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I. Introduction

Recent years have witnessed a growing interest in the assessment of economic status of households and the identification of the relatively poor in demographic/reproductive health research. This has largely emanated from an increasing emphasis on the powerful association of economic status (and of poverty) with demographic/reproductive health behavior and the increasing recognition of the need for formulating pro-poor development strategies to eliminate inequalities/disparities, especially in the context of sustainable development (United Nations, 1994). Paralleling this process has been the conceptualization of poverty as a multidimensional phenomenon, encompassing economic status as well as cultural, political, and ideological dimensions, the media within which poverty is rooted and reproduced. Although poverty is now embedded in a wider context and not merely as the lack of capacity to meet basic needs, the economic status of households is still a desirable analytical tool in research, at least as a variable that can be used in conjunction with other poverty-related attributes.

However, the measurement of economic status and wealth and the identification of the relatively poor remain as major challenges in demographic/reproductive health research. Concurrence is absent on robust and powerful indicators of economic status that can be constructed with data collected in sample surveys. Typically, in both descriptive and analytical studies that use survey data, demographic/reproductive health behavior is associated with such characteristics as the education of women (and men, but more often with that of women), urban-rural residence, occupation, ethnicity, religion and other socio-cultural or socio-economic variables. Multivariate analysis/predictive models often lack independent variables that signify the economic status of households, or at best, tend to use proxy indicators. This is particularly true for research in developing countries, where the sole information sources for analyzing the determinants of demographic/reproductive health behavior are

cross-sectional, single-round demographic and reproductive health surveys, such as the Demographic and Health Surveys (DHS) and the Reproductive Health Surveys (RHS), which, in turn, do not provide any direct information on economic status. It is also often the case that in such countries, well-formulated and official or semi-official taxonomies of economic status and/or social strata do not exist. In short, despite the general recognition that economic factors have an indispensable explanatory power in regard to most reproductive health behavior, practical and theoretical problems preclude the collection of information on economic status in demographic sample surveys.

The orthodoxy in estimating the economic status of households is to collect information on income, or more preferably on consumption expenditures, usually by using data collection strategies other than single-round surveys (Diamond, Matthews and Stephenson, 2001). Questionnaire modules used for collecting data on consumption expenditures, even if adapted for inclusion into single-round demographic surveys, are lengthy and require, in addition to cash expenditures, the collection of information on expenditure items such as social transfers, subventions, exemptions, in kind payments, inter-household transfers, and home production of food, which are clearly difficult to recover accurate information on. Moreover, such lengthy questionnaire modules are often considered as an extra burden on respondents, already under pressure to respond to a voluminous amount of questions on reproductive health and demographic histories, like those in the DHS questionnaire modules. Not surprisingly, very few demographic and reproductive health surveys collect detailed information on household expenditures, and in most countries, the collection of such information is often confined to the Living Standard Measurement Surveys (LSMS) or Household Budget Surveys (HBS)[1]. Such surveys, in turn, provide little, if any information on demographic/reproductive health behavior[2].

In the absence of information on consumption expenditures and/or income from demographic and reproductive health surveys, researchers often tend to collect and use proxy information on economic status, usually in the form of ownership of household assets, land ownership, dwelling characteristics and the like. Such information are utilized in a variety of ways to construct indicators of economic status, most often in the form of indexes constructed by using information on ownership of household

assets. These indexes typically do not refer to current income or consumption, or to absolute poverty, and can only be regarded as measures of relative wealth or economic status focusing on households' or individuals' position within the overall distribution.

Among the asset-based approaches to the assessment of the economic status of households, the simplest is perhaps the assignment of equal weights to all household assets. A household scores one point upon the ownership of an asset, and no points if the household does not possess the asset in question. The aggregated asset score is then taken as an indication of the household's economic status. This approach is further discussed (and indeed utilized) in the following sections. Another approach is to impose a set of weights to the household assets in question, often by estimating their average prices; an approach that necessitates extra work and the use of a considerable amount of external information, intrinsically prone to a multiplicity of errors[3]. A third option is to regress all assets as separate factors on the dependent variable of interest, say, on a key indicator of early childhood mortality. The resulting regression coefficients for each of the assets can be considered as the "weights" of the assets, and the set of weights as forming an index of economic status (Montgomery et al, 1999). However, since "…many assets play a both direct and indirect effect on outcomes…", "....there is no way to infer from the unconstrained coefficients on the asset variables from a multivariate regression analysis the impact of an increase in wealth" (Filmer and Pritchett, 1998).

A relatively recent effort in this area has been the formulation of an "asset index" by Filmer and Pritchett (1998), which appears to have found significant support in the research community. The Filmer and Pritchett Asset Index, as described in more detail below, is based on using principal components analysis to derive weights for household assets, which are then used to construct a weighted aggregate index, and consequently, to classify households (or survey populations) into quintiles of "wealth"[4].

The present paper poses a simple question in relation to the Filmer-Pritchett approach and proceeds from there: Does using a sophisticated statistical analysis tool lead to the production of a more powerful (proxy) indicator of economic status/wealth? Compared with other approaches that use more or less the same information but do not utilize sophisticated statistical techniques, does the Filmer-Pritchett approach produce a proxy index of economic status that better explains differentials in

demographic/reproductive health behavior? In short, is it worth the effort to use principal components analysis, which probably alienates the less statistically minded researcher or the potential non-technical reader by relying on an abstract set of weights for household assets? Or, is it possible to obtain similar results by using other, simpler approaches?

II. Data

Analyses in this paper were carried out with data of the Turkey Demographic and Health Survey (TDHS), conducted in 1998 as part of the international Demographic and Health Surveys (DHS) program (HUIPS and Measure DHS+, 1999). The TDHS mainly used methodologies and survey instruments designed by the DHS, although some modifications were introduced to adapt the survey to local needs[5]. The TDHS used a multistage, stratified cluster sampling approach, representative of the country.

The TDHS collected information via a number of survey instruments: The household questionnaire included a household roster and collected information on housing characteristics and ownership of durable goods. Information collected via the household questionnaire is used in this paper to construct the indexes of economic status. The TDHS also collected information from all women age 15-49 regarding their reproductive experiences and demographic behavior, by using women's questionnaires. A wealth of information was collected on reproductive health via these questionnaires, some of which are used in this paper. Additionally, the TDHS collected information from a subset of husbands of interviewed women. Finally, anthropometric measurements of women and children were undertaken to assess their nutritional status.

The TDHS collected information from 8059 households, 8576 women age 15-49, and 1971 husbands. No effort was made to collect information on consumption expenditures or income, with the exception of a small number of questions that were asked to estimate the amount of cash income of the household[6].

III. Indexing Household Economic Status

a. The Asset Count Index (ACI)

The most commonly used and simplest asset-based index for assessing the economic status of households can be named as the Asset Count Index (ACI), which is based on a simple count of the number of assets owned by households. In other words, rather than assigning weights to each household asset on the basis of an "objective" or statistically determined criterion, each household asset is assigned an equal weight (see Wang, 2002, or Gage, Sommerfelt and Piani (1996) for instance). This approach is simple and easy-to-use, yet its main shortcoming lies in its simplicity, in particular, the assignment of equal weights to household assets. For instance, Gage, Sommerfelt and Piani (1996) use this approach to construct an index which ranges from 0 to 6, based on scores of 1 for each of the 6 items potentially present in the households, namely 1) some toilet facility, 2) piped drinking water, 3) electricity, 4) non-mud floor, 5) radio, and 6) motorcycle or car. Households are then categorized into groups of low, medium and high socio-economic status based on their index values, respectively 0-1, 2-3, and 4-6.

By allocating equal weights to each household asset, the ACI fails to take into account the varying ease with which a household can acquire the assets in question. By owning a car, which might be a relatively expensive investment, a household is effectively assigned the same score with having a radio, which might be widespread and easily accessible with little cost to individual households. A household that has all assets but a car scores the index value of 5, as does a household which owns a car and other assets, but does not own a radio. In this case, index scores are equal although it is clear that to own a car would require incomparably larger economic resources than to own a radio. Nevertheless, even with such flaws, the ACI is commonly used by researchers who refrain from constructing more sophisticated indexes for one reason or another.

b. The Filmer and Pritchett Asset Index (FPAI)

Recently, an asset-based index which uses weights for household assets was proposed by Filmer and Pritchett (1998; 1999). For the construction of a weighted index of household assets and housing characteristics as a proxy indicator of economic status/wealth, Filmer and Pritchett (1998) make use of two sets of variables typically found in demographic survey data. The first set includes variables on the ownership of various household assets, such as television, refrigerator, bicycle and the like. The second set includes variables on housing characteristics, such as presence of electricity, source of drinking water, and floor material. An index constructed from these variables is then used to rank households or survey population by their economic status/wealth[7].

For the construction of the FPAI, each household asset is assigned a weight or factor score generated through principal components analysis. Principal components analysis extracts from a large number of variables those few orthogonal linear combinations of the variables that best capture the common information. The first principal component produces a linear index of the underlying variables[8]. Consequently, each household is assigned an index value of "wealth", whose mean is normalized to zero by the principal components procedure. The standardized index values of households are then weighted by the number of household members and are subsequently used to create break points that define wealth quintiles, ranging from the poorest (survey population scoring the bottom 20 percent of the index values) to the richest (top 20 percent scoring households).

The FPAI is an attractive way of producing a proxy indicator of economic status/wealth from a number of respects. It has appeared to be a good proxy, performing well, if not better than consumption expenditures, in explaining differentials in educational attainment and enrolment and a variety of other indicators (Filmer and Pritchett, 1998; Montgomery et al, 1999). It is considered to refer to long-run wealth, rather than to current economic conditions, which means that it is well suited for use in conjunction with social behavior, which is also determined in the long-run. The Filmer-Pritchett procedure produces standardized index scores, which can easily be used in multivariate analyses as a continuous variable. By dividing households into quintiles, the relatively poor can be identified, by taking the population in households with the lowest 20 or 40 percent of index values - in other words,

the population in the first quintile or in the first two quintiles. Finally, the index can be constructed by using a relatively small number of variables[9], often included in field surveys in any case.

The index has gained considerable popularity during the last few years[10], perhaps at least partly due to the institutional support it received. For instance, the World Bank teamed up with experts from the international DHS project to perform analyses on DHS data from various countries, attempting to show the relationship of economic status, determined by using the Filmer-Pritchett approach, with reproductive health, demographic behavior and other characteristics included in DHS data. Currently, results for 44 countries are available (World Bank, 2002; Rutstein, 2002), including Turkey (Gwatkin et al, 2000) but based on the results of the 1993 TDHS. Second, the Multiple Indicator Cluster Survey (MICS) project, conducted in 2000, advocated the use of the index[11]. The objective of the world-wide MICS project was to conduct field surveys in developing countries to fill in data gaps in the area of child rights for survival, health, protection etc, through the collection of information on such indicators as infant and child mortality, child morbidity, education, pre-school development, immunization, diarrhea, and orphanhood. Countries carrying out the MICS were advocated by UNICEF, the sponsors of the project, to collect information on a variety of household assets[12], so that the FPAI could be calculated and the linkages between poverty and child rights could be assessed, albeit in the descriptive country reports (UNICEF, 2002). In addition to these major efforts, the Filmer-Pritchett index has now been used in numerous studies by researchers from around the world (El Khoury and Panizza, 2001; El-Kogali and Suliman, 2001; Wagstaff and Yazbeck, 2001).

