



SUMMARY AND CONCLUSIONS

**SOME EFFECTS OF RURAL ROAD IMPROVEMENT IN
APPALACHIA—A CASE STUDY IN THE EASTERN
KENTUCKY COAL FIELDS**

By

Eldon D. Smith, J. Keith Wilkinson, and Kurt R. Ansel

RESEARCH REPORT 17 : May 1973

University of Kentucky :: College of Agriculture
Agricultural Experiment Station :: Department of Agricultural Economics
Lexington



Late-Stage Shifts in Baby Tobacco Allotments

1950-51

By Milton J. Holt, Robert E. Brown and Curtis M. Henderson

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SUMMARY AND CONCLUSIONS

A continuing issue facing public decision makers in rural areas, and particularly in the mountains of Eastern Kentucky, is the extent to which all-weather roads should be constructed to serve people living on unimproved roads. One argument in favor of investing in all-weather roads is that lack of adequate roads impedes the improvement of the human resources of the area. It is possible that residents on these roads are functionally isolated from health services, education, shopping, and the other activities which are important to developing the capabilities for adapting to and coping with the demands of the complex social and economic environment of the contemporary world. The purpose of the research reported here is to determine the extent to which residence on unimproved roads does, in fact, limit access opportunities, services, and cultural assets which are available to others.

Pike County, Kentucky, the site of this study is in the coal mining area of Eastern Kentucky. Its population is predominantly rural-nonfarm and has very low per capita income, low levels of education, and lower-than-average levels of physical health. Compared with the population of other areas, a high proportion of families have no employment income.

That distinguishable cultural traits of the people in the region persist and that they had their origins in a period when the mountain area was functionally and geographically isolated from the rest of the country are not denied. However, the evidence presented in this study shows that, at present, interaction between the population of the area, including those located in remote communities accessible only by unimproved roads, and other areas is relatively frequent. Moreover, the average frequency of travel for all purposes of people of comparable characteristics and circumstances is only about 15 percent less in areas without improved roads than in those with immediate access to paved roads. Significantly, less-frequent extra-neighborhood business and social contact is found mainly in shopping trips and participation of parents in school-related activities. There is no indication that offspring of persons living in areas with only unimproved roads are less willing to accept employment in other areas, that their adult offspring have received less formal education or that they travel less frequently to areas more than 100 miles distant.

From these facts it seems reasonable to conclude that expenditures for rural road improvement must be justified, if at all, mainly on the basis of direct economic costs and benefits or on the basis of equitable distribution of public services. There is no indication that lack of access to all-weather roads has any discernable adverse effect on the development of the human resources or cultural integration of the area with other parts of the country.

SUMMARY AND CONCLUSIONS
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SOME EFFECTS OF RURAL ROAD IMPROVEMENT IN APPALACHIA — A CASE STUDY IN THE EASTERN KENTUCKY COAL FIELDS

by

Eldon D. Smith, J. Keith Wilkinson, and Kurt R. Ansel*

Introduction

Several scholars have partially attributed the chronically depressed condition of Appalachia to functional social and economic isolation from other parts of the country.¹ However, in the period since most of these studies have been published a variety of factors has modified the degree to which these conclusions may be applicable. Television and a network of federal and state highways are among them. Yet important social and cultural differences persist.

While Ford in his "The Passing of Provincialism" provides evidence that the basic attitudes and aspirations for economic achievement, education, and the like are not greatly different on the average from those of people in other areas, he recognizes the cultural differences of mountain people which others have observed. He attributes these differences to economic circumstances and states that "economic development within the region... (is) not so much dependent upon their cultural integration as their cultural

integration is dependent upon economic development" [2; p. 34]. While some may question the extent to which highway development is responsible for it, a leaflet of The Kentucky Highway Department alludes to much the same change. It says:

"The people of these (four) regions (of Kentucky) were different in many ways, their speech varied, and the way they thought and acted set them apart... The new system of toll roads from Fulton... across the southern section of the state to Somerset... and from London to Hazard in the heart of the mountains spells the end of provincialism in Kentucky" [4].

Whatever may be the merit of inter-regional highway construction, it is no longer a major issue. The network is largely complete or in process of construction. Hence, if road deficiencies exist which limit the development of the region they are in the local or secondary road systems.

This study is based on data collected in the coal field region of Eastern Kentucky. Since there is very little agriculture in this region, the usual justification of expenditures for improved farm-to-market roads does not apply. In addition, most of the counties in this region are relatively poor and have very limited tax revenues in relation to their needs for improved public services of almost all types. Therefore, costly road improvements must be scrutinized very carefully to

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¹Examples are writings of T. W. Schultz [7], V. W. Ruttan [5], J. Weller [3], E. D. Smith [11], and many others.

determine whether the effects of road improvement on the largely nonfarm population of rural areas are important or unimportant to the welfare of the present population of the area and succeeding generations.

The objective of a companion study is to estimate the direct economic costs and benefits of road improvement to people who do not at present have access to improved roads [11]. However, in this study the emphasis is on the effects of road improvements on the human resources of the area. Thus, attention is centered on selected activities and the utilization of selected services such as medical care and education. Those selected are ones which are either believed to be important in themselves or are indicative of other aspects which are important in developing the capabilities of residents of these areas to cope with the demands of a complex contemporary social and economic environment. Some of the questions to be considered relate to whether residence on unimproved roads functionally isolates the affected residents from (a) access to important public and private services, and (b) from cultural and educational opportunities.² Of particular importance are the effects of this environmental factor on educational attainment and mobility of the population.

