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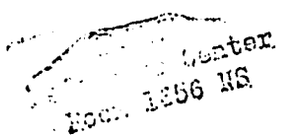

Institute for Communication Research
Stanford University

REVIEW OF RESEARCH: TELEVISION AND ITS LOWER-COST ALTERNATIVES

A.I.D./Institute for Communication Research
Stanford University
October 11, 1973

In the last two decades some powerful currents have been flowing in education, particularly in its application to developing countries. Most of these have involved in one way or other the development of new concepts of instructional technology and the application of instructional media to the problems of expanding and strengthening opportunities to learn.

A great burst of interest in instructional television came in the middle and late 1950's, following on the heels of instructional films. The most spectacular manifestation of this current was a series of projects making massive use of television in an attempt to accomplish swift system-wide change or "reform." Hagerstown had used ITV massively to strengthen teaching, but when Niger and American Samoa installed massive ITV programs in 1964 they used it for educational reform. So also did El Salvador (1968) and the Ivory Coast (1971).

A current toward the individualizing of instruction began to run about the same time. This was stimulated by a new interest in programmed instruction, growing out of Skinner's work. The growth of programmed instruction tapered off when it became apparent that the new method was apparently less profitable to commercial publishers than had been expected, but interest turned to computer-assisted instruction which is still too costly for wide use but is regarded as

one of the most promising of the instructional media devices for the late 1970's and 1980's.

Still another current of change began to run strongly in the 1960's. This was aimed at conducting more schooling out of school. The developing countries began to realize they would never meet their educational goals if they waited to build all the schools and train all the teachers they needed. The richer countries, too, began to doubt their ability to meet all the demands upon their educational systems with formal education in schools and on campuses. The result was the development of an idea that was far from new but that now could make use of the newer media -- the "open" school and university -- and with this an effort to "localize" education.

Along with all these developments came another current, or at least an undercurrent, of dissatisfaction with the costs of instruction, and an effort to find new ways to provide learning opportunities more cheaply. Among other things this led to a renewed interest in the less costly, less complex media of instruction.

When this work began we were in the concluding years of a five-year study of the use of ITV for educational reform in El Salvador. Within the limits of time and resources, therefore, the new research tried to sum up and fill in the available data on the massive use of television, and then to begin to explore the results of the newer currents. We designed the study, as much as possible, to cast light on the use of instructional media at different levels of cost and complexity. Thus,

within the general rubric of television for educational reform, we obtained the first considerable hard data on the effect and cost of ITV in American Samoa, and, though we were frustrated in attempting to gather hard data from the Niger project, we did amass some significant data on both that and the Ivory Coast project. We made an intensive cost-effectiveness study of three Mexican projects: 1) the Telesecundaria, which delivers secondary education by television at low cost to communities that do not have secondary schools, 2) the Radioprimaria which uses radio to expand three-year primary schools to six years, by using the same school building but with little or no addition of teachers, and 3) the Tarahumaran Radio Schools which provide basic primary education to remote indian villages. We obtained new field data on the large Thai Instructional Radio Project, and prepared a summary paper on various uses of radio in development projects. Summary papers on methodological issues and on instructional media costs were also produced. Finally, we endeavored to review all the available evidence from laboratory experiments, theory, and field projects, on the use of low-cost vs. high-cost media. This was summarized in the report Big Media, Little Media.

The reports are available. The following pages are a brief summary of them.

ITV in American Samoa -- After Nine Years

Wilbur Schramm, Stanford: Institute for Communication Research, 1973

American Samoa has one of the most elaborate instructional television installations in the world, including six VHF open-circuit channels, 10 videotape recorders, four studios, and two mountain-top antenna towers. The project began in 1964 as an attempt to equalize and improve the educational opportunities available to Samoan children. Every healthy American Samoa child is now in school, free and compulsory education extends through high school age, and television reaches every island except Swain's which is 200 miles away over open sea.

In the early years of this project, research, if not resisted, was at least not a part of the program. Therefore, there has been a great deal of interest in obtaining hard data on the effectiveness and cost of the American Samoa program. We now have a respectable amount of this information, gathered in the last three years.