Despite the sudden popularity of the index, there are also studies that have pointed out it's various shortcomings. For economists, who are accustomed to using measures of absolute poverty or economic status (in the form of poverty head-count ratios, for instance), the measure is unconventional and is of limited use in various situations. One major criticism of the index is the impossibility of using it for comparative purposes across populations or over a period of time, which applies to all asset-based (and other) proxies or measurements of economic status that effectively measure relative, rather than absolute economic status/poverty (Ferguson et al, 2002). However, there are some recent efforts to modify the index so that comparability across countries is ascertained, by using a common set of assets for all countries (Johnson, 2001). Another major

objection to the index is based on the observation that the tendency to acquire an asset differs among households from different cultural backgrounds (Ferguson et al, 2002), which means that the index actually measures other dimensions of variation in addition to wealth and is effectively incomparable across households.

c. The Asset Prevalence Index

The Asset Prevalence Index (API) was first developed in the mid-1990s (Hancioglu, 1995) but has been used very little in research[13] with the exception of one study which used a preliminary version (Tuncbilek, Unalan and Coskun, 1996). The index is constructed by using population-level data on the possession and presence of various household assets and housing characteristics and assigning component scores to households based on the abundance (prevalence) or rarity of each asset/characteristic in the general population.

The API is based on the observation (and assumption) that a household's wealth is positively correlated with its ownership of household assets that are not easily accessible by the majority of households in the general population. In other words, the cost of an asset is inversely correlated with its abundance, at least roughly – the more expensive an asset, the rarer it would be expected to be present in households. In short, those households with high economic status would have more access to expensive (and rare) assets than those with low economic status, while an inexpensive asset would be accessible by the majority of households.

Calculation of the API, based on this simple logic, is straightforward. First, a number of household assets are selected for the construction of the index, including durable consumer goods and housing characteristics. The abundance of each asset in the general population is then determined by running simple frequency distributions. The percentage of population in households without a specified household asset is then used as the weight of the asset in the index. In other words, if, in the general population, 95 percent of households own a television, a household which owns a television obtains a component score of 5. If 34 percent of the general population own a car, then an individual household which owns a car obtains 68 component points. In this scoring procedure, a household which owns a

common asset obtains a low score from that asset, while a household which owns a household asset rarely found in households obtains a high score. The index value is calculated by summing the component scores that a household has received from each asset. A high index value is therefore indicative of high economic status. A household which does not own any of the assets scores zero. For reasons of comparability with the other indexes, the API scores are also standardized into z scores with a mean of zero and standard deviation of 1. The API, like the FPAI, produces a continuous variable that can be used in multivariate analysis, and as with the FPAI, households are categorized into quintiles of wealth based on their standardized index scores.

An inherent problem of the API is that the logic behind its construction may not hold true for some consumer goods or housing characteristics. In Turkey, for example, some household assets, like refrigerators, have become the norm: The absence of a refrigerator in a household can safely be attributed to the lack of economic competence of the household to buy it. This probably holds true for most households not owning a refrigerator. Such assets are found commonly in households, and a household that owns such an asset obtains a low component score from this item in the API. The problem is that the absence of some other household assets cannot be solely attributed to the lack of economic competence to acquire them. Ownership of certain household assets may be very strongly correlated with their local availability, with the exposure of the household to information on the asset in question, or simply with taste, rather than the cost of the household asset and hence the economic potency of the household. A household may well be capable, in terms of purchasing power, to buy a car, but may not choose to buy an inexpensive item such as a camera, simply because the good in question is irrelevant to the tastes of household members. Households secluded in remote areas, for instance, may not be aware of the existence of or in need of relatively new innovations like computers or dishwashers – ownership of such assets is therefore a matter of informed choice and not necessarily of economic potency. Further still, some households may actually prefer not to have a flush toilet in the house and prefer a closed pit outside the house, purely for cultural reasons. Despite these conceptual problems, a household that owns a rare asset as a camera obtains a high API score, while a household that owns a car (assuming that cars are more common than cameras) obtains a lower API score: Ownership of a camera increases the API score by a larger margin than does the ownership of a car.

It is possible, of course, to construct the API on the basis of only those housing characteristics or household assets which can be safely assumed to be desirable by most households, the desire being relatively autonomous from taste, informed choice, or local availability[14]. However, trials with the API have shown that the inclusion of all household assets, as opposed to the inclusion of a basic set, enhances the performance of the index. From a practical point of view, the use of a larger number of assets increases the variation across households. Nevertheless, two variants of the API were constructed in this study; the first variant with the inclusion of a large set of assets and characteristics, including those whose ownership may be choice-related, and second, by utilizing only those assets or characteristics considered to be desirable by the overwhelming majority of households.

IV. Household Assets

Information on the possession of 17 household assets from the TDHS were used to construct the indexes. Thirteen items relate to the possession of durable consumer goods; four items refer to the presence of specific housing characteristics. Proportions of population in possession of these assets in their households ranges from 3.6 percent (proportion of population in households with a computer) to 92.9 percent (proportion of population in households with a refrigerator) (Table IV.1).

Table IV.1
Ownership/Presence of Household Assets and Housing Characteristics, Survey Population, Urban and Rural Areas, Turkey 1998

	National	Urban	Rural
Percent of Survey Population in Households with:			
Television	92.8	96.0	87.1
Refrigerator	92.9	96.6	86.4
Car	26.2	29.0	21.5
Telephone	77.7	81.7	70.8
Oven	65.7	76.1	47.9
Dishwasher	13.5	19.8	2.7
Washing machine	60.5	74.7	36.0
Vacuum cleaner	61.7	75.9	37.4
Video player/recorder	10.1	13.8	3.7
Camera	33.3	40.5	20.9
CD Player/music set	13.5	18.7	4.7
Mobile telephone	12.6	17.6	3.9
Computer	3.6	5.4	0.4
Piped water/bottled water	67.4	89.2	29.7
Private flush toilet	62.8	86.3	22.2
Finished floor material	74.8	83.9	59.2
Heating with central or private radiator	9.3	14.2	0.8
Number of Observations (Unweighted)	37,991	24,367	13,624

Note: A cut-off point of 10,000 population is used for urban and rural settlements.
Source: 1998 Turkey Demographic and Health Survey

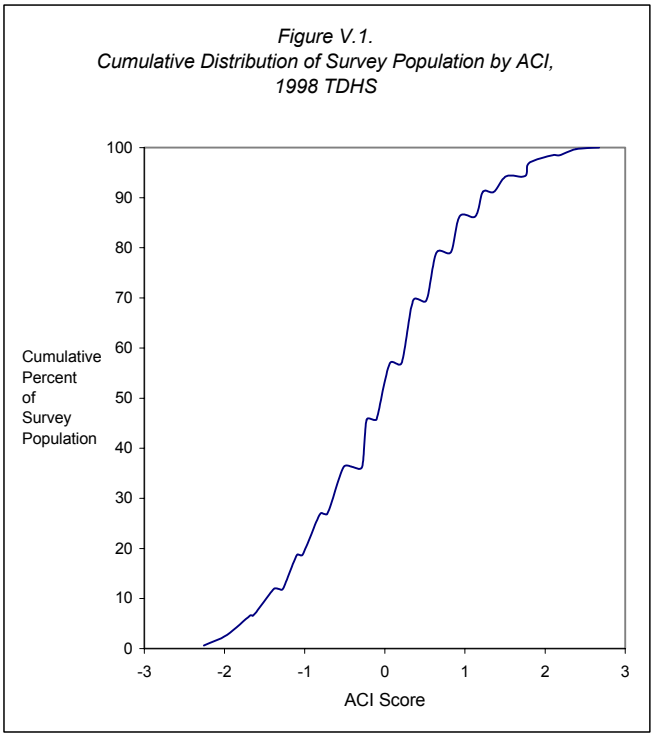
There are profound urban-rural disparities in terms of ownership/presence of the selected household assets in Turkey, which also provide some hints as to the possession of which assets are choice-related. For instance, dishwashers, video players, CD players, mobile telephones and computers have very low proportions in rural areas, and are probably lesser-known goods for much of the rural population. It happens to be the case that these durable goods are newer innovations, compared to other goods which have higher proportions. On the other hand, some rural households would typically be unable to use bottled water or equip the dwelling with central heating even if they desired, simply because bottled water is not marketed in some rural areas and central heating systems are only applicable if dwellings are multi-story buildings, which is generally not the case for the overwhelming majority of rural dwellings.

V. Results and Comparisons of Index Scores

a. The ACI

All 17 household assets were used for the construction of the ACI. To circumvent the problem of missing information on some household assets, the ACI was calculated as a proportion rather than a simple count: A household which had ownership information on all 17 assets and owned 11 of them was assigned an initial ACI score of 0.647, while a household which had ownership information on 15 household assets, had missing information on the two remaining assets, and owned 9 household assets was assigned an initial ACI score of 0.6[15]. ACI scores ranged from 0.0 (households which owned none of the assets) to 1.0 (households which owned all of the assets). The procedure produced only 34 distinct ACI values[16], which were transformed into standardized z scores with a mean of 0 and standard deviation of 1.

Figure V.1.
Cumulative Distribution of Survey Population by ACI, 1998 TDHS



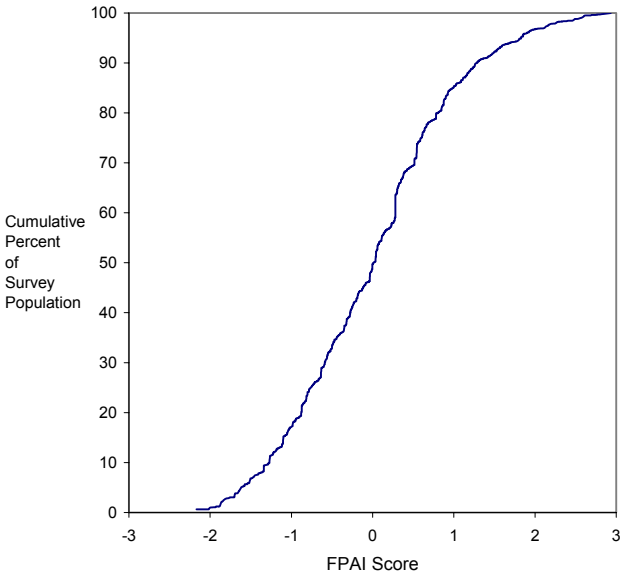
Some 81.3 percent of the survey population owned at least a quarter of the household assets, 43.1 percent owned at least one-half of the assets, and approximately 8.9 percent of households owned at least three-quarters of the household assets. These proportions are only approximate, since the number of distinct index values is rather low. This is clearly observed in Figure V.1 with the see-saw pattern of the index values by the cumulated survey population.

b. The FPAI

The FPAI was also constructed by using information on the ownership/presence of all 17 household assets. The first principal component had an eigen value of 4.682, and explained 27.5 percent of the total variance. This is a relatively high figure, compared to an analysis performed on the data of 35 countries, where the variance explained by the first principal component ranged between 18.6 percent and 30.9 percent (Filmer and Pritchett, 1999). However, as in the other applications of the FPAI, the second and third principal components also had eigen values above 1 (1.739 and 1.250 respectively), which is usually taken as the cut-off point for the determination of the number of underlying factors in principal components analysis. However, in line with the recommendations of Filmer and Pritchett, the "weights" of the assets were based on the component scores extracted with the first principal

component. 1552 distinct FPAI scores were obtained as a result. Figure V.2 shows that a relatively smooth cumulative distribution of the FPAI was obtained.

