount index decreased both in Cambodia as a whole as well as in all regions between 2004 and 2007. The estimates for 2004 in Table 75 are similar to, but higher in most cases than, the corresponding estimates in Table 11. The exception is the estimated headcount index for Cambodia as a whole relative to the poverty line, which is lower in Table 75 (34.01) than in Table 11 (34.78), even though all of the corresponding regional estimates are *higher* in Table 75 than in Table 11. The reason for this counterintuitive result is that the sampling weights are different between these two sub-samples, with the villages included in the 2007 CSES sampling frame (Table 11) having a substantially lower percentage of the population in urban areas (18.3%) than the villages actually included in the 2007 CSES sample (21.6%). On a region by region basis, the estimates in Table 75 suggest that the poverty decrease between 2004 and 2007 was greater in the panel of villages than in the two comparable cross sections for which estimates are presented in Table 11. The statistical significance of the panel estimates is explored below.

⁹³ Although the villages in the 2007 CSES sample are a 50% sample of the villages included in the 2004 CSES sample, the sample households were selected randomly in each year (i.e., there is a panel of villages, but not a panel of households).

Table 75. 2004 poverty estimates for villages included in the 2007 CSES sample

Region	2004 CSES (villages in the 2007 CSES sample)	2007 CSES (all sample villages)
Food poverty line		
Phnom Penh	2.86 (0.98)	0.11 (0.11)
Other urban	15.40 (2.44)	12.73 (3.06)
Rural	23.46 (1.59)	20.78 (1.79)
Cambodia	19.97 (1.28)	17.98 (1.49)
Poverty line		
Phnom Penh	5.10 (1.26)	0.83 (0.52)
Other urban	28.15 (3.56)	21.85 (5.05)
Rural	39.71 (1.81)	34.70 (2.07)
Cambodia	34.01 (1.48)	30.14 (1.77)
N	5,997	3,593

Source: column 3 (2007 CSES), column 2 (Table 11).

Imputing missing village prices

As discussed in the main report and in more detail in Annexes 1 and 2, many villages did not report even one price for many food and (especially) nonfood items. In a review of the report's first draft, Paul Glewwe observed that "the method of obtaining the regional food price deflators [is] a little worrying because of the problem of so many missing food prices." He suggested that it would be preferable to impute a price for villages not reporting any price for a given food or nonfood item. With each village in a given region as the unit of observation, Glewwe suggested estimating a regression with the observed prices of each item as the left-side variable and the prices of all the other items and a set of dummy variables as right-side variables. The dummy variables are used to correct for bias when there is no price reported for a given village. In villages where a given price is not reported, the price would be set to the village mean in the same region (based on the villages that report that price) and the dummy would be set equal to one (or to zero if the price is reported). The estimated regressions could then be used to impute a value for villages not reporting a given price (with the dummies set equal to zero), in effect imputing a value for the missing price on the basis of the prices of other items reported for that village.

Column 2 of Table 76 presents the results of implementing Glewwe's suggested procedure on the estimated poverty lines (column 1 presents for comparison the corresponding estimates used in the main body of the report, from Table 3 and Table 5). The only departure from Glewwe's suggested procedure is that missing prices are assigned the sample *median* value instead of the sample *mean* value (in order to minimize the effect of any outliers,

as discussed in Annexes 1 and 2).⁹⁴ The results indicate that using Glewwe's suggested procedure results in very similar poverty lines in all regions. However, there are considerably larger offsetting differences in the food poverty lines and nonfood allowances in Rural areas.

Table 76. Revised poverty lines based on imputed village prices compared to estimates without imputation, 2007

Region	Estimates without imputation (1)	Estimates with imputation (Glewwe) (2)	Percentage difference (3=100*(2-1)/1) (3)
Food poverty lines			
Phnom Penh	2,445	2,445	0.0
Other urban	2,274	2,286	+0.5
Rural	1,965	2,025	+3.1
Nonfood allowances			
Phnom Penh	647	647	0.0
Other urban	430	430	0.0
Rural	402	328	-18.4
Poverty lines			
Phnom Penh	3,092	3,092	0.0
Other urban	2,704	2,716	+0.4
Rural	2,367	2,353	+0.6

Source: column 2 (Table 3 and Table 5), column 3 (see text).

Table 77 presents estimates of the poverty headcount index using revised poverty lines based on Glewwe's suggested procedure (column 2), comparing them to estimates based on the poverty lines without imputation reported in column 1 of Table 76. The main differences occur with respect to the poverty headcount index relative to the food poverty line, where the estimates obtained using Glewwe's suggested procedure are higher than the estimates reported in Table 11 in Cambodia as a whole as well as in all regions except Phnom Penh.

⁹⁴ Another departure is that the procedure is also implemented in Phnom Penh in order to obtain estimates for the base (since the spatial price indices have current Phnom Penh prices as a base).

