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EVIDENCE, POLICY AND PRACTICE IN ENVIRONMENTAL HEALTH: AN INTERNATIONAL CASE STUDY OF SUN SAFETY

By

THERESA DAWN GARVIN, B.A., M.U.A

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AUTHOR: Theresa D. Garvin B.A. (Simon Fraser University)
M.U.A. (Virginia Polytechnic Institute & State University)

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ABSTRACT

The past decade has seen increasing interest in the uncertain and complex problems related to environmental health and global environmental change issues. While this has brought together scientists, policymakers and the public to work towards solutions, relations between the groups are strained due to the differences in how each group recognizes, validates and places limits on evidence and knowledge. This thesis presents a detailed case study of how internationally-accepted information is interpreted, adapted and adopted into specific programs in a single environmental health case study: Sun Safety programs in Australia, Canada and England.

Within the broad case study, the project uses a mixed method approach in a series of nested investigations. The first investigation uses critical theory to examine the theoretical relations between scientists, policymakers and the public. It concludes that each group engages in a different form of rationality (scientific, political, and social respectively) that is different yet equally valid. The second investigation uses expert interviews to trace the transfer of evidence and information from an international community of experts (an epistemic community) to national programs in Australia, Canada and England. This investigation concludes that framing and narrative construction are key to how information gets translated and transformed from evidence to policy at the national level. The third nested investigation reports the results of a survey of Public Health Units (PHUs) in Ontario, Canada to show the transfer of evidence and information from national policymakers to local programs for the public. It concludes that the public is playing an increasingly powerful role in defining problems and proposing solutions due, in part, to the rise of information as a commodity in the postmodern world. This thesis concludes that ideology plays a critical role in defining how evidence and knowledge gets translated and transformed in the policymaking process.

This work makes substantive and methodological contributions through its use of mixed and complementary methods and through its detailed analysis of an environmental health issue (Sun Safety) in three countries. The thesis' main contributions, however, are theoretical. First, it extends the epistemic community concept to show how international evidence is increasingly influential at the public level through technological advances and greater international flows of information. Second, it develops a framework explicating the different evaluative criteria used by scientists, policymakers and the public in uncertain and complex issues. Both of these contributions will prove useful for future research in complex and uncertain issues such as global environmental change and environmental health problems.

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"I know what I am, I'm a link in a chain, not an island alone on my own"
The Payolas

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This thesis is dedicated to my parents

Doug and Donna Garvin

for teaching me that learning never stops and that it can take many forms

and in memory of

Patti

who always warned me that something like this would happen.

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CHAPTER ONE: INTRODUCTION
Context and Organization of the Study

1.1. Research Context

Over the past decade, global environmental issues have been increasingly identified as important influences on the social, economic and physical health of human populations (see, for example, IPCC, 1995 and Government of Canada, 1997). On one level, coalescing interests around solving large-scale environmental concerns, such as global environmental change, provide a unique opportunity to develop a common framework for understanding the diverse interests and knowledge of scientists, policymakers and the public. However further examination of the relations between these three groups reveals considerable differences between how each group recognizes, validates and places limits on usable knowledge. These differences represent fundamental divergences in the epistemologies, philosophies and approaches to explanation in each of these communities.

1.2. Research Design

This thesis examines how knowledge is developed and used by scientists, policymakers and the public through a case study situated in a growing area of specific geographical concern: the human dimensions of global change. The study of the environment — both physical and human — has long been the concern of geographers (de Blij, 1993; Mitchell, 1991). This research explores the international

body of scientific knowledge about global change (especially ozone depletion) and examines how it is filtered through state apparatuses and institutions to appear in the form of state policies (Sun Safety programs). These policies are accepted or rejected, transformed, interpreted and adapted by society and the public. Thus how scientists, policymakers and the public construct and use knowledge and evidence becomes central to understanding how nations, governments and individuals react to global change and environmental health issues.

The project consists of a single, broad case study of Sun Safety (skin cancer prevention) programs. Within that case study are three nested investigations located at the intersections between science (scientists), policy (policymakers) and society (the public). The first nested investigation theorizes the intersections between the three communities. A critical review of the literature elicits the relationships between the three and, using a critical interpretive approach, a framework is proposed for understanding the epistemological distances between them.

The second nested investigation introduces the concepts of epistemic communities, narrative construction and issue framing and applies them to the case study in an international context. It uses a series of semi-structured interviews to examine specifically the intersection between science and policymakers by reconstructing the use of evidence in the construction of Sun Safety programs in Australia, Canada and England. This nested component of the larger case study shows how a single body of international scientific evidence is interpreted, transformed and adapted according to nationally-defined values, needs and priorities.

The third nested investigation further explores how knowledge is translated and transformed through the development and implementation of community-based programs. Situated in Ontario, Canada, this portion of the research examines the intersections between policymakers and public by documenting local Sun Safety programs at the level of the community public health unit. It presents the results of a survey questionnaire on local Sun Safety programs, showing that groups of international, like-minded scientists (epistemic communities) have influence beyond the international and national levels as they interact with local policymakers and the public in the construction, co-construction and re-construction of evidence in community-based Sun Safety programs.

These three nested investigations, all positioned within the larger case study of Sun Safety, are represented in Figure 1.1 showing the project structure. At the level of theory development and generation, this work brings together the disparate literatures on the sociology and the social construction of science with policy analysis, public understanding of science, and environmental risk to generate a framework for better understanding why scientists, policymakers and the public often talk past each other in environmental and environmental health debates. The concepts of epistemic communities, narratives and metanarratives, and issue framing are all important for understanding the lack of connection between the three groups. The theoretical discussion is then given form through the substantive examples provided in the two investigations of international and local programs.

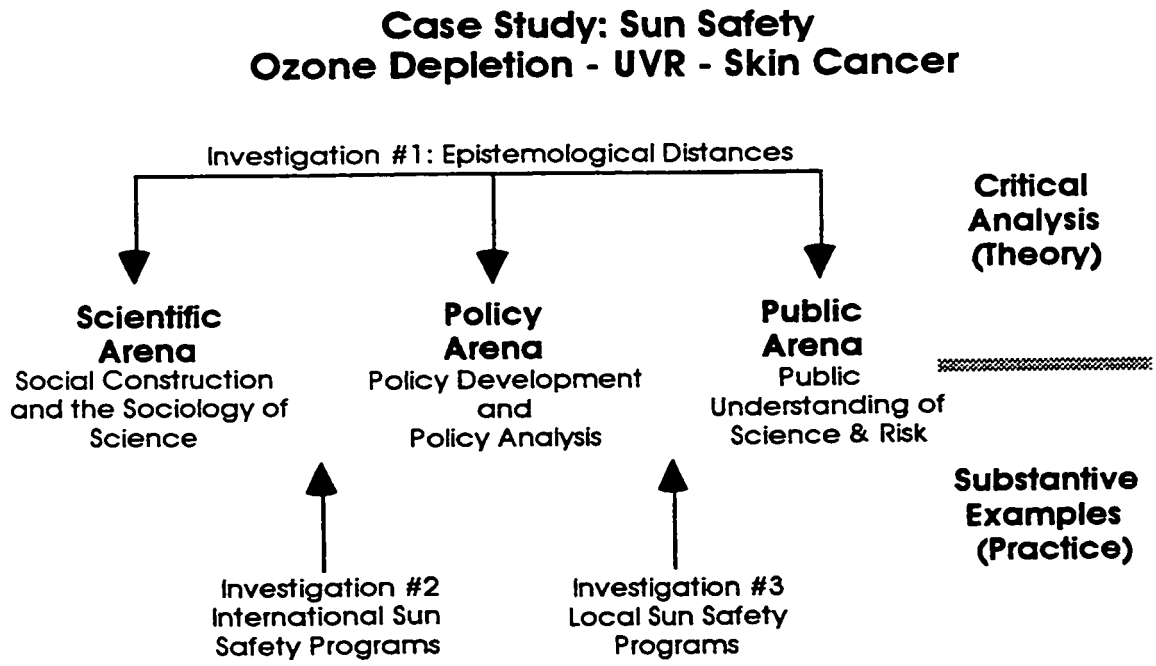

Figure 1.1
Project Structure

1.3. Theory and Method

This thesis employs a case study method focusing on the use of evidence in the development of Sun Safety policy. The purpose of the case study approach is to allow in-depth analysis of a single subject to generate general concepts that can then be tested against similar phenomena (Pederson, 1989). By this definition, case studies are necessarily inductive (Cresswell, 1994). Yin (1989) suggests that research problems that are especially appropriate for case studies are both contemporary and centered on questions about the *how* and *why* of an issue. In this thesis, that *how* and *why* translates into: *How was evidence and knowledge used?* (or, what happened?) and *Why was it used in this particular way*? (or, why did it happen?). Therefore this

thesis is not a simple recounting of what happened, but a reconstruction of the policy space and an example of how evidence, persuasion and power mediate the relationships between scientists, policymakers and the public (Stone, 1997; Litfin, 1994; Majone, 1989).

