



## QUALITY OF LIFE AND SOCIAL PRODUCTION FUNCTIONS: A FRAMEWORK FOR UNDERSTANDING HEALTH EFFECTS

JOHAN ORMEL,<sup>1,3\*</sup> SIEGWART LINDENBERG,<sup>2</sup> NARDI STEVERINK<sup>1,2</sup> and  
MICHAEL VONKORFF<sup>4</sup>

<sup>1</sup>Department of Health Sciences and Northern Center for Health Research, University of Groningen, Groningen, the Netherlands, <sup>2</sup>Department of Sociology and Interuniversity Center for Social Science (ICS), University of Groningen, Groningen, the Netherlands, <sup>3</sup>Department of Psychiatry and School for Behavioral, Cognitive and Neurosciences, University of Groningen, Groningen, the Netherlands and <sup>4</sup>Center for Health Studies, Group Health Cooperative of Puget Sound, University of Washington, Seattle, WA, U.S.A.

**Abstract**—Quality of life (QoL) has emerged as a new outcome paradigm. It is now the endpoint in various taxonomies of patient outcomes, in which relationships are modeled amongst biological abnormalities, symptom status, functional status, disability, health perceptions and quality of life. Although current models and taxonomies point at important determinants of QoL, they do not provide a heuristic that guides the conceptualization of QoL and the systematic development of an explanatory theory of how ill health affects QoL. General mechanisms linking ill health, behavior, and QoL are lacking. In this paper we propose social production function (SPF) theory as providing such a heuristic, relating the effects of ill health, the activities that patients engage in to maintain QoL, and QoL itself. This theory basically asserts that people produce their own well-being by trying to optimize achievement of universal human goals via six instrumental goals within the environmental and functional limitations they are facing. Three important notions of SPF theory are: (1) the linkages between goals, needs, and well-being; (2) the distinction between universal needs and instrumental goals; and (3) substitution among instrumental goals, activities and endowments according to cost–benefit considerations, whereby costs refer to scarce resources such as functional capacity, time, effort and money. We will argue that SPF theory meaningfully relates the “biomedical model”—with its focus on pathological processes and biological, physiological and clinical outcomes—to the “quality of life” model, with its focus on functioning and well-being. We describe SPF theory and how SPF theory can be used to: (1) operationally define and measure QoL; (2) clarify persistent measurement problems; and (3) develop an explanatory framework of the effects of disease on QoL. In the discussion section, we address the limitations of the SPF approach of QoL and its relationship with personality. © 1997 Elsevier Science Ltd

**Key words**—quality of life, health, disease, functional status, medical care, symptoms, disability, well-being

### INTRODUCTION

In clinical practice, medical technology assessment, epidemiological research and in health care policy, quality of life (QoL) has emerged as an important outcome paradigm (Spilker, 1990; Birren *et al.*, 1991; Fallowfield, 1991; Pope and Tarlov, 1991; Aaronson, 1990; Miettinen, 1987; Wilson and Cleary, 1995; Croog *et al.*, 1986; Ware and Sherbourne, 1992; Patrick and Bergner, 1990; Torrance, 1987; Feinstein, 1987; Fries, 1991; Mayou, 1990). Quality of life is a welcome addition to the traditional patient outcomes at the levels of pathology, impairments, symptoms, functional limitations, and disability (Wilson and Cleary, 1995; Meeberg, 1993; WHO, 1980; Nagy, 1991; Ormel *et al.*, 1992). It is a term which was first used shortly

after the Second World War and has, since then, been defined in several different ways. Many articles addressing QoL do not define the concept (Meeberg, 1993). Most early uses of the term QoL refer to well-being, conceptualized as either the objective conditions of living of an individual, as the person's experience of life, or as both. Contributions from psychology (Diener, 1984; Brief *et al.*, 1993; Costa and McCrae, 1980; Veenhoven, 1994), economics (Torrance, 1987; Juster and Stafford, 1985) and sociology (Campbell *et al.*, 1976) have helped the paradigm of QoL to mature and the measurement of (health-related) QoL has improved (Spilker, 1990; Fallowfield, 1991; Pope and Tarlov, 1991; Aaronson, 1990; Patrick and Bergner, 1990; Torrance, 1987; DeHaes and Van Knippenberg, 1985; Aaronson and Beckman, 1987). There is, for instance, increasing recognition that the patient's perception of his performance and

\*Author for correspondence.

well-being is critical, and that the individual patient is the appropriate source of information on his or her QoFL (Birren *et al.*, 1991; Aaronson, 1990; Schipper *et al.*, 1990). To date, numerous measures of health-related QoFL have been developed, are increasingly used, and have been shown to be responsive to important clinical changes (Spilker, 1990; Birren *et al.*, 1991; Fallowfield, 1991; Pope and Tarlov, 1991; Aaronson, 1990; Miettinen, 1987; Wilson and Cleary, 1995; Croog *et al.*, 1986; Ware and Sherbourne, 1992; Patrick and Bergner, 1990; Torrance, 1987; Feinstein, 1987; Fries, 1991; DeHaes and Van Knippenberg, 1985; Aaronson and Beckman, 1987; Cleary *et al.*, 1991; Karnofsky and Burchenal, 1949; Holland, 1984; Stewart and Ware, 1992).

