The Global Relevance of Behavioral Medicine: Health and Child Survival in the Developing World

John P. Elder,[1,4]

Thomas L. Schmid,[2]

Melbourne F. Hovell,[1]

Craig A. Molgaard,[1]

and

Judith A. Graeff,[3]

Running Head: Behavioral Medicine and Child Survival

1. San Diego State University

2. University of Minnesota

3. Academy for Educational Development

4. To whom correspondence should be sent at:

Graduate School of Public Health
San Diego State University
San Diego, CA 92182

ABSTRACT

Over 16 million children under 5 years of age will die in the coming year in developing countries due to diseases which are largely preventable. Behavioral medicine, through the application of behavior change technology to these pressing health problems, holds substantial promise, but it currently emphasizes issues related to illnesses of the world's affluent and aging populations. This paper will present an argument for the expansion of behaviorism beyond the medical and into public health arenas, specifically outlining the potential application of behavioral medicine to the health and social problems faced by developing nations. It will give examples of pioneering efforts in health promotion programs for children in those societies most in need.

Whether through the design of entire cultures[1,2] or influence of local policy makers[3] behaviorists have maintained interests in the continued expansion of the field of behavior change technology. Applied researchers have pressed forward in expanding the boundaries of their clinical work to areas which have traditionally been in the domain of medicine, such as behavioral issues in chronic disease and the application of biofeedback.

The convergence of the fields of behaviorism and medicine has lead to the development of "behavioral medicine."[4,5,6] With its roots in psychosomatic medicine,[6] behavioral medicine has been defined as: "the clinical use of techniques derived from the experimental analysis of behavior -- behavior therapy and behavior modification -- for the evaluation, prevention, management or treatment of physical disease or physiological dysfunction; and the conduct of research contributing to the functional analysis and understanding of behavior associated with medical disorders and problems in health care."[4] Given this initial focus (and the fact that most behavioral medicine specialists are physicians or clinical psychologists) the subject matter for behavioral medicine has been closely related to problems typically treated in clinics, especially chronic diseases and their risk factors. Recently, the prevention of chronic diseases has become an additional focus of behaviorally based procedures such as the use of social skills training for

preventing adolescent smoking,[7] lotteries for large scale smoking cessation efforts, and stimulus control procedures for increasing healthy food choices.[8] The role of behavior modification has become dominant in most public health promotion efforts in Western countries.

Public Health Perspectives and the Magnitude of Effect

With the recent expansion of behavioral programs to public health issues has come the realization of the value of scale. In small group or individual clinical settings, effects need to be relatively large to insure "clinical" significance. In a clinical setting, for example, a 10% success rate is considered embarrassing, in that 9 of the last 10 clients were failures. Moving out of the clinic to community based interventions, however, a 10% success in smoking cessation could mean that millions of people would be at reduced risk of cancer and heart disease. Indeed, the field of public health typically deals with relatively small effects over large numbers of people. It relies on population-based epidemiological analyses such as determinations of disease incidence and prevalence rates, standardized mortality ratios, and relative and attributable risks for organic and behavioral "causes" of disease or death. The statistically dependent system of research traditionally used in public health settings however, has made it difficult to determine the exact functional relationships and controlling

variables associated with unsuccessful as well as successful health programs. A rigorous functional analysis of programs provided by a behavioral approach to population based health problems may provide procedures which could lead to more exact identification of causal variables, and to more effective preventive and treatment procedures.

Based on over two decades of psychosocial research, the application of the technology of behavior change may be expected to yield relatively large effects from behavioral interventions, as applied in public health. However, even if the usual "large magnitude effects" are not as great as have been found for other areas of application, such as public school education, the use of modestly powerful interventions in large populations could produce "clinically significant" improvement in large proportions of the population. For example, if all practicing physicians reliably used stimulus control techniques and simply asked each of their smoking patients to quit, an estimated 2,000,000 quits per year could be achieved in the U.S. alone. Use of more powerful interventions such as stimulus control and satiation procedures may produce even greater change in more individuals, radically increasing the "magnitude of effect" from a population perspective. For this reason, it seems critical to expand the use of behavioral technology to public health.