The primary theoretical perspective behind this thesis is symbolic interactionism. This perspective sees reality as socially constructed (Berger & Luckman, 1967) and as mutually-constituted, mutually-constructed and mutually-reconstructed by members of social and cultural groups. The researcher's primary role is that of interpreter of symbolic meanings and analyst of the importance that symbols have for groups as they interact (Stern, 1994). Throughout the data collection and analysis process, participant reflection on emerging results ensures that the researcher's interpretations and analysis are both trustworthy and dependable (Baxter & Eyles, 1997; Lincoln & Guba, 1985).

The use of the case study and interpretation in policy analysis is now widely recognized (Yanow, 1996; Roe, 1994; Heineman *et al.*, 1990; Majone, 1989). There is, however, increasing admittance that the case study method, coupled with interpretive techniques such as discourse and narrative analysis, is not always tidy (Litfin, 1994). In attempting to explain reality, these approaches are, necessarily, discursive and dialectical in nature, and they deny unidirectional causal explanations (Yanow, 1996; Litfin, 1994). While every attempt has been made to make this thesis clear and straightforward, it does follow in this tradition of the somewhat untidy and complex policy analytic approach. Therefore the following chapters attempt to weave together a story about Sun Safety and skin cancer and to explain how that story is renegotiated, reinterpreted and transformed through time and over space.

1.4. Goals and Objectives

The primary goal of this thesis is to understand the relations between scientists, policymakers and the public in complex and uncertain issues such as global environmental change and environmental health. To that end, this work has three main objectives:

1) To bring together the disparate literatures surrounding the use of evidence and knowledge by scientists, policymakers and the public;
2) Using that literature, to generate a critical framework for understanding the epistemological distances that prevent consensus among those groups in complex, uncertain issues; and
3) To apply that framework to the case study of Sun Safety to understand the transformation of internationally-accepted information at the nexus between:
    i) international scientists and policymakers, and
    ii) policymakers and local programs.

This work makes at least three important contributions. First, this work advances our understanding of the different ways that scientists, policymakers and the public evaluate complex and uncertain issues. Such understanding is important because the solutions to complex and uncertain problems are predicated on a shared (if not a common) discourse. Second, the study moves beyond a strictly scientific interpretation of a purported environmental health issue (skin cancer and Sun Safety) to situate it within broader social science concerns such as ideology, hegemony and power. Finally, this study provides an example of the important contributions that qualitative and mixed research methods can make to the study of environmental health and global environmental change problems.

1.5. Organization of the Thesis

This thesis is organized into six chapters. **Chapter Two** provides a background to the case study by presenting a policy reconstruction of Sun Safety including developments in ozone depletion and skin cancer. It discusses the historical development and scientific recognition of ozone depletion as a global environmental change issue and presents the conflict and consensus that has emerged over time. This chapter also explicates the links between ozone depletion, increasing ultraviolet radiation (UVR) at ground level and rising rates of skin cancer. It provides updates of recent scientific data on ozone depletion and skin cancer and presents the consensus information representing the 'state of the art' knowledge emanating from international scientific committees.

Chapter Three introduces the theoretical grounding of the thesis in the first nested investigation: the epistemological distances between scientists, policymakers and the public (see Figure 1.1). It reviews the literatures on the sociology of science, policy and policy development, public understandings of science, and risk. This chapter proposes a framework for understanding the different ways that scientists, policymakers and the public generate, evaluate, and value evidence and knowledge. The chapter concludes by exploring the role of ideology in knowledge generation and discussing the hegemonic role of science in modern society.

Chapter Four presents the second nested investigation: the international study of Sun Safety programs. As shown in Figure 1.1, this nested investigation represents what occurs at the nexus between international information and national policy development as it is intersected by scientists and policymakers. It presents information compiled from semi-structured interviews and shows how the body of

scientific information regarding Sun Safety, skin cancer and ozone depletion is incorporated differently in different national contexts. The results are national Sun Safety programs with subtle but important differences. This chapter goes on to define key analytic concepts including ideology, epistemic communities, narrative construction and framing, concluding that ideology plays a key role in the complex and relational flows of information between scientists and policymakers

Chapter Five presents the third nested investigation: the local study of Sun Safety programs (see Figure 1.1). Positioned at the intersection between policy and the public, it presents the findings from the survey of local Public Health Units in Ontario and once again shows how ideology (as defined in Chapter Four) influences the interpretation of evidence. This chapter shows that, similar to their counterparts at the international/national level, policymakers and the public interpret scientific evidence within a particular context, shaped by national framing preferences and narratives.

Chapter Six summarizes the three nested investigations and brings them back together within the broad Sun Safety case study. It returns to the theoretical considerations in Chapter Three to show how epistemological distances between scientists, policymakers and the public are dialectically related to the construction of epistemic communities, narratives and the framing of Sun Safety. It then revisits the role of ideology in the construction and recognition of social problems, concluding that the changing relations of modern society are constructing, re-constructing and co-constructing the way evidence and information are valued in complex and uncertain issues. The chapter ends with a short discussion of the contributions of this work and recommendations for further research.

CHAPTER TWO: BACKGROUND TO THE CASE STUDY
A Policy Reconstruction of Ozone Depletion and Skin Cancer[1]

2.1. Introduction

This project's case study of ozone depletion and skin cancer is situated within a well-developed issue framework. Ozone depletion has been of scientific concern for almost 25 years and skin cancer, at least in some parts of the world, has an equally long history of public attention. This chapter presents a policy reconstruction of ozone depletion and skin cancer by drawing together the scientific achievements with the subsequent policy responses and their relationships through time. This not only provides a listing of what happened and when, but also identifies the tensions and schisms that result from dealing with environmental issues steeped in uncertainty. This chapter, therefore, provides the antecedent for the remainder of the work presented in this thesis.

A series of logical claims are the basis for the generally accepted link between skin cancer and ozone depletion (Garvin & Eyles, 1997). A useful heuristic for understanding this series of claims is to employ the concept of a Skin Cancer Cascade (Fitzpatrick, 1996). Under this approach, ozone depletion is seen to result in increasing ultraviolet radiation (UVR) at the Earth's surface. This greater radiation

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1 Portions of this chapter are revised from T. Garvin & J. Eyles, 1997. The Sun Safety Metanarrative: Translating science into public health discourse. *Policy Sciences*. 30. pp. 47-70.

increases the exposure of humans to potentially harmful radiation. Since exposure to sunlight is a risk factor for skin cancer, there will be greater incidence of skin cancer as a result of ozone depletion.

The following discussion presents, first, a summary of the science and history behind ozone depletion[2]. It then discusses some of the problems behind linking ozone depletion to radiation levels at ground level. The chapter ends with a discussion of skin cancer, its causes and impacts, and some of the uncertainties involved in linking skin cancer with ozone depletion.

2.2. Stratospheric Ozone Depletion

The first stage of the Skin Cancer Cascade begins with the assumption of stratospheric ozone depletion. Ozone is a gas created through the interaction of sunlight and oxygen in the earth's atmosphere. It is found in the stratosphere between 15 and 40 kilometers above the earth and concentration peaks in a thin layer at a height of about 25 km. It is this thin layer of high concentration that has been termed the "ozone layer." Through a continuous process of creation and destruction, sunlight (solar radiation) interacts with oxygen in the stratosphere to create ozone. Sunlight continually breaks apart oxygen (O_2) into free oxygen atoms which then join other oxygen molecules to become ozone (O_3). However these ozone molecules are highly unstable and when they are again exposed to solar radiation (sometimes almost immediately) the two ozone (O_3) molecules break apart to make three new,

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2 Data for this chapter originate from two consecutive literature searches conducted using the keywords "ozone depletion," "skin cancer," "sun safety," "ultraviolet radiation," and "melanoma." The search conducted in 1996 covered the years 1985-1995 and the search conducted in 1998 covered the years 1995-1998. Both searches used electronic databases in the natural, medical and social sciences such as Medline, Social Sciences Index, Geobase, and First Search

more stable, oxygen (O_2) molecules and the process begins again (Drake, 1994). It is through this photochemical process of continual creation and destruction that stratospheric ozone absorbs the bulk of the sun's radiation, allowing sufficient radiation to pass through to ensure the continuation of the planet's photochemical and photobiological processes necessary to sustain terrestrial life.

Solar radiation in the ultraviolet spectrum is divided into three main wavelength ranges. The ultraviolet C range (UVC) includes wavelengths shorter than 290 nanometers (nm). Solar radiation between 290 and 315 nm is labeled UVB and radiation with wavelengths higher than 315 nm is classified as UVA. Ozone in the stratosphere is critical in the filtering of solar radiation because it absorbs completely the lethal radiation in the UVC range, and absorbs almost all of the UVB which is also potentially damaging. By comparison, ozone absorbs little radiation in the UVA range (Drake, 1994). The ability of the ozone layer to absorb the shorter wavelengths in the UVB range are particularly important because radiation in this part of the spectrum is capable of damaging human skin and DNA (Lloyd *et al.*, 1994).