Recently Wilson and Cleary (1995) reviewed and integrated research on the interrelationships between levels of patient outcomes. Their review strongly suggests that there is not a direct, one-to-one relationship between severity of abnormalities, symptoms, functional limitations, disability, and loss of QoFL. Health perceptions, subjective measures of well-being and life satisfaction are not directly proportional to symptoms and functional limitations (Wilson and Cleary, 1995; Patrick *et al.*, 1988; Fowler, 1991; Linschoten, 1994; Parkerson *et al.*, 1993), which in turn are not directly proportional to physiological and anatomical abnormalities (Mechanic, 1978; Kellner, 1985; Barsky *et al.*, 1993, 1994; Peterson *et al.*, 1977; Wiesel *et al.*, 1984; Fields, 1984). The strength of the relationships is typically modest, in particularly in the mild-moderate range of severity of biological abnormality. The effects flowing from biological abnormalities, via symptoms and functional limitations, to QoFL are mediated and modified by psychological, social and cultural factors (Mechanic, 1972; Barsky *et al.*, 1992; Patrick *et al.*, 1988; Fowler, 1991; Linschoten, 1994; Parkerson *et al.*, 1993).

Quality of life is neither easily defined nor explained. Although most scholars stress that QoFL is ultimately subjective, many believe that objective indicators are at least equally important (Meeberg, 1993; Campbell *et al.*, 1976; McCall, 1975). There is ongoing debate on what domains of experience make up QoFL (Spilker, 1990; Fallowfield, 1991). Many argue that QoFL is multidimensional (Stewart and Ware, 1992; Ware *et al.*, 1981), others stress the one-dimensional nature, and still others argue that a multidimensional position does not preclude expression of QoFL by a single unitary value (Kaplan, 1988). Little is known about how non-medical factors modify and mediate the effects of impairments, symptoms, functional limitations and disability on QoFL. Several directions for the development of explanatory models have been proposed, some of which stress psychological processes, but others social and cultural factors. For instance,

Barofsky (1996) has suggested to focus on the cognitive processes in which people engage in when describing their QoFL as a way to examine the determinants of QoFL. Others (Guarnaccia, 1996) have pointed at the significance of cultural and social processes, in which norms, values and social comparison feature. Significant theory on the determinants of QoFL is also embodied in taxonomies of QoFL (Spilker and Revicki, 1996; Fries and Sing, 1996) and in theories on subjective well-being (Headey and Wearing, 1989; Costa and McCrae, 1980; Ormel and Schaufeli, 1991; Watson and Pennebaker, 1989). Although these models and taxonomies point at important putative determinants of QoFL, they do not provide a heuristic that guides the conceptualization of QoFL and the systematic development of an explanatory theory of how ill health affects QoFL. A general mechanism describing how ill health influences QoFL is lacking.

In this paper we propose social production function theory (SPF) as providing such a heuristic, relating the effects of ill health, the activities that patients engage in to maintain QoFL, and QoFL itself. We will argue that SPF theory meaningfully relates the "biomedical model"—with its focus on pathological processes and biological, physiological and clinical outcomes—to the "quality of life" model, with its focus on functioning and well-being (Wilson and Cleary, 1995; Johnson and Wolinsky, 1993). Social production function theory also clearly recognizes ill health is only one of the determinants of QoFL, albeit a critically important one, next to non-health factors in the psychological, social, economic and cultural domains of life.

We first describe SPF theory and its origins in economic, social and psychological theory. Quality of life in SPF theory is seen as psychological (or emotional) well-being which exists to the extent that universal needs are met: physical well-being and social well-being. These needs are met through engaging in activities that satisfy instrumental goals which are intrinsically rewarding. Physical well-being results from activities that produce stimulation, internal comfort and external comfort. Social well-being results from activities that produce affection, status and behavioral confirmation. SPF theory is then used to (1) operationally define and measure QoFL; (2) clarify persistent measurement problems; and (3) develop an explanatory framework of the effects of disease on QoFL. In the discussion section, we address the limitations of the SPF approach and its relationship with personality.

#### SOCIAL PRODUCTION FUNCTION THEORY

Social production function theory, as applied by Lindenberg in social relations (Lindenberg, 1986, 1991; Lindenberg and Frey, 1993), assumes that people produce their own well-being by trying to optimize achievement of universal needs within the

constraints they are facing. In accordance with economic and psychological theory, humans are seen as active agents who choose cost-effective ways to produce well-being whereby considerations of cost-benefit are limited by available information (Juster and Stafford, 1985; Becker, 1976; Liu, 1976; Headey, 1993). Cost does refer to all sorts of scarce resources that one can give up, such as money, time, and effort, including the time and effort required to develop new skills.

Three important notions of SPF theory are: (1) the linkage of the realization of needs with well-being; (2) the distinction between universal needs and instrumental goals which can be achieved through a variety of instrumental activities and endowments; and (3) substitution among these instrumental goals, activities and endowments according to cost-benefit considerations. (Endowments are statuses that contribute to achieving goals without any activity. For instance, being married can produce behavioral confirmation without any activity.) The linkage of well-being with the achievement of universal needs has its origins in psychological need theory (Murray, 1938; Maslow, 1970) and its modern version of subjective well-being theory (Brief *et al.*, 1993; Bradburn, 1969; Omodei and Wearing, 1990; Ormel and Wohlfarth, 1991; Ormel and Schaufeli, 1991). The distinction between universal needs and instrumental goals is derived from the new household economics (Stigler and Becker, 1977) and the notion of substitution of goals and activities from micro-economic price theory. Below we discuss these basic notions of SPF theory.

#### *Universal needs and instrumental goals*

The theory of SPF builds upon household production theory that rests on the assumption of two kinds of preferences (Stigler and Becker, 1977): universal preferences (needs) that are shared by all human beings, and individual preferences for the means (goals, activities, endowments) that lead to satisfying the universal needs. A social production function describes the functional relationships between satisfaction of universal needs on the one hand and satisfying instrumental goals on the other hand, and between satisfying instrumental goals and the activities and endowments employed to satisfy instrumental goals.