Figure V.2.
Cumulative Distribution of Survey Population by FPAI, 1998 TDHS



c. The API

The third approach that was used to construct a proxy index of economic status was the Asset Prevalence Index. Two variants of the index were calculated: The first variant, designated as API-1, used information on the possession of all 17 assets. The second variant (API-2), a reduced version of the API, excluded durable consumer goods/housing characteristics owned by/present in the households of less than 20 percent of the survey population. The 20 percent cut-off point was assumed to be sufficient in reflecting that the ownership/presence of the asset is correlated with consumer taste (for instance, video players and cameras), local availability (heating with private or central radiator), or informed choice (for instance, dishwasher)[17]. API-2 was constructed with 11 variables.

Table V.2
Ownership/Presence of Household Assets and Housing Characteristics, and Weights of Household Assets in the Asset Prevalence Indexes, Turkey 1998

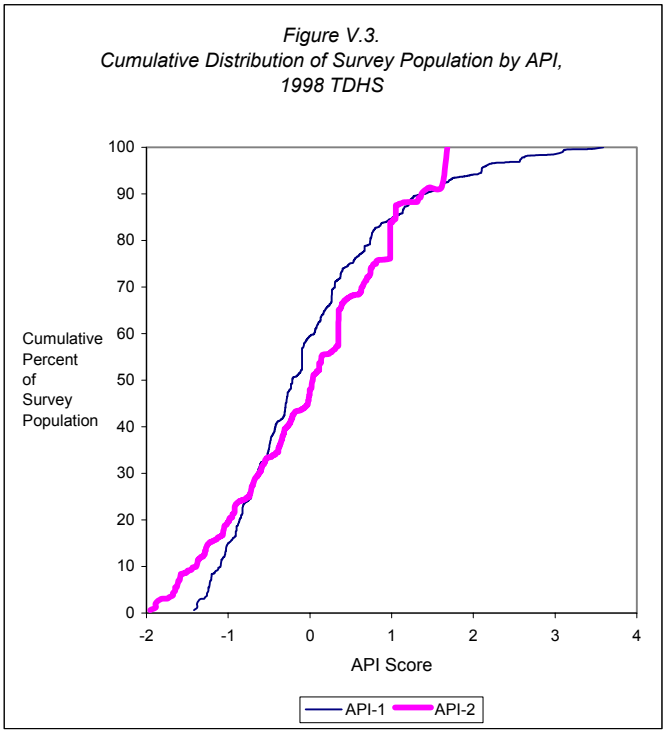
	Percent	Weight of Asset in the API-1	Weight of Asset in the API-2
Percent of Survey Population in Households with:			
Television	92.8	7.2	7.2
Refrigerator	92.9	7.1	7.1
Car	26.2	73.8	73.8
Telephone	77.7	22.3	22.3
Oven	65.7	34.3	34.3
Dishwasher	13.5	86.5	-
Washing machine	60.5	39.5	39.5
Vacuum cleaner	61.7	38.3	38.3
Video player/recorder	10.1	89.9	-
Camera	33.3	66.7	66.7
CD Player/music set	13.5	86.5	-
Mobile telephone	12.6	87.4	-
Computer	3.6	96.4	-
Piped water/bottled water	67.4	32.6	32.6
Private flush toilet	62.8	37.2	37.2
Finished floor material	74.8	25.2	25.2
Heating with central or private radiator	9.3	90.7	-
Total (Maximum Index Scores)		921.6	384.2

Source: 1998 Turkey Demographic and Health Survey

In accordance with the prevalence of household assets in Turkey, the maximum score that a household obtained on the basis of any asset was 96.4 points, in the case of possession of a computer, a rarely found asset in Turkish households. Ownership of a refrigerator generated only 7.1

points, because refrigerators are commonly found in Turkish households. A household which owned/had all of the household assets initially scored 921.6 points, in the case of API-1. In the calculation of API-2, a household which possessed all 11 household assets scored the maximum 384.2 points (Table V.2). The API-1 and API-2 scores were also standardized into z scores. Quite expectedly, the API-1 produced a wider range of values (1275 distinct values) and a more smooth distribution was obtained compared to API-2, which had a narrower range (572 distinct values) and exhibited see-saw patterns (Figure V.3).

Figure V.3.
Cumulative Distribution of Survey Population by API, 1998 TDHS



d. Comparing Standardized z Scores of Indexes

Comparing index values across indexes reveals the presence of strong correlations between them. It is apparent, however, that whenever API-2 is involved in the comparison, the relationship is weaker. Clearly, the API-2 does not approximate values obtained by the FPAI (Second panel, Figure V.4). On the other hand, a strong curvilinear relationship between the FPAI and the API-1 is observed. A quite interesting result is the strong linear relationship between the FPAI scores and the ACI scores: The very need for devising indexes that assign weights to household assets rather than treating them with equal weights has in part been triggered by the “apparent shortcomings” of the ACI.

Figure V.4. Scatter Plots Between Standardized Values of the Filmer-Pritchett Asset Index, the Asset Prevalence Index, and the Asset Count Index, Turkey 1998

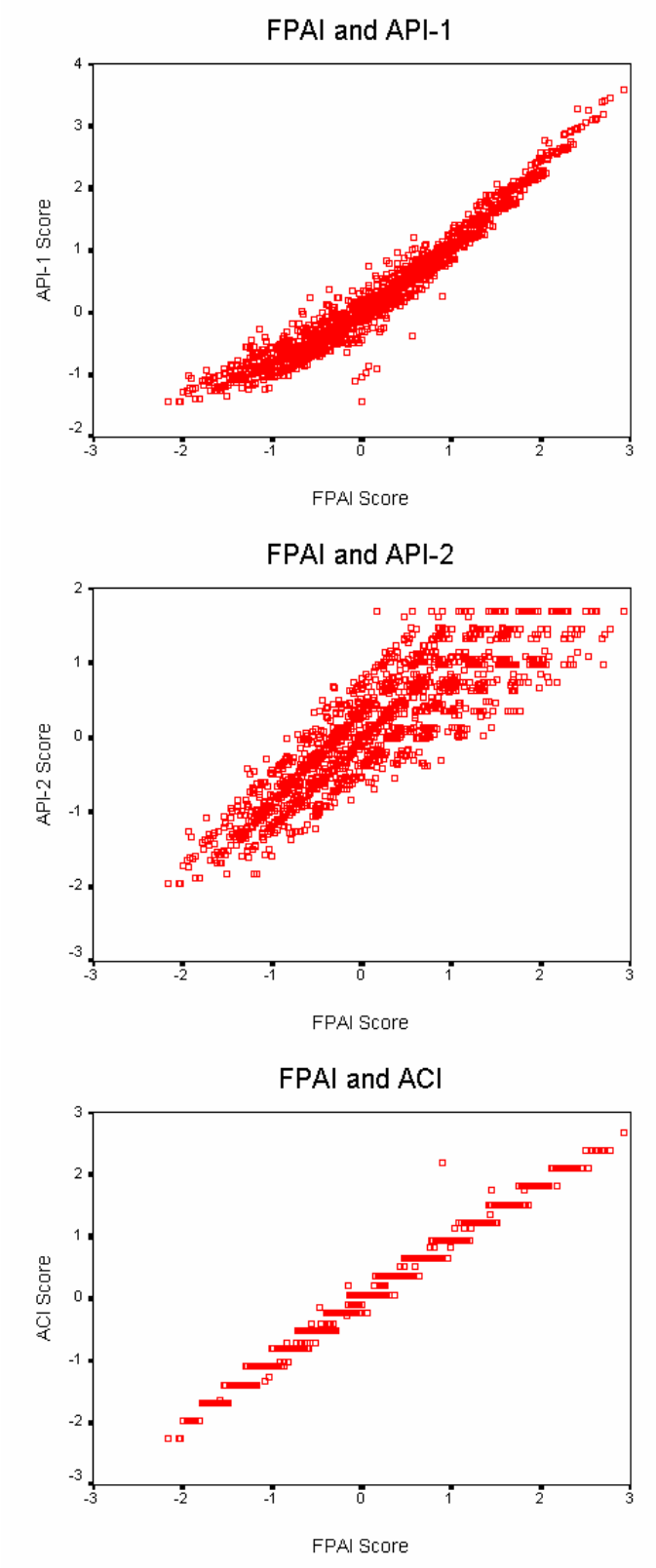
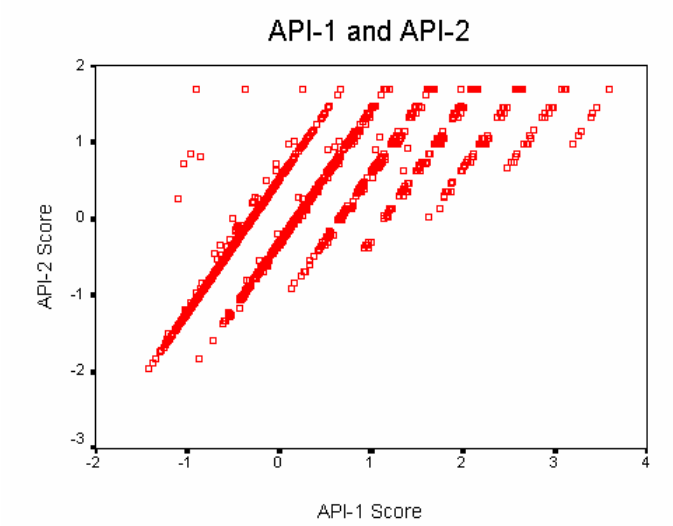
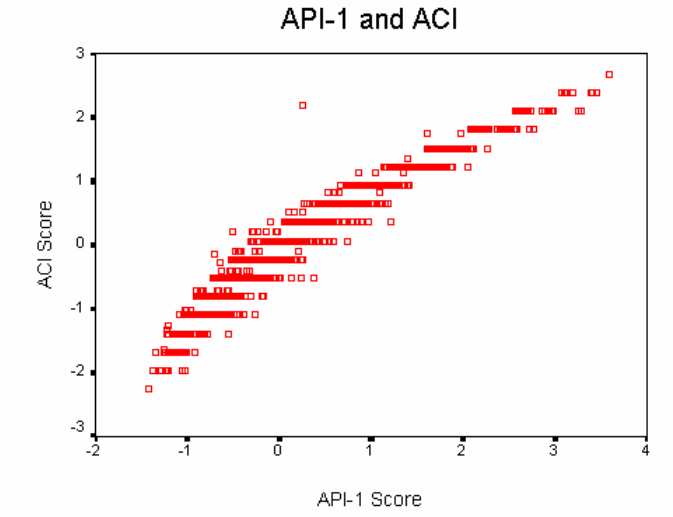
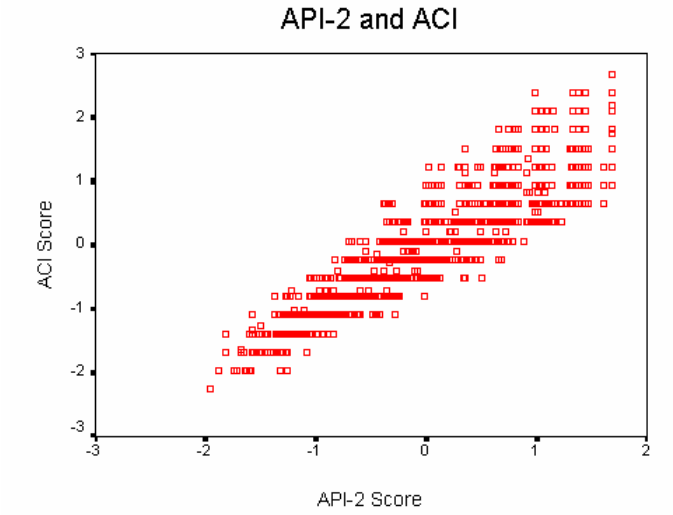


