

## THE COLSTON WARNE LEGACY

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As an old friend of Colston Warne, I am deeply moved by the opportunity and the honor you have accorded me to join in this annual tribute by his peers in consumer education to his lifetime devotion to the consumer interest. Few individuals in the history of the world have done more to assure better, longer, healthier lives for more people everywhere than Colston E. Warne. I can't think of a better accolade for anyone to have, or a better lifetime legacy to leave or a better friend to have had.

Consumerism has been an important part of American political life for as long as I have lived -- since the enactment of the Pure Food Law and the Meat Inspection Act, both written into law nearly 83 years ago. They were revolutionary developments in an economy in which the buyer basically was supposed to 'beware', usually without knowing what he or she was to beware of. Yet, after more than four score years of consumer protectionism, consumers are still obliged to beware of many things without always knowing exactly how they are dangerous to our health, to the environment, to the planet, or, at the least, to our pocket books. Caveat emptor may not rule the marketplace anymore, but it certainly hasn't abdicated all influence and gone into exile.

Some of our detractors like to picture us as well-meaning but misguided busy-bodies who flail at such things as faulty zippers, misleading diet advertisements, false or deceptive labeling, and other supposedly minor inconveniences of modern life; but we know -- and our critics know, too -- that, as important as these matters are to consumers, and will continue to be, we are also deeply concerned about broad concerns, such life-and-death issues as the air we breathe, the water we drink, the chemicals put in -- and pesticide residues left in -- our foods, the radiation dangers, the mounting evidence of the greenhouse effect, and all the factors working toward the destruction of the ozone layer -- in other words, the threats to the survival of life on this planet. Colston Warne taught many of us how to recognize and how to confront dangers such as these before they became crises.

There's still lots of work and many challenges for those who admire and want to further Colston Warne's achievements and beliefs. Remember the story about the director of the U.S. Patent Office many years ago who suggested that his office be abolished because "everything worthwhile has already been invented?" We certainly don't have that complacent feeling in consumer protection. When

a much-maligned Assistant Secretary of Agriculture named Rexford Guy Tugwell (many of you probably never heard of that New Deal "brain-buster") drafted and pushed into law the Food, Drug, and Cosmetic Act of 1935, we all thought -- as I am sure Tugwell did, too -- that every contingency in the marketing of dangerous food products, unsafe medicines, toxic cosmetics, unstable or untested antibiotics, and the use in consumer products of coal tar colors which carried serious health hazards, had been fully taken care of.

Like the Pure Food Act of 1906, The Food, Drug and Cosmetic Act of 1935 was a monumental and revolutionary law. But it wasn't too long before it, too, became terribly out of date as a result of scientific developments, and it soon required massive revisions, which were too long in coming.

We have learned over the years of consumer activism that some laws which serve vital purposes when they are enacted often turn out to be less effective or even counter-productive as they age: that technology, as I indicated, can make them obsolete; or, more important, that hostile administration of those laws can undermine their purpose and effectiveness. So we must not only campaign constantly to keep our legislation current with the changes in technology; we must also remain vigilant to expose lapses in administrative performance when they occur.

No consumer victory remains won; it must always be renewed and fortified. What the Congressional Reorganization Act of 1946 called the "oversight" function of Congress -- that is, to monitor critically the operations of the laws after they are enacted -- must never be permitted, especially in the case of our consumer statutes, to fall into that other, and more commonly used, dictionary definition of the word "oversight" -- meaning an inadvertent omission.

It seems to me that to be a consumer activist these days you have to have a fairly good sense of humor, as Colston had, as well as a sense of dedication, which he certainly had, because almost everything we propose is met at first with a barrage of ridicule, and the implication that we're trying to take the joy out of life. I think we've done a lot to put more joy into life by the laws we've helped enact in the consumer field. But the ridicule hurts. We've witnessed it. It creates an anti-government environment which allows our elected leaders to slash the budget of agencies to the point that they can barely do their job and it allows them to appoint of-

officials who do not believe in the mission of their agencies. We in the consumer movement are not new to ridicule. Remember when Mike Pertschuk's FTC was known as the "National Nanny" for trying to prevent manipulation of our kids by advertisers on Saturday mornings?

There was a time in our background, however, when the problem was not so much ridicule as it was the charge of "subversion," ... "communism." When Consumers Union was born in 1936, the very idea of comparative testing of, and then criticizing the products of American industry was considered a form of Bolshevism. Unlike today, when every important story from the magazine Consumer Reports appears immediately in every major newspaper and on all the TV networks. And today, a Consumers Union story made the front page. In its early days Consumers Union could not even buy advertising space in most newspapers to promote sales of its publication. Worse, people who did subscribe often ended up on lists of possibly -- probably -- disloyal Americans. Yes, I and my husband, were on such a list.

As President of Consumers Union, Colston Warne was a target of attacks on his "Americanism." If it bothered him, he never let on. Nor did he let it deter him from speaking up. And we can all be grateful to him for that spirit of plowing on, going forward, trying out new ideas, searching for solutions, no matter who said what about him or his ideas. This is a legacy we must not only cherish but put to work every day in the face of daily challenges to freedom of speech and conscience.

Colston lived to see his consumer objectives become not only realities but respectable ones, in the United States and around the entire world. He insisted that consumerism had to become global -- as it has! As his friend, I am in the wonderful situation now of having the opportunity to help carry on that part of his legacy in my role as a volunteer lobbyist at the United Nations for the International Organization of Consumers Unions (IOCU). This is another organization founded by Colston Warne and a handful of other activists who believed that international democracy could be furthered by organizing consumers in other countries to work vigorously for consumer rights. IOCU has grown from an organization of six member groups in 1956 to 170 different groups today, in 70 countries, all independent and all intent on making consumerism as important in their countries as it is in ours. Consumerism is now so pervasive an international influence that IOCU has memberships on every continent. We have offices in Asia, Latin America, Europe and are planning one in Africa. In addition, consumer groups have newly been organized in such previously unlikely countries as Bulgaria, China, Cuba, Hungary, Poland and the Soviet Union, forming what they call the Coordinating Committee of Consumer Organizations from the Socialist Countries (CCCOSC). Consumerism is worldwide.

That word "consumerism" -- do you know where it came from? I use it proudly, as you can tell, but it wasn't meant to be anything but a pejorative. It sprang into existence about 28 years ago, the brain child of an advertising agency, as a weapon for industry to use in fighting the late Senator Philip Hart's Truth In Packaging bill. "Consumerism" was supposed to sound enough like the word "communism" to scare the living daylights out of everyone, particularly politicians. It had the opposite effect, however; it gave us a long-sought name to describe our cause and ourselves, simple and concise, and it has stuck -- as a badge of honor rather than the opprobrium it was supposed to imply.

We've had lots of victories over the years, even though in this country for the past eight years, we've been fighting a rear-guard action to preserve past gains rather than score any important new ones. We've seen some of our best consumer laws undermined at the Federal level by hostile administration, by non-administration or by outright maladministration. Fortunately, the States have often moved in to fill the vacuum -- sometimes so effectively that the Federal Government then stepped in to try to preempt the field with weaker regulations, thereby legally denying jurisdiction to the States. There was almost another example of such preemption just this month, in auto emissions standards.

The Environmental Protection Agency came out with a standard for gasoline volatility which is significantly less effective as an anti-smog measure than the restrictions already in effect in seven northeastern states. Apparently those states will be given waivers by EPA so that the tougher state standards can still be enforced. Uniform national standards are often better than a patchwork of differing state regulations -- certainly they're preferred by industry -- but a national standard should not be a lowest common denominator, an excuse for ineffectualness.

So where do we go from here now in trying to reassert the need for bold and overdue new legislation, new programs, new initiatives on behalf of the American consumers? If any of our vital proposals for the protection of life and health and safety are seen to cost money, we're told to forget them: there's a huge budget deficit. Of course there is. But consumers did not cause that deficit! Consumerism did not create it! The Food and Drug Administration didn't put the Federal budget out of whack. Neither did OSHA. Nor, heaven help us, did the Consumer Product Safety Commission. Did the Federal Trade Commission unbalance the budget? Of course not! So let's not, as consumers, surrender willingly to a national do-nothing policy because of things we weren't responsible for causing.

If this booming -- some say "overheating" -- economy can no longer afford to protect

adequately the lives and health of our people because we're so poor as a nation, what in the world are we paying taxes for? If we're not paying enough to protect us from the Soviets and to protect us also from acid rain, nuclear or toxic wastes, ground water contamination, pesticide poisons, air pollution in our cities, gridlock on our streets, and collapsing bridges on our highways and railroads then when does it become permissible for anyone to say let's pay a little more? Are we to cough and wheeze and crawl our way to the hospital thanking our politicians for keeping our income and estate taxes low enough so that our survivors can give us a nicer funeral? Is that what government is supposed to be for?

Shortly before leaving office, President Reagan said that if the Soviet Union and the United States discovered that our planet was endangered by some extra-terrestrial force, we would instantly unite in a common effort to save Earth. So why don't we get together, he asked, to save it from other threats to our wellbeing? (Like cancer research) He was absolutely right, but he didn't do anything about it. Unfortunately, we haven't even paid our full dues to the one instrument we share in common to achieve that goal -- the United Nations.

The UN has recently demonstrated unexpected new effectiveness in solving or ameliorating some very serious world problems which had been considered virtually unsolvable. We should now encourage it to use its increased prestige to do much more in the environmental areas. That means getting wholeheartedly behind many of the recommendations of a remarkable document known as the Brundtland Report, prepared by a blue ribbon World Commission on Environment and Development. This group, whose members came from 21 different nations, was chaired by the Prime Minister of Norway, Gro Brundtland.

The report is entitled "Our Common Future -- From One Earth to One World." The General Assembly of the United Nations, after strong representation from many countries, asked that a global agenda for change be developed. The appointed group did just that by proposing strategies for achieving sustainable development by the year 2000 and beyond. Let me quote just one paragraph from it:

"Many efforts to guard and maintain human progress, meet human needs, and to realize human ambitions are simply unsustainable -- in both the rich and poor nations. They draw too heavily, too quickly, on already overdrawn environmental resource accounts to be affordable far into the future without bankrupting these accounts. They may show profits on the balance sheets of our generation, but our children will inherit the losses. We borrow environmental capital from future generations with no intention or prospect of repaying. They may damn us for our

spendthrift ways, but they can never collect on our debt to them. We act as we do because we can get away with it; future generations do not vote; they have no political or financial power; they cannot challenge our decisions. But the results of the present profligacy are rapidly closing the options for future generations. Most of today's decision makers will be dead before the planet feels the heavier effects of acid precipitation, global warming, ozone depletion, or widespread desertification and species loss. Most of the young voters of today will still be alive."

My problem, and I think it is one Professor Warne would have shared, is that while we contract for planes costing one billion dollars each, and talk of building 100 of them to protect us from some sensed danger, a whole armada of stealth bombers can not do a thing to stop death rays from a Chernobyl. And it may be likely that in the days of change in the Soviet government, that we are spending more to defend ourselves from an enemy that is diminishing than defending us against our real enemy -- the forces working to destroy our planet. The cost of even one stealth bomber could halt some of the massive destruction that is occurring. Isn't the threat of planet destruction greater than the threat of the Soviets? We must, I feel, get across to our people, and to theirs, that our common survival is very likely to be more in danger from environmental forces than from the nuclear weapons neither side can rationally ever dare to use.

Meanwhile, what can we afford to do in meeting consumer needs? No, I'm not an economist, but I know there's a lot of fallacious economic thinking going on in this country. You consumer educators have got to do a lot more talking up about it, not only to your students -- who seem to be not listening too hard, if we can go by their political attitudes -- but to the public at large. I don't know whether the publish-or-perish axiom still holds these days in the colleges and universities, but I can tell you this: you can always publish in some places where it also counts -- in the letters-to-the-editor columns of our newspapers, in op-ed pieces, in local radio and television station editorials or editorial responses, and in a great many such outlets for information which the consuming public always needs. Involve your students; you can help them experience the joy of participation in issues which certainly impinge on the future. After all, it's their future more than it is ours!