It is assumed that universal needs can be described in terms of a single utility function invariant across individuals, but that there are individual differences in how people go about achieving well-being. That is, there are different production functions for different kinds of people. The household production approach, as well as other economic approaches, however, do not specify the universal preferences.

The universal goals identified by SPF theory, physical well-being and social well-being determine

the level of psychological, or emotional, well-being. The instrumental goals relevant for physical well-being are internal comfort, external comfort and stimulation (or activation). Internal comfort refers to somatic comfort in terms of absence of thirst, hunger, pain, fatigue, and other somatic discomforts. External comfort refers to a living environment that is safe and pleasant. Activation refers to activities that produce arousal including mental and sensory stimulation and physical effort. Human beings seem to prefer a certain level of activation, although prolonged levels of high stimulation or physical effort become unpleasant and are thus a cost rather than a benefit. In other words, seen across the full range, physical well-being and activation are functionally related in the form of an inverted U (Hebb, 1958; Scitovsky, 1976; Wippler, 1987). Internal comfort, external comfort and activation (within the pleasant range), each are related to physical well-being in a monotonically increasing production function but we predict a non-linear increase in physical well-being with increasing stimulation and comfort. The more stimulation and comfort one has, the less valuable an additional unit of stimulation or comfort (i.e. decreasing marginal value). Figure 1 gives an overview of this heuristic.

The second universal need, social well-being, has been identified repeatedly by sociologists and psychologists as the most important universal need, although often under different labels. Adam Smith observed that "nature, when she formed man for society, endowed him with an original desire to please, and an original aversion to offend his brethren. She taught him to feel pleasure in their favorable, and pain in their unfavorable regard" (Smith, 1976). Smith (1976) and Marshall (1920) reiterated the importance of social well-being, as did Parsons and Shils (1961). "The struggle to preserve or enhance feelings of self-worth or prestige marks all men who live above a bare subsistence level" state Krech *et al.* (1962). For social well-being, SPF theory specifies three first-order instrumental goals: status, behavioral confirmation, and affection. Status refers to a relative ranking (mainly based on control over scarce resources). Behavioral confirmation is the confirmation of behaviors by others, in particular the feeling of having done "the right thing" in the eyes of relevant others even though direct reinforcement of the behavior may not occur. Affection includes love, friendship and emotional support, and is provided in caring relationships (intimate, family and friendship relations). All three instrumental goals are assumed to have decreasing marginal value for the production of social well-being. Thus, the more affection one has, the less valuable an additional unit.

Top level	Utility or Psychological well-being					
Universal needs	Physical well-being			Social well-being		
Instrumental goals	Activation/ stimulation <i>(optimal level of arousal)</i>	External comfort <i>(pleasant environment)</i>	Internal comfort <i>(absence of physiological needs)</i>	Status <i>(control over scarce resources)</i>	Behavioral confirmation <i>(what you get from "doing the right thing")</i>	Affection <i>(what you get from others who care about you)</i>
Examples of instrumental activities and endowments	Physical and mental activities producing arousal	Appliance, housing, security social welfare	Absence of pain, fatigue, thirst, and hunger; vitality	Consumption pattern excellence in sports/work occupation descent	Compliance with external and internal norms, group membership	Intimate interaction, providing emotional support Married
Example of resources	Physical & mental effort	Money	Food, health care	Education social class unique skills	Social skills, competence	Spouse, empathy, attractiveness

Fig. 1. The instrumental goals.

*Needs, goals, activities and endowments, and resources*

An important characteristic of the theory of SPF is that needs, instrumental goals, activities and endowments, and resources are hierarchically structured, with universal needs at the top and instrumental goals, activities and endowments, and resources at lower levels, linked by production functions which specify the relationships between needs, goals, activities/endowments, and resources for a particular individual or category of individuals. Figure 2 gives an overview of this hierarchy.

Resources (including such things as skills, time, technologies, savings, etc.) are employed in carrying

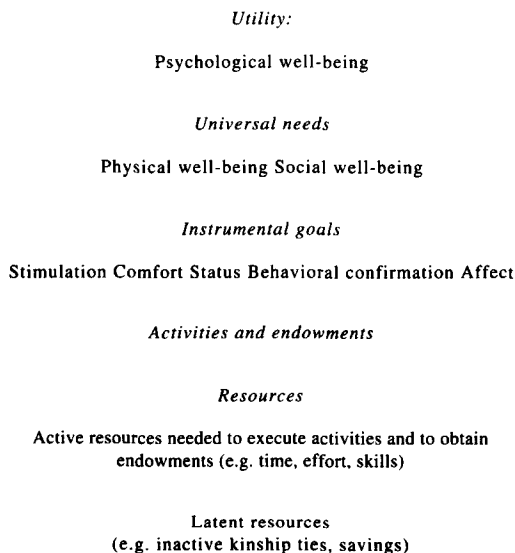


Fig. 2. Needs, instrumental goals, activities and endowments, resources.

out instrumental activities and in obtaining endowments that satisfy instrumental goals. Resources are needed for executing activities and obtaining endowments. Two kind of resources can be distinguished: active and latent resources. Active resources are those currently used by an individual; latent resources are those that can be activated without much cost. Latent resources are analogous to credit or savings. For example, when a partner dies, part of the lost production capacity for affection can be regained by reopening kinship ties that have been dormant for some time.

Many resources are multi-functional, i.e. can be used to achieve multiple goals. We note that some resources facilitate activities as well as represent endowments, in that they achieve goals without executing any activity. For example, money confers high status directly, but it also serves to give access to activities. Similarly, physical fitness is needed for a variety of activities but it also confers comfort directly.