Magnitude of effect issues are even more critical in underdeveloped countries, where millions of infants and small

children will die in the coming year from largely preventable problems. The following section suggests that the genesis of many of these problems are behavioral and not purely biological or medical, and will assert that techniques related to behavioral medicine are of strategic importance in addressing health problems of the developing world. The technology of behavior change may be the best single system for conceptualizing and implementing preventive programs for effectively preventing-reducing morbidity and mortality in the nations of the developing world.

Prevalence of Infant and Child Morbidity/Mortality

In 1979 readily available and inexpensive immunization could have saved 5 million of the 16,000,000 children who died in developing countries. Nearly 6 million more died due to malnutrition, much of it caused by inadequate breastfeeding or other behavioral factors. Two to three million are severely retarded by easily preventable diseases. In Mali, for example, 90% of infant deaths resulted from inadequate maternal care and unsanitary delivery practices.[9] Many of these problems are based on shifts in traditional behavior patterns to what is considered modern or Western practices. Egypt, for example, a country receiving over 2 billion dollars a year in U.S. foreign assistance, and has evidenced a radical shift in eating patterns in the past ten years with the per capita consumption of meat

almost doubling. This costly shift in preferred protein from the traditional legume and leafy vegetables comes at the same time the government is spending much of its assistance monies on importing more than half of its food and subsidizing those prices on the market, thus encouraging its consumption. In addition, the government continues to expand the amount of valuable food crop production to sugar production.[10] "Modernization," therefore, is at the root of many current and potential health problems.

Another example is in Zaire, where the quality of the diet is also declining as high carbohydrate plants such as yams, taro, and cassava are replacing the more nutritional higher protein vegetables. Attempts at developing a free market have resulted in farmers' preferring volume over quality. Thus, they see that the carbohydrate-heavy plants produce more profit per acre. Problems such as these have not only economic but also behavioral causes. Some of the richest countries in the world, the United Arab Emirates and Saudi Arabia, for example, have infant mortality rates that are as high or higher than other lesser developed and much poorer countries.[12] To a great degree, these high rates of infant mortality are related to the behavior of the parents, especially the mother's use of infant formula rather than breast feeding. Through aggressive commercial advertising for infant formula and personal advise, many mothers have been convinced that breast feeding is not

modern and is less healthy for the baby than using infant formula.[13] Although economic deprivation and the distribution of wealth are major considerations, relatively simple changes in nutritional and hygiene behaviors could result in major reductions in mortality in underdeveloped countries.

Applications of Behavior Modification to Health Problems in Developing Countries

Until the late 70's, the majority of efforts at resolving public health problems in developing countries had been based on traditional Western models of medical care delivery. In other words, these systems were highly centralized, highly technical, expensive, and focused on curative medicine. Efforts have since shifted to decentralized models designed to use available resources and focus on prevention programs rather than on curative medicine. In most cases, prevention involves a behavior change approach. In using this approach, the problems these countries face could be categorized functionally rather than epidemiologically, thus leading more easily into strategies for effective behavior change. Problems categorized functionally include limitations in financial resources, an inadequate and inappropriately trained work force, a wasteful fertility pattern and excessive population growth, communicable and vector-borne diseases which especially affect children, malnutrition, and a rural-based population with traditional health practices.

Two areas in which behavioral approaches have been or could easily be developed are discussed below. These include the prevention of wasteful fertility patterns and excessive population growth, and the prevention of malnutrition and control of diarrheal diseases.