And don't forget the effectiveness of letters to Members of Congress. When I was in the White House Consumer Office or in the Labor Department as Assistant Secretary for Labor Standards, I could see and taste -- truly savor -- the consequences of a single letter to a single Member of the House or Senate from

an informed professor or teacher or student with first hand information on a matter of national concern. Politicians thrive on ideas -- frequently other people's ideas. Give them enough information and they'll be sorely tempted to pick it up and run with it, particularly if you're a constituent.

I have many friends in this organization and I have seen many of them come forward at Congressional hearings to help make the difference in getting legislation enacted. I won't list any names for one reason only: I'm liable to leave out some very significant ones. But you people know who they -- and you -- are.

Your members have served on White House committees, on the Federal Reserve's Consumer Advisory Council, on numerous national commissions created to investigate consumer concerns, and in general meetings where the consumer point of view could be brought in. They have served well. This form of outreach must be expanded to bring to bear on our lawmakers the information you have developed through your research. And to actively influence public opinion, your students should be urged to train to represent consumers.

I'm speaking now as a veteran of hundreds of lobbying battles over many decades. Right now, I'm doing my lobbying mostly at the United Nations, where, instead of senators and representatives in Congress, I am lobbying diplomats from nations around the world. Many of them know much too little about consumer issues, but they are learning. I have gone to their home countries and to regional conferences -- particularly of Third World countries in Africa, Asia and Latin America assisting IOCU to help the burgeoning independent consumer groups in those countries learn how to impress their own governments and their UN diplomats with the importance of consumer issues coming before UN committees and the General Assembly.

It was this kind of grass-roots lobbying by consumer organizations in the Third World -- in underdeveloped and developing nations -- which greatly aided the adoption by the UN of its landmark Guidelines for Consumer Protection and the publication by the UN of its Directory of Banned or Restricted Products. The United States should have led in achieving those UN objectives. Unfortunately, it did not and in some cases the United States registered the sole negative voice. It is indeed ironic that in this day and age when the consumer movement, which was invented and made in America, has become a world-wide movement our own government appears to have given up on. Are we so nervous about economic competition that we, as a nation, care no longer to do what is right?

Now IOCU's members around the world are helping to push forward to UN adoption a far-reaching Code of Conduct for Transnational

Corporations, a Code with very important consumer aspects and safeguards which would give "rules of the road" to both transnational corporations and countries in dealing with the problems of international investment and related activities.

Such UN declarations are not always international laws or treaties. But even though up to individual countries to adopt voluntarily, they serve as moral and ethical guides and goals that the civilized world believes are worth following, and thus can carry great influence. But again, the Reagan Administration had been reluctant to support the proposed Code. I hope the Bush Administration will be more forthcoming and supportive at the UN.

As I noted, Colston Warne helped to lay the groundwork for what we in IOCU are now engaged in doing at the UN and furthering the work Persia Campbell helped begin. He felt that nothing could do more to further the concept of democracy around the world than the participation by consumers -- organized, independent consumer groups -- on the issues which affect their families' lives, health and economic wellbeing. In countries where new democratic systems are replacing, or have replaced authoritarian ones, the consumer movement is growing strongly.

When so many millions of people live on the edge of malnutrition and debilitating disease, it is not just "do-goodism" to work for international standards of public health, literally at the wellsprings. Sometimes, as in cases of epidemics, or nuclear accident, it is a matter of the survival of the human race -- in our own developed, as well as in developing nations.

Let me emphasize that consumers are not -- and must not consider themselves -- alone in these battles, without allies. Our experiences in Congress, in the state capitols, and in communities have proved to us that -- alone -- the consumer movement can seldom achieve its goals. It isn't that we're not considered "respectable" -- we're now very respectable. But as issues become more complicated, we need all kinds of help -- technical help -- inside information, if you will. We have to form coalitions with other groups on specific issues on which we may share agreement.

Sometimes we can find useful, if perhaps only temporary, allies where we may not expect them, in some sections of the business community. I have been impressed by the growing sense of social accountability among those executives who, for whatever good reasons -- or self-interest -- will work with consumers toward worthwhile objectives. They're seeking profits; we're trying to protect -- or advance the wellbeing of people -- children and families. Often, these objectives seem to be -- and are -- mutually antagonistic. But from time to time they are not!

Business executives love the consumer -- as a customer; they seldom feel warm affection for the consumerist. But when we can show business how it can do better for its bottom line by paying closer attention to our objectives -- if it sees there's money to be made by treating the consumer fairly, or that there are at least competitive advantages in doing so -- the path to cooperation is made smoother. They see we don't all have horns and carry pitchforks, and we see that not all business executives are characters out of the old Thomas Nast cartoons, depicted as porcine monsters wearing money bag suits decorated with dollar signs.

I think we're strong enough as a movement in this country to enable us to get into occasional alliances with segments of the business community, toward mutual objectives, without being co-opted or deflected, although my experience has been that you have to be very much on your toes and stand your ground!

I learned from my trade union collective bargaining days, while trying to organize the women in sweatshops, that if you can get people of opposing views to sit down together and really discuss their differences, compromises can be achieved. But I also learned -- this was from Eleanor Roosevelt during the days when we were working together on President Kennedy's Commission on the Status of Women -- that while you do have to compromise, you should always, she insisted, "compromise upwards."

We in the consumer movement have learned to be as tough as we are sweetly reasonable in our negotiations with the business people we deal with on some of these issues -- such as, for instance, in developing economical sources of basic pharmaceuticals for Third World needs. The organization International Medical Services for Health (INMED), set up to distribute in developing countries the kinds of medicines included on the World Health Organization's (WHO's) essential Drug List, refused to be a dumping ground for surplus or outdated medicines; it specified what it wanted to buy, as spelled out in the WHO guidelines, rather than accept what industry might have preferred to sell; and it got very good prices. The pharmaceutical company makes a profit, and the people who desperately need life-sustaining drugs get them efficiently delivered at prices they or their nonprofit providers can afford. This is an experimental program, but it is working very effectively, thanks to the mutual respect and cooperation which have characterized the negotiations between private voluntary organizations, (PVOs) consumers and industry for establishment of what is fundamentally a business arrangement, not corporate charity.

And here at home, in the collisions of interests which usually occur in the pathways to new legislation, there are always shifting alliances along the way. Almost every worthwhile consumer victory we have won in

Washington or in the States has been the result of hard work by consumerists and environmentalists and the perceived self-interest of some businesses aligned with us on an ad hoc basis. I am sure many of you have noted that fact in your research into consumer causes fought and won -- or lost.

Now, through the United Nations as well as through IOCU initiatives, we are trying to convince all international businesses to recognize that they, in their own interest, should help to achieve more fairness and justice to consumers, particularly in the poorer countries. If they don't, they risk the kind of backlash businesses operating in countries other than their own deeply fear. There has to be a conscience!

I am assured that there are no longer any billboards in some Asian countries urging mothers to buy over-the-counter steroids on the promise these would make their children bigger and stronger. When I inquired about such ads, I was told this practice was stopped as a result of the outrage registered by organized consumer groups, and that such corporate irresponsibility is out of style.

Nevertheless, I have talked to poor women in village stores in poor countries who were buying much-advertised tonics and vitamin preparations for their children with money they could better have spent on food. They assured me, however, that the stuff they had just bought was even better for the kids than food. They said the ads had told them that was so!

I still see big ads for baby formula in areas of the world where the water is so contaminated that many mothers completely lack the sanitary facilities to mix anything but lethal cocktails for children they would otherwise, under ordinary circumstances, nurse -- absent free hospital samples and the compelling advertised appeal to "be modern."

I've seen cigarettes given to children in the Third World and ads so attractively presented that young boys, just children, walk around smoking, thinking this makes them look "manly." At a recent meeting I attended, a representative of a tobacco company reported that their operating profits in underdeveloped areas of the world are "remarkably good." I think it unconscionable that tobacco companies seek markets in Third World countries among women and the poor, to make up for the markets that are diminishing in developed countries. And I recalled the letters-to-the-editor I'd seen in newspapers in some of those countries, where health authorities are trying to reduce cigarette smoking expressing dismay that the United States is pressing those countries for favored treatment for U.S. tobacco products. Is this good American foreign policy? I don't think so.

I've seen products no longer legally sellable in the United States being hawked abroad by American firms, and also by British, German, Dutch, French, and other nations. The UN Guidelines for Consumer Protection, and acceptance by the General Assembly of a Code of Conduct for Multinational Corporations, by establishing standards of what constitutes fair business and consumer practices, should put a big crimp in that kind of commerce, if not stop it entirely. Is this sort of thing our business? Colston Warne thought so; and, I am sure, all of us here do, too.

Many firms doing business in the Third World are already painfully aware of the kind of adverse publicity they can be subjected to for questionable or unconscionable consumer practices spotlighted by INTERPOL, an IOCU agency which sends out this information to consumer groups throughout the world, information which soon reverberates, I can assure you, in the board rooms of the offending corporations. Similar effective watchdog work is being done by other IOCU affiliates: Health Action International (HAI); Pesticide Action Network (PAN); and The International Breast Feeding Action Network (IBFAN).

If we hadn't become concerned about things like this before, we certainly have to be conscious of them now that the world is so close; so close that farmers in Austria, West Germany, Norway, Sweden, Poland, Rumania, Finland and Italy, and the people who used to buy and eat their produce, quickly learned to worry about a remote Soviet city we never heard of until a nuclear reactor there suddenly blew up.

When Margaret Thatcher, whom everyone regarded as the Godmother of Reaganomics, became alarmed about the ozone shield and tried to hurry-up mankind's response to a real crisis, I say we're all making progress.

So do not feel unappreciated and ignored as voices for consumerism. Our concerns are getting through. Our solutions are often regarded as impractical, however, because they are expensive. In this atmosphere of Gramm-Rudman-Hollings, of huge deficits, of the proposed hundred-billion-plus savings and loan bailout, of rampant floods as soil erodes and forests are paved, of droughts and the greenhouse effect, of the devastating medical costs of AIDS and an aging population, of the wearing-out of planes in our transportation system, of the crushing Third World debts to our banks -- certainly we have a litany of problems which cry out for solutions we presumably can't afford.

Was there ever a time in our history when we were convinced we could really afford to do all that we knew we had to do? I don't remember any such time, even including World War II. Then, despite truly vast expenditures of money and of scarce resources for military

purposes, we knew we also had to have day-care and affordable housing and a lot of other things we are told we just can't afford today. We can afford, and we can accomplish as a people, whatever we have the will to do.

So I leave you today with this friendly "directive" from an old warrior in the consumer battles: as Colston Warne did for so many, many fruitful years, use your skills as consumer educators, and your knowledge, to educate your fellow citizens -- not just your students -- on the need to confront our pressing consumer and environmental issues.. It is only wishful thinking to believe they can just be shelved until some great tomorrow when "things are better" or when the economy is "more normal" or when people are less inclined to expect the good life on the cheap. Believe me, at 82, I've never seen that day occur!

Meanwhile, I am greatly encouraged by the growing consumer movement which is becoming, throughout the world, a positive third force for constructive change. Be part of it and know you can and do make a difference.

As Colston Warne said over a quarter century ago.

"The world consumer movement is still exceedingly young. The affiliates of the International Organization of Consumers Unions are groping their way toward international consumer consciousness.

This movement has a strong and impelling central idea that consumers organize to make their weight felt in the market place as well as in national and international affairs. In the years ahead, this idea - this "new social invention" - will undoubtedly prove a powerful tool in bringing a more balanced pattern of world democracy."

We are seeing his prediction becoming a reality.

Thank you.

Chung L. Huang, University of Georgia<sup>1</sup>

The establishment of a Consumer Information Management System (CIMS) to collect panel data for addressing consumer oriented issues is presented. The main purpose of CIMS is to create an easy-access and ready-to-use system which can serve many potential surveys individually or simultaneously as needed. The discussion focuses on the advantages and disadvantages of such a system, and on the importance of maintenance to keep panels representative over time. The CIMS is useful for numerous marketing and consumer research, and its data base may be expanded via networking with similar operations among researchers in other parts of the country.

Information plays a vital role in any social organization and in the decision-making process of all economic agents. The need for better information and more accurate and adequate data bases suitable for economic and empirical analyses is well recognized by economists and other social science researchers. However, we often find ourselves in a passive position of using secondary data rather than generating our own. Unlike many other fields of scientific inquiry, a large part of economic information and data are assembled and disseminated by the federal and/or state governments. Data from the private sector are generally more limited in scope and not readily accessible to university researchers because they are generated primarily to satisfy a specific client and their costs are prohibitively high.<sup>2</sup> Recognizing this data limitation, Orcutt (1970) warned that social sciences will remain stunted as long as dependence on government data collection persists, because such data collection of necessity is done for other purposes and cannot be effectively controlled by researchers.