Unfortunately, the results of standardized tests given in the year when the project began have been lost or discarded. Therefore, there is no satisfactory quantitative baseline against which to measure the changes in learning over nine years. The best we have been able to do is to measure some of the learning in the school on the one island which has never had television. Because of the language problem in administering tests of other subjects and because an improvement in English language competence was the chief goal of the educational reform, these students were tested in understanding, reading, and speaking English. If the students on Swain's island are indeed representative

of American Samoa students before television, then spectacular improvements have occurred. Fifth and sixth grade students in the island who had never studied with ITV scored lower on these tests than third grade students in an isolated school on the main island of American Samoa, where television is in use. Furthermore, those students in the Swain's Island school who had spent a year or more in a school on an island where television was in use scored far above their fellow students who had never been exposed to ITV.

The best estimate of how well Samoa students are doing with television now comes from standardized tests given throughout the schools for the last three years. These tests, made in English and standardized on mainland students, are not wholly appropriate either for the culture or the language experience of the Samoa students, who, typically, use English in school and nowhere else, have no homework, no English reading material at home, and are actively discouraged from using the language at home. American Samoa is now making its own tests and beginning to standardize them against its own norms, which is more appropriate to system needs but will not provide a very good comparison with other systems.

The standardized tests -- given their lack of fit and probable unfairness -- show that the Samoan children are scoring at about the level of groups on the mainland who might be called "deprived" minority groups. Typically, the Samoan children do a little better in arithmetic, a little worse in reading, than, say, the Southern Black, Puerto Rican,

and Native American groups measured for the Coleman Report. In the early grades they are already below the American majority norm; as they go through school, they fall farther behind.

It can be argued that, given the situation, nothing more could be expected. The language problem, no matter how much the use of English has improved in the schools since 1964, is still causing difficulties. The Samoan students typically do much better (in comparison to test norms) on questions that involve rote learning than those that require higher cognitive skills -- abstract thinking, conceptualizing, problem solving. The question has been raised whether having to study in a foreign language of which one has little command, and of which his teachers have only a little more command, does not handicap a student in primary school in acquiring the intellectual skills and satisfying the curiosity that most children have. This question is now being explored by some comparisons with Western Samoa children who are taught for the first seven years in their native language.

The cost of instructional television in American Samoa is high because the very costly installation serves only 8,100 students. The best estimate we can now make is that the television costs about $157 per student per year, representing about one-fourth of the total cost of instruction.

Three Mexican Projects

The Mexican Telesecundaria: a Cost-effectiveness Analysis
John K. Maye, Emile G. McAnany, Steven J. Klees. Stanford: Institute for Communication Research, 1973.

Mexico's Telesecundaria (TS) system was founded in 1966 to extend secondary schooling (grades 7-9) to students who, because of various geographic and socioeconomic factors, were not able to continue their education beyond the primary level. The system which now serves approximately 32,000 students employs a mix of federal, state, and community resources. In place of large, federally-financed school buildings, TS classes meet in rooms provided by local municipalities, cooperatives, or social service agencies. Instead of specialized secondary school teachers, the TS relies on primary school instructors who are provided some special training in the use of television and are supplied monthly schedules of topics to be covered in each broadcast. Workbooks to assist students in their daily lessons are distributed at low cost through commercial bookstores.

A cost-effectiveness approach was used to evaluate the performance of the TS along with that of Mexico's traditional secondary school system. Samples of 9th grade classes were selected randomly from four states in order to compare the input and output characteristics as well as the costs of the two systems. Student learning and attitudes and teacher classroom performance were also evaluated. Finally, the systems' current and potential abilities to satisfy educational demand were examined in detail.

To compare the teaching effectiveness of the two instructional systems, achievement tests in mathematics, Spanish, and chemistry were administered in the sample classes during the 1971-1972 school year. Overall, TS students gained slightly more on these achievement tests, but the differences were not striking. Learning was strongly related to the students' origins and general abilities. Urban students in both systems outperformed their rural counterparts on all tests and expressed higher educational and occupational aspirations.

The TS was found to be less expensive than traditional secondary schooling in virtually all cost components: administration, facilities, teachers, and student expenses. In the cost components applicable to both systems, the costs of TS amounted to approximately $125 per student per year as compared to $200 per student per year for regular secondary school -- a savings of almost 40 percent for the TS. The TS added approximately $26 per student per year for television. This additional expense brought TS's total cost per student to $151, a figure still 25 per cent below that of the traditional secondary.