Wasteful Fertility Patterns

While much professional time and effort has been dedicated to determining the sociological, anthropological, psychological and economic dynamics involved in population growth, little progress has been made in changing the overall rate or pattern of growth.[13] A functional, behavioral approach would therefore seem to be a useful alternative. In fact, analysis of successful programs reveals many readily identifiable behavioral components. For example, the birth rate in China has been significantly reduced through a series of positive and punitive measures which fit well in a taxonomy of different behavior-consequence relationships.[16,17]

Implicit in much of the developing country health promotion literature are specific behavior modification techniques, although few articles are couched in the language of behavior analysis. Below, these techniques are reclassified into functional categories of positive and negative reinforcement, differential reinforcement of low rates (DRL) or of other behaviors (DRO), and punishment and response cost. For purposes

of this presentation, these terms will be used to summarize what behavioral procedures appear to have been used. The specific functional relationship between the effects of these procedures and outcome targets, however, should be determined empirically through appropriate behavior analytic designs.

Positive and Differential Reinforcement. Positive approaches to managing population growth by increasing various responses and outcomes are prescribed by Berelson[8] within his category of "incentive programs." Direct positive reinforcement can consist of payments or gifts for accepting sterilization (especially after the target number of children has been born), or for taking long term pills or receiving an implant, while lotteries to win various larger prizes for each person participating in a family planning scheme may be used to back up (and increase the value of) these one-to-one reinforcement approaches. For instance, on the island of Cebu in the Philippines Guthrie[19] noted a high rate of use of relatively ineffective rhythm and withdrawal methods among parents of children 30 months or younger although the parents, who were being encouraged to space births as much as possible. Mothers in one village were reinforced with coupons for backup reinforcers and in another with Polaroid prints, for accepting and maintaining more effective methods such as pills and the IUD. A third community clinic, functioning as the control in the study, used only education to get couples to practice birth control. At

the end of one year, 43% of the mothers in the coupon and Polaroid print reinforcer and 9% in the control condition were using adequate birth control, demonstrating the effectiveness of the second "immediate reinforcement" strategy.

Current family planning educational efforts should focus heavily on the potentially reinforcing properties of the target behavior. If it has no immediately obvious benefits, then artificial reinforcement such as lotteries must be used. Additionally, individuals may be more likely to model adaptive behavior if they perceive the target behavior as potentially more reinforcing than its alternatives and is acceptable to their peers. For instance local men who had already undergone vasectomy operations in India and had been reinforced for having done so were apparently more credible than other project staff (who had not had the operation).[20]

Approaches which may be roughly translated as "differential reinforcement of low rates of behavior" (DRL) would involve the reinforcement of individuals who accomplish lower rates of reproduction through later marriages, longer child spacing and later births. Examples of DRL approaches would include the provision of a specific number of years of free schooling to a married couple which would be divided among all their children. It may be assumed that the amount of schooling provided would be adequate to educate one or two children, but increasingly substandard or additionally expensive for more. The provision of

retirement or disability pensions for parents with fewer than a target number of children may also directly address the maladaptive nature of prevailing contingencies for large families.[21] In addition to the tax and welfare benefits offered through DRL scheduling, Berelson advocates shifts in socioeconomic institutions that would result in the delay of marriages. Specific applications of this category include provision of marriage benefits to parents of women who marry after the age of 20 and government funded marriage ceremonies for brides of this age or older.

In applied settings, "differential reinforcement of other behaviors" (DRO) is very similar to DRL. DRO procedures would similarly emphasize the provision of incentives for individual and social changes incompatible with having relatively more children. DRO applications to population control may include payments for child spacing. Government-sponsored medical treatment, housing, scholarships, loans, and subsidies could also be provided to families with fewer than N children. Promotion of female participation in the labor force outside the home, provision of a variety of extra familial distractions for promoting outside interests (e.g., additional cultural, athletic and other active or passive participatory programs which would be open only to those with fewer than the prescribed number of children), the promotion of universal education (level of education is one of the few variables which reliably predicts

family size) and the promotion of appropriate universal employment are perhaps "purer" examples of DRO. Many of the DRO procedures emulate social changes which evidently reduced population growth in industrialized countries.

Negative Reinforcement and Punishment. Singapore, China and other nations have also used a variety of negative reinforcement and punishment techniques for population control.[18] For instance, the withdrawal of maternity benefits or other governmental allowances after a greater than target number of children are born, and the levying of taxes on births are all examples of ways to negatively reinforce the practice of birth control.