2.2.1. History of Ozone Depletion

Widespread concern over ozone depletion first emerged in the early 1970s related to emissions from supersonic transport (SST) (Benedick, 1991; Crutzen, 1970). Researchers at this time felt that high-speed aircraft under development for travel in the stratosphere were likely to emit nitrous oxides capable of setting off catalytic reactions (Johnston, 1971; Crutzen, 1970). After a series of hearings, the U.S. Congress responded to scientific concerns over the potential atmospheric effects by canceling the American SST program. This was the first recognition that human activities might have long-term effects on stratospheric ozone and scientists began to show an increasing

interest in both the upper atmosphere and the environmental consequences of anthropogenic activity, particularly technological advances (Litfin, 1994).

This interest remained somewhat limited in the early 1970s and it was not until several years later that concern resurfaced over the possible deterioration of the upper atmosphere. In 1974, two researchers at the University of California at Irvine projected that chlorofluorocarbons (CFCs) — a ubiquitous chemical used in refrigeration and manufacturing processes — had a serious potential for depleting ozone in the stratosphere (Litfin, 1994; Maduro & Schauerhammer, 1992; Benedick, 1991; Nance, 1991; Roan, 1989). The researchers, Molina and Rowland, argued that the lack of a natural sink for CFCs meant that these chemicals would eventually percolate up into the stratosphere. Once there, the CFCs would be broken apart by solar radiation, producing free chlorine atoms. These chlorine atoms, as free agents, would interrupt the natural ozone process by breaking apart and destroying stratospheric ozone while the chlorine atoms themselves remained untouched. Molina and Rowland (1974) predicted that as more and more chlorine moved into the stratosphere the process of ozone destruction would increase at an ever more rapid rate (Drake, 1994; Litfin, 1994; Nance, 1991; Roan, 1989). Since these free chlorine atoms interrupt the natural process for absorbing solar radiation the researchers predicted that the stratosphere would eventually lose its ability to absorb solar radiation and damaging ultraviolet radiation (UVR) would then pass through the atmosphere and reach the earth's surface (Molina & Rowland, 1974).

As might be expected, this theory met with great resistance and was widely criticized (Litfin, 1994; Benedick, 1991; Roan, 1989). Scientists employed or contracted by manufacturing and chemical enterprises argued that there was no

conclusive proof that ozone depletion had, was, or would actually take place. Instead, they argued, ozone levels were in a natural state of flux and CFCs were unlikely to have a long-term effect on global ozone (Litfin, 1994). The lack of historical data on ozone levels meant this position could not be refuted. Meanwhile, manufacturers argued that replacing CFCs would not be economically feasible as there were no cost effective alternatives available. They took the position that the social and economic benefits resulting from CFCs far outweighed any potential long-term environmental effects (Roan, 1989).

Thus began a decade-long debate over the nature of scientific evidence, the validity of various predictive models, the accuracy of ozone measurement instruments and the economic implications of phasing out CFC production and use. On one side were chemists and atmospheric scientists that argued that the long-term effects of CFCs would not appear for decades; therefore precautions had to be implemented immediately. On the other side were industry officials arguing that the social and economic costs of abandoning CFCs were too great; they supported a theory that the stratosphere was self correcting and could adapt to the changes in chemical composition that resulted from CFCs. Caught in the middle were governments and the public (Litfin, 1994; Maduro & Schauerhammer, 1992; Benedick, 1991; Nance, 1991; Roan, 1989).

2.2.2. Conflict and Consensus

There are conflicting analyses about the degree of scientific consensus existing by the mid-1980s around Molina and Rowland's ozone depletion theory. Some analysts state that there was little dissension between experts that CFCs were the main cause of ozone depletion (Nance, 1991; Benedick, 1991; Roan, 1989).

Others suggest that considerable scientific uncertainty and disagreement remained (Litfin, 1994; Maduro & Schauerhammer, 1992). Underlying the scientific debate was growing uncertainty about the ability of science to provide unequivocal answers to complex, environmental problems.

The media, particularly in North America, played an important role in the ozone debate by providing extensive coverage of the issue. In retrospect, ozone depletion had all the requisite components for a good news story. First, there was the drama created by heated debates between recognized "experts" in the field. The issue also played on the conscience of consumers by relating economic development and growth with long-term environmental degradation and by contrasting individual convenience (for example, spray cans and refrigeration) with the health of the planet. Finally, the issue had a moral time component because ozone depletion raised the possibility of actions in the present affecting the health of future generations.

But by the early-1980s, the ozone depletion issue appeared to reach a stalemate. The controversy was not over the qualitative nature of the effects — it was agreed, in theory, that depletion of the ozone layer would certainly affect biological cycles on earth. The disagreement, however, was on the *quantity* of that effect (Baarschers, 1996). While the scientists argued over measurements and model calibrations, and policymakers debated who was responsible for taking action, public interest began to decline (Roan, 1989). In the late-1970s the public had responded to ozone depletion by voting with their pocketbooks and sales of aerosol products had dropped to pre-1968 levels in the United States (Roan, 1989; Dotto & Schiff, 1978). But by the early 1980s, public interest had again waned.

The debate over ozone depletion in the late 1970s and early-1980s took place amidst a general climate of increasing public support of the precautionary principle in environmental issues (Litfin, 1994; Maduro & Schauerhammer, 1992). The precautionary principle states that where equivocal evidence exists that can neither support nor deny environmental effects, it is best to err on the side of caution to prevent potential environmental destruction (Virtual Elimination Taskforce, 1993). At international talks in April 1983, Norway, Sweden and Finland used the precautionary principle as the basis for proposing a worldwide plan limiting CFCs but the plan was rejected by the international community. Instead, in March 1985 the international community signed the Vienna Convention calling for additional research and greater exchange of information on ozone depletion but they failed to agree on worldwide CFC regulations (Litfin, 1994; Roan, 1989).

By late 1985 the ozone controversy again made news headlines with the discovery of the Antarctic "ozone hole" (Farman *et al.*, 1985). Public interest was again ignited through the vivid image of a seasonal "hole" in the ozone layer appearing over the Antarctic and the striking portrayal of damaging radiation streaking through the hole to the earth's surface. Farman's findings postdated the signing of the Vienna convention, yet came at a critical time before the next round of international negotiations were set to resume in Geneva and, subsequently, Montreal (Litfin, 1994; Roan, 1989).

The Montreal Protocol on Substances that Deplete the Ozone Layer (UNEP, 1987) was signed in September, 1987 and called for a 50% reduction in worldwide CFC emissions. It was followed by amendments in 1990 and 1992 that increased both the level of emission reduction and sped up the timeline for that reduction. By

the tenth anniversary of the Montreal Protocol in 1997, it was being hailed as a "significant event in modern diplomatic history" and an important environmental achievement (Wardle *et al.*, 1997).

The shift toward precautionary action to "save the ozone layer" represented a key change in international diplomacy in environmental issues (Zehr, 1994; Benedick, 1991). This shift has continued into the 1990s and has promulgated a continuing scientific consensus that ozone depletion is a serious global problem. However there are still dissenting voices. In March 1992, Belgian meteorologists (DeMuer & DeBacker, 1992) found that the instrument that provided historical records on ozone — the Dobson Spectrophotometer — had probably mistaken reductions in atmospheric pollutants and produced unreliable ozone readings. They concluded that once these pollutants had been accounted for, there was actually an *upward* trend in global ozone over the past decades. Such research calls into question earlier predictions that ozone levels will bottom out in 2020 and suggests that mitigating factors make any kind of prediction very difficult.

Other researchers question the robustness of the models used to predict future ozone depletion to highlight the considerable scientific uncertainty. Models that predict a downward trend of, for example, 5% can have confidence intervals that result in predictions that should range between 2.5 and 9% (Wildavsky, 1995). Since these models are based on the chemical composition of the atmosphere, and our knowledge of that composition is constantly evolving, considerable variation exists in the reliability of these predictive models (Maduro & Schauerhammer, 1992).

Questions have also been raised regarding the representativeness of existing ozone records (Wildavsky, 1995; Maduro & Schauerhammer, 1992). Most historical

records of ozone readings are from developed countries that have the technology to make these measurements. For example, Canada has been recording ozone levels since approximately 1957 (Kerr & Wardle, 1993) but ozone records are still not available for many parts of the African continent. Thus the consensus on ozone depletion is based on measurements that still exclude certain parts of the globe.