Data and analyses are inextricably linked, but the importance of this linkage seems to have escaped some, if not most, of the members of our profession in the past few decades (Raunikar and Huang, 1987b). The emphasis is on developing and applying sophisticated mathematics and statistical procedures. The approbation and obsession of searching for

alternative estimators to alleviate some inherent data problems have sometimes limited progress and hindered efforts to improve data quality. For example, Rivlin (1975) observed that "ingenious efforts to tease bits of evidence from unsuitable data are much applauded; designing instruments for collecting more appropriate information is generally considered hack work." There is now some danger that the researcher may find himself lost in the abundance and complexity of available methods for studying economic phenomena. However, even the most sophisticated procedures devised have not been able to compensate for the need for a data base on economic units. Improvements in methodology and analytical procedure are in vain if they must be applied to mediocre or inadequate data bases (Tomek, 1985).

While there is a plethora of secondary data sources, the problem remains that most of the public data systems do not satisfy the requirements for systematic study of how social, economic, cultural, and psychological factors influence consumer's purchasing decisions and behavior. Except for a few localized surveys, the interest and resources needed to assemble data bases designed specifically for consumer research and demand analyses simply have not been forthcoming. Until better ways are found to obtain essential empirical evidence, there seems no great expectation for significant advancement in consumer demand research.

My assignment in preparing this paper was to describe and discuss a pilot study for developing and implementing a Consumer Information Management System (CIMS) in the Department of Agricultural Economics at the Georgia Experiment Station. The CIMS was conceived to provide a multidimensional research vehicle to facilitate the generation of primary data for researching and addressing issues that are consumer related and oriented. The intent is to present the concept of CIMS and to describe and identify some of its utilities and significance from the standpoint of generating interested discussion, ideas for applicable research endeavors, and possible networking with other state level samples.

In the remainder of this discussion, a brief review of survey designs for data collection is presented first. The emphasis is placed primarily on discussion of advantages and disadvantages relative to each design. This will be followed by a discussion focusing on the specific sample design, sampling procedure, and operation and maintenance procedures for the implementation of CIMS. Finally, the

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<sup>2</sup>For a detailed discussion of public and private data systems and sources for demand analyses, see Chapter 2, in Raunikar and Huang (1987a).

discussion concludes with a brief remark on potential research applications.

#### AN OVERVIEW OF SURVEY DESIGNS

The basic classification of survey designs discussed in this paper is divided between cross-sectional and panel designs. The cross-sectional survey typically involves a sample of elements from the population of interest. Characteristics of the elements or sample subjects are measured once at a single point in time. A panel is a relatively "fixed" sample of elements from which measurements or comparative data are taken on more than one occasion.

There are two types of panels, longitudinal and omnibus, distinguished by the way information is collected. The distinction between the longitudinal and omnibus panels is important. In a longitudinal panel, the sample subjects are measured repeatedly to yield a continuous flow of information for the same variables over a period of time. The longitudinal panel provides information about changes in individual behavior that are most suitable for studying the dynamics of consumer behavior and for determining causation and relationships.

In contrast, sample measurements taken from an omnibus panel may vary from time to time depending on the design and objectives of the survey. While a sample of elements is still selected and maintained, the omnibus design focuses primarily on ad hoc surveys and on serving multiple research projects. However, if one holds the variables and subjects constant, it is possible to take repeated measurements over time from an omnibus panel to generate longitudinal data for analytical purposes. The major attraction of omnibus panel is flexibility because it provides expeditious and economical methods of collecting information at very short notice (Chisnall, 1973).

#### Comparative Advantages and Disadvantages

Although omnibus and longitudinal panels differ in many aspects (e.g., sample design, and information collection), both types of panels have similar advantages and disadvantages when compared to cross-sectional surveys. Sometimes a research problem may dictate a clear choice between demanding or prohibiting the use of panels. More often than not, neither the advantages nor the disadvantages of panels are absolute; they must be balanced against each other.

In general, there are three potential advantages of using panels: 1) The sampling variances of measures of change are much smaller for panels than for groups of independent samples and it permits studies of individual changes as opposed to group behavior

over time (Sudman, 1976). 2) More accurate and better quality information can be collected from panels than cross-sectional surveys. Because behavior is recorded as it occurs in a panel, less reliance is placed on a respondent's memory and ability to recall past behavior. In addition, panel members can be contacted for incomplete information and for purpose of verification. 3) Panel data are uniquely valuable for studies concerning attitude formation and change, or purchase and saving decisions and their fulfillment.

A common problem arises when there is a possibility of contamination due to the destructive nature of the measurement. In these situations, the use of panels should be avoided. A subject may become contaminated if the measurement destroys the innocent or unbiased nature of the subject. One obvious disadvantage of conducting panel surveys is that it is a difficult and expensive method of data collection. Thus, sample sizes are usually small as compared to cross-sectional surveys unless significant federal support is involved. To a large extent, the sampling methods used for panels are similar to those used for cross-sectional surveys.

There are, however, two critical areas or disadvantages in panel sample design that require special considerations: 1) Panels are more likely to be nonrepresentative due to sample biases. Sample biases arise because of noncooperation of respondents. People who are not interested in the subject matter of the survey are more likely to show a low level of cooperation (Sobol, 1959). Consumer panels that require respondents to keep a continuing record generally have initial cooperation rates of about 60% and continuing cooperation rates of less than 50% (Sudman, 1976). Quackenbush and Shaffer (1960) reported that only 40% of the households selected for recruitment cooperated to the extent of becoming active members of the Michigan State University (MSU) consumer panel. Furthermore, it is possible that particular groups of people are more likely to drop out than others. Previous studies (Kosobud and Morgan, 1964; Quackenbush and Shaffer, 1960) suggested that response and drop-out rates are likely to vary considerably among people with different socioeconomic characteristics. 2) The attitude, behavior and reporting patterns of the panel members are likely to be affected because of the continuous reporting process. This problem of collecting data from the same respondents over time repeatedly is often referred to as a 'conditioning effect.' Respondents, because of their memberships of a panel, may be subject to 'conditioning' and begin to behave in an atypical manner. They may become self-conscious in their purchasing habits because they happen to be on a panel. Evidence suggests that panel data are most likely to suffer from conditioning effects of various degrees (Quackenbush and Shaffer, 1960; Prais, 1958; Neter and Waksberg, 1964).



While similar problems are likely to be present in one-time surveys, their occurrences are potentially more serious and frequent with panels. Furthermore, the problem of sample biases in panel surveys is likely to be compounded by reporting biases. Thus, the presence of conditioning effects may eventually cause a panel to become nonrepresentative, even if the original one was a representative sample of the population. Sample biases due to nonresponse in cross-sectional surveys, on the other hand, may cause potential reporting biases of respondents, but there are no reciprocal effects.

#### CONSUMER INFORMATION MANAGEMENT SYSTEM

Consumer panel research in the Department of Agricultural Economics at Georgia Experiment Station began with the planning and establishment of the Atlanta Consumer Panel (ACP) in 1956 (Purcell et al., 1957) and subsequently in 1974, the Griffin Consumer Research Panel (GCRP). The operations of ACP and GCRP were discontinued in 1962 and 1981, respectively. In October 1988, a pilot study to establish and administer a statewide consumer panel was initiated and funded by Georgia Experiment Station. The conception of CIMS is to utilize an integrated framework to facilitate various research activities that are dependent upon consumer surveys and primary data collection in Georgia. The purpose is to create an easy-access and ready-to-use system which can serve many potential surveys individually or simultaneously as needed.

CIMS also facilitates and promotes opportunities for interdisciplinary and multidisciplinary research. If properly established and maintained, the CIMS will aid and improve the potential for obtaining research grants and contracts to support on-going research programs. For example, research proposals submitted to granting agencies can use a subset of CIMS in the development of research methods and procedures. It would provide a speedy and inexpensive way to pretest research questions and concepts and to gather pilot data for preparation of grant proposals. CIMS can also be contracted to conduct special surveys. Thus, the basic design of the CIMS is of the nature of an omnibus panel. It allows for more flexibility than previous consumer panels.

#### Potential Advantages of CIMS

Disadvantages and problems associated with panel surveys noted above are applicable to CIMS. However, there are potential advantages of establishing the CIMS: 1) The CIMS provides greater geographic coverage. 2) Since initial contact with respondents is expensive, a common frame and basic sample permits economies of scale for subsequent survey operations. The CIMS is cost-effective because repetitive

operations common to every individually conducted survey can be eliminated. It minimizes the needs to collect and code similar information if different subsamples are selected for each individual survey. 3) As long as the survey sample remains relatively constant, a variety or a combination of different data gathering techniques may be effectively utilized without substantial increase in costs. Occasionally, it may be possible to make face-to-face interview very competitive with mail and telephone surveys. 4) The basic sample yields statistics for many populations, represented by distinct subclasses. For example, statistics may be given for age, sex, race, household size, income, occupation, education and other classes, and for a combination of them. Unless a screening process and device is employed, desirable subclasses in a simple survey cannot be readily allocated and controlled, and are merely accepted as found. The CIMS offers a quick and flexible system that is useful for ad hoc surveys.

#### Sampling Procedures and Recruitment

An initial master sample survey has to be conducted to recruit panel participants. The panel goal is approximately 500 member households which represent a stratified random sample of the population in Georgia. This aspect of the operation has been contracted with the University of Georgia Survey Research Center (SRC). The SRC offers the necessary expertise, resources, and credibility in securing quality samples.

Given the geographic spread of the target population and a very limited budget, personal contact for recruiting is not possible. Neither does a mail survey appear to be an efficient and feasible alternative. Use of the telephone to recruit potential panel members seems to be a logical choice. The once insurmountable problem of drawing a representative sample of the general public is lessened because approximately 95% of all households in Georgia subscribe to telephone service. In addition, the development of the random digit dialing (RDD) technique has practically insured that all telephone households will have an equal chance of being included in the sample even if their numbers are new, unlisted or recently changed (Cooper, 1964; Glasser and Metzger, 1972).

The sample selection procedure used in this study is known as two-stage RDD as developed by Waksberg (1978). First, each Central Office Code or telephone exchange, e.g. 228, serving the state was determined. Next, a four-digit random number was generated and appended to the 228-prefix. At this stage every possible number in the exchange was considered as a number of the population to be sampled, whether a working number or not.

Suppose the number 228-1234 was first generated and when it was dialed, a residence was contacted. The process then advanced into the second stage of selecting additional numbers, in random fashion, within the cluster of last two digits. This process continued until the desired numbers of interviews were obtained. If the original number called resulted in other than an eligible household, then the entire cluster (i.e. 228-1200 to 228-1299) was discarded. The procedure was then repeated until an adequate number of clusters to yield the total number of interviews desired was achieved.

Each number generated for the sample will be called until some final disposition for that number is achieved, for example, completed interview, refusal, or determined ineligible. If a number results in no answer, busy signal, strange noise, or complete silence, five successive calls over a period of three days will be attempted to determine its status. The number will be retired after five attempts that yield the same result without any indication that it is connected to a household.

Dillman, Gallegos and Frey (1976) suggest that lengthy introductions with telephone interviews, regardless of content, do not stimulate response, and it is advisable to obtain respondent's permission quickly in order to move right into the interview. When cooperation is obtained, the research objectives and the respondent's role in cooperating with the researcher will be explained in greater detail. Explanations of rewards and strict confidentiality will be given. A few additional questions concerning the demographic characteristics of the household will be asked and, the respondent's name and mailing address recorded. Reassurance of confidentiality will end the interview.

Following the recruitment of panel members, a mail questionnaire survey will be conducted to collect additional detail socioeconomic and demographic information of the consumer households. Results of the mail survey will be computerized and managed as a master data base. Periodic surveys will be conducted to keep an active and up-to-date master profile of the sample households.