This category of techniques may extend to punishment and response cost. Punishment will not be dealt with directly except to refer to the converse of the outcomes targeted by negative reinforcement. For example, the negative reinforcement of using birth control is equivalent to the punishment of procreative behavior without birth control. Approaches using response cost may include the use of government-vended licenses to have children and assessment of larger fees for marriage licenses. They may also include the techniques alluded to in the previous sections, namely the withdrawal of previously awarded maternity benefits and other governmental allowances for excessive births. Aversive approaches are fraught with problems, however, and can trigger strong back lash as demonstrated by the downfall of

Ghandi's government in India in 1977, which was at least in part a result of its attempt at compulsory sterilization.[21]

Malnutrition

Deficiencies in protein, calories, and other nutrients constitute a major threat to health in developing countries, especially in the young. Malnutrition is both causally and dependently related to rapid population growth as more and more children must share the limited food available, while parents have excessive numbers of children in part to insure that a certain number live to adulthood. This is their way to guard against not having sufficient numbers of survivors to carry on a family line or to have enough children to help support them and others in their older age. Reciprocal influences also serve to exacerbate problems related to malnutrition and diarrheal diseases. Children with inadequate protein and calorie intake are more susceptible to infectious diseases, while children with diarrhea are less able to absorb liquids and nutrients. Malnutrition itself is, of course, a part of a much larger picture then just food intake, including world economics, international politics, and food distribution patterns both within countries and within families. Again, behavioral approaches cannot address every aspect of malnutrition but do hold promise for ameliorating many aspects of the related problem.

Positive and Differential Reinforcement. Fewer examples of behavioral procedures for reducing malnutrition exist, but perhaps the exemplar of all behavioral applications in the developing world in a study conducted in the Philippines by Guthrie[23] and his colleagues. The authors again demonstrated the efficacy of the use of positive reinforcement for improving the feeding patterns young mothers used with their babies. Specifically, mothers were reinforced for maintaining breast feeding until at least the age of 12 months, supplementing breast milk beginning about the fourth month, raising green leafy vegetables, striving for a weight gain each month, and keeping appointments for subsequent medical checks on health, diet and growth progress.

Following an initial demonstration of success in a pilot study, the authors expanded their approach to three villages assigned to the lottery reinforcement condition, reinforcement with the use of a photograph of the mother and baby, or attention-only in which health education and weight monitoring were used. Results indicated that children between one and two and a half years old significantly improved as a function of the two reinforcement conditions compared to attention-only. The two systems of reinforcement did equally well in producing clinically significant improvements, even though not up to the level of well-fed urban children.

The authors provide a variety of recommendations for cross

cultural applications of behavior modification. Appropriate reinforcement sampling is first of all necessary in order to determine acceptable consequence procedures. Effective consequences must be directly and thoroughly tested with target population in terms of size, saliency, contingency, and reinforcement context. In the present study where the reinforcers were not presented, the authors found that many mothers objected to the initial lottery because those with a larger number of coupons did not always win while women with smaller numbers sometimes did. The investigators also encountered problems in using foodstuffs as reinforcers, as much of the population noted that these materials were at times provided free of charge by the government and international relief organizations. This could in part explain why photos were relatively more effective. Certain maladaptive prescriptions provided by traditional healers, the use of candy and "junk food" to quiet babies, and local beliefs that fish and fruit caused specific illnesses all served to reduce the potential impact of the reinforcement procedures. In general, however, the Guthrie study provides an excellent example of the use of positive approaches to improving nutrition and related public health issues, while pointing to the need to test Western assumptions relevant to reinforcement before program implementation.

Diarrheal disease control is another area of opportunity for large-scale impact on child survival. Advances in oral

rehydration therapy, combined with the importance of dietary management during diarrhea and prevention-related interventions, are now widely accepted by health professionals.[24,25] But again, effective service delivery lags behind proven technology. Programs must elicit greater physician support, design better oral rehydration solution (ORS) production and delivery systems, train health providers, and work to change health-related practices in the home.