It was anticipated that these gaps in global ozone data would be filled by the launching of the Nimbus-7 satellite in 1978. This satellite provides daily maps and data of the global distribution of total ozone. However this and other satellite information has been available only since 1978 and during the past two decades the earth has passed through a bottoming out of the natural eleven year solar cycle (Bailey, 1993; Maduro & Schauerhammer, 1992). The sun experiences these continuous eleven year cycles where it passes through maxima (where solar activity and UVR is very high) and minima (where activity and UVR are low). This flux in solar UVR significantly changes the ozone concentrations in the stratosphere through its interaction in the ozone productive process. For example, a solar cycle occurred between 1969 (maxima) and 1980 (minima). Measurements from the Nimbus-7 began just prior to the solar minima of the 1980s and low ozone levels measured during that time could be explained away by the solar minima. Therefore the global data supplied from 1978 may fill in some of the gaps by providing data for previously unmeasured parts of the globe but natural variation cannot be completely discounted as an explanation for minor fluctuations in global ozone over the past two decades (Wildavsky, 1995; Bailey, 1993; Maduro & Schauerhammer, 1992).

Despite some dissenting voices in the scientific community, there is a strong consensus among most scientists (as well as the public) that the earth's ozone layer is

in crisis. However even mainstream scientists admit that there remains some uncertainty as to the nature, cause and the extent of ozone depletion primarily because of problems with measurement instruments, predictive models and natural variability. But despite these problems, increasingly sophisticated and accurate measurements of ozone levels continue to show a downward trend in daily readings in many parts of the world. For example, ozone levels over Toronto, Canada reached their lowest levels ever in March, 1997 causing considerable concern for environmental scientists. As of 1999, Canadian researchers report that the average thickness of the ozone layer has declined by about 7% since 1980 and UVB has increased at the surface by about 8% over the same time period (Broadhurst, 1999). Despite the tentative ability to conclusively link these daily levels to long-term trends and anthropogenic activity, these readings nonetheless are widely used as conclusive evidence of the "crisis" of ozone depletion.

2.2.3. Recent Developments

The most recent international data strongly supports the scientific consensus confirming ozone depletion. In 1992, the United Nations Environment Program (UNEP) produced a consensus document predicting that total column ozone levels will continue to drop until at least 2020. The best case scenario sees those ozone levels bottoming out at that time, while other, less optimistic, scenarios see depletion continuing well into the late 21st century.

Far from the general climate of the early 1980s in support of the precautionary principle, environmental causes (including ozone depletion) are increasingly criticized in the 1990s. New criticisms of the ozone consensus (primarily originating in libertarian movements in North America) have reopened the

debate and increased divisions between scientists themselves and between scientists and policymakers. These critics employ an inflammatory rhetoric such as referring to environmentalists as "alarmists." Advocates of ozone depletion are labeled "apocalyptics" and accused of invoking "effective scare tactics" in the controversy (Bailey, 1993 p. 130). Other critics of the environmental movement have called environmentalism a "pagan religion" with concerns over CFCs labeled as "hype." According to these critics, Rowland and Molina's theory is "a version of atmospheric chemistry" culminating in "ozone scare stories" (Maduro & Schauerhammer, 1992 pp. 8-13).

Supporters of ozone depletion, and environmentalism in general, have reacted and responded with an equally inflammatory rhetoric. Critics of environmentalism have been accused of obfuscating problems, misinterpreting data and purposely misleading the public. Ehrlich & Ehrlich (1996, p. 152) have labeled this movement as "anti-science" and based on "fables that have no basis in reality." They coined the term "brownlash" to describe the movement critical of ozone depletion and other environmental degradation.

Despite these rhetorical battles between environmentalists and critics, scientific and political consensus over ozone depletion has stabilized over the past decade. Rowland and Molina shared the 1995 Nobel Prize for Physics with Paul Crutzen for their contributions to understanding stratospheric change. Optimistic assessments predict that the ozone layer will continue to deteriorate until the turn of the century, and take about another 50 years to return to pre-ozone depletion levels (van der Leun *et al.*, 1995). However these predictions are based on worldwide compliance with negotiated regulation and reductions in ozone-depleting substances

from the Montreal Protocol. Questions continue to arise around what might happen should some of the signature nations — especially those in the developing world — fail to comply fully (UNEP, 1997). As understanding of the processes surrounding ozone depletion increases, questions remain about mitigating the effects:

> "These questions are more difficult to answer than those posed initially when the problem of ozone depletion arose. Then the question was, will there be any effects so detrimental as to necessitate protection of the ozone layer? In principle, this could be answered by giving one or two clearcut examples. The present questions are much broader and require quantitative knowledge on all effects of potential importance." (van der Leun, *et al.*, 1995 p. 138)

Viewed in a historical context, ozone depletion started out as a highly polarized issue in the 1970s. Through the 1980s and into the early 1990s, a growing consensus among scientists allowed international policymakers to move forward on controlling CFC production and ameliorating potential future ozone decreases. However in the late 1990s there has been a growing polarization of the issue situated within a larger backlash against the environmental movement (Ehrlich & Ehrlich, 1996). As the first stage of the Skin Cancer Cascade, the certainty and acceptance of ozone depletion is not necessarily as straightforward as it might first appear.

2.3. Ground-level Ultraviolet Radiation (UVR)

The second stage of the Skin Cancer Cascade states that, as a result of ozone depletion, ground level UVR is on the rise and the international consensus on ozone depletion has led directly to questions about resulting human health effects. Studies currently predict that there may be long-term indirect effects on terrestrial plants, aquatic ecosystems, biogeochemical cycles, air quality and materials as more UVR reaches the earth's surface (van der Leun *et al.*, 1995). However these indirect effects of increased UVR from ozone depletion are hard to predict with accuracy, primarily

because even the direct effects have been difficult to document. This is due, in part, to remaining uncertainties about the level and type of UVR reaching the surface and to a lack of knowledge on the specific effects of UVR in general.

2.3.1. History of UVR Ground-level Measurement

The first recognition of ground-level radiation came in the early 1800s when it was detected that sunlight could be used as a prevention and cure for rickets through its ability to help the human body synthesize vitamin D (Webb, 1996). The beneficial effects of sunlight were especially promoted in England during the Industrial Revolution but it was not until the post-war era that the detrimental effects of sunlight were recognized. Blum (1948), followed by Cruickshank (1951), was the first to observe that sunlight had a role to play in the incidence of skin lesions and some infectious diseases (Webb, 1996).

Even though there was some understanding of the role sunlight played in human health, there was little knowledge at this time of the different wavelengths of solar radiation and their relative importance. The International Geophysical Year (IGY) in 1957 saw the establishment of instruments for monitoring atmospheric ozone levels, which led to increased understanding of the relationship between atmospheric ozone concentrations and ground-level UVR intensities (Webb, 1996). The first systematic monitoring of ground level UVR measurements took place in the 1950s and 1960s but interest in the subject declined because there were no measured or expected change in UVR levels over time (Weatherhead, 1996; Webb, 1996).

As interest in ozone depletion theories began to grow — first around the SST issue and then around CFCs — there was a growing need for sophisticated instruments for measuring solar radiation (Webb, 1996). At approximately the same

time in the 1970s, a number of researchers developed instruments for measuring different spectral regions, or wavebands, of solar radiation. Some of these instruments were developed by climatologists trying to understand changes in global climate, while others were constructed by radiologists interested in determining the spectra responsible for causing changes in human skin (called erythemal radiation).

Over the years, the number of UV monitoring stations has grown substantially (see Figure 2.1). The first extended network of UVR monitoring stations was established in 1974 at 30 locations worldwide (Weatherhead, 1996). Initially set up to measure the climatology of UVR, these stations provided valuable, though sporadic, baseline data for the study of ozone depletion. But inconsistent instrumentation and calibration, coupled with local perturbations, meant that early trend analysis from this network was inconsistent and did not provide the data expected (Weatherhead, 1996).

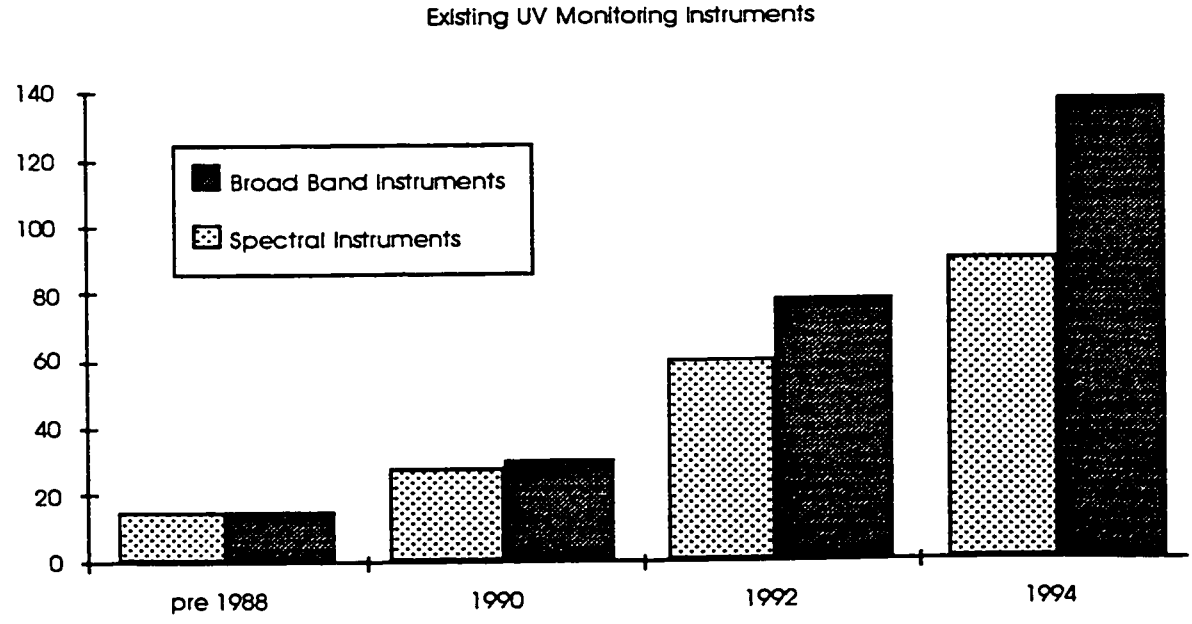

Figure 2.1
Increase in UV Monitoring Instruments 1988-1994
(adapted from Weatherhead, 1996 p. 24.)