#### Operation and Maintenance Procedures

A panel is a dynamic representation of the population. While population characteristics may change very slowly from time to time, the population itself is changing nonetheless continuously as a result of changes in birth and mortality rates. The most critical task, perhaps, is the maintenance to keep the panel representative of the population over time. Negligence of appropriate maintenance is a major factor that contributes to nonrepresentative panels. Three areas are of particular importance and concern: mobility, longevity, and mortality of panel membership.

Panel mobility. Certain types of households, such as young, small, those with professional occupations, and those that reside in larger metropolitan areas tend to be far more likely to move than others. Recent census data indicate that changes due to net migration in Georgia metropolitan areas averaged 11.1% from 1980 to 1987 as compared with 2.2% in nonmetropolitan areas. Dropping panel members who move would require costly or impractical methods to prevent obvious sample bias due to the dynamic nature of changes occurring in the population.<sup>3</sup>

Sobol (1959) reported that approximately 33% of his panel members had moved at the end of two years and eight months of operation. Of the final panel members, 22% were people who had been followed to a new location. He indicated that if these people had not been followed, the final panel would have contained only 48% instead of 61% of the original sample. Furthermore, the panel would have consisted of a higher proportion of older people, people who owned their homes, and people with incomes over \$5,000. Therefore, following movers is a very important measure in maintaining an unbiased distribution among members of a panel.

Tracking movers is far easier and much less expensive for panels that are operated primarily with mail surveys rather than personal or telephone interviews. CIMS will contact respondents subsequently via telephone, mail, or in-person interview, depending on the research topic. At the least, mailings will occur. Periodic correspondence with respondents is a good practice which not only stimulates cooperation but also yields information on new addresses for movers. When mails are delivered by first class, they will be automatically forwarded to the new mailing address if possible. For bulk mailing, requests for "address correction" should be visible on the envelop. Although this mail will not be forwarded, it will be returned with the new mailing address, if known, and a charge for the additional service.

In addition to following the households that move, some method must be designed to account for new household formations and household dissolutions. Thus, panel members should be asked to report periodically whether or not there has been any change in the number of adults or children living in the home, and if anyone has moved away and for what reason. The panel needs to be continually rejuvenated by bringing in new households formed and by dropping households dissolved.

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<sup>3</sup>If a panel is limited to residents of a specified geographic area, a household becomes ineligible and is dropped from the panel when it moves out of the area.

A household may be dissolved due to death in a family. For example, if a wife has been a panel member and she goes to live with some other members of her family after her husband dies, then she is dropped from the panel. There will be no need to replace her with a new household. New household formations typically are results of marriages. Split-off members should be recruited in a manner such that all new households have the same probability of being added.

Panel longevity. As active panel members continue to age, it is necessary to recruit younger households more frequently than older ones in order to keep the sample representative over time. Thus, sample biases due to panel aging can often be handled with procedures used to recruit replacement households. Longevity of membership is not viewed as a problem in a panel operation, except when there is evidence of conditioning effects occurring in reporting purchases. When people remain in a panel for a long period of time, there is a danger that their reactions in buying situation may become atypical.

Quackenbush and Shaffer (1960) reported that during the life of the MSU panel operation no members was discharged because of longevity. At the time when the panel was discontinued in December 1958, about 30% had been members since 1951, and more than half had participated in the panel operation over five of the eight years. Aside from the investments, it is understandably difficult to discharge loyal and reliable members.

To maintain sample representativeness over time and to reduce the danger of potential conditioning effects from occurring, participation in CIMS is initially limited to two years. A limited membership would help recruitment of potential participants because the commitment to serve in the panel would appear much less demanding. Additionally, a periodic random probability sample should be drawn from the population independently for purpose of checking and maintaining the representativeness of the CIMS.

Panel mortality. Members will drop out from the panel, and this is usually referred as panel mortality. While mortality is a change occurring in the panel that contributes to sample biases, it should be noted that it does not reflect changes occurring in the population. In general, reasons for dropping out are either due to personal situations, such as poor health, child birth, or refusal to cooperate.

In the first case, drop out households can be simply replaced by households of similar demographic characteristics. One way to handle this situation is to inflate the size of the original sample by oversampling certain types of households which are determined to have

higher drop-out rates than others (Sudman, 1976). This practice, however, entails additional expense to maintain an oversample whose data are not used.

Panel mortality due to refusal is of a different nature. Sobol (1959) suggests that refusal is a gradual process. There is a tendency for people who refuse to answer a few questions on earlier interviews to drop out at some later date. While households with characteristics similar to those who refused to cooperate may be recruited for replacement, there remains the problem of bias (Chisnall, 1973)

Panels that use mail questionnaires for data collection face a much more serious concern about response selectivity due to refusal than personal and telephone interview methods (Dillman, 1978). People who have less education are more likely to be underrepresented among those who respond. Older persons also seem likely to be underrepresented, partly because of lower educational attainment. Also, keeping written records is a more difficult task for older persons given their seeing and writing capabilities.

Considerable effort and experience are required to maintain a high level of panel cooperation and to reduce the drop-out or nonresponse rates. Many studies and techniques have been designed to improve the validity and reliability of different data collection methods by either increasing response rates and/or reducing biases caused by refusal (Dillman, 1978; Kanuk and Berenson, 1975). However, there seems no general consensus regarding their effectiveness other than the use of followups and monetary incentives.

Wotruba (1966) suggested that inducement had greater psychological than monetary motivation and that immediacy of the inducement was more important than its amount. An immediate inducement might counteract negative factors of length and difficulty and reinforce any positive factors, such as interest, more than would a promised or delayed inducement. Furthermore, increasing the number of novelties or incentives associated with mailed questionnaires also produce substantially faster and higher rates of returns (Pucel, Nelson and Wheeler, 1971).

Relatively small financial rewards are customarily used in most panels to compensate households for their cooperation. For example, members of the GCRP were paid \$1.40 for each diary returned on time. The amount of compensation was later increased to \$1.70. In addition, a point system which awarded members with extra bonus money was designed to encourage prompt and continued cooperation. Panel members usually received their payments on annual basis prior to the Christmas

holidays. While this reward system worked well with previous panels, its application to the CIMS does not seem practical and feasible. The nature of CIMS design simply does not warrant the extra efforts spent on paper work and on record keeping. The reward program for participants of CIMS will use immediate inducements including money and other novelties such as food coupons and other small gifts and souvenirs.

While it is important to compensate members for their cooperation, a continuing program of communication with panel households is equally essential to establish and maintain personal and close working relations with panel members. Respondents will be provided the opportunity to phone the office if they have reporting problems and will be invited to make comments and suggestions regarding studies in which they participate (Dillman, 1978; Quackenbush and Shaffer, 1960). To facilitate data collection and to induce a high level of panel morale for maximum cooperation, CIMS will maintain a close liaison with panel members by offering access to a toll-free telephone line and by providing feedback of research findings through publication of regular newsletters. These measures are designed to provide an environment which fosters and enhances rapport with members to minimize panel mortality.

#### CONCLUSION

This paper provides a general discussion on the development and establishment of the CIMS in the Department of Agricultural Economics at the Georgia Experiment Station. The CIMS was conceived to provide a multidimensional research vehicle to facilitate the generation of primary data for researching and addressing issues that are consumer related and oriented. The primary purpose was to create a easy-access and ready-to-use system which can serve many potential surveys individually or simultaneously as needed. The basic design of the CIMS is of the nature of an omnibus panel. It was conceived to provide different functions and focuses than previously operated panels such as ACP and GCRP.

One of the main advantages of CIMS is that it is efficient and cost-effective because many variable (research objectives) may be measured on the same set of sample elements and can be elicited from the same respondent at the same time. In addition, the primary operation of CIMS is to manage and maintain a current and up-to-date profile of the panel members. Thus, it minimizes the repetitive efforts of collecting and processing basic socioeconomic and demographic information that are essential to every individually conducted survey.

It is recognized that panel operations are particularly vulnerable to sample selectivity biases and nonrepresentative problems. In

order to avoid potential conditioning effects, membership in the panel will be limited to two years initially. Among other measures, periodic surveys will be implemented to monitor any changes occurring among the panel members. In addition, random probability surveys of the population will be conducted occasionally to insure that the panel is representative over time. Furthermore, devices for offering incentives and maintaining close liaison with the respondents will be implemented to induce maximum cooperation.

The CIMS offers an economical, flexible and expeditious approach which is potentially useful for continuous research, for conducting ad hoc surveys, and analyzing minority or segmented markets. As a research vehicle, the CIMS fills the needs of many alternative types of marketing and consumer research. For example, it can be used to study the effects of promotion and advertising, consumers' evaluation and purchase intention toward new products, changes in food and dietary habits both at-home and away-from-home, and various issues related to health, nutrition and food safety concerns.

The possibilities of using CIMS for research experiments seem especially attractive. To mention a few, controlled experiments can be designed for studying and modeling consumer behavioral changes with respect to exposure of some stimulus. Product brand-switching studies are particularly applicable. In addition, research may be designed so that attitudinal and behavioral information may be collected to construct and estimate an attitude-behavior model. Experiments to improve data collection methods can be conducted with the use of various instruments, such as limited vs. full coverage diary, the "Universal Product Codes," cash register tapes, and other evidences, for reporting food and/or nonfood purchases. Last but not least, there exists a potential of developing a regional or national data base at a minimum cost by networking similar operations among researchers.

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POTENTIAL CONSUMER BENEFITS OF SCANNER DATA:  
THE CASE OF SUPERMARKETS

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The introduction of optical scanners into supermarket checkouts is examined. Short- and long-term benefits for supermarkets and consumers are outlined. Problems in achieving the managerial potential are discussed. The extent to which consumers receive benefits is dictated by the extent to which contestable markets exist.

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The nation's food stores began their transition to the use of scanners for customer checkouts in the mid-1970's. Currently, well over half of the grocery stores have them in place. Many of the more aggressive regional and multiregional supermarket chains are close to one hundred percent utilization of scanners. Ever since the transition began, both the popular press and trade publications have heralded the advent of scanners as a technology that would revolutionize the industry. Exactly what are these potential benefits? Have the benefits been achieved? What are the consumer impacts? The last question has not been addressed in the literature, and answering it is the focus of this paper. However, to do so requires an appreciation of the answers to the first two questions.

This paper begins with a brief discussion of the organizational structure of supermarkets. Its purpose is to outline the environment into which scanners have been introduced. An appreciation of the existing managerial framework establishes the basis for the potential that scanner data have for enhancing the operation of supermarkets. It also facilitates a discussion of the problems that remain to be overcome to achieve the benefits. Once the potential for the supermarkets has been identified, then attention turns to an economic analysis of the conditions under which the benefits can be transferred from supermarkets to consumers.

#### Historical Overview

Prior to the introduction of scanners, the managerial organization of supermarkets was based on purchase records, warehouse movement, and labor contracts. Purchase records identified specific products and suppliers. Warehouse movement provided information about inventory levels. Labor contracts specified goods that could be handled by various employees and their wages.

Management's organizational structure, therefore, focused on the control of the inputs into the supermarket retail business. The revenues were much more difficult to monitor given the large

number of individual shoppers making essentially independent purchases. Even though the objective was to provide goods and services to consumers, the organizational structure was oriented toward "the back door," not "the front door." The input orientation of products resulted in classifications that did not necessarily reflect consumers' groups of substitutes and complements, thereby making demand analyses more difficult.

Scanners were originally introduced to read UPC bar codes for fixed weight items grouped under the dry goods heading. The technology at that time enabled scanners to read UPCs on cans and boxes. Computer software designed to process the codes only needed to recognize the label so it could be matched with a price file. Since these UPCs were unique by size and manufacturer, record keeping only involved noting the scanner had read a given UPC. Such data are called item movement data.

#### Supermarket Benefits

The benefits of scanner checkouts can be grouped into two broad areas; immediate and long-term. One immediate gain is the increased speed at the register. Fewer clerks are needed to serve customers. Rapid checkouts can also attract additional food shoppers from "slower stores." Billing accuracy is increased, so customers are charged properly. The efficiency of clerks can be monitored to identify operators who consistently use default codes and/or are unusually slow in processing.

Long-term benefits are related to enhanced managerial decision making through analyses of scanner data. Rather than being restricted to a framework based upon purchase records, customer purchases can be incorporated via the historical record generated by the scanners. Two related areas of benefits are store management and demand analyses. These are explained below.