Our emphasis on human resources and their development is a result of the strong evidence that the Appalachian region of Kentucky has been seriously disadvantaged in this regard. About 50 percent of the men examined for possible military service by the Selective Service in the Appalachian Counties of Eastern Kentucky in 1969 were rejected

²In subsequent references to unimproved roads we will refer to "primitive" or "unimproved" as classified by the Kentucky highway Department, meaning not graded, drained, or artificially surfaced.

because of deficient health of "mental abilities,"³ as compared with 41 percent for the 3 major urban areas and 45 percent for the state. Rejections for "mental ability" deficiencies were 18 percent for Appalachian counties as compared with only 6 percent for the urban counties and 12 percent for the state.⁴

The recognition of these deficiencies in these and other depressed rural areas appears to have been responsible for the gradual shift in federal, state, and local program emphases toward improvement of educational, health, and related public services. Therefore, in evaluating the importance of road improvements a key issue is whether the lack of improved roads affects the availability of such services to an important segment of population.

Survey Design

For all practical purposes commercial agriculture has disappeared from the coal field counties. In 1970 about 97 percent of the rural population was classified as "nonfarm." Commercial agriculture has never been the predominant source of income in this area. In recent decades the area has been heavily dependent upon coal mining and, in the early years of the century, upon timber industries for income and employment. The substitution

³Mental ability was mainly measured by the Armed Forces Classification Test, a written examination, testing primarily types of linguistic and analytical skills resulting from differences in educational preparation and personal experience. The "mental ability" term is quoted directly from Selective Service documents.

⁴Per capita expenditures for education in Appalachian coal field counties of Kentucky were about 92 percent of the state average and 68 percent of the national average, according to the 1967 Census of Governments. Data on Selective Service rejections are from unpublished internal documents supplied by the Kentucky Selective Service System. Urban Centers refer to Jefferson, Fayette, and Kenton and Campbell counties.

of machinery for labor in coal mining in the 1940's and 1950's and the earlier decline of the timber industry left the area with severe problems of unemployment and under-employment. Despite a 22 percent decline in population in the preceding decade, in 1960 median rates of male under-employment were about 29 percent in the coal field counties, nearly three times as high as for all Illinois counties.⁵ For these reasons and others, the study was confined to the coal mining area.

Pike County has a substantial population center and about 600 miles of unimproved road.⁶ Two populations—one with residence on bituminous all-weather roads and located in a radius 10 to 15 road miles from Pikeville (but within the county) and the other located at least one-half mile from an all-weather road and between 5 and 15 miles from Pikeville—were distinguished and randomly sampled.⁷ A proportional sampling scheme was followed in which sample segments were laid out on a highway map showing residential structures. A proportional, two-stage random sample was drawn. Segments of a given size class (number of residences) were the basis of stratification. Replacements were drawn when buildings shown on the maps were vacant or destroyed. In this area of declining population new structures not shown on maps were very infrequent and were ignored. Eighty-seven

useable questionnaires were obtained in the sample of households located on unimproved roads. Ninety-three were obtained from those located on paved roads. Three additional families had sufficient farm income to be classified by the Census as part-time or full-time farmers and were excluded from the analysis as being atypical.

Method of Analysis

The fundamental method for determining the effects of living on an unimproved road is to compare the frequency of the households' participation in various activities and educational attainment and mobility of their children. However, simple comparison would not provide a valid indication of the effect of road improvements (or failure to make them) on the residents of the area. The reason for this is that the populations of the two areas are different in age and educational composition, income, and availability of automobile transportation. Therefore, any differences observed by direct comparison might be caused by either their location as such, differences in population composition, income, transportation availability or some combination of these.

To adjust for these differences in the populations, estimates of what the average difference in frequencies between the two groups would be if they were similar in all other relevant respects except the location of their home were derived.⁸ This "Adjusted

⁵ Sources: *Underemployment Estimates by County, United States 1960*, Agricultural Economic Report No. 166, ERS, USDA, Washington, D.C., and *U. S. Census of Population 1970*. For the precise statistical definition of under-employment used in the former publication see P. 1, "Procedure." As used in the preceding narrative under-employment which is less productive than alternative employment for which the individual is qualified and corresponds closely to the concept employed in the statistical definition.

⁶ Source: Special tabulation, Kentucky Department of Highways, 1966. However, the data were based on inventories for earlier years, mostly from 1953-1960.

⁷ The 15-mile upper limit was established to eliminate the possible influence of other county seat communities.

⁸ Separate regressions were computed for paved roads and unimproved road residents to generate regression coefficients which could be used to estimate the effect of each variable on the type of activity analyzed. No adjustment in the difference between means was made if neither regression equation produced a coefficient which was significant at a probability level of 0.05 or less according to the "T" test. If both the coefficient for the paved road and unimproved road groups were significant, the one used to adjust for differences in average age, income, etc., was largest, i.e., the one which gave the smallest estimated adjusted difference between means of the two groups. This procedure is simply an expedient of conservatism in estimating the difference attributable to the road factor, itself. The regression statistics are all shown in Appendix Table 1.

Difference Between Means" is shown for each activity which was analyzed in the final column of Tables 2, 3, and 4. No such estimates were made if the groups were similar initially.

Characteristics of Residents of Communities on Paved Roads and on Unimproved Roads

The data shown in Table 1 indicate that the nonfarm population of this area is unusual in several respects. In general, the outmigration and return migration process which has reduced the population of the coal field area (Census Economic Area 9) by 33 percent in the past two decades has left a residual population of families with relatively old heads of households.⁹ Moreover, a high proportion have relatively little education and most have quite low incomes. Agriculture contributes very little to total income, and a high proportion of families are totally dependent on non-employment sources of income, a predominant proportion of which receive either private or Social Security retirement benefits. Despite the high average age of household heads, a majority have school age children in their households.