Since the mid-1980s, UVR monitoring instruments have increased in both numbers and accuracy. Early instruments focused solely on measuring the UVB spectrum, but newer instruments measure UVR in broad bands, including UVA and UVB. But problems remain. Figure 2.1 shows that most of the current monitoring instruments have been operating for less than a decade, providing little data for establishing long-term trends. In addition, monitoring systems do not show even geographical dispersion and therefore, like the early ozone monitoring networks, some parts of the world are left out completely (Weatherhead, 1996).

2.3.2. Conflict and Consensus in UVR Measurement

Concerns over human health effects of ozone depletion center on increased UVA and UVB at the earth's surface, primarily because UVC will continue to be absorbed by the earth's atmosphere. Interest in UVA has only begun recently with new epidemiological findings that implicate UVA in cutaneous melanoma (Weinstock, 1996; Donawho & Wolf, 1996). As will be discussed in the next section, the link between UVB and nonmelanoma skin cancers is much stronger (UNEP, 1997).

The strongest evidence for UVB increases at ground level comes from the Atmospheric Environment Service (AES) located near Toronto, Canada. Researchers at the AES have a record of daily, ground based UVB readings going back to 1989. This is the most extensive and reliable historical record claiming to link ground level UVB with stratospheric ozone concentrations, yet it provides insufficient data to establish whether or not there is a long-term relationship between the two (Kerr & McElroy, 1993). It has provided, however, sufficient data to show that on a *daily* scale, UVB levels in Toronto correlate with ozone levels. This means that ozone levels are low on those days that UVB levels are high, and that UVB levels are low

on those days that ozone levels are high (Kerr & McElroy, 1993). While this data does show a correlation, there are questions about whether the data is sufficient to suggest causation (alternative views are presented in Diffey, 1996).

Measurements from European (as compared to North American) monitoring stations conflict over whether or not UVB is increasing at ground level. Some measurements, such as those in England, show a downward trend in UVB in the short-term, but it is not statistically significant (Driscoll, 1996). Other short-term records (such as in Greece) show a high anti-correlation suggesting that UVB is on the increase as a result of ozone depletion (Zerefos, 1996). Meanwhile short-term findings from Finland in 1994 and 1995 suggest that any increase in UV levels appearing at the ground is not biologically significant even though ozone levels were much lower than expected during that time period (Leszczynski, 1996). Finally, there are some countries that conclude that it is impossible to predict trends in UVB levels, even in the short-term, based on the limited data currently available (Gillotay, 1996; Johnson, 1996).

Longer-term studies show equally conflicting results. Measurements from Austria and Switzerland show a statistically significant increase of 7% in UVB between 1981 and 1991 (Blumthaler, 1996). By contrast, average surface measurements from eight stations in the mainland U.S. have shown a decrease of 8% between 1974 and 1985 (Scotto *et al.*, 1988). Similarly, declines of between 5% and 14% were found in some parts of the rural U.S. (Liu *et al.*, 1992). Instead of increasing, these studies show that levels seem to be decreasing at the earth's surface. Scotto *et al.* (1988) also found that UVB decreased at ground level at one European and nine U.S. monitoring stations over approximately the same time period in which decreased ozone levels were reported.

A number of factors complicate and affect ground-level UVB readings and therefore may foster continued uncertainty. Data quality is getting better, but can still be a problem because different instruments measure the radiation in different ways (Madronich *et al.*, 1995). For example, some of the researchers mentioned above later found that the increase in ground-level UVR might have been the result of poor instrument calibration (UNEP, 1997). In addition, latitude, cloud cover, surface albedo (reflectivity), tropospheric aerosols and other tropospheric pollutants (including ground-level ozone) can all have an effect on ground-level readings (Madronich *et al.*, 1995). New models predicting UVB based on ground-level and atmospheric measurements have increased in predictive ability when correlated to short-term changes in total column ozone (UNEP, 1997); however the detection of long-term changes in UV trends remains difficult (UNEP, 1997; Madronich *et al.*, 1995).

2.3.3. Recent Developments

The quality and number of UV measurements have been increasing over the past decade, which has led to a reduction in predictive and measurement variation (Madronich *et al.*, 1995). Some researchers recognize that decreases reported in ground-level UVR in the US and Europe could be the result of local industrial pollution that lowers local readings despite increases at the global level (Crutzen, 1992). Even so, considerable complications remain in establishing the direct relationship between ozone depletion and ground-level UVR readings and the relationship remains equivocal (UNEP, 1997). According to UNEP (1997), this uncertainty is unlikely to change in the next few years for three reasons: (1) there is little historical data measuring UV levels from the pre-ozone depletion era, (2) it is

difficult to maintain accurate instrument calibration across sites and research groups, and (3) there is too much natural variability with, for example, cloud cover and pollution.

However advances are being made. There is increased UV monitoring in developing countries, providing better global coverage (UNEP, 1997). Increasing evidence from satellite data suggests that the greatest expected increases will occur at the higher and mid-latitudes of the northern and southern hemispheres with much less effect seen in the tropics. There is also evidence that these levels are seasonal and largest in the winter and spring (Madronich *et al.*, 1995). Measurement instruments are becoming both more sensitive and are measuring a more broad spectrum of solar radiation, providing more detailed information for future trend analysis. International researchers are recognizing that ozone depletion may increase both UVA and UVB at ground level, and also that measurement systems must be calibrated on an international basis to provide valid, comparable data. Most importantly, there is increasing recognition that estimations of the biological effects of ozone depletion require a thorough understanding of both the extent and variability of radiation (and especially UVB) at ground-level (Wardle *et al.*, 1997). In terms of maintaining certainty in the Skin Cancer Cascade, the assumption of increasing ground-level UVB still evokes considerable debate (see, for example, the discussions presented in Diffey, 1996).

2.4. Skin Cancer

The third stage of the Skin Cancer Cascade argues that increasing UVB at the earth's surface (resulting from ozone depletion) will lead to a higher burden of skin cancer among white populations (Fitzpatrick, 1996). There are three main forms of

skin cancer: cutaneous malignant melanoma (MM), basal cell carcinoma, and squamous cell carcinoma (Harvey, 1995). These last two are considered together as non-melanocytic skin cancer (NMSC). Throughout most of the world, NMSC is about ten times more common than MM; yet MM causes about three to four times as many deaths (Harvey, 1995).

Over the past 40 years, incidence rates for both NMSC and MM have risen substantially in predominantly white populations (Glass & Hoover, 1989). In addition, mortality rates from MM have also been on the rise, although some studies suggest that the mortality has leveled off over the past several years (Glass & Hoover, 1989; Bonett *et al.*, 1989). Most importantly, however, many studies suggest that increases in skin cancer rates over the last few decades are likely attributable to changes in general lifestyle and behavioral practices and that stratospheric ozone depletion is unlikely to account for any observed increases (Urbach, 1997; Moan & Dahlback, 1992; Amron & Roy, 1991).

At the international level, the World Health Organization (WHO) has recognized skin cancer as one of the human health implications of solar radiation, citing evidence that worldwide incidence of malignant melanoma is on the increase (WHO, 1998a). In 1993, in collaboration with UNEP, the International Agency for Research on Cancer (IARC), the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and other international agencies, the WHO began an international project to thoroughly review the scientific literature on ultraviolet radiation including an updated assessment on health hazards. The International Project on Health, Solar UVR and Environmental Change (INTERSUN) sought to promote collaboration in implementing programs to ameliorate health hazards and to

develop more accurate predictions of changes resulting from future UVR levels (WHO, 1998a). In addition to the international activities, most countries with a high percentage of at-risk populations have also implemented initiatives to reduce skin cancer incidence and mortality rates.

2.4.1. Skin Cancer Incidence and Mortality

Skin cancer rates vary greatly around the world. On a global scale, western developed nations are showing the greatest increases in skin cancer rates due to their population composition that includes a substantial proportion of people with high-risk characteristics. Those characteristics include fair skin that burns easily, blue eyes, light or red hair color and the propensity to freckle (Evans *et al.*, 1988).