Figure V.4. Scatter Plots Between Standardized Values of the Filmer-Pritchett Asset Index, the Asset Prevalence Index, and the Asset Count Index, Turkey 1998 (Continued)







These results provide only visual evidence on the relationship between the indexes and are in no way conclusive, but they provide the first hints that both the API-1 and ACI, constructed by using simple logic, are likely to perform almost as well as the FPAI, despite the fact that sophisticated statistical techniques were not used in their construction.

VI. Quintiles of Economic Status

As indicated earlier, Filmer and Pritchett (1998; 1999) propose the division of the survey population into quintiles of economic status, on the basis of index scores assigned to households or the survey population. The same procedure can also be applied to the other indexes, thereby producing a comparable taxonomy of economic status. By dividing the survey population into quintiles, one can hopefully isolate those households which lie at the bottom of the 'wealth ladder', in the first quintile, which are identified as those in relative poverty on the basis of the index values.

Comparing the allocation of the survey population into quintiles of economic status across the four different indexing approaches confirms the broad interpretations based on the figures in Figure V.4. The first three panels in Table V.3 are of specific importance: These tables show the degree of correspondence of the quintiles obtained by the Filmer-Pritchett approach with those obtained by other indexes. In all three tables, the proportions that show correspondence between the indexes (proportions along the left-to-right diagonals) take a U-shape, indicating higher degrees of correspondence for the first and last quintiles. In other words, the three indexes approximate the Filmer-Pritchett taxonomy to a greater degree in the "poorest" and "richest" categories, by over 90 percent, with the exception of the richest quintile in the case of API-2. In regard to the identification of those in relative poverty, API-1, API-2 and ACI correctly identify more than 90 percent of those indicated by the Filmer-Pritchett approach. API-1 and ACI identify correctly about 95 percent of those identified as relatively rich households by the FPAI. The least convincing correspondence of the three indexes between the FPAI appears to be in the case of API-2: For instance, only 52.1 percent of those allocated into the fourth quintile by the FPAI are also classified into the same quintile by the API-2.

Table VI.1
Correspondence Between Economic Status Quintiles Constructed by The Filmer-Pritchett Index, the Asset Prevalence Index and the Asset Count Index, Turkey 1998

		API-1 Quintiles					
		Poorest	Second	Middle	Fourth	Richest	n
FPAI	Poorest	90.5	9.3	0.2	-	-	7347
Quintiles	Second	8.6	78.6	12.3	0.5	-	7347
	Middle	0.9	12.0	69.3	17.7	0.1	7342
	Fourth	-	-	18.3	77.0	4.7	7344
	Richest	-	-	-	4.8	95.2	7357
Total		20.0	20.0	20.0	20.0	20.0	36738

		API-2 Quintiles					
		Poorest	Second	Middle	Fourth	Richest	n
FPAI	Poorest	90.4	9.6	-	-	-	7347
Quintiles	Second	9.6	77.8	11.8	0.7	-	7347
	Middle	-	11.6	65.9	21.5	1.0	7342
	Fourth	-	0.9	17.5	52.1	29.5	7344
	Richest	-	0.1	4.8	25.6	69.5	7357
Total		20.0	20.0	20.0	20.0	20.0	36738

		ACI Quintiles					
		Poorest	Second	Middle	Fourth	Richest	n
FPAI	Poorest	94.5	5.5	-	-	-	7347
Quintiles	Second	4.4	83.8	11.8	-	-	7347
	Middle	0.9	10.8	80.5	7.8	-	7343
	Fourth	0.1	-	7.7	87.1	5.1	7344
	Richest	-	-	-	5.2	94.8	7357
Total		20.0	20.0	20.0	20.0	20.0	36739

		API-2 Quintiles					
		Poorest	Second	Middle	Fourth	Richest	n
API-1	Poorest	98.5	0.6	0.1	0.3	0.6	7346
Quintiles	Second	1.1	90.0	8.9	0.0	-	7339
	Middle	0.4	7.5	63.9	28.0	0.1	7355
	Fourth	-	1.7	22.0	48.1	28.2	7345
	Richest	-	0.2	5.0	23.6	71.2	7354
Total		20.0	20.0	20.0	20.0	20.0	36738

		ACI Quintiles					
		Poorest	Second	Middle	Fourth	Richest	n
API-1	Poorest	89.4	10.6	-	-	-	7346
Quintiles	Second	10.3	74.7	15.1	-	-	7339
	Middle	0.3	14.0	68.2	17.4	-	7355
	Fourth	-	0.7	16.6	74.4	8.2	7345
	Richest	-	-	0.1	8.2	91.7	7354
Total		20.0	20.0	20.0	20.0	20.0	36738

		ACI Quintiles					
		Poorest	Second	Middle	Fourth	Richest	n
API-2	Poorest	88.4	11.6	-	-	-	7346
Quintiles	Second	10.5	72.1	16.8	0.6	-	7343
	Middle	0.1	15.7	64.4	16.4	3.4	7348
	Fourth	0.3	0.7	18.7	57.4	23.0	7346
	Richest	0.7	-	0.1	25.6	73.6	7355
Total		20.0	20.0	20.0	20.0	20.0	36738

Regarding comparisons between quintiles produced by the ACI, API-1 and API-2, the best correspondence appears to be between API-1 and ACI for the higher quintiles, and between the API-

1 and API-2 for the lower quintiles, i.e. those in relative poverty. The latter is not surprising since API-2 is constructed as a subset of API-1.

The Kappa statistic[18], calculated to quantify the degree of agreement or correspondence between different indexing approaches also shows that the FPAI quintiles agree well with those of other indexes, particularly the ACI. In fact, the latter produces the highest degree of agreement between any pair of indexes. Lowest degrees of correspondence are calculated when quintiles of the API-2 are compared with the quintiles of the other 3 indexes.

Table VI.2
Degree of Agreement Between Quintiles of Economic Status Constructed by the Filmer-Pritchett Asset Index, the Asset Prevalence Index, and the Asset Count Index, Kappa Values, 1998 TDHS

Kappa Values

	API-1	API-2	ACI
FPAI	0.777	0.639	0.852
API-1		0.679	0.746
API-2			0.640

For all Kappa values: p<0.001
Source: 1998 Turkey Demographic and Health Survey

VII. Economic Status and Reproductive Health

An index of economic status may be used for a variety of reasons in reproductive health research. On a descriptive level, such an index may be useful in showing gross differentials in reproductive health and demographic behavior according to economic status, just as other taxonomies are used to show disparities, like those of region, urban-rural residence, religion, ethnicity, and education[19]. Alternatively, one may seek to understand, through multivariate analyses, whether economic competence is in fact independently correlated with and influences reproductive health and demographic behavior. From a service delivery perspective, the identification of the relatively poor and their reproductive and demographic behavior may be important, so that pro-poor service and policy strategies can be developed to eliminate disparities and inequalities. Hence, for one reason or another, the value and usefulness of an index of economic status can be assessed by the extent to which it reveals the differentials with respect to indicators of reproductive health and demographic behavior. The recent World Bank effort to show disparities in reproductive health and demographic

behavior by economic status can be considered as an attempt in this respect (Gwatkin et al, 2000; World Bank, 2002; Rutstein, 2002).

At first glance, this standpoint appears to bear a disturbing tautology. The *a priori* assumption that economic status is in fact associated with reproductive health/demographic behavior may simply not be true. However, if it is the case that economic status is in fact a powerful predictor of reproductive health behavior, then the quest for maximizing differences in reproductive health between the relatively rich and the relatively poor as a means to demonstrate the usefulness of an index is justified.

To test whether this is true, the four indexes of economic status, together with other socio-economic variables, are regressed on a number of dependent demographic/reproductive health variables. In these forward stepwise logistic regressions, the standardized z scores calculated for the four indexes are alternated without changing the remaining set of socio-economic variables, so as to be able to assess the comparative effects of the indexes on reproductive health/demographic variables in a somewhat standardized way. Logistic regression is an appropriate multivariate technique for this purpose, since it allows the use of dichotomous dependent variables (which is the case with all reproductive health/demographic variables considered, as described below), and the use of continuous or categorical independent variables.

The following reproductive health variables were constructed as (dichotomous) dependent variables for the regressions:

- *Diarrhea prevalence:* The proportion of children under 5 who had had diarrhea during the 15 days prior to the TDHS, based on mothers' reports concerning the presence of loose stools.
- *Underweight prevalence:* The proportion of children under 5 at the time of the TDHS, whose weights were below minus two standard deviations from the median reference standard for their age, established by the World Health Organization, the US Centers for Disease Control, and the US National Center for Health Statistics (WHO/CDC/NCHS).

- *Stunting prevalence:* The proportion of children under 5 at the time of the TDHS whose heights were below minus two standard deviations from the median reference standard for their age, established by WHO/CDC/NCHS.
- *Prenatal care from a Medical Doctor:* The proportion among live births during the 5 years prior to the TDHS for which women received at least one prenatal care consultation from a medical doctor.
- *Delivery Attendance of Medical Staff:* The proportion among live births during the 5 years prior to the TDHS that were attended by medical staff, including medical doctors, midwives and nurses.
- *Delivery at Health Facility:* The proportion among live births during the 5 years prior to the TDHS who were delivered at a health facility, such as a hospital or health center.
- *Post-neonatal (PNN) Mortality:* The probability of dying after the first month of life but before the first birthday. Live births during the period 1-9 years prior to the survey were included in the analyses[20].
- *Use of Family Planning:* The proportion among women age 15-49 who were using, at the time of the TDHS, any method of contraception (modern or traditional) to avoid or delay pregnancies.