The main distinguishing features of the residents of areas with only unimproved roads are higher-than-average age of household heads, lower educational levels, a higher proportion with no employment income, and distinctly lower average levels of total income from all sources, \$1,378 lower than those living on paved roads.

⁹See Sanders [12] and Weideman [13] for analyses of the reasons for and selectivity of return migration.

Effects of Access to Improved Roads on Economic and Social Participation

No measure of native abilities has yet been developed which totally eliminates the effects of environmental factors. Further, it was not feasible to administer the existing standardized ability measures to the persons included in the sample. Therefore, in the absence of evidence to the contrary, we will assume that differences in the behavior of the two groups being compared are a result of environmental influences such as cultural influences, family life, social and educational opportunities or the physical influence of living in a situation in which communication and ease of travel are determined by access to improved roads.

Recreational, Social, and Shopping Activities

The stated purpose of an activity may or may not denote its effects on the individual who engages in it. The variety of personal experiences to which individuals, especially the young, are exposed are generally recognized to have potential indirect effects on their capabilities for dealing with the complexities of modern living and on their adaptability to new and unfamiliar situations. From a purely economic point of view, beyond a certain minimum level additional shopping trips may be redundant, yet in shopping trips children and young adults are often exposed to a variety of influences which create an awareness of possibilities of careers, cultural interests, business opportunities, and the like which may have profound effects on their attitudes and aspirations. Shopping trips are both business and social events. In addition, the fact that an individual finds it feasible to make more shopping or recreational trips suggests that he is also better able to avail himself of virtually all available public services which are important

Table 1

Characteristics of Sample Households, by Place of Residence, 1966

Characteristic	Place of Residence	
	On Paved Road	On Unimproved Road
1 Average age of head, years	50.1	54.4
2 Average years school completed	7.0	6.2
3 Average number of persons per household	3.7	3.8
4 Percent with children under 18 years	63.0	50.0
5 Percent with no employment income	35.0	46.0
6 Percent with no employment income receiving Social Security or retirement income	97.0	88.0
7 Average annual income of household all sources	\$4,660.00	\$3,282.00
8 Average combined value of cash farm income and home-produced foods at valued retail prices	\$ 150.00	\$ 263.00
9 Proportion of families owning automobiles	85	64
10 Total number of sample respondents	93	87

to his physical and social well-being. In other words, data on these activities serve as indicators of several other opportunities which *could have* an important bearing on the development of the human resource potentials of those affected. Data on the frequencies of shopping and recreational participation are presented in Table 2.

Unfortunately, it is fairly difficult to interpret data on shopping activities. Shopping includes both major shopping trips when supplies of groceries for a week or more are purchased or when clothing and other major purchases are made, as well as so-called convenience shopping for small items such as a loaf of bread or a quart of milk. Much of the convenience shopping takes place at small country stores which abound in the rural areas of Appalachia. Moreover, a high proportion of this was reportedly done by walking to the stores, especially among the families living on paved roads where such stores are relatively numerous. In any event, the distinction between "regular" shopping trips and "convenience shopping" is necessarily somewhat arbitrary or judgmental whether the distinction is made by the survey respondent or by the analyst. The criteria employed are noted in footnotes to Table 2.

From Table 2 it is obvious that the residents of the areas without improved roads made significantly fewer trips for "regular" shopping purposes than those living on paved roads. The remaining difference after adjusting for the small difference in average number of persons per household is highly significant statistically.

A regression analysis of convenience shopping was not made because a high proportion of this was done by walking. However, the much more frequent convenience shopping in the group living on paved roads is probably partly explained by the much shorter average distance to the convenience outlets patronized, 0.68 miles as

compared with 1.7 miles.¹⁰

While the frequencies were significantly different, there is reason to question whether the highly frequency represents either an economic or social advantage. These country stores are usually high cost retailing units. Moreover, although they serve as neighborhood gathering places for conversation and other informal socializing, the local nature of the store clientele and its neighborhood location limits the extent to which it can contribute to the broadening of interests and social perspectives, and the development of tastes, folkways and social skills demanded by a modern urban-industrial society.

There were no significant differences in frequency of trips for spectator recreation such as movies and athletic events. In fact, the residents of the areas with only unimproved roads appeared to participate somewhat more in this type of recreation once allowance was made for differences in incomes.

Trips specifically to visit friends or relatives ("social recreation") were significantly less frequent among the families living on unimproved roads than those living on paved roads. However, this was attributable in part to differences in ages of heads of households. When adjustment was made to allow for this difference, the remaining "adjusted" difference was not significant.

Non-church organizational participation was also not significantly different in the two groups.¹¹

¹⁰Information on the distance to the nearest country store, as distinguished from the one patronized, was not collected.

¹¹Church organization participation was not included in the analysis because churches have quite varied programs. From observation, we judge that the church programs available in the two groups are quite dissimilar. This makes interpretation of differences in average frequency of participation virtually meaningless.