Store management can be enhanced. Sales of specific products can be monitored, and historical records can be used to project demand. Display effectiveness can be measured. Purchase and inventory records can be matched with sales to obtain better measures of the shrink that occurs and possible theft problems identified. Tighter inventory controls and automatic re-ordering could occur. Given the low profit margins and the high volumes of sales, the savings could be substantial. Reports suitable for various levels of management can be generated, as suggested by Thomas, Capps, and Long (1987). Labor requirements for restocking shelves, bagging groceries, and operating registers could be projected more accurately.

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Through an accurate record of product-specific sales, stores can make better decisions about how much shelf space should be allocated to each item. This is becoming particularly important because of the proliferation of new products. For example in our work over 1,400 bar codes have been associated with the meat, poultry, and seafood categories for a multiregional supermarket. Any new products in existing stores can occur only if there is a reduction in space allocated to other items. As an illustration, we have found that a regional chain carries 31 UPCs for bacon, and item movement for a week varies between one and several thousand in a single store. The introduction of a new brand of bacon would entail reducing the space allocated among the existing store products. Sales data can also be coupled with product specific cost to estimate direct-product-profit for foods.

Scanner data also represent a new source of information about consumer demand. As a record of actual consumer purchases, estimates of direct and cross price elasticities are possible. The impacts of various advertising and promotional schemes can also be estimated. This is being done at several universities including Cornell, Iowa State, Tennessee, and Texas A & M. For example, at Tennessee we are working with scanner data from a multiregional chain and incorporating electronic media and newspaper advertising. The USDA is also working in this area. Proprietary vendors of scanner data are conducting similar research, primarily for food processors and commodity groups.

These observations suggest significant potential benefits are expected from scanner data analyses. However, to date the long-term benefits have not been achieved. There are several reasons for this. One is that some chains use scanners and in-store computers that are incompatible with corporate level computer systems. The volume of data is another constraint. Many stores carry 40 to 60 thousand items, so the data sets are quite large and expensive to manipulate. Given all the immediate pressures for data processing, there is limited opportunity to begin the work of tapping the long-term benefits.

UPCs are assigned by a national organization. They are twelve digit codes. The first six refer to a specific manufacturer, and the last six identify a specific product for that manufacturer. However, the codes themselves are not arranged into any logical numerical order that would permit sorting by UPCs to obtain product groups. Consequently, if one wants to generate a list of codes for a group of related products from a demand perspective, it cannot be done by UPC values. For example, in our work we are looking at meat, poultry, and fish. These products are found in seven different inventory management record groups for which we have identified over 1,900 bar codes. Elimination of non-meat, poultry, and fish foods in these groups leaves just over 1,400 codes to include in the data set.

Another problem is that not all food items have UPCs, so stores have introduced their own bar codes. This is particularly true for fresh produce, meat, and seafood; delicatessen; bakery; and floral departments. In addition individual stores may be able to create special codes for items purchased directly from suppliers such as local growers. Rapid movement items also may have special cash register keys that circumvent the scanner. Thus, a hodgepodge of bar codes may be mixed in with the UPCs, and all need to be incorporated into a scanner data set.

Variable weight items pose particularly difficult problems. Until recently, scanners were not very accurate in reading bar codes on these packages. Consequently, these foods were not included in the scanner programs that were originally developed. Instead they were added on to the existing item movement framework, even though more information is needed. Revenue is price times quantity sold, and if quantities are variable, more than item movement is needed. This complicates the data processing procedures. Altering the software can be expensive and time consuming, thereby delaying the generation of requisite data.

#### Consumer Benefits

Scanner data clearly have the potential of generating significant impacts on the supermarket industry. As a change in technology, the introduction of scanners has the capability of significantly lowering the costs of those firms that are willing to acquire the requisite managerial skill to analyze their data. The benefits to business are in the realm of cost savings. How can consumers benefit? Furthermore, since scanner data provide so much information about revenue/consumer behavior, should consumers and consumer groups be concerned?

The transfer of cost savings to consumers depends upon the competitive structure of the supermarket industry. Total cost, total variable cost, and marginal cost are decreased for those firms that successfully incorporate scanner data analyses. Furthermore, supermarkets are already under pressure to react to food processors and vendors' claims about sales based upon proprietary data. An argument could be advanced that consumers would be served best by supermarkets paying attention to their own sales as opposed to vendors' claims about product movement. Similarly, some nonfood scanner research at the University of Iowa suggests that TV advertising may be ineffective (Gannett New Service). This raises the possibility that advertising budgets could be significantly reduced.

Without any change in prices, the short-run profits of supermarkets that are successful in managing scanner data will be higher than those of competitors. Traditional economic theory has an adjustment mechanism. If the market is purely competitive, then higher profits in the short-run encourage entry, and through increased competition, the firms return to break even positions, and consumers have benefited through lower prices. At the other extreme, a monopoly would be able to

Table 1. Financial Performance of Food Retailers and Selected Industries, 1987 and 1988.

| Industry<br>Average     | 1987             |                 |                |                 | 1988            |      |      |      |
|-------------------------|------------------|-----------------|----------------|-----------------|-----------------|------|------|------|
|                         | P-E <sup>a</sup> | DR <sup>b</sup> | Y <sup>c</sup> | ES <sup>d</sup> | PE              | DR   | Y    | ES   |
| Airlines                | 14               | .37             | 1.16           | 1.67            | 10              | .25  | .60  | 2.13 |
| Beverages               | 13               | .72             | 2.83           | 1.39            | 16              | .77  | 2.14 | 2.78 |
| Electronics             | 15               | .65             | 1.85           | 2.33            | 12              | 1.17 | 3.42 | 3.52 |
| Food & Lodging          | 35               | .32             | 1.92           | 1.47            | 23              | .20  | .43  | 2.16 |
| Food Retailing          | 15               | .44             | 1.78           | 1.52            | 19 <sup>e</sup> | .48  | 2.02 | 1.69 |
| Nonfood Retailing       | 12               | .45             | 2.34           | 1.58            | 16              | .43  | 1.34 | 1.71 |
| Personal Care           | 15               | 1.13            | 3.29           | 2.38            | 14              | 1.10 | 3.03 | 2.72 |
| All Industry<br>Average | 15               | .89             | 3.18           | 1.83            | 16              | .92  | 2.89 | 2.77 |

<sup>a</sup>P-E = (Stock price)/(Earnings).

<sup>b</sup>DR = dividend rate.

<sup>c</sup>Y = Annual dividend as a percent of stock price.

<sup>d</sup>ES = earnings per share.

<sup>e</sup>adjusted for an atypical food retailer.

Source: Business Week, selected issues.

maintain abnormal profits in the long-run, so the cost savings would not be shifted to consumers.

Based upon this framework, some empirical work exists regarding the profit structure of the supermarket industry. The most extensive analysis occurred in the mid-1970s at the request of the Joint Economic Committee, U.S. Congress. It focused on the prices charged by supermarkets for a fixed market basket of foods and on the profits of the nation's seventeen largest food chains. Results suggest that prices increase as the number of firms in a geographic area decreases, and a threshold of at least four chains operating in area was needed to ensure competition. However, instances of higher prices also tended to be associated with higher costs, so that profits were not necessarily higher. More recent work (Marion 1986) supports these results. An inference to be drawn is that as long as at least four firms are competing in an area, there is the potential for the transfer of cost savings to consumers.

A newer theory of competition is that of contestable markets (Baumol 1982). Such markets are characterized by free entry and exit. With respect to this definition, new entrants suffer no disadvantage in terms of production or quality relative to existing firms. This would seem to apply to geographic overlaps among regional and multiregional chains as they have reached sizes that are associated with minimum average costs. These firms, then, are in positions to expand their regions and/or expand within local areas of present regions (Marion).

Contestable markets, through the threat of entry, cause firms to price products to discourage entry. That is, competitors have no incentive to

enter a market if a normal rate of return is the best that can be expected. Therefore, cost savings are transferred in the long-run via prices that are lower than what would occur in the absence of costs falling.

Do supermarkets operate in contestable markets? A partial answer can be found through an examination of the profits of supermarkets vis-a-vis other industries. Some recent data on corporate performance reveals that food retailers do not appear to be earning unusually high rates of return (Table 1).

These observations suggest that the economic environment in which supermarkets operate will result in long-run consumer benefits from the introduction of scanners. Through lowering costs, the innovative firms will gain in the short-run. In the long-run the contestable nature of the industry will lead to lower prices than would otherwise occur.

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CONSUMER ATTITUDES TOWARDS PORK  
PRODUCED WITH RECOMBINANT PST

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Consumer acceptance of lean pork produced with porcine somatotropin (PST) could be the most important issue facing the pork industry. According to the National Research Council (1988), nutrition and health concerns have an increasingly significant influence on food choices. Consumers are demanding meat products that are leaner and lower in cholesterol (Cross et al., 1986). Traditionally, swine producers have relied on selective breeding programs to produce leaner animals; however, these methods take years to accomplish. The discovery of gene-splicing techniques in the early seventies led researchers to develop products which could improve the quality of livestock. One of these products, porcine somatotropin, will enable swine producers to produce leaner pigs that grow more efficiently. Large-scale production of porcine somatotropin is now possible using recombinant-DNA technology and standard fermentation techniques, (Cogburn, 1985).

The thrust of scientific developments has not always been matched by public acceptance. Although the advantages of PST to swine producers have been proven (Boyd et al., 1986), public perceptions towards the use of genetically engineered products to produce food could complicate commercialization of the product. Moreover, genetically engineered products have not had much success obtaining FDA approval. One vaccine was temporarily removed from the market due to pressure from consumers (Flemming, 1987).

Consumer demand for leaner meat products sometimes clashes with their concern regarding the safety of genetically engineered products like PST. Questions that can be asked are: What are the characteristics of the people concerned with biotechnology in food production?; How do their concerns affect consumption of pork produced with PST?; and, Who would those people trust to give them information regarding biotechnology and PST?

Thus far, very few studies have been conducted on consumer acceptance and demand for lean pork. Lemieux and Wohlgenant analyzed the willingness of consumers to pay for leaner pork products.

Their results indicated that consumers would be willing to pay a premium for leaner pork products. However, their study did not introduce the issue of using a genetically engineered compound, such as PST, to produce the leaner pork. In another study conducted by the Office of Technology Assessment (OTA), public approval of the environmental use of genetically altered organisms in agriculture increases, as the risk decreases. As such, the use of recombinant PST to produce lean pork could have a strong influence on consumer acceptance and the successful commercialization of the product.

The purpose of this study was to address these issues. The research examined; (1) attitudes and perceptions regarding the use of PST in pork production, (2) factors that affect these attitudes, (3) the association between attitudes and individual socioeconomic and personal characteristics, and (4) the identification of target groups where the level of concern regarding the use of PST is high. For objectives (1) and (2), results will be presented using descriptive analysis. For objectives (3) and (4) measures of both the dependency (Chi-square) and direction (Spearman's rank correlation) of the bivariate relationships will be presented.

### Study Methods

The survey was designed with cooperation from specialists in the fields of Food and Nutrition/Cooperative Extension, Food and Resource Economics, and Swine Production. Focus groups were used to assess the clarity and appropriateness of the questions in the survey. Questionnaires were mailed to the metropolitan areas of Atlanta, Chicago, Los Angeles, New York, and Philadelphia. The cities of Atlanta and Philadelphia were chosen because of their proximity to the Universities conducting the study. Approximately 9,200 survey questionnaires were mailed out in June, 1988 and 1,016 responses were received by the end of September 1988, a response rate of about 11 percent.

Respondents were asked a total of 14 questions regarding their eating habits and their concern with biotechnology. The respondents were stratified by income, education, gender, age, and city, which were hypothesized to influence their responses. Table 1 defines these categories and shows the percentage of respondents within each group. Contingency

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tables were constructed based on each stratification and survey response. The Chi-square statistic was used to test the dependence/independence of the bivariate relationship between a given response and stratified group. The null hypothesis for this test is that the stratification and response are independent. Spearman's rank correlation was used to estimate the degree of association.