Emphasizing goals of child survival in underdeveloped countries, the United States Agency for International Development (USAID) has recently demonstrated its recognition of the importance of behavioral technology through its funding of a special program called Communication for Child Survival, or HEALTHCOM,[25] which makes use of behavior analysis as well as communication tools. From 1982-1992, HEALTHCOM (and its predecessor the Mass Media and Health Practices Project, MMHP) is working in up to 17 countries to create effective public education programs aimed at engineering significant behavior change. In addition, HEALTHCOM is committed to strengthening local institutional capacities to use communication more systematically and provide both short and long-term technical assistance for training and development. Primary attention is given to diarrheal disease control and immunizations. One example of how HEALTHCOM has applied behavior analysis principles to bringing about the appropriate use of child survival

technologies is the "Happy Baby Lottery" conducted in The Gambia during 1982. The use of a simple oral rehydration solution (ORS) made in the home from water, sugar, and salt, to prevent dehydration, the most serious consequence of common acute diarrhea. Oral rehydration fluid can be used to treat 85-95 percent of cases of dehydration from watery diarrhea in all age groups. To provide an incentive for mothers to seek out information and learn how to mix ORS, The Gambia's Medical and Health Department created the "Happy Baby Lottery" as a national contest offering inexpensive but attractive prizes to mothers who could demonstrate how to mix correctly a simple oral rehydration solution.

Four weeks after distribution of ORS mixing-pictures, the names of 18 villages from all over the country were drawn randomly and announced over the radio. Each of these villages was visited by a contest judge, one of the local health workers. Every woman in the village who came to the contest with a mixing-picture in hand was eligible to enter an initial drawing. The contest chose 20 women who then had a chance to demonstrate their mixing knowledge. Each of the 20 women who correctly demonstrated how to mix the sugar-salt solution won a prize of a one-liter plastic cup. If she could correctly answer at least three out of five questions about how to administer the solution she also won a second prize which was a bar of locally made soap.

While three-fourths of the mothers participating in the

Lottery were able to identify the steps in mixing ORS correctly, only 8% of the mothers in a comparison group were able to do so. Again, it appears that the effectiveness of this clinically proven technique was greatly enhanced through this behavioral procedure.[27]

Negative Reinforcement and Punishment. In general, these approaches appear to have far less promise than do their positive counterparts, especially in the area of malnutrition which by its nature requires acceleration of behaviors having a natural positive value or the reduction of barriers (and punishers) which inhibit appropriate behaviors of children in underdeveloped countries. Certain negative reinforcers, however, could be considered. For instance, governments may give further consideration to taxing or reducing subsidies for relatively non-nutritional foodstuffs and other consumable products such as tobacco and alcohol. This may direct more spending toward the targeted foods and other materials by making them appear less expensive.

Conclusions

Over 500 children have died from preventable health problems in the time it took to read this article. Traditional health education and medical technology alone cannot prevent this and related morbidity and premature mortality affecting the majority of the World's population. While behavioral medicine continues

to enjoy rapid growth and increasing popularity in the West, it is of limited public health relevance in countries most in need, and appears to be moving ever farther away from its behavior analysis foundation.

Behavioral procedures have considerable potential for enhancing the public health of the developing world. Through an emphasis on stimulus control, contingency management procedures, instructional technology and related approaches to workforce development behavior analysis can effectively address many of the important health problems facing the world today such as diagnosis and management of health and psychological problems, population control and malnutrition.[27]

Given our typically occidental background behaviorists may be naive to the specific cultural practices and problems of developing countries. Therefore, extensive research in how to adapt applications and systematic replications of techniques developed in the West to local conditions will be required for behavior change procedures to be accepted in the developing world.[28] Through such work, behavioral medicine can pioneer efforts to health problems thus making a major contribution to reducing the incredible and tragic mortality patterns characteristics of under-developed countries.