Table 2

Frequency of Shopping Activities, Recreational Travel and Organizational Participation Travel by Location of Household

Purpose of Travel	On Unimproved Road		On Paved Road		Raw Difference Between Means	Adjusted ^h Difference Between Means
	Households Reporting Activity (Number)	Mean Frequency ^g (Trips per Year)	Households Reporting Activity (Number)	Mean Frequency ^g (Trips per Year)		
1. Shopping						
a. "Regular" grocery and non-grocery ^a	86	72.3	93	93.6	-21.3	-20.5*
b. Convenience grocery shopping ^b	58	137.2	76	214.4	-77.2***	--
TOTAL	86	209.5	93	308.0	-98.5***	--
2. Recreation						
a. Spectator recreation: movies, ballgames, etc. ^c	31	10.5	28	11.5	- 1.0**	+ 4.3**
b. Social ^d	62	23.3	63	34.2	-10.9*	- 7.9**
TOTAL	--	33.8	--	45.7	-11.9***	--
3. Organizational Participation ^e	10	2.4	28	4.5	2.1**	- 1.9**
TOTAL RESPONDENTS	87 ^f	--	93	--	--	--

^aSince 37 of 50 reporting more than twice per week "regular" grocery shopping reported no convenience shopping, it was assumed that any in excess of two reported "regular" trips per week were for "convenience shopping" purposes and were credited accordingly.

^bIncludes, respectively, 24, 6 and 60.0 trips annually for isolated and non-isolated which were originally reported as "regular" grocery shopping (see footnote a).

^cIncludes all spectator recreation.

^dInformal socializing.

^eIncludes both organized social activity, e.g., lodges, and clubs and farm organizations, and labor unions.

^fOnly 86 reported on social recreation.

^gFor all respondents.

^h"Adjusted" differences between means refers to the difference remaining after allowance for other significant factors as determined by regression analysis. (See text explanation for exact procedure.)

*Isolated significantly lower at $P = 0.05$. Minus (-) sign indicates lower frequency in isolated group; + indicates higher frequency.

**Isolated not significantly lower at $P = 0.05$.

***Significance not tested.

From the evidence that we have two conclusions may be drawn: (a) the average frequency of contacts for shopping, recreation and organizational participation, while somewhat lower in the communities on unimproved roads, is still quite high, or an average of 4.5 times per week compared with 6.9 for those living on paved roads, and (b) that the only significant difference is in the frequency of shopping trips, which, of course, comprise the predominant reason for contacts outside the neighborhood other than children attending school. If one ignores the difficult-to-interpret convenience shopping activity, which is predominantly an intra-neighborhood activity, it is clear that the neighborhoods without improved roads are not greatly disadvantaged in terms of access to the aggregate of recreational, social, organizational and shopping contacts outside the immediate neighborhood.

Medical and Dental Service

Although families living on paved roads made more trips for medical and dental services, the difference was an average of only one doctor's office visit per family annually and 0.25 visit to dentists per family annually. These differences in frequency of use of dental services and medical services are not statistically significant.

Regression analysis of the frequencies of dental visits indicates that among the residents of areas with unimproved roads, but not those with paved roads, a highly significant relationship exists between family income and use of dental services. This suggests that among this generally very low income group (\$3,230 per year average) members of households with lower-than-average incomes are frequently deprived of even the very limited level of dental service of the average family. Moreover, the use of dental services by both

groups is very low. Well below half of the families in both groups, especially the ones on unimproved roads, visited a dentist one or more times during the previous year despite the fact that a substantial majority (56 percent of isolated area households and 61 percent of non-isolated households) had children of school age or below.¹²

Extra-Curricular Participation of High School Students

Extra-curricular activities are usually regarded as important socializing and attitude-shaping elements of high school programs. Many of them require participation in after-school hours, often requiring the student to miss his bus and return home by automobile. Thus, the student from the more inaccessible neighborhood may find it inconvenient and difficult to participate because of the location of his home, and because his more isolated, low-income environment may provide an inferior opportunity to develop basic social and physical skills required for participation in the more prestigious and attractive activities.

The evidence on this point is not very conclusive. Only 6 of the 21 high school students from the families living on unimproved roads participated in *any* extra-curricular activity as compared with 18 of 30 in the non-isolated neighborhoods, a significant difference (5 percent level). However, the number of activities per participating student was 1.83 and 1.11, respectively. While one may speculate that the initial participation is more important than

¹²It is not clear whether lack of dentists, deficient awareness of the importance of dental care for future health, or other factors explain this situation.

Table 3

Medical and Dental Service Trips by Location of Household

Types of Service	On Paved Road		On Unimproved Road		Raw Difference Between Means	Adjusted Difference Between Means ^a
	Number of Participating Families	Mean Frequency Per Year (All Families)	Number of Participating Families	Mean Frequency Per Year (All Families)		
Dentist	32	1.09	42	1.34	-0.25**	+0.36**
Doctor-office visit	78	8.77	86	9.84	-1.07**	-1.07 ^b
Total number of families	87	--	93	--	--	--

**Unimproved road not significantly lower at $P = 0.05$; + indicates unimproved road area higher frequency than paved road area.

^aAdjusted difference between means refers to the difference remaining after allowing for differences in other significant factors as determined by regression analysis. (See text explanation for exact procedure.)

^bNot adjusted because no regression coefficients were significant.

additional ones, this is not an established fact.¹³

Parental Participation in School-Related Activities

Parents often express their interest in education through participation in school-related activities such as P.T.A., attendance at athletic events, musical, dramatic and other performances, and the usual classroom visitation programs. If, however, difficulties in obtaining transportation, lack of what they regard as appropriate clothing, or "social barriers" make it unfeasible or awkward for them to attend these events, these families are deprived of a potential avenue of support for educational achievement.

Parents of school-age children in the two samples showed a marked difference in attendance of school-related functions. Only 10 of the 42 families in the neighborhoods with unimproved roads attended any school-related activities, compared with 25 of the 48 from neighborhoods with paved roads. Moreover, those more disadvantageously located families that attended any such activities attended only half as many per household. Average frequency per household was only one-fourth as great among these families, a highly significant difference. Differences in income, education of the head of the household, and automobile ownership did not account for this difference. Average family income of those attending such events was not significantly higher than the average for respondents in the two samples, \$3,870 as compared with \$3,280 for the unimproved road locations and \$4,860 as compared with \$4,660 for the paved road locations.