Table 1 - Stratification Categories and Descriptive Statistics

|    | <u>CATEGORY</u> | <u>CODING</u>         | <u>VARIABLE NAME</u> | <u>% OF GROUP</u> |
|----|-----------------|-----------------------|----------------------|-------------------|
| 1. | Age             | (18-34)               | YOUNG                | 29%               |
|    |                 | (35-54)               | MIDDLE               | 39                |
|    |                 | (55+)                 | OLD                  | 32                |
| 2. | Income          | < \$15,000            | INCLW                | 19%               |
|    |                 | \$15-35,000           | INCMID               | 34                |
|    |                 | > \$35,000            | INCHIGH              | 47                |
| 3. | Education       | 0 = H.S. and below    | EDUC                 | 39%               |
|    |                 | 1 = College and above |                      | 61                |
| 4. | Sex             | 0 = female            | GENDER               | 52%               |
|    |                 | 1 = male              |                      | 48                |
| 5. | City            | Atlanta               | ATLANTA              | 25%               |
|    |                 | Chicago               | CHICAGO              | 17                |
|    |                 | Los Angeles           | LOS ANGELES          | 18                |
|    |                 | New York              | NEW YORK             | 16                |
|    |                 | Philadelphia          | PHILADELPHIA         | 24                |

### Results

There were several questions in the survey designed to capture the factors which could affect the consumers' attitudes towards the use of a genetically engineered product, i.e. PST in pork production. Results indicate that most of the respondents are concerned with the use of a genetically engineered product. Table 2 shows the response percentages to three of these questions. Respondents were asked about their level of concern with, "... the use of recombinant DNA technology to produce human food?", "... changing bacteria so it is not in its natural form?", and "... growth promotants used in livestock and poultry production?" For each of these questions, at least 44 percent were very concerned and 38 were somewhat concerned. Between 9 and 17 percent of the respondent said they were not concerned.

Commercialization of a genetically engineered product, such as PST, depends heavily on assuring the public that the product is safe. Therefore, it is vital that safety information come from a source that the public trusts. Table 2 shows the respondents' tendency to believe sources of safety information. Respondents said that they were most likely to believe statements made by university scientists. Eighty-nine percent of those surveyed expressed that they were inclined to believe university scientists. This result is

similar to a 1987 OTA study in which 86 percent of the respondents said that they were inclined to believe statements made by university scientists. Federal agencies also have a high level of credibility with at least 81 percent of the respondents inclined to believe them. News agencies and the companies making the product only had 42 and 18 percent of the respondents, respectively, believing that they were credible. In a separate question, respondents were asked what they felt was the single most important criteria for them to accept PST's use. The most common answer (given by 44 percent) was the need for FDA approval. Several questions in the survey were designed to determine the attitudes of the respondents regarding the use of PST in hog production. Results from these questions are also given in Table 2 and indicate that even though there is a high degree of concern for the use of genetically engineered products in food production, people are willing to accept them under certain circumstances. At least 61 percent of the respondents indicated that they were in favor of PST use for each of the following reasons; it increases rate of growth, lowers the cost of production, and results in a leaner product. Specifically, 61 and 75 percent of the respondents, respectively, indicated that they were inclined to agree with the first and second conditions. A higher percentage of the respondents (86 percent) favored PST adoption if it resulted in a leaner pork. Table 2 also presents changes in the consumption of pork produced with PST. Thirty-three percent said they will eat more if pork is leaner. About 23 percent of the respondents said they will eat less because of PST use and 24 percent will eat pork not treated with PST. Only 23 percent said they will eat more because it will be cheaper. In contrast, about half of the respondents would not change their consumption patterns due to PST. Respondents were also asked if they were willing to pay a premium for leaner pork produced with PST. Forty-eight percent of the respondents said they would be willing to pay something extra, while 52 percent would not.

Questions dealing with the concern and acceptance of genetically engineered products, specifically, pork produced with PST, were cross-tabulated with five socioeconomic and demographic variables. This was done to measure the degree of association between consumer attitudes toward those questions and respondents' characteristics. The hypothesis is that consumer acceptance and concern is dependent on income, education, gender, age, and location.

Tables 3-6 show the bivariate relationships between the respondents' characteristics and the questions asked. Table 3 shows the results dealing with the following question, "How concerned are you with the use of recombinant-DNA technology to produce a product for human food?" Education and gender showed a statistically significant Chi-square with a positive correlation (from the Spearman's rank correlation) indicating that the better-educated

and male respondents were less concerned with the use of recombinant-DNA technology to produce food, than were the lower-educated and female respondents.

Table 2 - Factors Which Affect Consumers' Attitudes Regarding the Use of PST in Pork Production

| Statement   | Response %          |                         |               |
|---|---------------------|-------------------------|---------------|
|   | Very Concerned      | Somewhat Concerned      | Not Concerned |
| How concerned are you with ...  |                     |                         |               |
| 2.1 ...the use of recombinant DNA to produce human food.                                | 44                  | 39                      | 17            |
| 2.2 ...changing bacteria so it is not in its natural form.                              | 46                  | 38                      | 16            |
| 2.3 ...growth promotants used in livestock and poultry production?                      | 53                  | 38                      | 9             |
| Would you believe statements about the safety of PST if the statements were made by ... | Inclined to Believe | Inclined not to Believe |               |
| 2.8 ...Federal Agencies   | 81                  | 19                      |               |
| 2.9 ...University Scientists  | 89                  | 11                      |               |
| 2.10 ...News Media  | 42                  | 58                      |               |
| 2.11 ...Company making PST  | 18                  | 82                      |               |
| I am in favor of using PST because...   | Agree               | Disagree                |               |
| 3.1 ...it increases rate of growth in hogs.   | 28                  | 33                      | 39            |
| 3.2 ...it lowers the cost of producing pork.  | 40                  | 35                      | 26            |
| 3.3 ...it will result in leaner pork.   | 62                  | 24                      | 14            |
| If pork is produced with PST I will...  | Most Likely         | No Change               | Less Likely   |
| 3.4 ...eat more because it will be leaner.  | 33                  | 47                      | 20            |
| 3.5 ...eat more because it will be cheaper.   | 23                  | 53                      | 24            |
| 3.6 ...eat less because of PST use.   | 23                  | 54                      | 23            |
| 3.7 ...eat pork not treated with PST.   | 24                  | 50                      | 26            |
| 3.8 Are you willing to pay more for leaner pork produced with PST?                      | Yes<br>48           | No<br>52                |               |

Results from Table 4 are from a cross-tabulation of the question, "How concerned are you with changing a bacteria so that it is not in its natural form?" Education and gender again showed statistically significant Chi-square and a positive correlation, indicating that the better-educated and male respondents showed less concern with the manipulations of genes in a bacteria.

Table 5 shows the cross-tabulation results of the question, "How concerned are you with growth promotants used in livestock and poultry production?" Gender, age, income, and city showed significant Chi-squares. Gender was positively correlated, indicating that males were less concerned with growth promotants than females. For age, the Spearman correlation estimated was quite small relative to its estimated standard error. This implies that the basis for the high Chi-squared value is not a continuous function across the stratification. This can be seen by looking at Table 5. The middle age group expressed significantly more concern (66% very concerned) than either the younger (50%) or older (51%) group. Income showed a marginally significant (p=.073) Chi-square value. The main difference arose from the low income group (A), where 62 percent were

Table 3 - Contingency Table: Question 2.1\* vs. EDUCATION and SEX

| RESPONSE(%)        | EDUCATION         |                   |
|--------------------|-------------------|-------------------|
|                    | HS Grad and Below | College and Above |
| Very concerned     | 52                | 39                |
| Somewhat concerned | 38                | 40                |
| Not concerned      | 11                | 21                |

Chi<sup>2</sup> = 18.61      Spearman = .144  
Prob = .000      ASE = .033

| RESPONSE(%)        | GENDER |      |
|--------------------|--------|------|
|                    | FEMALE | MALE |
| Very concerned     | 51     | 36   |
| Somewhat concerned | 37     | 41   |
| Not concerned      | 11     | 23   |

Chi<sup>2</sup> = 28.31      Spearman = .180  
Prob = .000      ASE = .034

\* Question 2.1: How concerned are you with the use of recombinant DNA technology to produce a product for human food?

- Chi<sup>2</sup> - Chi-squared value for the null hypothesis that the rows and columns are independent.
- Prob - Prob-value for the Chi-squared test.
- ASE - asymptotic standard error.
- Spearman - rank correlation coefficient

Table 4 - Contingency Table: Question 2.2\* vs. EDUCATION and SEX

| RESPONSE(%)        | EDUCATION         |                   |
|--------------------|-------------------|-------------------|
|                    | HS Grad and Below | College and Above |
| Very concerned     | 52                | 43                |
| Somewhat concerned | 36                | 38                |
| Not concerned      | 12                | 19                |

Chi<sup>2</sup> = 8.85      Spearman = .099  
Prob = .012      ASE = .034

| RESPONSE(%)        | GENDER |      |
|--------------------|--------|------|
|                    | FEMALE | MALE |
| Very concerned     | 55     | 37   |
| Somewhat concerned | 35     | 40   |
| Not concerned      | 10     | 23   |

Chi<sup>2</sup> = 33.86      Spearman = .200  
Prob = .000      ASE = .034

\* Question 2.2: How concerned are you with changing a bacteria so that it is not in its natural form?

- Chi<sup>2</sup> - Chi-squared value for the null hypothesis that the rows and columns are independent.
- Prob - Prob-value for the Chi-squared test.
- ASE - asymptotic standard error.
- Spearman - rank correlation coefficient

very concerned versus 52 and 50 percent for the middle and high income groups (B and C). The cities in the survey displayed wide differences in responses to this question. The "very concerned" response percentages ranged from 44

percent in Atlanta, to 66 percent in New York. The ranking of cities, by concern (highest to lowest) is New York followed by Los Angeles (58 percent), Philadelphia (51 percent), Chicago (50 percent), and finally Atlanta.

In Table 6, the cross-tabulation examined the respondents' attitudes toward responding favorably to the question, "Do you think that if pork is produced with PST, you will; eat more

**Table 5 - Contingency Table: Question 2.3\* vs. SEX, AGE INCOME, and CITY**

| RESPONSE(%)        | GENDER |      |
|--------------------|--------|------|
|                    | FEMALE | MALE |
| Very concerned     | 61     | 43   |
| Somewhat concerned | 34     | 43   |
| Not concerned      | 5      | 17   |

Chi<sup>2</sup> = 37.64      Spearman = .197  
Prob = .000      ASE = .032

| RESPONSE(%)        | AGE   |       |     |
|--------------------|-------|-------|-----|
|                    | 18-34 | 35-54 | 55+ |
| Very concerned     | 46    | 60    | 49  |
| Somewhat concerned | 44    | 33    | 39  |
| Not concerned      | 10    | 7     | 11  |

Chi<sup>2</sup> = 15.68      Spearman = -.019  
Prob = .003      ASE = .033

| RESPONSE(%)        | INCOME |    |    |
|--------------------|--------|----|----|
|                    | A      | B  | C  |
| Very concerned     | 62     | 52 | 50 |
| Somewhat concerned | 30     | 38 | 41 |
| Not concerned      | 8      | 11 | 9  |

Chi<sup>2</sup> = 8.56      Spearman = .063  
Prob = .073      ASE = .033

| RESPONSE(%)        | CITY |    |    |    |    |
|--------------------|------|----|----|----|----|
|                    | AT   | CH | LA | NY | PH |
| Very concerned     | 44   | 50 | 58 | 66 | 51 |
| Somewhat concerned | 44   | 37 | 34 | 30 | 40 |
| Not concerned      | 11   | 13 | 8  | 4  | 9  |

Chi<sup>2</sup> = 23.41      Spearman = Not applic.  
Prob = .003      ASE = Not applic.

correlation for the third and fourth. The results indicate that male individuals would be more likely to increase their pork consumption if pork was leaner and cheaper due to PST. They would also be less likely to eat pork produced without the use of PST, if given that option.