However, even within western developed nations, rates vary substantially over both time and space. For example, in Australia melanoma rates increased 6.3% annually in men and 2.9% annually in women between 1959 and 1985 (Giles *et al.*, 1996). Since then rates in Australia appear to have plateaued even though they remain the highest in the world (Berwick & Halpern, 1997; Boyle *et al.*, 1995). While similar increases are now being seen in some parts of Europe and North America, there are also some considerable differences. In Canada, for example, the incidence of melanoma decreased annually for women (-1.0%) and increased only slightly for men (1.5%) between 1985 and 1992 (NCIC, 1997, Table 9). Other studies show that mortality appears to be cohort-related with those born in the early part of the 20th century experiencing higher rates than cohorts born ten to 20 years later (Berwick & Halpern, 1997; MacNeill *et al.*, 1995). There is, therefore, some doubt that current increasing melanoma incidence and mortality can be attributed solely to global increases in UVR as the result of ozone depletion. Because skin

cancer can have a latency period of up to 50 years, much of the exposure that has led to current incidence pre-dates ozone-depletion. Instead, increasing rates are most likely the result of changes in social attitudes towards baring skin in public (Randle, 1997; Aase & Bentham, 1996).

Predictions by the international community state that for every 1% decrease in stratospheric ozone there will be a corresponding 2% increase in NMSC (Urbach, 1997; van der Leun *et al.*, 1995) and 0.6% increase in MM (Urbach, 1997) worldwide. Taking into account the amendments made to international agreements on ozone-depleting substances, UNEP (1997) predicts that relative increases in the incidence of all skin cancers will peak at almost 10% by 2060. But the predictive models continue to come under question with some suggesting that global environmental changes may result in higher temperatures that might encourage behaviors resulting in greater exposure (Bentham & Aase, 1996), yet modifications in these behaviors may more than make up for the predicted effect of ozone depletion (Urbach, 1997). In other words, a warmer climate may motivate individuals to suntan more, but these behaviors could be controlled by efficacious public health campaigns encouraging avoidance.

2.4.2. The Nature of Epidemiological Evidence

As shown by the differences in incidence and mortality rates, evidence on the cause of skin cancer remains equivocal — more so for MM than for NMSC. Epidemiological studies of NMSC have identified older age, blue eyes, light colored skin, red or blonde hair and high lifetime cumulative UVR exposure as risk factors. Almost without fail, epidemiological studies have shown a strong relationship between cumulative UVR exposure and NMSC (Harvey, 1995). However there is a

greater debate around the risk factors for MM (van der Leun, 1996). There is considerable inconsistency between studies examining the association between MM and cumulative UVR exposure (Harvey, 1995). Some studies show that MM has a strong positive correlation with high variation in local UVR levels (Aase & Bentham, 1994), suggesting that intermittent exposure is the culprit. Meanwhile other studies suggest that intermittent exposure resulting in a moderate tan may, in fact, be protective among those in the population that tan well anyway (Dubin *et al.*, 1989).

Two basic types of research design are used in epidemiological research: descriptive studies and analytic studies (Hennekens & Buring, 1987). Descriptive studies are primarily useful for the formulation of hypotheses and the generation of research questions. They include correlational studies, case studies, and cross-sectional surveys. The main problems with descriptive studies are that they are based on data from groups rather than individuals, they cannot control for intervening variables (spuriousness) and they do not allow the researcher to conclusively link individual exposure with individual outcome. The advantages of the descriptive study are that it often uses readily-available data, is relatively inexpensive, and can identify important associations for further study (Duncan, 1988).

Analytic studies provide much stronger evidence and can be either observational (case-control or cohort) or intervention studies (experimental). At the same time these studies can use exposure as the starting point of the study (prospective) or disease outcome as the starting point (retrospective). The advantage of analytic studies is that they can often show a direct and causal relationship between exposure and outcome.

Randomized control trials (RCTs) are considered the strongest of the analytic epidemiological research designs because they allow the researcher to control for many potentially confounding variables. However RCTs are not always viable for both practical and ethical reasons. Using melanoma as an example, ethical questions would certainly be raised should an experiment expose a case group of individuals to high doses of UVB while locking a control group into a dark room for several months. While this is, of course, an exaggeration, it provides an example of the ethical and practical problems inherent in RCTs.

Since epidemiologists studying skin cancers can seldom use the most rigorous research design (RCTs), they have developed an alternate way of judging the viability of a cause-effect relationship. This method is a series of steps that looks at (1) the strength of the association between the cause and effect, (2) its biologic credibility, (3) whether or not the findings are consistent with other studies, (4) the time sequence and whether or not the exposure precedes the outcome, and (5) the existence of a dose-response relationship (Hennekens & Buring, 1987, pp. 39-43; Roht *et al.*, 1982, p. 327). These criteria for causality, as well as an examination of research design, is included in the following analysis of epidemiological studies of sun exposure and melanoma.

In a summary of the Symposium on Environmental Skin Cancer, Mukhtar & Bickers (1993) examine various experimental investigations into the relationship between ultraviolet (UV) exposure and melanoma. Prospective cohort studies using laboratory animals show that exposure to solar UV radiation appears to produce DNA damage to the skin and results in skin lesions. Experimental tests in laboratory animals show that UVB exposure impairs the functioning of cells responsible for

anti-tumor melanoma immunity and creates an immunosuppressive microenvironment preventing the body's natural anti-tumor activity. At the genetic level, these new findings support dose-response relationships and epidemiological consistency between studies. They also show specific etiology and a proper exposure-outcome (time) sequence. The main problem presented by these preliminary studies is that they have almost all been conducted on laboratory animals. There remains little experimental evidence that these findings from laboratory animals can be equated to similar outcomes in human beings.

Moan and Dahlback (1992) report on a study examining melanoma, solar radiation and ozone depletion in Norway. This study is a retrospective correlational (population) study comparing UV flux, ozone levels, and melanoma rates from 1957 to 1989. It found that there has been no change in ozone levels or in the UV flux levels in Norway over the time period but that there has been a substantial increase in melanoma incidence rates. They found that the skin cancer rates increase with decreasingly latitude. This relationship has held over time, supports other international findings, and suggests that in European countries with a high proportion of at-risk population (such as Scandinavian countries), areas of lower latitudes have higher incidence rates. There are three limits in this type of a correlational study. First, it prevents determination of specific etiology because it shows only that there is a connection between the two variables, not a causal relationship. Second, it assumes that there is an exposure-outcome (time) sequence which is not necessarily a part of the study. And third, correlational studies cannot show individual dose-response relationships. The study discussed above equated latitude with exposure and did not account for differences in socially-related sun

exposure that may have differed between regions. At the population level, and within these limitations, latitude as proxy for sun exposure does show clear strength of association (latitude and melanoma incidence are correlated). Therefore the main benefit of the study is that it showed a clear (though not necessarily causal) relationship between ambient sun exposure, as represented by latitude, and melanoma incidence in humans.

Dubin *et al.* (1989) conducted a retrospective case-control study in New York State between 1979 and 1982 to identify susceptible subgroups at higher risk of developing melanoma from sun exposure. These researchers wanted to identify host-susceptibility factors that could be related to increased melanoma risk. Data regarding exposure was elicited during interviews asking respondents to recount average sun exposure in hours per day for up to 20 years in the past (both cases and controls). This study found that variables associated with increased risk of melanoma included little or no ability to tan, history of freckling, moles, red hair, and blue eyes. The main variable to show a gradient was number of moles (increased number of moles equaled increased risk). Sun exposure was examined within subgroups of host characteristics and researchers found that tanning ability was a moderating factor for some subjects. Poor tanners showed a significant dose-response relationship with moderate exposure resulting in only a moderate increase in risk. However, among good tanners, moderate exposure slightly decreased risk while much exposure increased risk, but not to as high a level as the poor tanners. The study concluded that short-term versus long-term effects may have to be examined to thoroughly understand the link between exposure and outcome.

The strength of the case-control study design is that it allows the researcher to link individual exposure with individual outcome. The prospective nature of the above study, however, leaves opening for bias. The main problem with the Dubin *et al.* study is the potential for recall bias in asking subjects for self-reported exposures for up to 20 years in the past. Other variables, such as number of sunburns in the past, are also open to recall bias and raise questions about the validity of the exposure measures. Through the use of cases and controls, this study respects temporal aspects by examining exposure in the past and studying incidence in the present. Criteria for biological plausibility and consistency of association is met through the identification of population subgroups and the identification of host-susceptibility factors for melanoma. Overall, this study provides much stronger evidence for a link between sun exposure and melanoma, and suggests a number of individual characteristics that may mediate that relationship.