¹³Because of the mixed evidence, no regression analysis was done.

Services Provided at the Home

While many services require the user to travel to the place where they are available, others are provided at the home. These include a variety of repair, sales, delivery, and other commercial services, in addition to home visits by social workers, school officials and other government workers. Thus, the participation of the individual family in the broader community and its services may depend upon both (a) the ease with which the individual may leave his neighborhood to obtain desired services and social interactions, and (b) the accessibility of his home for the delivery of other services.

Generally, the survey data suggest that both commercial and public services are less frequently delivered to the areas with poor roads (Table 4). The difference is significant for the private services, and surprisingly, is not explained by differences in income,¹⁴ car ownership or number of persons per household. However, the difference in frequency of visits by public and school officials is not significant according to the statistical standard which we have applied ($P = 0.05$).¹⁵

From this analysis we may conclude that there is no reliable basis for the belief that public agencies worked *less* intensively on

¹⁴Differences in frequency of commercial service calls could be explained by owner maintenance. However, this is normally related negatively to income, a factor which we have analyzed. The regression equations have no coefficients which are significant at $P = 0.10$, including family income and is not reported here.

¹⁵Regression analysis of the frequency of public official and school official visits provides only one significant coefficient. In the non-isolated group there is a highly significant positive relationship between frequency of such visits and income levels. This suggests that the poor, the group least able to care for their own needs, are receiving less of the types of services which require home visits on the average than those who are more affluent. Automobile ownership, number of school age children in household and age of head of household were not significantly associated with number of visits by school and other public officials.

Table 4

Average Annual Frequencies of Visitation by Commercial, And
Public Service Agencies to Residents, by Location

Type of Agency or Personnel	On Unimproved Road	On Paved Road	Raw Difference Between Means	Adjusted Difference Between Means
Repairmen, servicemen, deliverymen and salesmen	22.6	41.2	-18.6*	-18.6* ^a
School and public officials	1.1	2.0	-0.9**	-0.9** ^b
TOTAL	23.7	45.2	21.5	-21.5***

*Isolated significantly lower at $P = 0.05$.

**Isolated not significantly lower at $P = 0.05$.

***Not tested for significance.

^aNo adjustment because no regression coefficients significant.

^bNo adjustment because difference in mean values of significant regression coefficient was not sufficient to affect the result.

programs requiring home visitations with the residents of areas located on unimproved roads. But if their location in an isolated area did not impede delivery of such services, it is somewhat surprising that the areas on unimproved roads with their much lower average levels of family income and greater dependency on transfer payment and retirement income did not receive *more* frequent visits from welfare workers, poverty program administrators, etc.

Combined Automotive Travel for All Purposes

Some forms of participation and service access do not require special family trips. But, in a majority of those that we have discussed, travel is required. Travel frequencies provide an approximate indicator of the extent to which the difficulty of access to the social opportunities and services, and the influence of the social environment of the isolated areas limits participation in the activities and reduces utilization of services of the larger community. But, in comparing travel frequencies of the residents of isolated and non-isolated areas, allowance must be made for several other factors which could affect the need to travel or the opportunity to do so. Since dependence on purchased food determines in some degree the frequency of need for shopping, some allowance must be made for the differing importance of home produced food in two groups. Family size, distance from primary service centers and net income also affect frequency of travel. Ownership of an automobile determines the feasibility of travel. These factors were taken into account in comparing the aggregate travel frequencies of the families living on unimproved roads with those on paved roads. The procedure and the regression statistics are shown in Appendix II.

While the average frequency of automotive travel per year was 225 trips for

the families living on unimproved roads and 323 for those on paved roads, the adjusted difference estimates based on the regression statistics were much smaller. For residents with comparable characteristics and circumstances, personal travel appears to be about 15 percent less if the family lives on an unimproved road than if it lives on a paved one.

While it is evident that bad roads impede contact with agencies and people outside the immediate neighborhood somewhat, the resulting differences are small. Furthermore, even the people living in the areas with unimproved roads—who are older, poorer, and less frequently own a car—made an automobile trip on the average of two days out of three. Having to travel on unimproved roads is inconvenient, uncomfortable, and somewhat costly in travel expense, and in lost work time resulting from impassable roads as we show in a companion study [11]. However, the analysis of travel frequencies strongly supports the view that it does not functionally isolate the affected families to an important degree from the rest of the broader community and its services.

Effects on Educational Attainment and Mobility

While the crude indicators which have been examined suggest that environmental differences caused by inadequate roads are relatively unimportant in determining social interactions and availability of services to the people who are affected, there is more direct evidence of the possible effects on educational attainment and mobility with respect to past job experience and willingness to accept employment in other areas.¹⁶

¹⁶As Brown and Schwarzweiler [1] have noted, education may have acculturating effects which are important to social and economic mobility.

Data shown in Table 5 show that large numbers of the residents of both areas have already lived and worked outside the mountain area or have tried to obtain employment outside the Appalachian region. A small and non-significant difference in the number of pre-retirement-age heads of households who were willing to move to a major city to increase income by \$200 per month was noted, the difference favoring the residents of areas with unimproved roads. Almost identical proportions had traveled outside a 100-mile radius in the past three years, and the same was true of proportions having adult offspring living outside Appalachia. There is absolutely no evidence from this study to support the belief that the impediments to movement resulting from living on bad roads have reduced general geographic or occupational mobility, i.e., willingness to move if opportunities for more

earnings are available.¹⁷

From Table 6 it is obvious that the educational level of offspring of the heads of households who have completed school is definitely higher than that of their parents. However, there appears to be no difference in any age group or income class associated with the area of residence. On the average, they appear to have dropped out of school at about the age when attendance was no longer mandatory, or at age 16.