Social production functions describe the relationships and basically specify for a particular individual how well-being is produced. In order to visualize these relations, it is useful to look at a brief example. Utility (*U*), or psychological well-being, is achieved via physical well-being (*PW*) and social well-being (*SW*); thus, the utility function is  $U = f(PW, SW)$ . Social well-being is produced by three means: status (*S*), behavioral confirmation (*BC*) and affection (*A*). Thus, the production function for social well-being is  $SW = f(S, BC, A)$ . Each of these factors can, in turn, be instrumental goals, being produced by other factors. Thus, behavioral confirmation is often produced by membership in groups (*I*) and by conformity to norms (*C*). The production function is thus  $BC = f(I, C)$ .

Conformity to norms, in turn, is produced by a variety of activities (and by abstaining from activities), like dressing appropriately, keeping the house clean, not complaining too much etc., depending on the normative expectations in the social environment of the individual. The lower we go in the hierarchy, the more context-specific the production function will become.

#### *Substitution*

Instrumental goals are viewed in SPF theory as substitutable depending on their relative cost. For example, if opportunities and resources for achievement of status are decreasing, a person is likely to increase the production of affection and behavioral confirmation if that production is relatively easier ("cheaper") than the production of status. In terms of expressed preferences, this would show up as an increased interest in doing things right and in personal relationships. Similarly, if a person becomes disabled and can no longer perform the activities which yielded stimulation, he/she may increase alternative activities like reading, watching television, and telephoning. Obviously, the kinds of alternatives open to people depend heavily on their resources, such as money (say, for adapting the home), education (say, for the ability to process complex information), and size of the social network (say, for social contacts). Given the likely shape of the production functions and given the typical changes in old age, we can expect in our society quite generally two instrumental goals to become relatively more important as age progresses: comfort and affection (Steverink, 1995).

If a person lacks the necessary resource for the realization of a higher level goal, then the production of this resource can become an instrumental goal in itself. For example, somebody may direct his activities toward making money in order to be able to adapt the home. As the realization of the goal is distal in time, such an activity can also be seen as investment activity. Multi-functional activities, especially those that combine production and investment and those that serve multiple instrumental goals, are clearly the most efficient kinds of activity. For example, close social interaction may produce affection, behavioral confirmation and stimulation and be an investment for the accessibility for social contact in the future. If social interaction was arranged by the partner and the partner should die, then the necessary social skills may be lacking for this efficient kind of activity. An elderly person may then gain most from learning social skills, in order to maintain social interaction.

In sum, people may lose important instruments for the production of physical and social well-being, but this does not necessarily lead to a long-term decrease in psychological well-being because people will shift activities toward close alternatives. From the viewpoint of an observer, this will seem like a

change of preference. Some losses are so severe that they surpass the ability to substitute, in which case the individual will be pushed to a lower level of well-being.

However, substitution at the level of instrumental goals is not unlimited. According to SPF theory, the universal goals of physical and social well-being can each be operationalized in terms of a multiplicative function of three instrumental goals (a so-called Cobb-Douglas production function of the form  $A = X^a \cdot Y^b \cdot Z^c$ ; with  $\Sigma a, b, c = 1$ ). This means to say that substitutability is limited. For example, the individual needs some level of activation for physical well-being and no realistic level of internal and external comfort can compensate that.

### APPLICATIONS

How can SPF theory assist in operationally defining and measuring QoL? And how can it be used to examine why and how consequences of disease influence QoL? What possible applications are there? We will discuss how SPF theory could be used to: (1) operationally define and measure QoL; (2) clarify persistent measurement problems; (3) obtain a better understanding of what a popular health-related QoL instrument measures in terms of SPF theory; and (4) develop an explanatory framework of the effects of disease on QoL.

#### *Operational definitions and measurement*

Social production function theory provides a basis for a systematic approach to operational definitions and theory-driven measurement of QoL. Current measures of QoL are heterogeneous and without a unifying theoretical perspective. QoL measures range from unitary indices to those tapping multiple dimensions of well-being, and from one level of patient outcomes to multiple levels of functioning. SPF theory differentiates: (1) unifying higher-order outcomes (psychological well-being, physical well-being and social well-being); (2) six instrumental goals; (3) activities and endowments; and (4) active and latent resources. How could these variables making up an SPF be measured? Before we outline a theory-driven measurement strategy, it should be noted that in the context of this paper we can only sketch the direction operationalizations would take. How this direction would be different from standard approaches, will be addressed in a later section.

The heart of the social production hierarchy consists of the six instrumental goals for physical well-being (internal and external comfort, activation) and social well-being (status, behavioral confirmation, affection). These six instrumental goals are conceptually clear-cut and apply to all cultures, although what activities and endowments produce, say, status will vary across cultures. Therefore, they seem most appropriate for the measurement of

QoFL. They are specific relative to the universal needs but still sufficiently general to allow comprehensive application and to guide measurement of less general, lower level activities, endowments, and resources. Therefore, they also offer a "natural" validation criterion for measures of QoFL that tap lower or higher levels in the hierarchy.

First of all, the measurement of the six instrumental goals themselves. Here both indirect and more direct measures can be used. For example, affection may be measured directly by measures of perceived emotional support and loneliness. Or it may be measured more indirectly by items taking stock of affection-providing activities of others toward the person or by more crude items taking stock of relevant endowments such as being married and having children. Status may be measured as the self-placement of the person in the social stratification, or by taking, say, the intersubjective occupational prestige ranking. The other four first-order instrumental goals may similarly be measured by direct, subjective, or more indirect, intersubjective approaches. These approaches have substantial face validity. Because of the high theoretical embeddedness and clear meaning of the instrumental goals, psychometrically adequate measures of these goals may help to validate measures of lower levels (activities, endowments, resources) as well as of the higher levels (physical and social well-being, psychological well-being).