Table 77. Revised poverty headcount estimates based on imputed village prices compared to standard estimates (without imputation), 2007

Region	Estimates without imputation	Estimates with imputation (Glewwe)
Food poverty line		
Phnom Penh	0.11 (0.11)	0.11 (0.11)
Other urban	12.73 (3.06)	13.72 (3.57)
Rural	20.78 (1.79)	22.64 (1.87)
Cambodia	17.98 (1.49)	19.56 (1.56)
Poverty line		
Phnom Penh	0.83 (0.52)	0.83 (0.52)
Other urban	21.85 (5.05)	22.13 (5.10)
Rural	34.70 (2.07)	33.96 (2.08)
Cambodia	30.14 (1.77)	29.58 (1.78)

Source: column 2 (Table 11), column 3 (see text).

It is difficult to conclude which procedure to prefer. The procedure used to obtain the estimates reported in Table 3 and Table 5 is obviously flawed because it relies on prices reported by only a few villages in the case of some items and given evidence presented in the report that village price non-reporting is highly selective, rather than random. However, Glewwe's proposed procedure also confronts problems. There are many instances (particularly in Phnom Penh and in the Other Urban areas, as indicated in Table 49 and Table 57) where the number of villages reporting the price of an item is far less than the number of other prices and dummy variables included in the regression's right-hand side.⁹⁵

Treating poverty lines as random variables

All of the poverty estimates presented thus far assume that the poverty lines are fixed in repeated sampling, i.e., that the poverty lines themselves are not random variables. However, this is not the case in Cambodia because the poverty lines are based in part on the village prices that are collected in the CSES. If another sample were drawn, different village prices would be observed and this would in general lead to different poverty lines and to different poverty estimates. It is possible to use the technique of bootstrapping (repeatedly drawing random samples of PSUs with replacement) to obtain a large number of alternative poverty estimates (for example, 100 or more), each corresponding to a different set of village prices,

⁹⁵ A simplified imputation procedure using a single right-side variable (i.e., the first principal component of the other prices after recoding missing values to the sample median) results in the following alternative estimates for the Other Urban and Rural regions (the Phnom Penh estimates are of course the same because they are based on the Phnom Penh CPI, not the village prices): Other Urban areas (food poverty line=2,087, nonfood allowance=401), Rural areas (food poverty line=1,841, nonfood allowance=401). These estimates are considerably lower than those reported in Table 76 and would therefore result in considerably lower poverty estimates.

poverty lines and values of per capita household consumption. The standard deviation of these alternative poverty estimates provides a consistent estimate of their standard errors.

One problem in implementing this procedure with the 2007 CSES is that some of the random samples of PSUs do not provide even a single price observation for some items (particularly nonfood items). This problem is avoided by setting missing village prices to their regional median values prior to re-sampling (i.e., prior to drawing successive random samples of PSUs).

Table 78 (column 2) compares bootstrapped poverty lines based on 100 repetitions to the standard fixed poverty lines (column 1). The standard deviations of the random poverty lines are reported in parentheses in column 2 (the standard deviations of the fixed poverty lines are zero by definition). The poverty lines for Phnom Penh are fixed in both columns 1 and 2 because they are based exclusively on the Phnom Penh CPI. However, the bootstrapped poverty lines for the other two regions exhibit considerable variability. For example, the 100 bootstrapped poverty lines for the Rural region range from 2,270 to 2,514 (with a mean of 2,375).

Table 78. Bootstrapped poverty lines (100 repetitions) compared to standard fixed poverty lines, 2007

Region	Standard fixed poverty lines	Bootstrapped poverty lines (standard deviations)
	(1)	(2)
Food poverty lines		
Phnom Penh	2,445	2,445 (0)
Other urban	2,274	2,266 (131)
Rural	1,965	1,972 (51)
Nonfood allowances		
Phnom Penh	647	647 (0)
Other urban	430	421 (21)
Rural	402	403 (20)
Poverty lines		
Phnom Penh	3,092	3,092 (0)
Other urban	2,704	2,687 (143)
Rural	2,367	2,375 (55)

Source: column 2 (Table 3 and Table 5), column 3 (see text).

Table 79 presents bootstrapped estimates of the poverty headcount index (column 2) and compares them to the estimates obtained using fixed poverty lines (column 1). The estimated standard errors are reported beneath each set of estimates. The main interest is in the estimated standard errors and how they differ between the standard (analytical) estimates and the bootstrapped estimates. However, the bootstrapped poverty estimates are also reported without bias correction in column 2 for comparison.⁹⁶ The results indicate that the bootstrapped standard errors, as expected, are generally larger than the estimated standard errors obtained using fixed poverty lines. For example, the bootstrapped standard error for the poverty headcount index relative to the poverty line for Cambodia as a whole is 2.41, compared to 1.77 with fixed poverty lines. Surprisingly, however, the bootstrapped standard errors for Other Urban areas are smaller than the estimates obtained with fixed poverty lines.