A total of 32 logistic regressions were carried out (8 dependent variables, regressed with 4 sets of independent variables each time, with alternating indexes of economic status). All resulting regression equations were significant at the 0.001 level. Most independent variables were used for all regressions. These included the region of residence, type of place of residence, region of residence until age 12, mother's (or woman's) level of education, father's (or husband's) level of education, mother's (or woman's) gender attitude score, and parents' (or couple's) mother tongue[21]. These are socio-cultural and socio-economic variables commonly used in multivariate analyses of reproductive health behavior in Turkey. Additionally, other independent variables were entered into regressions depending on the reproductive health indicator considered. These included the presence of health insurance of parents[22] in the case of prenatal care from a medical doctor, delivery attendance of medical staff, and delivery at a health facility. Presence of a medical problem around the time of birth[23] was used as an independent categorical variable in the case of delivery attendance of medical staff and delivery at a health facility, while the number of living children and years since first marriage were used in the regressions on the use of family planning.

Table VII.1
Results of Logistic Regressions: Diarrhea Prevalence, 1998 TDHS

	FPAI	API-1	API-2	ACI
Region of Residence				
West	1.0000	1.0000	1.0000	1.0000
South	1.1631	1.1602	1.1841	1.1752
Central	1.3190*	1.3119*	1.3400*	1.3260*
North	1.0504	1.0489	1.0679	1.0450
East	1.9097***	1.9324***	1.9602***	1.9190***
Type of Place of Residence				
Urban				
Rural				
Mother's Region Until Age 12				
West				
South				
Central				
North				
East				
Mother's Education				
None				
Primary				
Secondary				
Higher				
Father's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	0.9409	0.9289	0.9354	0.9409
Secondary	0.9099	0.9005	0.8855	0.9178
Higher	0.4916**	0.5089**	0.4520**	0.4895**
Mother's Gender Attitude Score	1.0629*	1.0643*	1.0675*	1.0649*
Parents' Mother Tongue				
Both Turkish	1.0000	1.0000	1.0000	1.0000
Both Kurdish	0.7597*	0.7641*	0.7633*	0.7629*
Turkish and Kurdish	2.0988***	2.0757**	2.0899**	2.1178***
Other	0.9795	0.9781	0.9708	1.0012
Economic Index Score	0.7883***	0.7638***	0.8225***	0.7913***
Constant	-0.9773***	-0.9781***	-0.9849***	-0.9758***
Entered at Step	1	1	1	1
Number of Children under age 5	3310	3310	3310	3306

Note: A shaded area shows that the variable was insignificant and did not enter the forward stepwise logistic regression equation.
**** p < 0.001, ** p < 0.01, * p < 0.05*
Source: 1998 Turkey Demographic and Health Survey

Table VII.2
Results of Logistic Regressions: Prenatal Care from a Medical Doctor, 1998 TDHS

	FPAI	API-1	API-2	ACI
Region of Residence				
West	1.0000	1.0000	1.0000	1.0000
South	1.1079	1.0797	1.0923	1.0885
Central	1.0307	0.9999	1.0330	1.0174
North	0.8531	0.8455	0.8637	0.8632
East	0.4532***	0.4612***	0.4418***	0.4554***
Type of Place of Residence				
Urban	1.0000	1.0000	1.0000	1.0000
Rural	0.6915***	0.6383***	0.6789***	0.6993***
Mother's Region Until Age 12				
West	1.0000	1.0000	1.0000	1.0000
South	0.3029***	0.3133***	0.3042***	0.3017***
Central	0.3112***	0.3226***	0.3060***	0.3127***
North	0.3164***	0.3216***	0.3134***	0.3171***
East	0.2935***	0.3295***	0.2929***	0.2890***
Mother's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	1.9763***	1.8969***	1.9886***	2.0014***
Secondary	3.2208***	3.0381***	3.3130***	3.3024***
Higher	6.5250*	5.7325***	7.3414**	6.9328**
Father's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	0.7859	0.7759	0.7919	0.7961
Secondary	1.1700	1.1754	1.2002	1.1915
Higher	1.0120	1.0002	1.1007	1.0670
Mother's Gender Attitude Score	0.8094***	0.8027***	0.8057***	0.8086***
Parents' Mother Tongue				
Both Turkish		1.0000		
Both Kurdish		0.7152*		
Turkish and Kurdish		1.3507		
Other		0.9307		
Presence of Health Insurance	1.7106***	1.7203***	1.7314***	1.7232***
Economic Index Score	1.7857***	1.7976***	1.6489***	1.7020***
Constant	1.8550***	1.8727***	1.8658***	1.8582***
Entered at Step	1	2	1	1
Number of Births (Last 5 years)	3422	3422	3422	3417

Note: A shaded area shows that the variable was insignificant and did not enter the forward stepwise logistic regression equation.
**** p < 0.001, ** p < 0.01, * p < 0.05*
Source: 1998 Turkey Demographic and Health Survey

Table VII.3
Results of Logistic Regressions: Delivery Attendance of Medical Staff, 1998 TDHS

	FPAI	API-1	API-2	ACI
Medical Problem Around the Time of Birth	1.8430***	1.8389***	1.8028***	1.8366***
Region of Residence				
West	1.0000	1.0000	1.0000	1.0000
South	1.4437	1.4095	1.4370	1.4063
Central	0.5305	0.5547	0.5628	0.5267
North	0.8642	0.8701	0.8844	0.8753
East	0.6086*	0.5832*	0.5962*	0.6015*
Type of Place of Residence				
Urban	1.0000	1.0000	1.0000	1.0000
Rural	0.6395***	0.5946***	0.6278***	0.6470**
Mother's Region Until Age 12				
West	1.0000	1.0000	1.0000	1.0000
South	0.4611*	0.4808	0.4624*	0.4635*
Central	1.3043	1.3030	1.2447	1.3017
North	0.8710	0.9025	0.8761	0.8754
East	0.4781**	0.4957*	0.4738**	0.4704
Mother's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	1.6008***	1.6092***	1.6068***	1.5993***
Secondary	3.5368***	3.5388***	3.6628***	3.5914***
Higher	78.857	66.692	90.055	83.459
Father's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	1.0251	1.0407	1.0287	1.0218***
Secondary	1.8465**	1.9265**	1.8977*	1.8661*
Higher	1.9605	2.0056	2.0442	2.0210**
Mother's Gender Attitude Score	0.8281***	0.8219***	0.8230***	0.8241***
Parents' Mother Tongue				
Both Turkish	1.0000	1.0000	1.0000	1.0000
Both Kurdish	0.3057***	0.3031***	0.3104***	0.3035***
Turkish and Kurdish	0.3368***	0.3406***	0.3475***	0.3358***
Other	0.4907**	0.5048**	0.5104**	0.4695***
Presence of Health Insurance	1.4958***	1.5337***	1.5163***	1.5085***
Economic Index Score	1.8213***	1.9733***	1.6812***	1.7345***
Constant	3.2142*	3.2191***	3.2449*	3.2152*
Entered at Step	2	2	2	1
Number of Births (Last 5 years)	3426	3426	3426	3421

Note: A shaded area shows that the variable was insignificant and did not enter the forward stepwise logistic regression equation.
**** p < 0.001, ** p < 0.01, * p < 0.05*
Source: 1998 Turkey Demographic and Health Survey

Table VII.4
Results of Logistic Regressions: Delivery at Health Facility, 1998 TDHS

	FPAI	API-1	API-2	ACI
Medical Problem Around the Time of Birth	2.5605***	2.5549***	2.5192***	2.5463***
Region of Residence				
West				
South				
Central				
North				
East				
Type of Place of Residence				
Urban	1.0000	1.0000	1.0000	1.0000
Rural	0.6282***	0.5941***	0.6065***	0.6272***
Mother's Region Until Age 12				
West	1.0000	1.0000	1.0000	1.0000
South	0.5036***	0.5090***	0.4944***	0.4946***
Central	1.0163	1.0342	1.0029	1.0076
North	1.1290	1.1550	1.1320	1.1350
East	0.4344***	0.4355***	0.4237***	0.4264***
Mother's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	1.4279**	1.4517**	1.4509**	1.4363**
Secondary	2.8192***	2.8505***	2.9897***	2.8921***
Higher	2.4568	2.2866	2.8330*	2.6224
Father's Education				
None				
Primary				
Secondary				
Higher				
Mother's Gender Attitude Score	0.8387***	0.8331***	0.8346***	0.8360***
Parents' Mother Tongue				
Both Turkish	1.0000	1.0000	1.0000	1.0000
Both Kurdish	0.3555***	0.3489***	0.3545***	0.3539***
Turkish and Kurdish	0.5430*	0.5477*	0.5526*	0.5400*
Other	0.3155***	0.3157***	0.3221***	0.3106***
Presence of Health Insurance	1.7299***	1.7653***	1.7571***	1.7484***
Economic Index Score	1.5132***	1.5527***	1.4048***	1.4530***
Constant	1.2602***	1.2571***	1.2821***	1.2640***
Entered at Step	2	2	2	2
Number of Births (Last 5 years)	3414	3414	3414	3409

Note: A shaded area shows that the variable was insignificant and did not enter the forward stepwise logistic regression equation.
**** p < 0.001, ** p < 0.01, * p < 0.05*
Source: 1998 Turkey Demographic and Health Survey

Table VII.5
Results of Logistic Regressions: Underweight Prevalence, 1998 TDHS

	FPAI	API-1	API-2	ACI
Region of Residence				
West	1.0000	1.0000	1.0000	1.0000
South	1.7156*	1.7431	1.6980*	1.7383*
Central	1.0438	1.0516	1.0262	1.0420
North	0.9305	0.9400	0.9071	0.9092
East	2.4019***	2.5381***	2.3922***	2.4183***
Type of Place of Residence				
Urban				
Rural				
Mother's Region Until Age 12				
West				
South				
Central				
North				
East				
Mother's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	0.5758**	0.5631***	0.5810**	0.5713**
Secondary	0.4169	0.4092	0.4158	0.4074*
Higher	0.0761	0.0822	0.0688	0.0713
Father's Education				
None				
Primary				
Secondary				
Higher				
Mother's Gender Attitude Score				
Parents' Mother Tongue				
Both Turkish				
Both Kurdish				
Turkish and Kurdish				
Other				
Economic Index Score	0.6388***	0.6085***	0.6421***	0.6527***
Constant	-3.2812***	-3.2699***	-3.3066***	-3.2895***
Entered at Step	2	2	1	2
Number of Children Under Age 5	2737	2737	2737	2735

Note: A shaded area shows that the variable was insignificant and did not enter the forward stepwise logistic regression equation.
**** p < 0.001, ** p < 0.01, * p < 0.05*
Source: 1998 Turkey Demographic and Health Survey