Let us first turn to the lower levels: activities, endowments and resources. *Activities* may be measured directly by means of time budgets. This method can be used to identify the time spent on major activities such as sleep, personal care, work, housekeeping, shopping and cooking, child care, having meals, sex, visiting and having visitors, TV watching, sports and other leisure activities, etc. For each activity, benefits and costs could be estimated by well-briefed raters under the heuristic guidance of the instrumental goals. For example, benefits refer to the extent to which an activity contributes to the production of one or more of the six instrumental goals, and costs refer to amounts of scarce resources, such as time, effort and money, used to execute the activities. It is especially important to assess the multi-functionality of activities because that is an important ingredient in the efficiency of production functions. For example, dining out achieves internal comfort but it may also produce activation and affection. Mountaineering is a reliable source of activation, but may also yield status if one is a good climber and known as such. An important category of activities are so-called (instrumental) activities of daily living [(I)ADL]. They include bathing, eating, dressing, getting in and out of a chair/bed, waling short distances, cooking, cleaning, ironing, shopping, riding a bike/car, making a phone call, gardening. Individuals unable to perform ADL and IADL are clearly

experiencing reduced QoFL. Their significance resides in the fact that they represent basic production capacity for both kinds of comfort, and some of them also for stimulation and various forms of social well-being. The measurement of endowments is probably straightforward as soon as they have been identified. Endowments are statuses and resources as a result of prior activity that enhance the achievement of the instrumental goals. For example, the very fact of being married can produce behavioral confirmation and status without any current activity. It is clear that the further elaboration of measurements of activities, endowments and resources can and must be guided by psychometrically satisfactory measurements of the six instrumental goals.

Let us now turn to the higher levels: utility (or psychological well-being), physical and social well-being. They too can be measured directly by means of overall subjective impression of well-being [such as embodied in Cantril's ladder; the Delighted-Terrible Scale (Andrews and Withey, 1976); and the Fordyce global measure of happiness (Fordyce, 1988)]. Perhaps utility measures like the Time Trade Off method (Torrance, 1987; Hays *et al.*, 1993), yielding the willingness to trade off length of life in return for health, could be used as indicators of psychological well-being.

#### *Clarifying persistent measurement issues*

One area of continuing debate is whether QoFL is ultimately a one- or a multidimensional concept. Most scholars seem to agree that QoFL is a multidimensional phenomenon, in the sense that many domains of experience are involved and make up the QoFL of a particular individual. They argue that due to the weak correlations among dimensions an aggregate measure is meaningless as it involves adding apples to oranges (Stewart and Ware, 1992; Ware *et al.*, 1981). Yet many argue that the multidimensional origin of QoFL does not preclude expression by a single unitary value. They argue that an overall assessment of life satisfaction or need fulfillment is possible, meaningful, and captures the essence of the concept of QoFL (Torrance, 1987; Bush, 1984). It is the overall evaluation of the basket of fruit that is important (Hays *et al.*, 1993). Supported by considerable success with utility and global rating assessments, proponents of the decision theory approach maintain that the ultimate concern is with the overall desirability of the aggregate (Kaplan, 1987). From the perspective of SPF theory, in particular the hierarchy, the discord can be clarified. The unitarians in fact focus on utility (i.e. psychological well-being) as a unidimensional expression of QoFL, whereas the advocates of the multidimensional operationalization focus on lower levels in the hierarchy of goals, for instance, the instrumental goals. Thus, the two positions stress different levels in the hierarchy. The value of SPF

theory is that it relates the two positions, in the sense that the lower level dimensions are means for producing the higher levels. SPF theory also suggests that the level at which QoFL should be defined and measured is best selected on the basis of the specific research question at hand. For example, for assessing relative QoFL in a population, a high level approach (utility, universal needs) seem the best choice. For locating possible problem areas in production of QoFL, the instrumental goals may be most appropriate. For intervention purposes and especially for the assessment of health effects on QoFL, measurements of lower regions of the hierarchy (activities, endowments, resources) would be most useful.

Operational definitions of QoFL in its multidimensional form as the achievement of the six instrumental goals provides an inroad to the solution of the problem of what domains of experience should go into a multidimensional approach. The problem of domain selection has elicited considerable debate not only in terms of which domains should be selected but also in terms of the indicators at a lower level of each domain (Surtees, 1989). Frequently proposed domains are: physical function, psychological state, work performance, social interaction, and somatic sensation (Spilker, 1990; Birren *et al.*, 1991; Fallowfield, 1991; Schipper *et al.*, 1990). Though terminology still differs, most proposed domains are to a large extent consistent with this classification. The problem here is that two organizing principles are confused: (1) the level at which patient outcomes, or health status, can be described (biological abnormalities, symptoms, functional limitations, disability, and QoFL); and (2) the dimensions, or domains, that can be distinguished within each level of patient outcomes. For the level of QoFL, SPF theory proposes the hierarchy, in particular the six instrumental goals.

Another area of continuing debate is subjective versus objective approaches. Many consider QoFL in terms of objective indicators of living conditions, or behavioral capacities, or abilities to perform important roles (Meeberg, 1993). Others focus on subjective need satisfaction, be it in terms of life as a whole or in terms of specific needs in the major physical, environmental, psychological, social, and economic realms of life. A problem fueling the objective-subjective controversy is that objective and subjective judgments regarding QoFL will not necessarily be in close agreement (Campbell *et al.*, 1976). Even the interrater reliability of "objective" QoFL ratings by clinical personnel is moderate at best (Aaronson, 1990). Recent accounts of the current status of the concept tend to emphasize the subjective and individualized nature of QoFL (Spilker, 1990; Birren *et al.*, 1991; Fallowfield, 1991; Pope and Tarlov, 1991; Aaronson, 1990).