All of the study designs examined above preclude the identification of a direct causal relationship between sun exposure and melanoma. While they begin to provide a plausible explanation for the processes behind rising melanoma incidence rates, the evidence, at some levels, remains equivocal. The data provided by the animal experiments show that there may be a biological process whereby UV exposure reduces the skin's ability to fight cancerous cells (Mukhtar & Bickers, 1993), and it is possible that similar processes may also be identified in humans in the future. The ecological study of Moan & Dahlback (1992), supported by other evidence from Norway (Aase & Bentham, 1996, 1994), shows that there is a geographical dimension to melanoma incidence that may be related to ambient solar radiation levels. The study by Dubin *et al.* adds the individual dimension by showing

some of the biological and behavioral factors that increase an individual's risk of melanoma. While the strength of the evidence linking ozone depletion and local UVR levels to melanoma appears to be increasing, it remains tentative.

This equivocal nature of the scientific evidence has been instrumental in structuring how skin cancer has been defined as a health policy problem. The inconclusive nature of the evidence suggests that MM (and, to a lesser extent, NMSC) is a problem grounded in uncertainty because there is limited evidence that the suggested precautionary actions will actually reduce incidence or mortality (Berwick & Halpern, 1997). Despite this fact, health policymakers in many countries have defined skin cancer (including MM) as a preventable disease that is under the control of the individual. In terms of skin cancer prevention, the problem has been recast at the individual level. By structuring skin cancer as a problem of exposure at the individual level, policy response and solutions are assigned to the health promotion arena (for a detailed discussion of this see Garvin & Eyles, 1997).

2.4.3. Health Promotion and Skin Cancer

Skin cancer prevention, recast by health promotion professionals as Sun Safety, makes the issue more amenable to intervention. Many health policy solutions suggest increasing education and knowledge as the most appropriate way to reduce individual exposure. This response is despite growing proof that such health promotion efforts have little or no effect on changing sun exposure behavior in individuals (Rossi *et al.*, 1994; Lombard *et al.*, 1991; Cameron & McGuire, 1990). There is little, if any, evidence that widespread public health campaigns affect individual behavior without addressing important motivating and predisposing factors (e.g. smoking cessation and heart-health programs). Yet, despite the lack of

evidence supporting simple information campaigns (Steckler *et al.*, 1995), health promotion professionals continue to exhort individuals to reduce individual sun exposure. Some researchers suggest that increasing skin cancer rates have less to do with physical exposure and more to do with social and economic changes over the past 40 years that promote and reward sunbathing (Harvey, 1995; Weinstock, 1993; Glass & Hoover, 1989; Keesling & Friedman, 1987). Therefore community and social intervention are the most appropriate venues for skin cancer prevention programs (Wilson *et al.*, 1999).

The bulk of community intervention studies on skin cancer have taken place in Australia. In the 1980s and 1990s, researchers there have managed to achieve an unprecedented change in public attitudes towards sun exposure (Marks, 1992). As a result of their work, Australia, which previously had the highest skin cancer rates in the world, has seen incidence rates begin to level off. This success was not achieved through a simple increase in the knowledge around sun protection and skin cancer (Borland *et al.*, 1990). Instead it was successful because it targeted structural impediments as well as social and behavioral norms. By the early-1990s Australians reported a lower tolerance for those wearing brief clothes in public, a decreased desire for a deep suntan, a reduction in the equating of tan skin with health, and substantially increased sales in UV-resistant clothing and sunscreen (Marks, 1992).

2.4.4. Recent Developments

While public health programs have focused on encouraging individuals to reduce risk through protection from the sun, laboratory researchers and epidemiologists have continued to search for concrete evidence of the biological pathways linking sun exposure to skin cancer. Most promising has been work on

genetics. Recent studies suggests that early cellular damage to the skin through sun damage (most often as sunburns in childhood) can provide a pathway for later development of skin cancer (Leffell & Brash, 1996). The argument states that sunburns early in life can mutate the p-53 gene in a skin cell. This damage is permanent and the damaged gene remains for the rest of one's life. Later in life, when skin is again damaged by exposure to UVR, skin cells surrounding the damaged p-53 gene die off and provide the opportunity for the skin cell with the mutated p-53 gene to grow and multiply. This multiplying, mutated skin cell grows to become skin cancer (Leffell & Brash, 1996). This recently proposed biological pathway provides a plausible explanation for the mixed findings relating intermittent with cumulative lifetime exposure with the various forms of skin cancer.

This new biologically plausible explanation is also useful for epidemiologists who have recently found a strong cohort effect in skin cancer rates. For example, in Canada, the probability of dying from MM is about double for men in the 1950 cohort than for men in the 1930 cohort (MacNeill *et al.*, 1995). If, as proposed, UVR acts as both an immune system suppresser, a tumor initiator and a tumor promoter (Grossman & Leffell, 1997), then sun exposure behaviors throughout the life span become important. This may begin to explain recent findings that not only sunburns in childhood but also sunburns in the 10 years prior to diagnosis increase MM risk (Holly *et al.*, 1995). The result of these new developments is an increased interest on the part of health promotion specialists to encourage sun protection as a lifelong priority.

2.5. Summary and Conclusion

The Skin Cancer Cascade (Fitzpatrick, 1996) provides a useful heuristic for understanding the posited relationship between ozone depletion and skin cancer. As

a story, it takes a relationship that is rife with uncertainty and moves it through a series of stages, each embedding increasing certainty into the explanation. At each level of the "cascade" there exist disagreements, debates and equivocal evidence. Among atmospheric scientists there remains a lot to be understood about ozone depletion in the stratosphere though there is a strong consensus that ozone depletion is indeed taking place (UNEP, 1997). There is conflicting evidence as to whether or not UVR levels are increasing on the earth's surface, let alone whether or not such increases can be attributed to ozone depletion (UNEP, 1997). If such increasing UVR is found, there are also debates over whether the increases would lead to a rise in skin cancer. Very little is understood about the impact this will have on human health. Not only are there many unknowns regarding the histology and etiology of skin cancers, but there are now questions arising as to other, perhaps more important, health impacts including cataract damage and effects on human immune systems which may affect global immunization programs (Wardle *et al.*, 1997). Despite these considerable uncertainties, the Skin Cancer Cascade's compelling story has become part of a generally-accepted explanation, or metanarrative (Roe, 1994), linking skin cancer to the environment (for examples of this see WHO, 1998a).

CHAPTER THREE: THEORETICAL INVESTIGATION
Epistemological Distances:
Differences in Ways of Knowing

3.1. Introduction

Chapter Two provided a policy reconstruction as background material for the broad case study of Sun Safety program implementation in Australia, Canada and England. It presented the conflict and consensus behind each stage of the skin cancer cascade and identified some of the inherent uncertainties in this environmental health issue. This chapter (Chapter Three) presents the first nested investigation in the thesis. The purpose of this chapter is to explore why and how evidence and information is judged by science, policymakers and the public. The chapter begins with background information to place the discussion within the context of some current social science debates including issues of classification and group relations. After a short explanation of the method employed, the chapter examines the different definitions and uses of knowledge and evidence by scientists, policymakers and the public. The chapter concludes by discussing the role of ideology in defining epistemological distance and the importance that ideology plays in uncertain environmental health issues.

3.2 Background

The following pages provide a short discussion around which this nested investigation takes place. First, it provides definitions of the key terms used throughout the chapter and the thesis. Next, it outlines some of the concerns with

classification in social science research and then explores the literature explicating the relations between scientists, policymakers and the public.

3.2.1. Definitions

Throughout the thesis, some terms are used to organize, simplify and make workable a complex theoretical discussion. In the following pages, the term *science* is used broadly to refer to the body of knowledge and generalized truths surrounding phenomena. This is sometimes referred to as the natural sciences and, in most cases, employs the hypothetico-deductive "scientific method." *Scientists*, therefore, are those working within the arena of science as knowledge producers and validators. *Policy*, by comparison, refers to the application of information to the political world of people and ideas. It includes culturally-constructed and mediated institutional structures, decision-making and the processes underlying it, as well as the negotiations that take place between actors in those structures and processes; policy is the struggle over ideas that takes place within that political and institutional context. Policymakers, therefore, are those actors engaged in the decision-making process. They may be elected officials, bureaucrats, technocrats or consultants depending on the institutional structure in which they operate. *Society* refers to the broad workings of the human social world and is the arena in which policies are implemented. Subsequently, the *public* is a very broad definition incorporating the groups and individuals operating in that social world. Each of these arenas and their groups will be discussed in greater detail throughout the chapter.

3.2.2. Issues of Classification

This study's classification of three groups — scientists, policymakers and the public — merits a short discussion. Classification is the grouping of like objects on the basis of some similarity of properties or relationships (Grigg, 1967). It is a method for imposing order and is one of the basic procedures in making sense of the world (Eyles, 1990; Harvey, 1969). However classification contains inherent problems that must be recognized. These include:

- creating artificial, polarized distinctions,
- masking in-group differences, and
- masking between-group similarities.