Costs were analyzed in a number of different ways to see: 1) how much it would cost to expand regular secondary schools to the areas now served by TS, and 2) how the systems differ in their ability to satisfy educational demand and to produce graduates at varying budget levels. If the regular secondary system were expanded to the environment currently served by the TS, the costs would be at least 50 per cent greater than those currently incurred by TS. Furthermore,

with only 10,000 students enrolled in the system, the TS is at a breakeven point with the regular secondary on a cost per student basis. At increased enrollment levels, the cost differential would increase in favor of TS. In terms of cost, then, the Mexican TS appears to be an extremely efficient means to expand educational opportunity.

A Report on the System of Radioprimaria in the State of San Luis Potosi, Mexico. Peter L. Spain, Stanford: ICR, 1973.

The Radioprimaria (RP) is a pilot project of the Mexican Secretariat of Public Education in rural communities around the provincial capital of San Luis Potosi. Begun in 1970, the project was designed to help complete rural primary schools by presenting most subjects for grades 4-6 over radio and allowing these 3 grades to be taught by one teacher. In 1972, a study was made of the 46 RP schools along with a sample of local rural primary schools not using radio. Conclusions from the study were drawn from data derived from examination of state school statistics, costs of RP system, observation of all sample schools, before and after achievement testing of 6th graders in all sample schools, extensive community interviews of rural parents, a teacher questionnaire, and interviews with industries and state labor offices in San Luis.

Major conclusions from the evaluation were in two areas, those external to the school system and those internal to it:

A. External factors to schooling:

1. Interviewed parents were consistently in favor of more schooling

for their children, not so much to improve the rural situation which most considered unchangeable, but rather as a passport to the city and better jobs;

2. the industrial sector of the capital of San Luis offered only a very limited possibility of employment for school graduates;

B. Factors internal to the school system:

3. observation of RP schools showed that supervision was badly needed to motivate and get feedback from teachers about RP and to assure that schools have functioning radios (41 percent of RP schools did not);

4. achievement testing indicated that learning in RP schools was about equal to non-radio primary schools in the area; however, lack of proper control made it difficult to attribute learning efficiency to radio in these schools;

5. the teachers were city oriented (about 75 percent commuted to rural areas from the city), they did not like teaching in the rural areas and they were not overly enthusiastic about RP although (somewhat inconsistently) they thought its use should be expanded; unlike rural parents, teachers thought education was relevant to the solution of rural development problems.

6. rough cost estimates showed that RP was relatively inexpensive and would be much less expensive than trying to complete rural schools in the traditional way with a teacher for each fourth, fifth, and sixth grade class rather than have one teacher for all three, plus RP.

Finally, the study concluded that although RP has survived for three years as a pilot project at almost no cost to the local San Luis area, there are urgent problems that must be resolved if RP is to make an impact on expanding primary rural education. However, the study questioned whether expanding primary rural education would really help the development of the Mexican countryside. Education alone, the study concluded, cannot eradicate the problems of underdevelopment which are a product of long standing social and economic inequities.

The Radio Schools of the Tarahumara, Mexico: An Evaluation

Sylvia Schmelkes de Sotelo, Stanford: ICR, 1973. The radio schools (RSs) of the Tarahumara area of Northern Mexico were founded in 1955 by Catholic missionaries to reach remote villages of the Tarahumara indians. They operated in Spanish, using the official primary school text books as a base. In 1971, when the evaluation study was begun, they were reaching 46 schools with 1,081 students in grades 1-4. The study, undertaken by the Centro de Estudios Educativos of Mexico City, evaluated the efficiency of the RSs and pinpointed the problems that faced the RS system. Results of the study were as follows:

1. The achievement levels of grades 1-4 were comparable to equivalent grades of lower class schools in Mexico City but a high drop-out rate after first grade meant that advantages were far greater for white or mestizo than for Tarahumara children. Considering the small number of students who finished 4th grade at all and that most of these

were not Tarahumara, the cost-efficiency of the system was questionable;

2. The relatively advantaged students, even among the Tarahumara, were those most likely to succeed in school with the result that graduates were likely to leave their communities to continue school elsewhere and were not likely to return;

3. Curriculum unrelated to local needs and cultural values led to this emmigration by the best young people from their communities.