Social production function theory provides some help in the debate regarding objective-subjective

controversy. Universal needs, instrumental goals, activities, endowments, and resources can be measured subjectively, by asking a person's opinion, as well as objectively, for instance, by using raters. Some elements of SPF theory, however, lend themselves more for subjective measurement approaches than others. The subjective approach is more suited to establish the level of satisfaction of needs and the achievement of instrumental goals, whereas objective approaches are more feasible for the measurement of activities, endowments and resources. In addition, SPF theory suggests to be cautious with the interpretation of changes in personal preferences as changes in standards. For example, if a person maintains that he or she does not find status important then that should be taken to mean that for that person status is at present not a viable means for increasing social well-being and that behavioral confirmation and/or affection are being used for this purpose instead. If the situation changes and status can be produced more easily (say, because the environment begins to put a high value on particular skills that the person involved possesses) then that person will change his or her judgment concerning the importance of status (meaning here: social recognition for having valued skills most other people don't have). There is thus nothing "subjective" in saying that status is unimportant for you.

#### *An SPF theory perspective of the MOS SF-36*

An important instrument of subjective, i.e. self-reported, health-related QoFL is the RAND 36-item Health Survey (RAND, 1986) which is identical to the MOS SF-36 described in Ware and Sherbourne (1992). The 10 items on physical functioning refer to the patient outcome level of functional status. Bodily pain (two items) and energy/fatigue (four items) refer to the level of symptoms, whereas role limitations (seven items) and social functioning (two items), tap the disability level the taxonomy of patient outcomes. Emotional well-being (five items) and general health perceptions (five items), in turn, tap aspects at the level of psychological well-being.

In terms of SPF theory, the physical functioning items measure health-related constraints. The significance of these health-related constraints for QoFL depends on what activities the patient used to produce well-being, and the impact of these constraints on opportunities for substitution. As argued in the following paragraph, different activity patterns, i.e. production functions, cause the very same constraint to have different impacts on QoFL. The very same holds true for the role functioning items in the RAND-36. The significance of health-related limitations in role performance for QoFL depends on what roles the patient used to produce well-being. Although the most important roles are covered in the RAND-36 (work and social role), other roles such as the parental role, the family role, the

citizen role are not evaluated (Wiersma *et al.*, 1988). The energy and pain items of the RAND-36 refer in terms of SPF theory to physical well-being, in particular internal comfort. In addition, these symptoms will also have an indirect effect on QoL via their inhibiting impact on activities and roles. Finally, the items on emotional well-being measure aspects of psychological well-being, and therefore are the only direct measure of utility in the RAND-36.

The selection of activities and roles in the RAND-36 is practical but not theory-driven and not based on knowledge about the productivity of activities. It also does not assess the meaning of symptoms and functional limitations for an individual's social production functions. Perhaps most seriously, the RAND-36 covers only some of the six first-order instrumental goals. Activation, external comfort, status, affection and behavioral confirmation are hardly addressed. Thus although the RAND-36 is a convenient instrument for some levels of patient outcomes, it is rather atheoretical and heterogeneous, and gives an incomplete account of QoL as defined by SPF theory.

#### *A framework for understanding health effects*

The explanatory framework is presented in Fig. 3. The model provides a heuristic for understanding how consequences of disease affect QoL. Symptoms and functional limitations place constraints on an individual's activities, endowments and resources, thereby increasing their costs, and thus reducing the behavioral means for achieving the instrumental goals, with subsequent negative effects on QoL. According to the framework, two mechanisms control the effects of symptoms and functional limitations on QoL: (1) the short-term effects are largely determined by the extent to which

highly cost-effective production opportunities are constrained by the symptoms and functional limitations (i.e. activities and endowments that yield much physical and/or social well-being relative to their cost); and (2) the long-term effects depend largely on the extent to which opportunities for substitution are curtailed. This in turn depends on the extent to which symptoms and functional limitations (a) reduce the range of substitutable activities (by reduction of resources needed for the building up of new capacity); and (b) impair the ability to select cost-effective multi-functional activities from the behavioral repertoire. The ability to substitute depends on the number of alternative trajectories through which a person can achieve well-being. The more options for, or routes towards well-being, people have at their disposal, the less vulnerable they are to loss of activities that produce well-being (Steuerink *et al.*, 1994). The variety in behavioral repertoire is undoubtedly built up over the life course.

Social production function theory distinguishes between production and investment activities. Activities may immediately satisfy an instrumental goal (production), they may increase the potential for future production (investment), or both. Multi-functional activities, especially those that combine production and investment and those that satisfy multiple instrumental goals, are the most effective means of production and therefore SPF theory stresses the need to examine the effects of physical and mental limitations on these kinds of activities.

Through substitution, individuals may be able to sustain an adequate quality of life despite seemingly major reductions in functional capacities. For example, older persons whose physical capacities have become limited by chronic disease may experience reductions in internal comfort, physical acti-

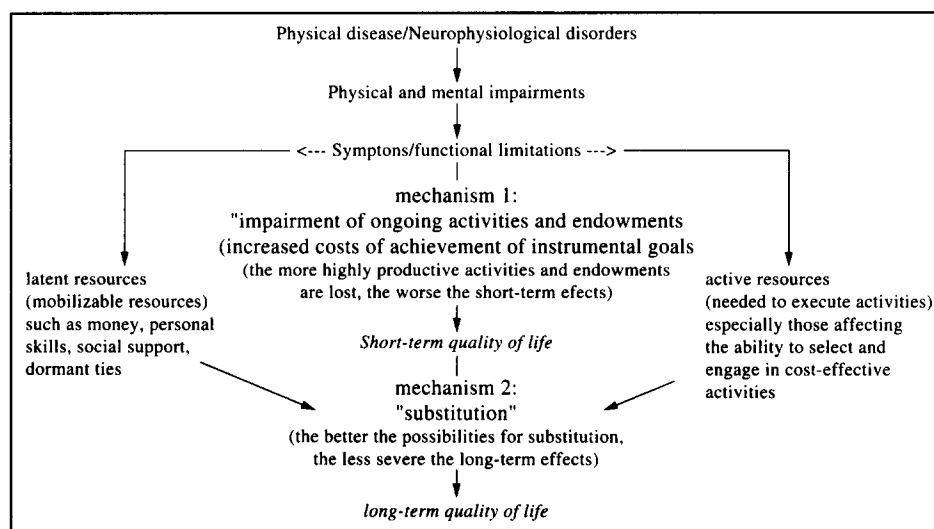


Fig. 3. A framework for understanding health effects.