Results from Tables 3-6 provided certain respondent characteristics that influenced attitudes and perceptions regarding the use of PST in pork production. In most cases, gender and education, and to a lesser degree, age, influenced the attitudes and level of concern towards the use of PST. Location also was an important factor. It is equally important to

**Table 6 - Contingency Table: Questions 3.4 - 3.7\* vs. SEX**

| RESPONSE(%) (3.4) | GENDER |      |
|-------------------|--------|------|
|                   | FEMALE | MALE |
| Most likely       | 30     | 36   |
| No change         | 44     | 50   |
| Less likely       | 26     | 14   |

Chi<sup>2</sup> = 17.63      Spearman = -.119  
Prob = .000      ASE = .035

| RESPONSE(%) (3.5) | GENDER |      |
|-------------------|--------|------|
|                   | FEMALE | MALE |
| Most likely       | 21     | 25   |
| No change         | 48     | 58   |
| Less likely       | 31     | 17   |

Chi<sup>2</sup> = 20.57      Spearman = -.131  
Prob = .000      ASE = .035

| RESPONSE(%) (3.6) | GENDER |      |
|-------------------|--------|------|
|                   | FEMALE | MALE |
| Most likely       | 29     | 17   |
| No change         | 48     | 60   |
| Less likely       | 22     | 24   |

Chi<sup>2</sup> = 16.46      Spearman = .104  
Prob = .000      ASE = .037

| RESPONSE(%) (3.7) | GENDER |      |
|-------------------|--------|------|
|                   | FEMALE | MALE |
| Most likely       | 30     | 19   |
| No change         | 47     | 53   |
| Less likely       | 24     | 28   |

Chi<sup>2</sup> = 12.01      Spearman = .111  
Prob = .002      ASE = .038

\* Question 2.3: How concerned are you with growth promotants used in livestock and poultry production?

- Chi<sup>2</sup> - Chi-squared value for the null hypothesis that the rows and columns are independent.
- Prob - Prob-value for the Chi-squared test.
- ASE - asymptotic standard error.
- Spearman - rank correlation coefficient

because it will be leaner, eat more because it will be cheaper, eat less because of the use of PST, and eat pork produced without the use of PST". In all of the above questions only the gender variable showed statistically significant Chi-square, with a negative correlation for the first and second questions, and a positive

\* Do you think that if pork is produced with PST, you will:

- 3.4 ... eat more because it will be leaner?
- 3.5 ... eat more because it will be cheaper?
- 3.6 ... eat less because of the use of PST?
- 3.7 ... eat pork produced without the use of PST?

- Chi<sup>2</sup> - Chi-squared value for the null hypothesis that the rows and columns are independent.
- Prob - Prob-value for the Chi-squared test.
- ASE - asymptotic standard error.
- Spearman - rank correlation coefficient

note that income and age (except for one case) showed weak and insignificant relationships to the questions asked. One can then surmise that consumer perceptions of genetically engineered products and acceptance of pork produced with recombinant PST, is generally not as sensitive to the levels of income and age.

### Conclusion

The results indicate that female and less-educated respondents are more concerned with the use of biotechnology in the production of food than are males and better-educated respondents. Although there is a high degree of concern regarding the use of genetically engineered products, PST use could be accepted under certain conditions. The public is inclined to favor using PST to reduce production costs and to produce higher quality, leaner pork products. The results also indicate that consumers are not willing to pay more for pork produced with PST. Roughly half of the respondents indicated they would not change their consumption of pork due to the use of PST.

According to a 1987 survey conducted by the Office of Technology Assessment (OTA), only about one in six Americans rates his or her basic understanding of science and technology as very good. The same survey showed that the public will not accept the use of a genetically engineered product if the safety level of the product is not known. The results of this study indicate that education plays a role in the level of concern regarding the use of biotechnology in the production of food. This is in agreement with Offutt and Kuchler, who state that in order to change the publics' views toward genetically engineered products, the level of understanding about these products must be increased.

Education programs which address the safety issues of pork produced with PST would be most beneficial if they were to target the less-educated, female consumer. These programs should be developed and implemented by groups such as universities and public agencies, which enjoy a high level of trust by consumers. The manufacturers of products like PST need to work closely with university scientists and public officials in order to improve their public image and enhance the successful commercialization of genetically engineered products.

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DIFFERENTIAL RESPONSE IN FOOD DEMAND OF LOW-INCOME AND NON-POOR  
HOUSEHOLDS TO CHANGES IN HOUSEHOLD COMPOSITION

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Estimates from the 1977/78 Nationwide Food Consumption Survey indicate that low-income households respond differently to changes in household composition than non-poor households. Non-poor households primarily alter total food expenditure in response to household size changes while low-income households must also make other adaptations to maintain caloric intake. Further examination suggests that alterations of food choice within composite food groups as opposed to across food groups may be the adaptation.

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To paraphrase Hemingway, the poor are no different from the rest of us, they just have less money. In fact the poor are different, and the difference between the poor and non-poor with respect to food acquisition behavior is one of the oldest and best established relationships in economics. Ernst Engel noted in the nineteenth century that the poor spent less money, but a greater portion of income on food as compared to the non-poor. The diet of the poor is different than that of the non-poor, and the poor are more responsive to changes in income and prices than the non-poor.

In standard theory of consumer economics households demand food based on household preferences for foods constrained by income and food prices. Preferences are over both the quantity and quality of food. Household composition can also be cast as a constraint to preferences (Barten, 1964). The purpose of this paper is to estimate the effects of household composition on food demand by poor households, and to compare that with non-poor households.

#### MODELING FOOD DEMAND

Given a fixed income and exogenous prices, how can a household respond to changes in household composition? There are basically four strategies that a household can follow. For expository purposes we will assume an increase in household size.

- (1) A household could maintain food expenditure and food consumption, which would result in lower per capita food intake.
- (2) A household might increase food expenditure in an amount sufficient to purchase enough food

to maintain per capita food intake for the now larger household (at constant income, this means an increased budget share to food).

(3) A household could alter choices among foods to purchase cheaper foods (across broad food groups) and maintain caloric intake, e.g. decreasing meat consumption while increasing egg consumption.

(4) A household might purchase the same foods (across broad food groups), but to reduce food quality purchased (which means cheaper food items within broad groups) in an effort to maintain per capita food intake.

In fact any household does not likely follow any single strategy, but utilizes some combination of these four approaches to changes in household composition (or income or price changes).

As part of a larger research project a two-stage budgeting approach was utilized to model food demand by U.S. households. In this model income is first allocated to broad expenditure categories (one of which is food), and then food expenditure is allocated to specific foods. Estimates from the second stage of the allocation process for low-income households have previously been reported (Tufts, Gerner, & Haas, 1987). The interest here is in the allocation of income to aggregate food expenditure, and particularly, in the estimates of household composition effects.

At the first budgeting stage of household food demand it is hypothesized that expenditure on food is a function of income, the prices of food and all other goods, and household composition. Additionally, a number of socio-demographic dummy variables can be incorporated into the model to account for preference differences.

Attempts were made to utilize economic theory to estimate the effects of income, prices, and household composition on food demand. Both an Almost Ideal Demand System model (Deaton & Muellbauer, 1980) and the Linear Expenditure System (Stone, 1954) were fit to the data, but each model was quite uninformative. Problems with data, non-linearity, and multicollinearity resulted in imprecise estimates of the model coefficients. As an alternative, a multivariate linear regression was used to estimate the effects of income, prices, and household composition on household food expenditure. While this model is not informed by economic theory, it provides a plausible specification for examining the effects of household composition on food demand.

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## DATA

The data were taken from the USDA Nationwide Food Consumption Survey, 1977/78 (NFCS); both the Low-Income Supplement and the entire national representative sample were utilized. The low-income sample was defined by eligibility for food stamps, with about half the sample receiving food stamps and half eligible but not participating in the program. An after-tax income of about \$450 was the cutoff level for a family of three, and about \$570 for a family of four (USDA). The samples were disproportionate probability samples from the 48 contiguous states, with 4500 households in the low-income sample and nearly 15,000 households in the entire U.S. sample. For the purposes of this paper the terms low-income and poor are used to define the sample from the Low-Income Supplement, while the non-poor sample is from the representative sample from the entire U.S. (which includes some households that could be classed low-income).

Household data were obtained via an interview with the household member most familiar with food preparation. Data were collected on household demographic characteristics, meals served to guests, and household food consumption. For individual household members data were collected on meals eaten from household stores. The household food data relate to all food consumed by the household from household sources over the preceding seven day period. Food acquired and consumed away from the household is not included, food eaten away from home but from household stores is included. The food data include the quantity of food and the expenditure on that food. Price must be computed from the price-quantity-expenditure identity. Food consumption in this data is food disappearance and includes wastage and spoilage. The dependent variable in this report is the total food expenditure on foods consumed at home or from home stores over a one week period.

Income is specified as monthly income, and is the sum of income from all sources and food stamp bonus. Where monthly income is missing, or lower than total food expenditure, the previous year's income (prorated) is used.

The price of expenditures other than for food was generated by taking regional comparison prices from 1967 and projecting them to 1977 using the region-specific CPI. This provides four levels of price for the category of "all other goods". Because of the regional nature of this price it is not clear if the price of all other goods is proxy for region or is in fact a relative price level proxy.

For the analysis presented here, the over 2000 food items recorded in the NFCS were aggregated into eleven composite foods (Dairy, Fat, Starch, Bread & Cereal, Sweets, Meat, Fish & Poultry, Eggs, Vegetables, Fruit, and Other). These groupings were defined to represent separate foods from the point of view of the consumer as well as provide meaningful nutritional groups. Composite foods were aggregated on the basis of

caloric content rather than the more conventional weight units, pounds or grams. This was done because we believe consumers implicitly purchase food by number of servings, approximated better by caloric content than by physical weight.

The food price of interest is not the price paid by the consumer for individual food items, but rather the price faced by the consumer for the composite food. This price was computed by taking the weighted average ratio of the price of each food item purchased by the household to the sample mean price for that item (see Appendix). The weights utilized were based on the relative contribution (over the sample) of each item to the composite food. Total food expenditure was computed as the sum of expenditures on each of the eleven foods in the system.

The household demographic variables were created from the meal counts for each family member. Each demographic variable was defined as the number of meals eaten from household stocks by a person of the relevant age and sex characteristics. Meal counts, rather than number of household members is appropriate to examine the effect of household size on food demand. The number of meals served over a week was found to be more closely related to food consumption than the nominal household size, as determined by persons under one roof.

A full week of meals is taken to be 21 meals. Nine age/sex groups were defined; the categories being (1 & 2) boys and girls under age 11, (3 & 4) males and females from age 12 to age 18, (5) men 19 to 51 years (6) women 19 to 51 years, (7) men 52 years and over, (8) women 52 years and older, and (9) women either pregnant or lactating. Based on work by Kennedy, et. al (1982), meals were weighted such that breakfast and lunch received a weight of .25 and dinner a weight of 0.5. These weights are based on caloric contribution to the daily intake from each meal. One advantage of using a specification of this sort is that household composition becomes a continuous variable. However, care should be taken in interpreting results, as household size in this specification refers to meal consumption, and not persons living together.

A set of dummy variables were used to account for the systematic variation in preferences. Race (white or black), residence (urban, suburban, rural), ethnic group (Hispanic or non-Hispanic), and food stamp use were used in the specification as dummy variables.

Random subsamples were generated from each NFCS sample to reduce the computation burden. Table 1 presents descriptive statistics of the two samples utilized in the estimations. Income is quite strikingly different between the samples, while household composition is quite similar. Household size refers to the number of persons living in the household, the age/sex categories represent meal counts by persons eating in the household.



TABLE 1. Descriptive Statistics for Low-Income and Non-Poor Households

| Variable                     | Low-Income      | Non-Poor        |
|------------------------------|-----------------|-----------------|
|                              | n = 2190        | n = 2165        |
|                              | mean (sd)       |                 |
| Income                       | \$402 (268)     | \$1222 (1204)   |
| Total Food Expenditure       | \$36.80 (24.99) | \$43.30 (25.55) |
| Household Size               | 3.32 (2.2)      | 3.07 (1.7)      |
| Price Food                   | \$0.67 (.08)    | \$.81 (.09)     |
| Price Other                  | \$1.79 (.07)    | \$1.86 (.07)    |
| Log Income                   | 5.81 (.62)      | 6.75 (.89)      |
| Boys $\leq$ 12 yrs.          | .41 (.69)       | .27 (.55)       |
| Girls $\leq$ 12 yrs.         | .40 (.70)       | .26 (.54)       |
| Boys, 12 - 18 yrs.           | .25 (.56)       | .19 (.47)       |
| Girls 12 - 18 yrs.           | .24 (.51)       | .19 (.48)       |
| Men, 18 - 51 yrs.            | .36 (.54)       | .49 (.54)       |
| Women 18 - 51 yrs.           | .55 (.59)       | .58 (.56)       |
| Men 52 + yrs.                | .25 (.42)       | .27 (.42)       |
| Women 52 + yrs.              | .42 (.50)       | .37 (.50)       |
| Women, pregnant or lactating | .03 (.18)       | .03 (.16)       |
| Sum meal counts              | 2.91            | 2.65            |

### RESULTS

Total weekly food expenditure was regressed as a function of the natural logarithm of income, the price of food, the price of other, the meal counts for the nine age/sex groups, and the various socio-demographic dummy variables. The results of the regression estimations for the low-income and non-poor samples are found in Tables 2 and 3, respectively. None of the socio-demographic dummy variables (race, residence, etc.) were found to be significant for either model and are not included. The models are quite similar, with negative intercepts and all other variables having a positive sign. A rise in income increases total food expenditure, as does a rise in food price. Increasing the number of meal counts for any age/sex group leads to greater total food expenditure. For example, for the low-income sample an increase of one male child on average adds \$7.12 to weekly family food expenditure. Of the household demographic variables only the coefficient for pregnant or lactating females in the low-income sample fails to reach statistical significance.