References

1. Skinner B: Walden Two. New York: Macmillan, 1948.

2. Skinner G: Science and Human Behavior. New York: Macmillan, 1953.

3. Stoltz S: Adoption of innovations from applied behavior research: Does anyone care? Journal of Applied Behavior Analysis, 1981, 14:491-505.

4. Pomerleau O and Brady J: Behavioral Medicine: Theory and Practice. Williams & Wilkens, Baltimore, 1979.

5. Gentry W: What is Behavioral Medicine? In J. Eiser (Ed.) Social Psychology and Behavioral Medicine. John Wiley, New York, 1982.

6. McNamara J: Behavioral psychology and medicine: An introduction. In J. McNamara (Ed.) Behavioral Approaches to Medicine. Plenum, New York, 1979.

7. Evans R: Training social psychologists in behavioral medicine research. In J. Eiser (Ed.), Social Psychology and Behavioral Medicine. New York: John Wiley, 1982.

8. Farquhar J, Maccoby N, Wood P, and Alexander J: Community education for cardiovascular health. Lancet, 1977, 1192-1195.

9. Gollady F: Community health care in developing countries. In P.K. Gosh (Ed.) Health Food and Nutrition in Developing Countries. New York: Greenwood Press, 1984.

10. Ali, A: Nation's sweet tooth resulting in major budgetary headache. The Middle East Times, 1985, 29 September - 5 October, p. 7, 3(40). Nicosia: Cyprus.

11. Finqt P: Some methods to improve nutrition. In K. Gosh (Ed.), Health Food and Nutrition in Third World Development. New YOrk: Greenwood Press, 1984.

12. Harfouche J and Verhoestrate L: The State of Child Health in the Eastern Meditreranean Region. WHO Regional Office for the Eastern Region (technical publication #9), 1983, 2-27.

13. Farrag I: UNICEF Cooperation in High-Income Countries: A Case Study for the Gulf. UNICEF Gulf Area Office, 1982, 18; Annex 12-B.

14. Fendall N: Medical care in developing nations. In N. Fry and F. Farndale (Eds.), International Medical Care. London: Medical and Technical Publishing, 1972.

15. Birdsall N: Population growth and poverty in the developing world. Population Bulletin, 1980, 35:5.

16. Lamal P: Contingency management in the People's Republic of China. The Behavior Analyst, 1984, 7(2):121-130.

17. Population Control in China. World Health, 1983, February-March, p. 30.

18. Berelson B: Beyond Family Planning. Studies in Family Planning, 1969, 38:17-27.

19. Guthrie G, Fernandez T, and Estrera N: Small scale studies and field experimentation in family planning in the Philippines. International Journal of Intercultural Relations, 1984, 8:391-412.

20. Rogers E and Shoemaker F: Communication of Innovations: A Cross-Cultural Approach. Illinois: The Free Press, 1971.

21. Todoro M: Economic Development in the Third World (Chapters 6 & 7). New York: Longman, 1981.

22. LoLordo V and Shapiro K: A behavior approach to population control. In D. Glenwick and L. Jason (Eds.) Behavioral Community Psychology. New York: Praeger, 1980.

23. Guthrie G, Guthrie H, Fernandez T, and Estrera N: Cultural influences and reinforcement strategies. Behavior Therapy, 1982, 13:624-637.

25. Pierce, N and Hirschhorn N: Oral-fluid--a simple weapon against dehydration in diarrhea. World Health Organization Chronicles, 1987, 31, 87-93.

26. Snyder J, Yunus M, Washed M, and Chakraborty, J: Home administered oral therapy for diarrhea: a Royal Society of Tropical Medicine and Hygiene. 1982, 76, 3, 329-333.

26. Academy for Educational Development: HEALTHCOM communication for child survival: field notes. A.I.D.

Contract No. DSPE-C-0023. Washington, D.C., 1985.

27. Applied Communication Technology: The mass media and health practices evaluation in The Gambia: a report for the major findings. A report from Stanford University to the United States Agency for INternational Development, August 1985.

28. Elder J: Applications of behavior modification to health promotion in the developing world. Social Science and Medicine, 24, 4, 335-349.