4. RSs have overloaded their operational, administrative and financial capacities to the point that there is little supervision in the schools, no feedback from teachers, no middle or long range planning, and severe financial problems;

5. Radios were operating in only 7 of 24 schools in the sample. Furthermore, the programing did not take advantage of the potential of radio for reaching a broad sector of Tarahumara people with relevant information in their own language and in ways that reinforce their culture.

The CEE investigating team proposed to the missionaries that the RS system be completely changed to a new type of radio school that would be devoted to preparing adolescents and adu' for their role in the many social and cultural changes that are imminent in the Tarahumara area. This proposal would concentrate on nonformal education in literacy, health, and the development of local natural resources for the Tarahumara population. The proposed changes met with mixed reactions from the missionary group and are under consideration.

Radio and Rural Development: Five Utilization Strategies
Emile G. McAnany, Washington, D.C.: Information Center on Instructional Technology, 1973.

Radio as an effective means for development of rural areas in Third World countries has four advantages over other communication technologies: it saves time because it is presently the most widespread form of mass communication; it offers cost advantages over TV, for example, in production, transmission and reception costs; it is an effective means of instruction and information dissemination (though no evidence can show comparative effectiveness with TV); it helps localize development effort because of its cost and relative simplicity

Radio's effectiveness, however, depends to a great extent on how it is used in development. This paper reviews the evidence for strengths and weaknesses of five basic utilization strategies that have been tried over the last decades.

A. Open broadcasting: the unorganized audience. The most common way to use radio is to provide programs aimed at certain audiences, at convenient times and in appropriate languages in order to diffuse certain kinds of information on topics like health, family planning, agriculture and general culture. Programs can reach a wide potential audience but without organized reception or some form of feedback, the strategy's effectiveness is problematic.

B. Instructional Radio: the Organized Learning Group. Radio has long been used to bring formal instruction to students in schools. As

an instructional medium, it has been especially popular in some areas to teach second languages. Its greatest effectiveness assumes an organized listening, drill and feedback procedure that is most often missing in rural areas. Recent evaluations of two such projects reveal that although radio seems to be an effective medium for teaching, problems of organization often limit its impact on learning. This is in addition to the problem of whether more formal education really will help rural areas.

C. Radio Rural Forums: The Deciding Group. The radio forum idea grew out of a Canadian experiment and has diffused over 20 years to many developing countries. The essential elements are a village group discussing an issue suggested by a periodic radio broadcast under the leadership of a local person and then deciding to take action to improve the local village life. The internal problems to proper functioning are considerable but they can be overcome with proper organization. What is not clear is the solution to the common external problem: even if forums are effective, they cannot affect significant change in rural areas without major support from government or other agencies from outside.

D. Radio Schools: the Informal Learning Group. The model set by Sutatenza radio schools in Colombia has been imitated widely throughout Latin America in the last 15 years. The strongpoints of the model are that its focus is exclusively rural, it locally organizes groups for listening, is uses a multi-media approach to teaching, and it adapts to

local structures like the parish.

E. Radio Animation: the Participating Group. This strategy calls for radio to stimulate local listening groups to focus on the problem of underdevelopment in order to understand how to promote their own development. It is problem rather than solution oriented. The MEB project of Brazil, especially as it operated before 1964, was an example of local groups creating a sense of their own worth in solving their own problems. The disadvantages are that such projects often lack focus and are disorganized and do not form a more coherent mass organization.

The conclusions of the review of radio strategies disclose several problems: efforts are small, fragmented, often poorly organized and financed; little evidence exists about effectiveness, less about costs; radio is often conceived of as a means for development independently of other social organizations in the rural areas. Certain remedies for these problems are suggested in the concluding section of the paper.

The Cost of Instructional Radio and Television for Developing Countries
Dean Jamison with Steven Klees, Stanford: ICR, 1973.

In this paper a consistent methodology for evaluation of the costs of instructional radio and television was described and applied to analyze the cost of a number of projects. Annualized costs for 5 instructional television and 3 instructional radio projects were obtained. For two of the television projects, time streams of costs and expenditures were available, and this information was used to examine the time structure of average costs. Finally, general cost equations for use in planning educational technology projects were developed and applied to evaluate costs of realistic example television and radio projects.