In sum, whatever impediments to mobility and education exist in the rural areas we have studied are not unique to the geographically less-accessible neighborhoods with unimproved roads. They appear to be a general phenomenon in the rural nonfarm population of the area.

¹⁷See Schwarzweller's studies for a more elaborate analysis of factors affecting geographic and occupational mobility of Appalachian area young people [8, 9].

CONCLUSIONS

In general, the nonfarm rural-resident participation in activities away from home and access to public services is not greatly affected by residence on unimproved roads. Residents of areas served by unimproved roads make about 15 percent fewer trips away from home than do people of similar characteristics living on all-weather roads. The difference is largely in shopping trips. Visits to medical and dental offices are not significantly different, nor are differences in recreational trips. Although fewer high school students who live on unimproved roads participate in extra-curricular activities, those who do participate do so more frequently than students living on unimproved roads. The parents living on unimproved roads do

not participate in school activities as frequently. Travel outside the county, educational achievement of adult children, and willingness to migrate also are not affected by road improvement.

It must be concluded that residence on unimproved road does *not* significantly affect access to public services or participation in activities outside the home. On the basis of this data, it cannot be argued that rural road improvements will reduce functional isolation or improve the capabilities to adjust to the demands of the modern world. Road improvements must be justified on other grounds, such as equity, social benefits and costs of the roads, or political considerations.

Table 5

Indicators of Geographic Mobility of Families, by Location of Residence

Employment Mobility Indicator	Unimproved Road		Paved Road	
	Number	% of Total	Number	% of Total
1 Total respondents	87	100.0	93	100.0
2 Have lived outside Appalachia	37	42.5	30	32.3
3 Have not lived outside mountain area but have tried to get employment outside Appalachia	6	6.9	11	11.8
4 Total have lived or sought employment outside Appalachia	43	49.4	41	44.1
		<u>% of Total Under 65</u>		
5 Total respondents under age 65	63	100.0	71	100.0
6 Have not lived outside, but willing to move to Detroit, Chicago, or Indianapolis for an additional \$200 per month earnings	14	22.2	13	18.3
7 Not willing to move to Detroit, Chicago or Indianapolis, but willing to move to Cincinnati, Louisville or Lexington	4	6.3	1	1.4
		<u>% of Total</u>		
8 Some high school or adult family member travelled outside 100-mile radius during last three years	55	63.2	57	61.3
9 Offspring 20 years old and over now living outside Appalachia	148	54.5	133	58.6
10 Not living outside Appalachia	124	45.6	94	41.4
11 Total offspring over 20	272	100.0	227	100.0

Table 6

Years of School Completed by Offspring of Sample Heads of Households,
by Age, Income Class, and Location of Residence

Age Range and Income Class	Unimproved Road		Paved Road	
	Number of Offspring	Average Years School Completed	Number of Offspring	Average Years School Completed
<u>All Incomes</u>				
18-24 years	65	10.3	68	10.4
All ages 18 and over	272	9.5	244	9.7
<u>Under \$3,500 Income</u>				
18-24 years	37	10.1	19	10.3
All ages 18 and over	195	9.4	129	9.3
<u>\$3,500 Income and Over</u>				
18-24 years	28	10.6	49	10.5
All ages 18 and over	77	9.6	115	10.2

[15] Schwarzwelder, Harry K., *Socio-Economic Change and Migration Patterns of Farm Men from Eastern Kentucky Kentucky*, Kentucky Agricultural Experiment Station Bulletin 583, Lexington, 1953.

[16] Smith, Eldon D., "Nonfarm Employment Information for Rural Areas," *Journal of Farm Economics*, Vol. 36, No. 3, 1956, pp. 813-827.

[17] Smith, Eldon D., J. Keith Wilkinson, and Kurt E. Amstel, "Economic Data and Analysis of Rural Road Improvement in the Eastern Kentucky Coal Field," Unpublished manuscript, Department of Agricultural Economics, University of Kentucky, 1972.

[18] Waddeman, Wesley, "Rural Migration to the Suburbanizing Farming Area of Eastern Kentucky," Unpublished manuscript, University of Kentucky, Department of Agricultural Economics, 1972.

[19] Weber, Jack, *Yesterday's People*, Lexington: University of Kentucky Press, 1965.

Table 10

Number of Sample Heads of Households by Age, Income Class, and Location of Residence

Age Group	Income Class	Total	
		Number of Sample Heads	Percentage of Total
All ages 18 and over	Under \$1,000	103	12.2
	\$1,000 and over	747	87.8
18-24 years	Under \$1,000	103	12.2
	\$1,000 and over	747	87.8
25-34 years	Under \$1,000	103	12.2
	\$1,000 and over	747	87.8
35-44 years	Under \$1,000	103	12.2
	\$1,000 and over	747	87.8
45-54 years	Under \$1,000	103	12.2
	\$1,000 and over	747	87.8
55-64 years	Under \$1,000	103	12.2
	\$1,000 and over	747	87.8
65 years and over	Under \$1,000	103	12.2
	\$1,000 and over	747	87.8
Total		850	100.0