TABLE 2. Multiple Regression of Total Food Expenditure as Function of Income, Prices, and Household Composition

| VARIABLE                      | Low-Income sample                   |             |
|-------------------------------|-------------------------------------|-------------|
|                               | PARAMETER ESTIMATE (standard error) | t statistic |
| Intercept                     | -54.0 (9.37)                        | -5.8        |
| Ln Income                     | 5.50 (.766)                         | 7.2         |
| Price Other                   | 16.14 (4.85)                        | 3.3         |
| Price Food                    | 12.06 (4.19)                        | 2.91        |
| Male Child                    | 7.12 (.57)                          | 12.6        |
| Female Child                  | 6.82 (.55)                          | 12.5        |
| Male Teen                     | 11.74 (.67)                         | 17.5        |
| Female Teen                   | 10.22 (.72)                         | 14.2        |
| Male Adult                    | 7.66 (.74)                          | 10.2        |
| Female Adult                  | 7.34 (.80)                          | 9.2         |
| Elder Male                    | 7.48 (.88)                          | 8.5         |
| Elder Female                  | 4.04 (.86)                          | 4.7         |
| Female, Pregnant or Lactating | 1.33 (2.00)                         | .7          |

Adjusted  $R^2 = 59\%$

The estimated income, price, and household size elasticities of expenditure are found in Table 4. Income elasticities are quite low, as is usually found for American households. Not surprisingly, low-income families are nearly twice as responsive to changes in income compared to the non-poor families. Similarly, low-income households are much more responsive to changes in the price of food than non-poor households, although food remains price inelastic for each group. Non-poor households have a larger household size elasticity, which indicates that an increase in household size leads to relatively greater expenditure among the non-poor than for the poor. A household size elasticity less than unity is consistent with economies of size in food acquisition and a decreasing per capita consumption in larger families.

The household size elasticity of expenditure presented in Table 4 is computed as the weighted average of individual elasticities. Another approach to examining household composition effects is to compute the calories a household adds to weekly household intake based on the coefficients in Tables 2 and 3. Table 5 presents the equivalent daily caloric consumption for the nine age/sex categories based on the estimated change in household expenditure in response to

TABLE 3. Multiple Regression of Total Food Expenditure as Function of Income, Prices, and Household Composition

| VARIABLE                      | <u>Non-Poor sample</u>                 |             |
|-------------------------------|--|-------------|
|                               | PARAMETER ESTIMATE<br>(standard error) | t statistic |
| Intercept                     | -69.0 (9.98)                           | -6.9        |
| Ln Income                     | 3.39 (.43)                             | 7.9         |
| Price Other                   | 11.12 (5.08)                           | 2.2         |
| Price Food                    | 44.92 (4.03)                           | 11.1        |
| Male Child                    | 7.85 (.70)                             | 11.3        |
| Female Child                  | 7.87 (.71)                             | 11.0        |
| Male Teen                     | 14.43 (.84)                            | 17.1        |
| Female Teen                   | 10.77 (.81)                            | 13.4        |
| Male Adult                    | 16.97 (.79)                            | 21.4        |
| Female Adult                  | 12.62 (.84)                            | 15.1        |
| Elder Male                    | 14.10 (1.02)                           | 13.8        |
| Elder Female                  | 10.74 (.95)                            | 11.3        |
| Female, Pregnant or Lactating | 11.59 (2.35)                           | 4.9         |

Adjusted R<sup>2</sup> = 58%

household composition changes. The estimates for the low-income and non-poor samples are found in the first two columns, the last column is the Recommended Daily Allowance (RDA) for the same age/sex category (Committee on Dietary Allowances, 1980). For example, the \$7.12 increase in total household expenditure found for the male child in the low-income sample would purchase 1,540 Kcals (at the prices the poor pay for foods). The \$7.85 a male child would add to

TABLE 4. Income, Food Price, and Household Size Elasticities

|                            | <u>Low-Income</u> | <u>Non-Poor</u> |
|----------------------------|-------------------|-----------------|
| Income Elasticity          | .15               | .08             |
| Food Price Elasticity      | -.78              | -.16            |
| Household Size Elasticity* | .58               | .76             |

\* Estimated from weighted sum of individual age/sex category elasticities.

the expenditure of a non-poor household translates into 1,390 Kcals.

The very low estimates for elderly female and pregnant or lactating female cannot be interpreted as real consumption estimates for these groups. The estimates are based on the apparent additional weekly food expenditure a household makes in response to the addition of this age/sex person, not on any measure of individual consumption. Further, the estimate for the pregnant or lactating woman is based on a very poorly estimated coefficient (t statistic of 0.7)

TABLE 5. Estimated Daily Caloric Equivalents Based on Household Demand for Total Food Expenditure<sup>a</sup>

| Age/Sex Category             | <u>Daily Caloric Consumption (Kcals)</u> |          |                  |
|------------------------------|--|----------|------------------|
|                              | Low-Income                               | Non-Poor | RDA <sup>b</sup> |
| <b>males</b>                 |  |          |                  |
| 0 - 11 yrs.                  | 1,540                                    | 1,390    | 1,800            |
| <b>females</b>               |  |          |                  |
| 0 - 11 yrs.                  | 1,460                                    | 1,390    | 1,800            |
| <b>males</b>                 |  |          |                  |
| 12 - 18 yrs.                 | 2,510                                    | 2,560    | 2,750            |
| <b>females</b>               |  |          |                  |
| 12 - 18 yrs.                 | 2,190                                    | 1,905    | 2,150            |
| <b>males</b>                 |  |          |                  |
| 18 - 51 yrs.                 | 1,640                                    | 3,000    | 2,800            |
| <b>females</b>               |  |          |                  |
| 18 - 51 yrs.                 | 1,570                                    | 2,235    | 2,050            |
| <b>males</b>                 |  |          |                  |
| 52 + yrs.                    | 1,600                                    | 2,250    | 2,400            |
| <b>females</b>               |  |          |                  |
| 52 + yrs.                    | 860                                      | 1,900    | 1,800            |
| pregnant and lactating women | 285                                      | 2,050    | 2,500            |

a) These estimated daily equivalents are based on multiple regression coefficients from a model of total household food expenditure as a function of income and household composition, not on any measure of individual consumption.

b) Adapted from Recommended Dietary Allowances, (Committee on Dietary Allowances, 1980).

An examination of Table 5 reveals that non-poor households respond to changes in household composition in what could be termed a strictly additive manner. That is, a non-poor household responds to the addition of any age/sex person by increasing household expenditure in a manner that

provides the expected number of calories that such an age/sex person would consume. This conclusion is based on the high correlation between the estimates for the non-poor sample and the RDA. In contrast, a low-income household responds to additions to family size by increasing expenditure, but not in a manner that is consistent with recommended caloric requirements. Particularly disturbing in the low-income sample are the nearly equivalent implied caloric consumptions for most age/sex categories. The caloric intakes for the non-poor and RDA show equivalent rankings at the .01 level of significance for Spearman's ranked correlation test, the low-income sample is not equivalent by this test.

#### DISCUSSION

If we once again consider the four possible strategies proposed at the beginning of this paper, we can now state that low-income households do not respond to increases in family size by purchasing more of the same calories (option #2). At least, they do not do so to the same extent as the non-poor sample, and likely do not do so to an extent that allows this to be the only adaptive response. In contrast, in the face of increases in household size the non-poor sample is estimated to increase expenditure sufficiently to meet the increased caloric needs and purchase the same quality diet.

Do the poor buy the same foods, but in reduced quantities (option #1)? Examination of sample means shows that weekly per capita caloric consumption for non-poor households is 21,920 Kcals and for low-income households is 21,660 Kcals. While there are small differences in the age/sex composition in these samples, this is strong evidence that low-income households provide the same calories per family member as non-poor households. Thus it appears that strategy #1 is not followed.

The third potential strategy for food consumption in the face of household composition changes was suggested as maintaining expenditure, but purchasing cheaper broad categories of foods. Do families alter the shares to composite foods in response to household composition constraints? Previously (Tufts, Gerner, & Haas, 1987) we have estimated budget shares to eleven food groups as a function of total food expenditure, food prices, and household composition. Without an explicit household size variable that estimation does not separate household composition effects due to the size constraint from alterations in preferences based on age/sex categories. However, an increase in household size without a corresponding increase in food expenditure is equivalent to a decrease in expenditure at constant household size. Computations from our previous work for total expenditure elasticities indicate that a decrease in total food expenditure of 10% would lead to a diet with relatively greater proportions of dairy, starches, bread & cereal, and eggs, and with relatively less sweets and meat. The mean total

food price of this new diet composition falls from \$0.6655 to \$0.6648, or a decrease in price of .07 cents per 1,000 Kcals. If we then examine the effect of the price change, at a mean expenditure of \$36.80, the alteration in diet composition translates into a weekly family caloric increase of only 58 Kcals. We can conclude that changes in diet composition across broad food groups is not an important strategy in maintenance of food quantity in the face of increased constraints due to increased household size.

Unfortunately, at this time I can only present an argument based on negative evidence that part of the coping strategy of low-income households to increased household size must be to purchase lower quality (lower price) foods within the broad food categories. The argument is based on the logic that the three potential adaptations besides alteration in price chosen are not sufficient to maintain diet quantity. Low-income households do maintain caloric intakes, but do not increase food expenditure nor alter broad food consumption patterns sufficiently to account for maintained consumption. Thus households must also alter choice within food groups (changing to less costly items) as a mechanism to maintain consumption.

What this means intuitively is that poor households respond to increased constraints of increased household size by increasing expenditure and altering food choice. But the alteration in food is not changing from meat to beans, but by changing from hamburger to bologna. There are at least two important implications of this.

First, changes within food groups may have very different nutritional sequelae than changes across food groups. Particularly for a group such as meat, the change from high price to lower price is likely to result in greater fat consumption. In other groups, such as fruits or vegetables, the change within group may be more related to canned or frozen items in place of fresh produce; the nutritional impact of this type change is likely marginal. From a nutritional standpoint, we must first document the type of changes households make, and then relate these changes to nutritional outcomes.

A second important implication of this result is to food demand analysis. It is generally assumed that once food items are aggregated and an appropriate price computed, that this price remains invariant. Demand analysis is based on consumers choosing quantity based on price, income, and other variables. In fact, it would appear that at least low-income consumers select commodity, quantity, and price. The econometric implications of an endogenous price are beyond this paper.

At present the argument that quality (or price) is endogenous can only be made by default. I have computed a variable based on the relative price of food items within each food category that is one measure of quality. I hope to

estimate a series of equations similar to demand equations, only with food quality as the dependent variable. If such estimations prove fruitful, we would have a richer understanding of how consumers respond to changes in constraints, such as household composition, by altering both quantity demanded and the quality of that quantity.

#### APPENDIX

$$1. p_i = \sum_j (P_i \times p_{ij}/P_{ij}) \times (W_{ij}/\sum_j W_{ij})$$

where:

$p_i$  = household price faced

$P_i$  = national sample price

$p_{ij}$  = household price paid

$P_{ij}$  = national average price

$W_{ij}$  = national average weight

and  $i$  indexes across 11 foods and  $j$  indexes food items within a composite food group  $i$ , but only for items purchased by the household.

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