A number of conclusions emerged from the analysis:

1. It is realistic to expect the costs of instructional television to range from 1.5¢ to 15¢ per student per hour, depending most importantly on the number of students in the system. The low end of this range can only be reached if close to a million students are using the system in a reasonably compact geographical area.

2. It is realistic to expect the costs of instructional radio to range from 1/3¢ to 3¢ or 4¢ per student per hour, about one fifth as much as instructional television. The high end of this range can be reached with very small numbers of students (several thousand); the low end might require several hundred thousand.

3. Cost estimates respond reasonably sensitively to the social

rate of discount; going from a 0 to a 15% social rate of discount can increase annualized cost estimates by 15% to 40%.

4. The heavily front-loaded costs and rear-loaded utilization of technology projects results in a requirement that projects last 10 to 20 years to allow unit costs to fall to a reasonable level. If there is a substantial probability that a project will not last 15 years, its initiation should be reconsidered.

The analysis provided only the cost side of the input to a cost-effectiveness analysis of the potential role of instructional television and radio in developing countries. Yet the surveys of Chu and Schramm (1967), Schramm (1973), and Jamison, Suppes, and Wells (1973) indicate that these media are good substitutes for conventional instruction of reasonably high quality. For these reasons we can expect to see an expanding role for the new media, as substitutes for conventional inputs, as the media prices continue to decline relative to that of conventional instruction.

BIG MEDIA, LITTLE MEDIA
Wilbur Schramm, Stanford: ICR, 1973

Big Media: Little Media is a book-length review, up-to-date as of late 1972, of evidence bearing on the choice between high-cost and low-cost media for instructional purposes, especially in the developing countries.

The first part of the report reviews what might be called the "micro" evidence -- some hundreds of laboratory experiments and theoretical and analytical treatments, mostly from the United States and other economically developed countries. Many of these studies are presented in tabular or chart form so that their implications can be easily seen. The literature on fitting media to educational tasks is first examined, then the experiments on effectiveness of individual media for instruction along with such cross-media comparisons as are available, and finally the studies of instructional media cost.

The conclusions from this micro evidence can be summarized as follows:

1. There is abundant evidence that people can learn effectively from any medium, big or little, complex or simple, costly or less costly.

2. There is good reason to believe that more of the variance in learning effect can be explained within than between the media. That is, there seem to be large differences in learning related to how instruction is presented by a medium and how it fits the needs and

abilities and interests of the learners. These seem to be more stable than differences related to the use of one medium rather than another.

3. It is only common sense to believe that one medium may be more effective than others for a given instructional task. It is hard to believe that a pictorial medium is not more effective in presenting concepts of space or appearance; that an auditory medium might not be more effective in teaching learning chains and concepts that involve sound; that print might not be more efficient in presenting higher order learning such as rules or problem solving; that a tape might be maximally efficient in providing language practice or a programmed medium in providing interactive practice without the active participation of a teacher. In truly multi-media teaching, it might be possible to shift back and forth readily among media best equipped for a particular instructional task. However, when schools are not liberally equipped with media, as they are not in most developing countries, then it is necessary to average the needs of a course against the strengths of available media, and in this case the common sense approached suggested above is probably more useful than the available theory.

4. The "Big" Media obviously cost a great deal more than the Little Ones -- that is, instructional television more than instructional radio, films more than film strips, computer-assisted instruction more than programmed instruction, and so forth -- and the complex media are more difficult to program and manage. Economies of scale enter

powerfully into this equation, and so also do the special needs of the instruction to be presented or the project to be developed.

Therefore, the "macro" evidence appearing in the last four chapters of Big Media, Little Media is particularly relevant. These latter chapters of the report review briefly the available evidence on the use of different media in actual field projects--as opposed to controlled laboratory experiments and theory.

One of the areas considered is the massive use of television for national educational reform. Hard data on effectiveness are minimal from the nine-year-old project in Niger, and have not yet become available from the Ivory Coast. Some such data have recently come from American Samoa, and the El Salvador project has been carefully studied since its beginning. Perhaps the chief conclusion emerging from these studies is that television, perhaps because of its cost and size and demands upon a system and its dramatic quality, has the ability to serve as a catalyst for system-wide reform in a way that a smaller medium probably would not.