vation and behavioral confirmation as they become more symptomatic and less active. However, they may sustain well-being by substituting intimate relationships and intellectual pursuits for internal comfort and physical activation. SPF theory guides the search for specific substitutes for the chronically ill. This implies going beyond the standard ADL and IADL batteries to identify activity patterns associated with sustaining QoFL among persons with particular chronic diseases or impairments. SPF theory supports the position of those who stress the significance of enhanced control for searching and finding substitutes by people themselves (Bandura, 1977; Brandstädter and Baltes-Götz, 1990). Some also found that control-enhancing interventions were psychologically and physically beneficial (Clark *et al.*, 1991; Rodin *et al.*, 1991). Nursing home patients encouraged to exercise greater personal control reported feeling happier, were more active socially and were more alert. Because the ability to select cost-effective activities is essential to the identification and utilization of efficient opportunities for achieving instrumental goals, interventions which enhance autonomy could be expected to have a beneficial effect on activity levels and well-being. In particular, resources could be screened for the degree to which they offer variety in the behavioral repertoire.

Social production function theory provides a basis for understanding why neurophysiologic impairments associated with conditions such as depression, chronic pain, neurological diseases, schizophrenia and advanced cognitive decline often produce substantial disability and loss of QoFL in the absence of physical impairment (Ormel *et al.*, 1994). These neurophysiologic impairments are associated with dysfunction in higher-order processes including energy, self-regulation of affect, self-confidence, concentration, memory, reasoning, and long-term planning. Such higher-order dysfunctions may have profound effects on social production. Chronic depression, for example, is associated with significant and enduring disability (Ormel *et al.*, 1993, 1994; Wells *et al.*, 1989; VonKorff *et al.*, 1992; ). The intervening mechanism may be that loss of cognitive and emotional capacities impairs the adaptive capacities of the person, both the capacity to engage in activities that produce QoFL and the ability to identify and choose activities that are effective in achieving instrumental goals and well-being (Holroyd and Creer, 1986; Lorig, 1993).

#### DISCUSSION AND CONCLUSION

The study of QoFL from an SPF perspective has limitations as well as prospects. To date, it is unclear how SPF theory should incorporate or deal with personality and cognitive processes such as those involved in self-reports, social comparison, and standard shift. On the other hand application

of SPF theory to QoFL has potential benefits, for instance for disability policy and interventions to sustain QoFL among the chronically ill.

#### Limitations

A difficult problem for an SPF perspective on QoFL is standard shift. Standard shift occurs when the standard used by people to rate their QoFL changes over time. In the instance of a changing standard, repeated readings of QoFL have different meanings. This phenomenon of intra-individual standard shift has been called upon to explain the lack of change in well-being amongst cancer patients (DeHaes, 1988), lottery winners (Brickman *et al.*, 1978) and liver transplantation patients (Heyink, 1993). Standard shift is typically understood as a powerful adaptive mechanism to maintain a "normal" level of subjective well-being and is the central mechanism in the adaptation level model of well-being (DeHaes, 1988; Brickman *et al.*, 1978). This model asserts that life events prompt only very transient changes in well-being because a person rapidly adapts to the new situation by raising or lowering comparative standards in the direction of the new situation, or adapts by other means. This process minimizes discrepancy between achieved and desired QoFL. However, it can not be excluded yet that the robustness of well-being in the face of major life events does not result from standard shift. Two other processes may be involved that do not call upon the cognitive mechanism of standard shift. First, the changes in activities, endowments and resources that the event brought about may well change the level to which one or more instrumental goals are realized. But, due to the non-linear relationship between instrumental goals and universal needs (decreasing marginal utility), this may only minimally impact the satisfaction of universal needs, and thus psychological well-being. Second, in the case of negative events, the impact may quickly erode as substitution neutralize lost activities and endowments. Thus, in contrast to adaptation level theory, which posits highly reactive changes in personal standards, SPF theory allows for steadiness of those standards in the short run and gradual change in the long run.

Personality, in particular neuroticism or negative affectivity, is associated with psychological well-being. Various models have been proposed to account for this relationship. Headey and Wearing (1989) distinguish four types: the personality model; the adaptation level model; the life event model; and the dynamic equilibrium model. The personality model assumes that well-being depends mostly on personality, especially the traits of neuroticism and extraversion (Costa and McCrae, 1980). The adaptation level model (already discussed above) introduces standard shift as the mechanism to minimize discrepancies between achieved and desired life

situation. Personality is involved in this as it can explain why some people persistently experience large discrepancies (unsatisfied) and other small or no discrepancies (satisfied). The life event model proposes that life changes are exogenous shocks that have significant but decaying effects on well-being (Lawton, 1983; Surtees, 1989). In the life event model, well-being at a particular point in time is a function of the total exposure to positive and negative life events in the past whereby the effects of distal events will usually have faded away. As the empirical evidence strongly suggests a mixed model involving both personality and life events, Headey and Wearing (1989) proposed the dynamic equilibrium model. The essential feature is that each person has a normal, or equilibrium, pattern of life events and normal level of well-being; both are predictable on the basis of stable personality characteristics. Deviations from the pattern of life events alter well-being, but the change is usually temporary because personality traits act to equilibrate the situation and draw people back to their normal level of life events and well-being. Studies since Headey and Wearing's discussion have provided support (Duncan-Jones *et al.*, 1990; Ormel and Schaufeli, 1991). For instance, Ormel and Schaufeli (1991) found that 60% of explained variance in distress is due to stable person characteristics, and 40% to life situation changes. (The 60% contains effects of personality mediated by controllable life changes; these could not be separated in the data.)