Table VII.6
Results of Logistic Regressions: Stunting Prevalence, 1998 TDHS

	FPAI	API-1	API-2	ACI
Region of Residence				
West	1.0000	1.0000	1.0000	
South	0.9548	0.9551	0.9682	
Central	0.9107	0.9031	0.9186	
North	0.9672	0.9649	0.9693	
East	1.6784**	1.7305**	1.7305**	
Type of Place of Residence				
Urban				
Rural				
Mother's Region Until Age 12				
West				1.0000
South				1.2101
Central				1.0394
North				1.2908
East				1.8916**
Mother's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	0.5837***	0.5815***	0.5827***	0.5848***
Secondary	0.4225***	0.4339***	0.4090***	0.4295***
Higher	0.2311	0.2653	0.2032	0.2306
Father's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	0.6402*	0.6317*	0.6364*	0.6482*
Secondary	0.5015**	0.4925**	0.4880**	0.5152**
Higher	0.4084*	0.4151*	0.3778*	0.4258*
Mother's Gender Attitude Score				
Parents' Mother Tongue				
Both Turkish				
Both Kurdish				
Turkish and Kurdish				
Other				
Economic Index Score	0.6525***	0.5998***	0.6892***	0.6549***
Constant	-2.1620***	-2.1443***	-2.1851***	-2.1764
Entered at Step	2	2	2	2
Number of cases	2737	2737	2737	2735

Note: A shaded area shows that the variable was insignificant and did not enter the forward stepwise logistic regression equation.
**** p < 0.001, ** p < 0.01, * p < 0.05*
Source: 1998 Turkey Demographic and Health Survey

Table VII.7
Results of Logistic Regressions: Post-neonatal Mortality, 1998 TDHS

	FPAI	API-1	API-2	ACI
Region of Residence				
West				
South				
Central				
North				
East				
Type of Place of Residence				
Urban				
Rural				
Mother's Region Until Age 12				
West				
South				
Central				
North				
East				
Mother's Education				
None				
Primary				
Secondary				
Higher				
Father's Education				
None				
Primary				
Secondary				
Higher				
Mother's Gender Attitude Score				
Parents' Mother Tongue				
Both Turkish				
Both Kurdish				
Turkish and Kurdish				
Other				
Economic Index Score	0.4330***	0.3949***	0.5131***	0.4579***
Constant	-4.2296***	-4.2218***	-4.1106***	-4.1937***
Entered at Step	1	1	1	1
Number of Births (Last 1-9 years)	2698	2698	2698	2694

Note: A shaded area shows that the variable was insignificant and did not enter the forward stepwise logistic regression equation.
**** p < 0.001, ** p < 0.01, * p < 0.05*
Source: 1998 Turkey Demographic and Health Survey

Table VII.8
Results of Logistic Regressions: Use of Family Planning, 1998 TDHS

	FPAI	API-1	API-2	ACI
Region of Residence				
West	1.0000	1.0000	1.0000	1.0000
South	1.0118	1.0060	1.0242	1.0140
Central	1.0496	1.0550	1.0726	1.0606
North	1.0305	1.0365	1.0307	1.0617
East	0.4774***	0.4646***	0.4826***	0.4851***
Type of Place of Residence				
Urban				
Rural				
Woman's Region Until Age 12				
West	1.0000	1.0000	1.0000	1.0000
South	0.5074***	0.5095***	0.4969***	0.5070***
Central	0.7919	0.7927	0.7753	0.7914
North	0.6450**	0.6387	0.6430**	0.6389**
East	0.6805***	0.6865*	0.6681**	0.6809**
Woman's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	1.4375***	1.4343***	1.4433***	1.4549***
Secondary	1.4280*	1.3948*	1.4830**	1.4328*
Higher	0.9846	0.9597	1.0750	0.9947
Number of Living Children	1.6973***	1.6961***	1.6916***	1.6931***
Years Since First Marriage	0.9147***	0.9162***	0.9157***	0.9148***
Husband's Education				
None	1.0000	1.0000	1.0000	1.0000
Primary	2.2192***	2.2874***	2.2079***	2.2087***
Secondary	2.5021***	2.6210***	2.4861***	2.4678***
Higher	3.0736***	3.2070***	3.1848***	3.0801***
Woman's Gender Attitude Score		0.9416*		
Couple's Mother Tongue				
Both Turkish	1.0000	1.0000	1.0000	1.0000
Both Kurdish	0.4258***	0.4188***	0.4291***	0.4251***
Turkish and Kurdish	1.5728	1.5875	1.5999	1.5651
Other	0.5871**	0.5820**	0.5963**	0.5985**
Economic Index Score	1.3047***	1.2108***	1.2998***	1.3078***
Constant	0.5204***	0.5798***	0.5464***	0.5304***
Entered at Step	6	6	6	6
Number of Married, Exposed Women Age 15-49	4458	4458	4457	4450

Note: A shaded area shows that the variable was insignificant and did not enter the forward stepwise logistic regression equation.
**** p < 0.001, ** p < 0.01, * p < 0.05*
Source: 1998 Turkey Demographic and Health Survey

Results show that the economic index scores entered all of the logistic regression equations with very powerful degrees of significance. In all 32 regressions, economic indexes were significant at the 0.001 level, entered the regression equations at the first or second steps, and were shown to have considerable net effects on the reproductive health indicators. Increases in economic status scores significantly increased the likelihood of provision of prenatal care from a doctor, delivery attendance by medical staff, delivery at a health facility, and use of family planning. On the other hand, gains in economic status were negatively associated with the prevalence of diarrhea, underweight and stunting in children, and with post-neonatal mortality risks. Regression results leave no doubt that long-run wealth (that asset-based indexes are supposed to approximate) is a powerful determinant of reproductive health behavior.

On the other hand, mixed results are obtained for the comparative net effects of different economic status indexes, when specific reproductive health variables are regressed and all other socio-cultural variables are kept constant. Since the levels of significance of all indexes in all regressions are equal, it is possible to compare the coefficients of indexes when regressed on the same dependent variable. For this comparison, a 5 percent cut-off of proximity is used. If the coefficient of an index is within 5 percent of that of the index which appears to be the best predictor, this is considered to be sufficiently close. The best predicting index is the index that has a coefficient with the largest absolute difference from unity.

The FPAI is not the best predictor in any of the regression sets. In four sets, concerning those on diarrhea prevalence and prenatal and delivery care, API-1 performs the best. In two of the remaining reproductive health variables, underweight prevalence and use of family planning, the ACI has the greatest influence on the dependent variable, while the API-2 appears to be the best predictor of stunting and post-neonatal mortality. In most cases, the coefficients of 2 or 3 indexes are within 5 percent of each other. The only exception is post-neonatal mortality, where API-2 has the smallest coefficient (has the maximum lowering effect on post-neonatal mortality among all indexes), and the coefficients of other indexes are 10 to 23 percent higher than that of the API-2. It can safely be concluded from these results that although economic status appears to have net and significant

effects on reproductive health behavior, none of the indexes can be preferred over the others in terms of their strength in predicting reproductive health behavior.

One noteworthy finding from the regressions is that for post-neonatal mortality, the economic status index scores were the only variables that remained in the final logistic regression equations. All other variables, such as mother's education, usually considered to have net effects on early age mortality, albeit usually through multivariate analyses that lack good proxies for wealth, were insignificant and were left out of the final equations.

Results pertaining to other variables are beyond the scope of this paper, but there are some findings that are worthy of emphasis. It appears from the findings that type of place of residence is only effective on reproductive health behavior when the behavior in question is directly related with access to health services, in the case of use of medical prenatal and delivery services. This probably reflects the varying accessibility of such services in urban and rural areas. Couples' mother tongue, a proxy variable for ethnic background, on the other hand, is effective both when use of services is relevant, as well as in cases like diarrhea and use of family planning. These results may indicate, on one hand, the difficulties of ethnic groups in Turkey, particularly the Kurds, in using the services which are extremely Turkish-language dominated, and the effect of different cultural backgrounds on child morbidity and the likelihood of couples' efforts to limit childbearing. Women's (mother's) education has net, statistically significant and considerable effects on almost all reproductive health behavior as expected, with the exception of diarrhea and post-neonatal mortality. An interesting finding is that husband's education is more effective than woman's education in increasing the use of family planning; a somewhat expected result since a considerable proportion of family planning methods used in Turkey are male oriented methods. Also of interest is that health insurance increases the likelihood of using prenatal care and delivery services considerably. The effect of economic status continues even after the presence of health insurance is controlled for. This indicates that cost is a major obstacle in regard to the use of reproductive health services in Turkey. Finally, gender scores of mothers are found to be significant in most of the equations. The higher the gender score, the worse the reproductive health outcome, e.g. the higher the prevalence of diarrhea, the lower the use of prenatal and delivery services. If gender scores of women can be taken as an indication of the

existence of patriarchy in the household, then female autonomy appears to be influential in producing positive reproductive health outcomes. In sum, however, the estimated logistic regression equations indicate that economic status is a strong predictor of reproductive health behavior, but that other social and cultural attributes also have independent predictive effects.

VIII. Rich-Poor Differentials

Having ascertained the net effect of economic status on reproductive health behavior, one can compare the relative performance of economic status indexes by assessing the extent with which such indexes reflect differences in reproductive health indicators.

For the assessment of the performance of the four indexes of economic status, one possible approach is to calculate and compare the so-called rich-poor ratios in reproductive health indicators across various indexing approaches. These are simply the ratios between the value of the indicator of reproductive health in the highest quintile (the "rich"), to that of the same indicator in the lowest quintile (the "poor"), expressed as absolute deviations from unity[24]. The higher the rich-poor ratio, the wider differential between the poor and the rich it points out, i.e. the better it may be regarded to capture the differential between the rich and the poor. In scientific notation, rich-poor ratios are calculated as:

$$RPR = abs\left(\frac{x_5}{x_1} - 1\right)$$

where x_1 and x_5 are the estimates of the reproductive health indicator for the first and fifth quintiles respectively.

Gross rich-poor ratios were calculated with respect to the 8 reproductive health variables described in the previous section. The ratios are termed as gross, since they are descriptive in nature and do not imply any causal relationships between economic status and reproductive health. They are calculated without any consideration of other socio-cultural or socio-economic variables which may be confounding the relationship between economic status and the reproductive health indicator in

question. It may not be wealth or economic status *per se* that influence reproductive health. Rather, determining factors may be other (non-economic) characteristics such as education which may be simultaneously associated with both economic status and reproductive health.