A second area examined is the extension of schooling beyond the school and the campus. Here we have concentrated upon the "open" universities and schools, of which there are now nearly 50 in the world, the oldest 40 years old. Evidence of effectiveness, where hard evidence is available, is impressive. Such evidence comes, for example, from the British Open University, the German Telekollegg, the Japanese NHK Gakuen (radio-television-correspondence high school), the

radio teacher training program in Kenya, the Polish Television Academy, the Mexican Telesecundaria and Radioprimaria, and others. The learning scores, where available, are very encouraging. These schools seem to be discovering that many students who would be excluded by entrance requirements from resident schools or universities, do very well in an "open" school (for example, 90 per cent of the first class in the British Open University did not have university entrance qualifications, and still 16,000 out of 19,000 passed the difficult examination at the end of the year). They have better retention rates that might be expected: one of the lower rates is that of the NHK Gakuen which, despite the fact that it takes only students who can't win places in ordinary high schools, still brings 30 per cent of them up to graduation. And such schools typically save money over residence teaching: for example, the British Open University is costing only about 70 per cent as much per student as even the least expensive campus universities in Britain. The most elaborate of these "open" institutions are using multi-media teaching; for example, both Japan and Britain use both radio and television, along with texts and correspondence study, and the British University provides kits for home experiments, optional study centers and tutorial assistance (and still saves money!) Where multi-media approaches have not been used, one of the broadcast media is typically combined with correspondence study. Both radio (as in Australia and the German Funkkolleg) and television (as in Chicago and the German Telekolleg) seem to work

effectively. The obvious medium for this sort of project seems, therefore, to be either radio or television, combined with correspondence and such other instructional opportunities as are possible.

Another chapter takes up the macro evidence on the use of media to enrich an educational program. Here the experience is considerable but the hard evidence from developing countries disappointingly scant. The conclusions are predictable: a number of media seem to be effective for this purpose. Hard data on this effect exist, for example, on television from Latin America, radio from South Asia, programmed instruction from central Africa. The cost figures, where available, are also encouraging: about 5 cents per student hour for ITV in Colombia, less than 2 cents per student hour for radio in Thailand.

A fourth area reviewed is that of non-formal, or out-of-school education, leaving out the extensions of formal education described under the name of "open" universities and schools. Here, up until late 1972, the hard evidence was rather scant. A number of tentative conclusions emerge. A local study group or forum apparently contributes to the effectiveness of a broadcast medium in non-formal education. The more local a non-formal project is, the less the need of instructional media for it. A combination of media, or media and personal contacts, always seems to be more effective than one alone. The temptation is to say that the less costly, less complex media are the obvious ones for this kind of use, and yet there are cases when television has been used, apparently effectively.

The most general conclusion of the review is that a number of considerations other than effect and cost must enter into the choice of instructional media. These include the size of audience to be served, the amount and kind of instruction to be provided, the amount of central vs. local control to be sought, the extent to which the medium is to be used for system-wide "reform." There is no automatic reason to prefer a Big Medium or a Little one. However, especially in a developing country, when the choice seems to point to one of the less costly and complex media, there is encouraging evidence that such a medium can be used effectively.

Research Reports on Educational Television and its lower cost alternatives published by the Institute for Communication Research, Stanford University, Stanford, California - Contract No. AID/csd 3284

1) Big Media, Little Media (Wilbur Schramm)

2) The Mexican Telesecundaria: A Cost-Effectiveness Analysis (John K. Mayo, Emile G. McAnany, Steven J. Klees)

3) A Report on the System of Radioprimaria in the State of San Luis Potosi, Mexico (Peter L. Spain)

4) The Radio Schools of the Tarahumara, Mexico: An Evaluation (Sylvia Schmelkes de Sotelo)

5) Teacher Observation in Mexico (Judith A. Mayo)

6) ITV in American Samoa -- After Nine Years (Wilbur Schramm)

7) The Effectiveness of Alternative Instructional Media: A Survey (Dean Jamison, Patrick Suppes, Stuart Wells)

8) The Cost of Instructional Radio and Television for Developing Countries (Dean Jamison, Steven Klees)

9) Notes on Instructional Cross-Media Comparisons (Wilbur Schramm)

10) Notes on Case Studies of Instructional Media Projects (Wilbur Schramm)

11) Notes on Cost-Effectiveness Evaluation of Schooling in Developing Countries (Dean Jamison)