Social production function theory might encompass the role of personality in QoFL, and it might also be able to deal with the findings supporting the dynamic equilibrium model. Social production function theory readily handles results about small long-term impacts of life events on well-being for most people. In the instance of undesirable events, the cost-effectiveness of all or most current activities is often not significantly changed by the events, important resources may not be altered, and effective and rapid substitution can occur if they are. Social production function theory views humans as actively shaping and reshaping their activities to attain goals, using all manner of personality and environmental resources at hand. If personality is conceptualized as reflecting a person's resources and constraints, the central assumption of the dynamic equilibrium model that personality controls the long-term level of exposure to life events, is not necessarily in contrast with SPF theory. In SPF theory resources determine what activities and endowments are cost-effective for a particular individual or group of people.

With regard to the strong association of neuroticism with well-being, neuroticism might be interpreted from an SPF theory perspective in terms of two powerful resources: a reduced ability to choose cost-effective activities and endowments and lack of

social skills. Both hypotheses could account for the observed relationship between neuroticism and adversity in a number of studies (Ormel and Wohlfarth, 1991; Watson and Pennebaker, 1989). But other interpretations, more difficult to handle for SPF theory, are feasible too. For instance, neuroticism might reflect biological characteristics that influence cognitive standards involved in the subjective assessment of well-being. Another option, equally difficult to handle for SPF theory, is that neuroticism directly bears upon neurophysiological processes involved in the experience of well-being.

Social production function theory-driven measurement of QoFL, in the form of self-report measures of universal needs and instrumental goals, will have to take into account cognitive processes. As Barofsky (1996) has shown self-reports on QoFL are complex behaviors that involve the respondent's interpretation of the question, retrieval from memory, and even their editing of their answers in the light of social desirability and privacy needs. Considerable work on the cognitive foundation of response processes has been done in the past centuries (Barofsky, 1996; Diener, 1994). This knowledge will have to be considered when attempting to develop QoFL measures from an SPF theory perspective.

#### *Potential implications*

The SPF framework of QoFL has potential implications for disability policy and interventions to sustain QoFL among the chronically ill (Pope and Tarlov, 1991; Bandura, 1977; Lorig, 1993). Social production function theory suggests two natural strategies for improving health-related QoFL among persons experiencing chronic illness: identification and removal of factors that limit substitution (resource enhancement); and providing information or enriching the behavioral repertoire to facilitate achieving instrumental goals. The rationale for stressing substitution is that when, as a result of functional limitations, activities cannot be performed, substitution may permit maintenance of well-being by providing a different approach to satisfying the same goal, or by substituting one resource for another. As described earlier, successful substitution depends on the richness of the behavioral repertoire and the ability to select cost-effective activities from the repertoire. Given the changes set in motion by the development of illness, adaptation may be largely determined by the existence of alternative means for achieving well-being. The more alternative means, the more possibilities for substitution and the better the adaptation in the face of functional limitations. The fewer substitution possibilities exist, the more precarious the production of well-being is likely to become. In general, individuals have a wide range of possibilities in what instrumental goals they wish to pursue and

for ways of achieving any instrumental goal except status, but symptoms and limitations can be so pervasive, resources so limited or constraints so insurmountable that severe loss of QoFL occurs. The variety in behavioral repertoire is undoubtedly built up over the life course. However, information on ways of adapting to an impairment or on the availability of adaptive aids may also enhance the behavioral repertoire.

A critical resource for achievement of instrumental goals is the ability to select cost-effective multi-functional activities from the behavioral repertoire. Multi-functional activities are those that simultaneously satisfy multiple preferences. Social production function theory would predict that an activity that simultaneously achieved activation, behavioral confirmation and affection will have a more potent effect on well-being than an activity that satisfied only a single preference. We suspect that multi-functional activities are more likely to be sustained as well. For example, an exercise program in which an individual goes walking with a group of friends in a pleasant setting may have a greater impact on QoFL than an individual exercise program that does not satisfy behavioral confirmation and affection.

### Conclusions

According to SPF theory, QoFL is ultimately defined by utility (or psychological well-being) which itself depends on the extent to which the universal needs of physical and social well-being are satisfied. Physical well-being is produced by producing activation and internal and external comfort; social well-being by status, affection and behavioral confirmation. Individuals achieve these instrumental goals through activities and endowments. Actions to produce QoFL are constrained by environmental opportunities, lack of information, and by functional limitations. Individuals choose among available opportunities to produce well-being according to the subjective estimate of the relative cost of those opportunities. The theory describes relationships (1) between physical and social well-being and the achievement of instrumental goals; (2) between achievement of instrumental goals and the activities and endowments; and (3) between activities and endowments and the resources needed to carry out activities and obtain endowments. Symptoms and functional limitation are modeled as constraints (lack of resources) that hamper activities and endowments, and through this the achievement of instrumental goals. An SPF perspective on QoFL with its emphasis on substitution may help to frame the consequences of ill health in a theoretically fruitful model that may have important research and policy implications. It suggests what directions the measurement of various parts of the production of QoFL might take and how traditional controver-

sies surrounding the measurement and explanation of QoFL might be resolved.

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