Table VIII.1
Estimates of Selected Reproductive Health Variables by Quintiles of Economic Status, and Gross Rich-Poor Ratios (GRPR), 1998 TDHS*

Index		Diarrhea Prevalence	Prenatal Care from A Medical Doctor	Delivery Attendance of Medical Staff	Delivery At Health Facility	Stunting	Under-weight	PNN mortality (per 1000)	Use of Family Planning
FPAI	Poorest	40,4	38,6	55,9	48,4	27,7	16,1	43,7	48,8
	Second	31,9	56,0	75,3	62,9	22,4	10,6	22,9	56,3
	Middle	31,7	77,9	90,2	83,4	12,8	6,9	15,7	64,9
	Fourth	26,2	86,3	94,8	86,2	8,5	3,0	10,1	69,4
	Richest	16,1	93,0	98,4	94,8	3,9	2,2	5,6	74,2
	GRPR	*0,603*	*1,409*	*0,760*	*0,959*	*0,859*	*0,863*	*0,872*	*0,520*
API-1	Poorest	40,4	38,7	56,5	49,5	27,5	15,3	43,6	49,9
	Second	32,7	56,9	74,8	62,9	21,8	10,3	18,0	56,4
	Middle	30,5	77,5	91,0	82,5	13,6	8,3	22,0	65,9
	Fourth	26,4	86,1	93,8	86,9	9,8	2,7	7,7	68,0
	Richest	16,4	91,7	97,8	93,1	3,0	2,1	7,3	73,8
	GRPR	*0,594*	*1,370*	*0,731*	*0,881*	*0,891*	*0,863*	*0,833*	*0,479*
API-2	Poorest	40,3	38,5	56,0	48,9	27,6	15,5	43,5	49,5
	Second	33,2	55,0	74,6	61,9	22,6	11,2	18,9	56,3
	Middle	28,7	80,8	91,4	84,7	12,5	6,9	19,1	63,2
	Fourth	26,0	85,4	94,6	87,0	9,4	3,7	13,5	70,5
	Richest	18,9	90,0	96,6	91,4	4,0	1,8	4,5	74,1
	GRPR	*0,531*	*1,338*	*0,725*	*0,869*	*0,855*	*0,884*	*0,897*	*0,497*
ACI	Poorest	39,5	39,0	57,2	50,0	27,6	15,5	45,5	49,7
	Second	33,8	58,1	74,9	63,2	20,4	10,7	17,4	57,7
	Middle	29,6	76,6	90,1	82,3	15,6	7,2	19,1	62,5
	Fourth	28,0	84,5	93,4	84,9	8,6	3,5	10,8	68,9
	Richest	15,6	92,7	98,4	94,5	3,4	2,2	6,2	75,2
	GRPR	*0,604*	*1,377*	*0,720*	*0,890*	*0,877*	*0,858*	*0,864*	*0,513*
All		30,1	67,9	81,1	73,1	16,0	8,3	33.4	63,9

The gross rich-poor ratio (GRPR) is calculated as the absolute deviation from unity of the ratio of the value of the indicator in the fifth quintile to the value of the indicator in the first quintile,
Source: 1998 Turkey Demographic and Health Survey

The gross poor-rich ratios with respect to selected reproductive health indicators by the four indexing approaches reveal that in general, there is little difference between the indexes in revealing differentials by economic status. The highest values of the GRPR are obtained for prenatal care, while the rich-poor gap in

terms of diarrhea prevalence appears to be lowest. For all reproductive health indicators, differentials between the rich and the poor are large. However, in almost all cases, the API-1, API-2 and the ACI reveal rich-poor gaps as large as, if not larger than the FPAI. The FPAI performs significantly better than the other indexes in a number of cases, particularly in regard to delivery at health facilities and post-neonatal mortality, but for some reproductive health indicators, other indexes perform as well or better: For diarrhea prevalence, rich-poor ratios calculated on the basis of the ACI are larger, for instance. For stunting prevalence, API-1 performs better; for underweight prevalence, the API-2 produces a higher rich-poor ratio than the other indexes.

Although gross rich-poor ratios provide some evidence to the effect that there is little difference between various indexing approaches in terms of revealing differentials between the rich and the poor in regard to reproductive health, such analyses are insufficient from a number of respects. For one, gross differentials may be profound, but the reliability of the gross rich-poor ratios may not be statistically justified due to possible high components of variance in the respective estimates for the rich and the poor. Secondly, such ratios are gross estimates, as indicated earlier. Hence, it would be useful to calculate 'net' rich-poor ratios to show the rich-poor differentials in reproductive health when the effects of other variables are controlled for[25].

Logistic regression is convenient for this purpose too, since it allows entering the economic status quintiles as categorical independent variables. If the lowest quintile is taken as the reference category, then odds ratios estimated for each of the other four quintiles represent net differences of the observations in the other quintiles from the poorest quintile, on the basis of the dependent variable, and by including other independent variables. The ratios are termed as 'net', since they are calculated after the effects of other confounding factors are controlled for. It is also possible to estimate the statistical significance of the net differences, therefore accounting for possible differences in variation coefficients of the estimates for observations in different quintiles. The absolute deviation of the value of the coefficient for the fifth quintile from unity provides the net rich-poor ratio.

The odds ratios shown in Table VIII.2 were estimated by using the same independent variable sets shown in Tables VII.1 to VII.8. In other words, the only difference of the 32 logistic regressions undertaken here was the inclusion of the economic status indexes as categorical variables (in the for of quintiles of wealth). It is

therefore not surprising that the economic status index variables entered all equations with considerable statistical significance, as in the case of previous logistic regressions that used economic status as a continuous variable. In all regression equations that were fitted, the odds ratios of the richest quintiles were significant at the 0.001 or 0.01 level (Table VIII.2). This means that there were sufficient differences between the reproductive health indicators of the observations in the first and fifth quintiles – i.e. that rich-poor differentials are significant[26].

Table VIII.2
*Odds Ratios for Quintiles of Economic Status for Selected Reproductive Health Variables and Net Rich-Poor Ratios (NRPR)**
1998 TDHS

Index		Diarrhea Prevalence	Prenatal Care from A Medical Doctor	Delivery Attendance of Medical Staff	Delivery At Health Facility	Stunting	Under-weight	PNN mortality (per 1000)	Use of Family Planning
FPAI	Poorest	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Second	0,773*	1,256	1,517*	1,219***	0,984	0,771	0,515**	1,058
	Middle	0,873	2,270***	2,308***	2,100***	0,660	0,666	0,351***	1,459**
	Fourth	0,722*	2,833***	2,964***	1,830***	0,484***	0,306***	0,224***	1,672***
	Richest	0,454***	3,320***	7,533***	4,508***	0,291***	0,302**	0,130***	1,809***
	NRPR	*0,546*	*2,320*	*6,533*	*3,508*	*0,709*	*0,698*	*0,870*	*0,809*
API-1	Poorest	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Second	0,801	1,216	1,382*	1,109***	0,934	0,791	0,418***	1,043
	Middle	0,820	2,049***	2,427***	1,731***	0,726	0,876	0,563*	1,515**
	Fourth	0,732*	2,806***	3,308***	1,803***	0,571**	0,304***	0,202***	1,535***
	Richest	0,462***	2,811***	4,951***	2,749***	0,213***	0,320**	0,204***	1,646***
	NRPR	*0,538*	*1,811*	*3,951*	*1,749*	*0,787*	*0,680*	*0,796*	*0,646*
API-2	Poorest	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Second	0,827	1,162	1,453	1,121	0,968	0,841	0,442***	1,077
	Middle	0,798	2,551***	2,497***	2,053***	0,683*	0,739	0,493**	1,287*
	Fourth	0,738*	2,604***	2,679***	1,815***	0,597*	0,434**	0,358***	1,705***
	Richest	0,543***	3,368***	3,996***	2,319***	0,265***	0,231***	0,121***	1,858***
	NRPR	*0,457*	*2,368*	*2,996*	*1,319*	*0,735*	*0,769*	*0,879*	*0,858*
ACI	Poorest	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Second	0,895	1,269	1,286	1,059	0,903	0,839	0,373***	1,033
	Middle	0,796	2,108***	2,228***	1,746***	0,836	0,717	0,412***	1,285*
	Fourth	0,780	2,502***	2,298***	1,514*	0,488***	0,358***	0,231***	1,474**
	Richest	0,443***	3,277***	7,035***	3,549***	0,258***	0,318**	0,136***	1,839***
	NRPR	*0,557*	*2,277*	*6,035*	*2,549*	*0,742*	*0,682*	*0,864*	*0,839*

** The Net Rich-Poor Ratio is calculated as the absolute deviation of the odds ratio of the fifth quintile from unity.* Levels of significance are indicated as follows: *** p<0.001, ** p<0.01, * p<0.05.
Source: 1998 Turkey Demographic and Health Survey

The largest rich-poor differentials are obtained for delivery attendance from medical staff, prenatal care, and deliveries at health facilities. These are directly cost-related variables, as mentioned earlier. On the other hand, the relationship of economic status quintiles with diarrhea prevalence, stunting, underweight prevalence, post-neonatal mortality and use of family planning is indirect in nature, where economic competence would be expected to have more indirect effects on all of these variables in a more complicated fashion. However, the rich-poor differentials are still significant: A child under age 5 and living in a rich household is 45-56 percent (depending on the economic status index used) less likely to have had diarrhea than his/her counterparts in poor households. Stunting and underweight prevalence is profoundly more prevalent among children in poor households. Children in such households are 71-79 percent more likely to be stunted, and 68-77 percent more likely to be underweight. Poverty also appears to increase post-neonatal mortality considerably: Children in rich households are 80-88 percent less likely to die during the post-neonatal period.

Economic status also affects the likelihood of contraceptive use of women. A woman living in a rich household is 65-86 percent more likely to use contraception than a woman living in a poor household.

In most cases, the net rich-poor differentials uncovered by the four different indexing procedures are very similar. If a 5 percent cut-off of proximity is used, the net rich-poor ratios of 2 or 3 different indexes are sufficiently close to each other for most reproductive health indicators. The FPAI produces the largest net rich-poor ratio in regard to 3 reproductive health variables, the API-2 also produces the largest ratios for 3 variables. In general, the higher the average of the net rich-poor ratios for a reproductive health variable, the higher is the variation between the ratios indicated by different indexes.

It is noteworthy that the relatively poor appear to have substantially different reproductive health situations than not only the richest, but from all other wealth groups. A move from the poorest to the second quintile, for instance, has the net effect of reducing post-neonatal mortality by 50 to 70 percent. The same comparison yields an improvement of about 29 to 52 percent in delivery attendance of medical staff, depending on the economic status index adopted.

One other criterion that can be used to assess the performance of the indexes is the presence or absence of monotonous increases or decreases (depending on the direction of the expected relationship) in the odds ratios for observations in the quintiles. In most cases, odds ratios indeed increase or decrease in a monotonous fashion by quintiles of wealth. This is true for 23 out of 32 logistic regressions that were performed.

IX. Conclusions

Asset-based indexes of economic status are not new innovations, but their use in the area of reproductive health and demographic behavior has been fuelled recently by the formulation of the Filmer-Pritchett Asset Index, and the adoption of the index by major international organizations in the field as a useful tool for uncovering differentials in reproductive health/demographic behavior by economic status.

The choice of assets for the construction of indexes of economic status is based on pragmatic rather than conceptual considerations. Such indexes, when constructed using demographic/reproductive health survey data, are likely to fill in important information gaps, since they enable the construction of linkages between the relative positions of households in terms of economic status and their social/cultural/health behavior. However, although evidence suggests that the asset ownership-consumption expenditures relationship is quite close (Filmer and Pritchett, 1998; Montgomery et al, 1999), the usefulness of such indexes is limited with their ability to measure relative, rather than absolute wealth. Nevertheless, the advent of robust indexes of such nature is still a considerable gain for research in the field of population.