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REFERENCES

- [1] Brown, James and Harry Schwarzweller, "Education as a Cultural Bridge Between Eastern Kentucky and the Great Society," *Rural Sociology*, Vol. 27, 1962, pp. 363-365;
- [2] Ford, Thomas R., "The Passing of Provincialism," in T. R. Ford, editor, *The Southern Appalachian Region*, Lexington: University of Kentucky Press, 1962, pp. 9-54.
- [3] Hughes, R. F., Jr., "Population Adjustments and the Economic Status of Southern Farmers," Mimeo, Department of Agricultural Economics and Rural Sociology, University of Tennessee, 1956.
- [4] Kentucky Highway Department, *Facts Regarding Your Highways in Kentucky*, leaflet, undated.
- [5] Ruttan, Vernon W., "The Impact of Urban Industrial Development on Agriculture in the Tennessee Valley and the Southeast," *Journal of Farm Economics*, Vol. 37, No. 1, 1955, pp. 38-56.
- [6] Sanders, John, "Some Aspects of the Economics of Return Migration: With Reference to the Eastern Kentucky Coal Fields," Unpublished M.S. thesis, University of Kentucky Department of Agricultural Economics, 1967.
- [7] Schultz, Theodore, E., "A Framework for Land Economics - The Long View," *Journal of Farm Economics*, Vol. 35, No. 1, 1952, pp. 204-215.
- [8] Schwarzweller, Harry K., *Career Placement and Economic Life Chances of Young Men From Eastern Kentucky*, Kentucky Agricultural Experiment Station Bulletin 686, Lexington, 1964.
- [9] Schwarzweller, Harry K., *Sociocultural Origins and Migration Patterns of Young Men from Eastern Kentucky*, Kentucky Agricultural Experiment Station Bulletin 685, Lexington, 1963.
- [10] Smith, Eldon D., "Nonfarm Employment Information for Rural People," *Journal of Farm Economics*, Vol. 38, No. 3, 1956, pp. 813-827.
- [11] Smith, Eldon D., J. Keith Wilkinson, and Kurt R. Ansel, "Economic Costs and Benefits of Rural Road Improvement in the Eastern Kentucky Coal Fields," Unpublished manuscript, Department of Agricultural Economics, University of Kentucky, 1973.
- [12] Weideman, Wesley, "Return Migration to the Subsistence Farming Area of Eastern Kentucky," Unpublished manuscript, University of Kentucky, Department of Agricultural Economics, 1972.
- [13] Weller, Jack, *Yesterday's People*, Lexington: University of Kentucky Press, 1965.

REFERENCES

[1] Brown, James and Harry Schwabacher, "Education as a Cultural Bridge Between Eastern Kentucky and the Great Society," *Rural Sociology*, Vol. 27, 1962, pp. 363-368.

[2] Ford, Thomas R., "The Passing of Provincialism," in T. K. Ford, editor, *The Southern Appalachian Region*, Lexington: University of Kentucky Press, 1962, pp. 9-24.

[3] Hughes, R. F., Jr., "Population Adjustments and the Economic Status of Southern Farmers," Mimeo, Department of Agricultural Economics and Rural Sociology, University of Tennessee, 1956.

[4] Kentucky Highway Department, *Fact Finding Tour Highway in Kentucky*, Jefferson, undated.

[5] Ruttan, Vernon W., "The Impact of Urban Industrial Development on Agriculture in the Tennessee Valley and the Southeast," *Journal of Farm Economics*, Vol. 37, No. 1, 1955, pp. 38-56.

[6] Sanders, John, "Some Aspects of the Economics of Return Migration: With Reference to the Eastern Kentucky Coal Fields," Unpublished M.S. thesis, University of Kentucky, Department of Agricultural Economics, 1957.

[7] Schultz, Theodore, K., "A Framework for Land Economics - The Long View," *Journal of Farm Economics*, Vol. 35, No. 1, 1952, pp. 204-215.

[8] Schwabacher, Harry K., "Career Placement and Economic Life Chances of Young Men from Eastern Kentucky," *Kentucky Agricultural Experiment Station Bulletin 586*, Lexington, 1954.

[9] Schwabacher, Harry K., "Sociocultural Origin and Migration Patterns of Young Men from Eastern Kentucky," *Kentucky Agricultural Experiment Station Bulletin 585*, Lexington, 1953.

[10] Smith, Eldon D., "Nonfarm Employment Information for Rural People," *Journal of Farm Economics*, Vol. 38, No. 3, 1956, pp. 813-827.

[11] Smith, Eldon D., J. Keith Wilkison, and Kurt R. Ansel, "Economic Costs and Benefits of Rural Road Improvement in the Eastern Kentucky Coal Fields," Unpublished manuscript, Department of Agricultural Economics, University of Kentucky, 1973.

[12] Weideman, Wesley, "Return Migration to the Suburban Farming Area of Eastern Kentucky," Unpublished manuscript, University of Kentucky, Department of Agricultural Economics, 1972.

[13] Weiser, Jack, *Kentucky's People*, Lexington: University of Kentucky Press, 1955.