Table 79. Revised estimates of poverty headcount index (assuming random poverty lines) compared to standard estimates (fixed poverty lines), 2007

Region	Standard poverty estimates based on fixed poverty lines (estimated standard errors)	Bootstrapped poverty estimates without bias correction (bootstrapped standard errors)
Food poverty line		
Phnom Penh	0.11 (0.11)	0.10 (0.12)
Other urban	12.73 (3.06)	13.82 (3.06)
Rural	20.78 (1.79)	21.09 (2.39)
Cambodia	17.98 (1.49)	18.34 (2.00)
Poverty line		
Phnom Penh	0.83 (0.52)	0.80 (0.54)
Other urban	21.85 (5.05)	21.93 (4.53)
Rural	34.70 (2.07)	34.79 (2.86)
Cambodia	30.14 (1.77)	30.23 (2.41)

Source: column 2 (Table 11), column 3 (see text).

Panel estimates of changes in poverty between 2004 and 2007

The 360 primary sampling units (PSU) in the calendar year 2007 CSES sample are a 50% subsample of the PSUs in the larger calendar year 2004 CSES sample. Although the sample households in each PSU were randomly sampled in each year, 2007 CSES sample provides panel data at the PSU (village) level for both 2004 and 2007. This feature of the sample

⁹⁶ Bootstrapped estimates of sample means or proportions are usually corrected for bias due to sampling variation, but in this case the actual bootstrapped poverty estimates based on 100 repetitions are reported.

design was not exploited in developing the estimates reported in Table 11. However, it is taken into consideration here to assess whether the estimated changes in the poverty headcount index between 2004 and 2007 are statistically significant.

Table 80 reports both cross-section and panel estimates for the 360 PSUs (villages) that are included in both the 2004 and 2007 CSES. Columns 1-2 present cross-section estimates of the poverty headcount index from the 2004 CSES. Column 1 presents 2004 estimates from the 360 villages actually included in the 2007 CSES sample (from Table 75), while column 2 presents 2004 for the same 360 villages, but using the 2007 sampling weights. Column 3 presents 2007 estimates from the full 2007 CSES sample (from Table 11, column 3). The estimates in column 4 and 5 are panel estimates of the mean *change* in the poverty headcount index between 2004 and 2007 in the 360 sample villages included in both surveys. The estimates reported in column 4 are population-weighted sample means of the poverty headcount index in the sample villages. The estimated standard errors (in parentheses) in column 4 are obtained using the standard formula for calculating the estimated standard error of a sample mean. They indicate that the change between 2004 and 2007 in the poverty headcount index relative to the poverty line is statistically significant at the 0.05 level for Cambodia as a whole and for Rural areas as well as for Rural areas relative to the food poverty line. In addition, the estimate relative to the food poverty line is statistically significant at the 0.10 level for Rural areas.

Column 5 presents bootstrapped estimates of the change in the poverty headcount index obtained by repeated random sampling of the PSUs (100 repetitions). For each of the 100 samples, the population-weighted sample mean change in the poverty headcount index is calculated. The estimates reported in column 5 are sample means of the 100 population-weighted sample means. The estimated standard errors (in parentheses) are the standard deviations of the 100 population-weighted sample means. The estimates in column 5 indicate that the change between 2004 and 2007 in the poverty headcount index relative to the poverty line is statistically significant at the 0.05 level in Cambodia as a whole and in Rural areas, while the change in the poverty headcount index relative to the food poverty line is statistically significant at the 0.10 level for Cambodia as a whole and in Phnom Penh.

Table 80. Panel estimates of the change in the poverty headcount index between 2004 and 2007 compared to the standard cross-section estimates (estimated standard errors)

Region	Standard cross-section estimates			Panel estimates (change 2004-2007)	
	2004		2007	First differences in the village means	Bootstrapped estimates (without bias adjustment)
	Villages in the 2007 CSES sample (2004 sampling weights)	Villages in the 2007 CSES sample (2007 sampling weights)	Villages in the 2007 CSES sample (2007 sampling weights)		
Food poverty lines					
Phnom Penh	2.86 (0.98)	0.58 (0.33)	0.11 (0.11)	-0.47 (0.33)	-0.47 (0.24)
Other urban	15.40 (2.44)	15.91 (2.95)	12.73 (3.06)	-3.18 (2.66)	-3.43 (3.79)
Rural	23.46 (1.59)	24.15 (1.59)	20.78 (1.79)	-3.36 (1.84)	-3.53 (2.24)
Cambodia	19.97 (1.28)	21.05 (1.24)	17.98 (1.49)	-3.07 (1.35)*	-3.22 (1.84)
Poverty line					
Phnom Penh	5.10 (1.26)	1.45 (0.53)	0.83 (0.52)	-0.61 (0.64)	-0.68 (0.76)
Other urban	28.15 (3.56)	25.89 (3.75)	21.85 (5.05)	-4.05 (3.40)	-4.03 (4.73)
Rural	39.71 (1.81)	39.81 (1.82)	34.70 (2.07)	-5.11 (2.06)*	-5.32 (2.51)*
Cambodia	34.01 (1.48)	34.72 (1.51)	30.14 (1.77)	-4.57 (1.53)*	-4.72 (2.06)*
N	5,997	5,997	3,593	360	360

Source: column 1 (Table 11), column 2 (Table 75), column 3 (see text), column 4 (Table 11), columns 5-6 (see text).

* indicates statistical significance at the 0.05 level.