The calculations and comparisons in this paper are confined to the situation in Turkey, and are not necessarily representative of the situations in other countries. However, there is sufficient evidence that the use of sophisticated statistical techniques to construct an index of economic status (in the case of this paper, the Filmer-Pritchett Asset Index), does not enhance the robustness and explanatory power of the analyses. On the contrary, simple asset-based indexes, such as the Asset Count Index and the Asset Prevalence Index, are likely to perform as well as the former. On the basis

of the Turkish DHS data, different indexing approaches produce similar stratification and relative ranking of households into wealth quintiles, and perform with similar effectiveness in predicting reproductive health behavior.

The results also show convincingly that variables on economic status are indispensable for our understanding of reproductive health behavior, be it in descriptive or analytical studies. Descriptive reports that are produced on the basis of findings from demographic/reproductive health surveys miss information on a very important background variable if background variables on economic status are not constructed; multivariate analyses seeking to understand the determinants of demographic/reproductive health behavior are likely to be concluded with rather incomplete (and perhaps misleading) conclusions if variables on economic status are not accounted for. In short, methodological efforts to produce robust measures or indexes of economic status that can be constructed by using survey data are justified.

The similarity of different asset-based indexing approaches means that one is likely to obtain similar results whichever the index approaches is used. This means that asset-based indexes, based on simple logic rather than statistical perfection can be used with the same effectiveness and can be used by a wider audience which invariably comprises those who are unfamiliar with techniques such as principal components analysis. The wide use of the latter, to the extent of including the resulting economic status index in descriptive survey reports carries the inherent danger that a descriptive tool would be used without the full understanding of it by the producer, given the extensive sharing of relatively simple and user-friendly computer programs with those who are less statistically minded and would, in most cases, not have the luxury of attempting to understand the sophisticated technique in question.

The findings in this paper have to be confirmed with data from other countries; but also, there is need to work on new approaches towards improving the performance and robustness of asset-based indexes. In addition to the inability of these indexes in representing absolute poverty or absolute levels of wealth, a major problem that remains is that comparisons across countries and in time are not possible, and moreover, intra-country comparisons may not be valid due to the association

between the possession of household assets and tastes, cultural backgrounds, and choice patterns of households. Possible improvements in asset-based indexes could therefore be the use of external information such as average national income to make quintiles of wealth comparable, and in regard to the selection of assets that should be included.

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NOTES

[1] For reviews of the methodologies and contents of these surveys, see Grosh and Glewwe (2000) and Grosh and Munoz (1996).

[2] A major conceptual problem would remain unsolved even if such information were collected simultaneously, due to the lack of proper correspondence of the relevant time frames. Consumption expenditures largely reflect current economic status of households, whereas current demographic/reproductive behavior of household members is shaped over a course of time, during which economic status of the household may have varied considerably. There would clearly be a problem of synchronicity between current economic status and demographic/reproductive behavior, which cannot be dissociated from past demographic/reproductive experiences.

[3] Information on the prices of household assets can be estimated by using different ways. These would include asking the costs of assets to the respondents, or using average prices of each asset from official sources. In any case, the accuracy of the estimates is likely to be questionable. The information collected is often below par due to recall problems. Furthermore, the existence of inflation may distort the comparability of prices of household assets which may have been acquired over a considerable time span. There are also problems in connection with the use of "average"prices: It may be that a specific household asset will have a wide range of prices depending on the brand. Also, the "prices" of some assets or housing characteristics may be very difficult to estimate: Consider estimating the average price of a flush toilet, for instance.

[4] The Filmer and Pritchett Asset Index appears to be named with a variety of terms: the Wealth Index, the Asset Index, the Standard of Living Index etc.

[5] Detailed information on the methodology of the TDHS and the DHS can be found in HUIPS and Measure DHS+ (1999).

[6] Acknowledging the difficulty of collecting comprehensive information on income or consumption expenditures with a small number of questions that would be tolerated into the questionnaires, the TDHS aimed at classifying households in terms of their cash income brackets. Cash income was not asked directly to the respondents. First, respondents were required to state whether their income was below a certain amount; if not, they were asked if their income was above a certain amount. By asking a chain of such questions, the information obtained allowed the placement of the household in an income bracket during the analysis stage. These questions were largely experimental, seeking to answer whether such information would be correlated with information on household assets, and whether such information would enhance the performance of multivariate analyses. Some analyses of this information were performed, but all remain unpublished to date.

[7] In the first applications of the method, Filmer and Pritchett estimated standardized scores of economic status for households and subsequently ranked households into "wealth quintiles" without any reference to the survey population. In this variant of the method, each household member is assigned an asset index score which has been calculated by assuming equal weights for households. In later applications, however, the calculation of standardized scores is carried out on the basis of households, but consequently, survey populations, rather than households are categorized into wealth quintiles. This can be achieved by weighting households by the number of household members and estimating the quintile cut-off points on the basis of the survey population.

[8] Filmer and Pritchett (1998) argue that the "factor" which explains the largest amount of "co-movement" of different assets can be interpreted as a household's economic status, i.e. the first principal component. They recognize a generic problem with the principal components procedure, though: the difficulty in explaining second and higher order components. In trials of the index with various country data, the first eigen values are relatively high, but so are the eigen values of the second and sometimes the third component. Although such results imply that the "co-movement" of the assets is explained by more than one factor, Filmer and Pritchett still suggest the use of the first principal component for deriving weights for household assets.

[9] Although the FPAI can be constructed by using information on a small set of household assets, it has also been shown that increasing the number of household assets enhances the performance of the index and increases the variability of index scores across households (Johnson, 2001).

[10] The sudden gain of popularity of the Filmer-Pritchett index is somewhat surprising and is probably a reflection of the desperation of researchers to come up with analyses to link demographic/reproductive health and economic status, particularly poverty. Macro International Inc is now using the index to produce information sheets for DHS showing differences in health, nutrition and population outcomes by wealth quintiles in different countries, and the World Bank is using the index to monitor socioeconomic programs and reforms in the health sector. The adoption of the index as a major monitoring tool is somewhat unexpected and possibly too

courageous, given it's indirect nature and a variety of criticisms directed towards it. For these criticisms, see the main text.

[11] Interestingly, UNICEF refers to the FPAI as the "DHS Wealth Measure". The index was developed to measure intra-country economic status from data of any household survey, but the obvious primary target for performing analysis with the index was the DHS surveys. Most applications of the index indeed use DHS data. The collaboration between the World Bank and the DHS project must have led UNICEF to name the index as such.

[12] UNICEF (2002) suggests the use of information on the following assets for the construction of the FPAI: main material of dwelling floor, number of rooms in the dwelling, main source of drinking water, toilet facility used, possession of electricity, radio, television and refrigerator, ownership of bicycle, motorcycle and car, and main cooking fuel used by the household.

[13] One study by Kalaycioglu, Kardam, Tuzun and Ulusoy (1997) appears to use information on household assets in a somewhat similar fashion, but only as part of a broader index of "socio-economic stratification". Even in this case, the information on the prevalence of ownership of household durable consumer goods is used in conjunction with the average market prices of the durables in question. The authors do not specify whether this approach was adopted from another study, or whether it was their own design.

[14] This is probably true for all asset-based indexes, including the FPAI.

[15] Households which had missing information on more than half of the assets were assigned missing values for the ACI.

[16] If there were no missing information on any of the assets, 18 different values would have been obtained, ranging from 0 to 17. Usually, studies using the asset count index do not mention the problem of missing information (Gage, Sommerfelt and Piani, 1996; Wang, 2002). In fact, taking the missing information into consideration and calculating the API as a proportion rather than a simple count has two positive effects on the resulting index scores: 1) A larger number of index scores are obtained, thus providing a wider range of index values, 2) A downward bias in the index scores of households with missing information on some assets is eliminated.

[17] The 20 percent cut-off point also corresponds to a quintile, used to classify the survey population.

[18] Cohen's Kappa measures the degree of agreement between the categories of two variables when both are measuring the same object. A value of 1 indicates perfect agreement, and a value of 0 indicates that agreement is no better than chance.

[19] In the main report of the TDHS, the following were used as socio-economic background variables for most of the tables: Region, type of place of residence and education. No proxy variables for economic status were included.

[20] The post-neonatal mortality variable was constructed as a dichotomous variable by considering a real birth cohort in the denominator. In other words, the probability was constructed as a proportion which includes in its numerator those infants who died during the post-neonatal period, and those infants who had survived until the end of the first month of life in its denominator. Live births during the last one year prior to TDHS were excluded since some of these children would have not completed the risk of dying during the post-neonatal period at the time of the TDHS.

[21] These variables stand for the following: *Region of residence* refers to the 5 regions of the country at the time of the survey, where the Eastern region is the least and the Western region is the most developed. *Type of place of residence* refers to urban or rural residence of the household at the time of survey. Settlements with more than 10,000 population are designated as urban areas. The *gender attitude score* was constructed by combining the responses of women to 4 statements regarding gender issues: Women scored one point from each of the following if they agreed that a) men are wiser than women, b) Women should not argue with men, c) Important decisions in the household should be taken by men, d) Sons' education is more important than daughters' education. The gender attitude score ranged from 0 (no agreement with the statements) to 4 (agreement with all statements). Mother tongue was used as a proxy for ethnic background. Other common variables are self-explanatory.

[22] In cases when (would-be) parents are covered by a health insurance scheme, they are fully or partially exempted from paying towards pre-natal consultations or deliveries.

[23] Women were asked a series of questions to explore whether they had had any medical problems around the time of birth. The medical problems specified were a) regular labor which had lasted more than 12 hours, b) excessive bleeding that was life threatening (as perceived by the respondent), c) high fever with bad smelling vaginal discharge, d) convulsions not caused by fever, and e) episiotomy. The dichotomous variable constructed from these information was based on whether the woman had any of these problems.

[24] Such ratios are widely used to assess the performance of economic status indexes (UNICEF, 2002; Filmer and Pritchett, 1998; 1999; Gwatkin et al, 2000; Johnson, 2001; Rutstein, Gwatkin and Johnson, 2002; Rutstein, 2002). In some applications, however, reverse (i.e. poor-rich) ratios are calculated, and usually, the initial value of the ratio is used. However, it is useful to transform the ratio into an absolute deviation from unity, since the values of some demographic/reproductive health indicators are expected to decline by wealth (for instance, mortality rates), while others would be expected to increase (such as delivery attendance). Naturally, when transformed into absolute deviations from unity, the poor-rich and rich-poor ratios produce the same results.

[25] Naturally, these ratios are 'net' only on the basis of the other independent variables which are used and controlled for.

[26] Other independent variables that were used in the estimation of the odds ratios are not shown here, since the objective is to compare the odds ratios and net rich-poor ratios for the various indexes.