Regression Analysis of Factors Relating to Social and Economic Participation of Isolated and Non-Isolated Households

Regression Statistics^a

Y1	X1	X2	X3	X4	X5	a	R ²
Annual Frequency of Type of Participation and Location	No. Persons In Household	Household Income (\$100)	Auto. Ownership Variable	Age of Household Head (Years)	Years Schooling Completed ^b	Constant Term	
1. Regular shopping trips Unimproved road	+5.200* (2.422)	+0.190 (0.202)	-4.103 (10.254)	Omitted	Omitted	+52.55	0.11
Improved road	+3.987 (2.087)	+0.016 (0.205)	+13.703 (12.540)	Omitted	Omitted	+61.98	0.05
2. Spectator recreation Unimproved road	+0.699 (1.166)	+0.411* (0.091)	+2.682 (4.657)	-0.174 (0.134)	Omitted	+0.474	.31
Improved road	+0.356 (1.442)	+0.059 (0.053)	-5.549 (8.663)	Omitted ^c	Omitted	+13.922	0.01
3. Non-church organizational meetings Unimproved road	Omitted	0.085** (0.045)	0.252 (2.375)	Omitted	0.789* (0.291)	-8.146	0.16
Improved road	Omitted	0.128* (0.053)	-1.568 (3.132)	Omitted	0.021 (0.259)	-0.177	0.10
4. Informal socializing Unimproved road	Omitted	+0.114 (0.157)	-10.682 (8.054)	-0.690* (0.231)	-0.052 (2.001)	+71.996	0.23
Improved road	Omitted	+0.010 (0.228)	-16.240 (13.749)	-0.626* (0.294)	-4.356** (2.290)	+100.504	0.11
5. Dentist office visits, Family trips/year Unimproved road	+0.103 (0.115)	+0.048* (0.010)	+0.605 (0.487)	Omitted	Omitted	-1.658	0.28
Improved road	+0.200** (0.107)	0.012 (0.011)	-0.588 (0.648)	Omitted	Omitted	+0.738	0.09
6. Parents school-related activity participations ^d Unimproved road	Omitted	0.018** (0.011)	-0.566 (0.623)	Omitted	0.148** (0.082)	+4.410	0.27
Improved road	Omitted	0.015	-0.773	Omitted	0.094	+4.859	0.10

(Continued)

Appendix I (Continued)

Regression Analysis of Factors Relating to Social and Economic Participation of Isolated and Non-Isolated Households

Regression Statistics^a

Y ₁	X ₁	X ₂	X ₃	X ₄	X ₅	a	R ²
Annual Frequency of Type of Participation and Location	No. Persons In Household	Household Income (\$100)	Auto. Ownership Variable	Age of Household Head (Years)	Years Schooling Completed ^b	Constant Term	
	Omitted	(0.077)	(0.947)	Omitted	(0.077)	+4.859	0.10
7. Frequency of public official visits to home	X ₆ No. Children In School						
Unimproved road	0.310** (0.165)	-0.016 (0.010)	-0.991** (0.531)	-0.105 (0.48)	Omitted	2.002	0.08
Improved road	-0.150 (0.695)	0.164* (0.055)	+2.584 (3.333)	+0.011 (0.071)	Omitted	-8.551	0.10

*Significant at P = 0.05

**Significant at P = 0.10; no asterisk - not significant at P = 0.10

a () = Standard error of coefficient

b By head of household

c Omitted by error

d Included only families with school age children

APPENDIX II

Two approaches to comparing the isolated and non-isolated groups are possible. One, in effect, asks the question, "How frequently would the non-isolated residents travel as compared with the isolated residents if they had the same family size, value of food production, distance per trip, net income and frequency of ownership of automobiles as the isolated residents?" The other, in effect, inquires, "How would the frequency of travel of the population of the Isolated area compare with the frequency of the non-isolated residents, if family income and other factors were equal to theirs?"

To make these comparisons, two regression equations were computed relating each of the variables noted above to the annual frequency of trips for all purposes, one for the 87 isolated neighborhood residents and the other for the 93 non-isolated neighborhood residents. Mean values for each variable, regression coefficients, constant terms and standard errors of the coefficients (in parenthesis) are shown in the accompanying table.

If the paved road area equation is used to estimate the trips per year for a population with the characteristics of the isolated households, we estimate about 272 trips per year as compared with an actual frequency of 225. If the equation for the areas with unimproved roads is used to estimate the number of trips per household for a population identical to the non-isolated area, we estimate (by coincidence) 272 trips, compared with an actual 323.

From this analysis of aggregate travel frequencies, we may infer that personal automotive travel is roughly 15 percent less for residents of isolated areas than for comparable rural-nonfarm residents who live on bituminous-surfaced roads.

According to our regression estimates, differences in income and the closely associated differences in automobile ownership, account for about two-thirds as much of the difference in travel frequencies as does the locational factor.

Our regression equations leave a majority of the variance in travel frequencies unexplained, suggesting that unidentified factors importantly affect travel frequencies and are shown on page 26.

Factors Affecting Frequency of Travel for All Business, Social
and Recreational Purposes, by Area of Residence

Variable	Unimproved Roads		Paved Roads	
	Mean Value ^a	Regression Coeff. (Standard Error)	Mean Value	Regression Coeff. (Standard Error)
Y No. trips per year	224.95	----	322.52	----
X ₁ Avg. value food production for home consumption	\$246.78	- 0.072 (0.035)	\$127.10	- 0.154 (0.067)
X ₂ Avg. distance per trip (mi.)	11.75	- 6.096 (1.245)	9.69	- 6.338 (2.191)
X ₃ Family size (members)	3.71	+13.639 (5.879)	3.75	+ 7.551 ^b (6.280)
X ₄ Net income	\$2,909.75	+ 0.015 (0.007)	\$4,346.11	+ 0.010 ^b (0.006)
X ₅ Ownership of auto. or truck (1=own; 2=not own)	1.36	-65.619 (25.607)	1.15	-83.499 (37.196)
a Constant term	----	308.953	----	427.844
R ²	----	0.45	----	0.23
n	----	87	----	93

^aAll differences in mean values significant at P = 0.05.

^bNot significant at P = 0.05; all other significant.