The first problem — that of creating artificial, polarized distinctions — comes from the ordering of properties based on likeness (Grigg, 1967) and the socially-constructed nature of the classification process. Penrose (1992) warns that one outcome of the socially-constructed classification process is that society ends up valuing one category more than another. One example would be the classification of scientists as 'rational' and policymakers and the public as 'political and emotional.' This abstract view sees scientific interpretations, due in part to their 'rationality,' as having more value than those of policymakers and the public in terms of competition for legitimacy and attention in environmental health issues (Margolis, 1996; Cutter, 1993; Shrader-Frechette, 1991).

A second problem with classification is that it can mask considerable in-group differences. For example, there can be substantial divisions within the single category of "science" and this can be seen in the early ozone depletion experience. Molina and Rowland (1974) were highly criticized by meteorologists for their early theorizing on

ozone depletion because they were chemists and stratospheric ozone was considered as the concern of meteorologists (Roan, 1989). Likewise, not all policymakers — even within a single country such as Canada or England — supported the phase out of CFCs (Litfin, 1994). And some civil organizations organized in support of an aerosol ban in the early 1970s while other fought against it (Roan, 1989). Therefore, in creating the classifications of scientists, policymakers and the public, differences are set up that often mask important heterogeneity within each group.

Finally, classification can often mask similarities or homogeneity that emerges between and across groups. This is particularly important for understanding how individuals can easily move across classifications based on different life roles. For example, an atmospheric scientist may, at the same time, be considered a scientist in her research realm, a policymaker because she sits on an advisory committee, and a member of the public because she participates in community environmental projects. On a different level, not-for-profit voluntary environmental groups such as Greenpeace and the Sierra Club, normally assumed to be part of civil society, are increasingly taking part in policymaking processes — so much so that they may be considered as policymakers themselves (Lipschutz, 1996). Thus it must be remembered that the classification of the groups as scientists, policymakers and the public can be somewhat artificial in its distinction.

Despite the problems with classification, there are advantages to a broad conceptualization of scientists, policymakers and the pubic. The use of such categories is essential to how ideas are communicated even though they may mask diversity within groups and potential similarities between groups (Penrose, 1992). The main guideline for classification is that members of a group be more like all

other members of the group than like members of another group (Johnston, 1976). Thus classification depends, primarily, on objectives (Eyles, 1990; Grigg, 1967). Rather than absolutes, categories assigned in the classification process are better seen as flexible and designed to meet a specific purpose in order to best reflect a complex and changing reality (Eyles, 1990; Johnston, 1976; Grigg, 1967).

For this study, the classification of groups of scientists, policymakers and the public may best be considered as "ideal types" (Weber, 1947). This categorization provides a useful construct for identifying the common interests, roles, socialization, ideologies and values that both define each of the groups and distinguish them from one another. If, as Rein (1983) contends, we are moving toward a more fractured understanding of the world made up of a mosaic of positions based on different underlying values, we must ascertain limits and boundaries within which to make sense of the world. As Penrose (1992) concludes: "categories are essential to our communication of ideas, to our transfer of knowledge, and, in some instances, to our processes of (self)definition" (p. 219). At some point, it may be more appropriate to move past the monolithic constructions of concepts such as "science" or "the public" to an more appropriate appreciation of the within-group differences implied by talking about "sciences" and "the publics" (Irwin & Wynne, 1996). Such a discussion, however, is beyond the scope of this thesis.

3.2.3. Relations between Scientists, Policymakers and the Public

Speaking broadly, there is both criticism and misunderstanding between scientists, policymakers and members of the public. Scientists, for example, often have difficulty understanding the political nature of the policy process (Margolis,

1996). They see the policy process as irrational and politically motivated and criticize that it is based more on expediency than on scientific evidence (Stone, 1997). For their part, policymakers have an equally critical view of scientists. Policymakers often see science and scientists as methodologically rigid, myopic in scope and interests, and non-committal in conclusions. When called on to make policy recommendations, scientists are often loathe to extrapolate conclusions to a larger context or to provide what policymakers call policy-relevant data (Keyfitz, 1995). As a result, scientists and policymakers are often in conflict and somewhat critical of one other.

However scientists and policymakers do agree on one point: that the public has a tendency to react emotionally or viscerally to complexity and is often incapable of appreciating the uncertain nature of environmental issues (Powell & Leiss, 1997; Margolis, 1996; Shrader-Frechette, 1991). The public, on the other hand, is also critical of both scientists and policymakers. The public criticizes science for using inaccessible, technical language and for failing to provide absolute answers — particularly in relation to health risks (Powell & Leiss, 1997; Shrader-Frechette, 1991). The public criticizes policymakers for acting too cautiously, or for not acting at all, to calm public fears and concerns (Cutter, 1993). The result is a public losing faith in the ability of science to solve its problems and losing trust in its political leaders to act in its (the public's) interest (Irwin & Wynne, 1996). And yet, in order to move forward on any issue, these players (scientists, policymakers and the public) must find a way of working together even though differing world views, differing interests and even differing languages mean that these groups often talk past, rather than with, each other.

In addition, the three groups of scientists, policymakers and the public *themselves* tend to identify differences that sets each apart from the other. Jasanoff & Wynne (1998) argue that the public has an antagonistic relationship with scientists. For example, the public often asks scientists for quick and simple (as well as convenient) solutions to problems that are complex and intractable. This sets up a vicious circle. The request for simple solutions implies to scientists that the public does not understand the scientific difficulties inherent in many problems. So scientists requisition surveys to find out the scientific savvy of the public. But surveys conducted to test public knowledge and scientific literacy are themselves constructed and administered by scientists and therefore may only be measuring the degree to which the public conforms to surveyors' stereotypical images of an ignorant public (Jasanoff & Wynne, 1998).

The implication, therefore, is that the players in the three arenas use different languages, as well as having their own discourses and agreed-upon conventions for identifying knowledge and constructing persuasive arguments (Throgmorton, 1991). Members often use caricatures and generalizations to set one off against the other (see, for example, Ehrlich & Ehrlich's (1996) comparison of the behavior of scientists and the public in understanding environmental problems). The identification of distinct differences between scientists, policymakers and the public *by the groups themselves* reflects the socially-constructed nature of their identities and suggests that they are all engaged in a mutual construction of science, policy and society (Shackley *et al.*, 1996).

3.2.4. Summary

While clear delineations between science and scientists, policy and policymakers, and society and the public may be somewhat artificial, they serve as important constructs for organizing a discussion around differences in knowledge construction and use. The preconceived notions that underlie the relations between the three groups define the ways the groups interact, which underlies the first investigation: the epistemological distances between science, policy and civil society. The remainder of this chapter explains the methods undertaken in this investigation and outlines the epistemological distances found between scientists, policymakers and the public.

3.3. Methods

This first investigation of the case study on ozone depletion and skin cancer uses a critical theoretical approach. Critical Theory builds on early German intellectual traditions and is identified with the Institute for Social Research operating in Germany in the late 1920s and into the 1930s (Calhoun, 1996; Blaikie, 1993; Agger, 1991). Known as 'The Frankfurt School,' these early Critical Theorists were, primarily, concerned with trying to explain how and why the social revolution prophesied by Marx did not come to fruition (Agger, 1991). They saw critical social theory as a key component of the self-reflexive process of public discourse and participatory democracy (Calhoun, 1996).

The leading contemporary exponent of Critical Theory is Jurgen Habermas who argues that all knowledge can be best understood in terms of the interests of those who created it. Scientific inquiry, according to Habermas, consists of three

categories, each producing its own form of knowledge based on with its own set of interests, strategies for interpreting experience, and internal social organization (Habermas, 1978). For Habermas, the *empirical-analytical* sciences are primarily interested in prediction and control through the manipulation of technically-exploitable knowledge. Through work, or instrumental action, this form of science seeks to increase human domination (or control) over both nature and human social relations. This category, therefore, includes the natural sciences, as well as economics, sociology and political science (Blaikie, 1993). Habermas' second form of knowledge comes from the *historical-hermeneutic* sciences, using understanding as its underlying interest. This understanding includes a practical interest in the communicative relations within and between individuals and groups, as well as the interpretive meanings associated with everyday discourse, art, literature, and all other forms of human interaction. This category includes many of the social sciences and humanities. The third form of knowledge, according to Habermas, is *critical* in approach. This involves self-reflection with an underlying interest in emancipation. But Critical Theory as a practice, according to Habermas, has a more broad agenda. It involves all three forms of knowledge:

> "It includes interpretive understanding of systems of belief and modes of communication using the methods of historical-hermeneutic science; the critical evaluation of these; and the investigation of their causes by the methods of empirical-analytic science." (Blaikie, 1993, p. 55).

Critical Theory, therefore, provides researchers with a frame, or a context, for making sense of social science findings. The social scientist's task is to first understand the subjective, ideologically-based situation of an individual or group. Next the researcher must explore the forces leading to the situation, and then show

how those forces could be overcome through a greater awareness by the individual or group. Through this process there is the attempt to reach the truth or what Habermas called an "ideal-speech" situation (Habermas, 1984). An ideal-speech situation is one of discursive democracy where all engage in discussion with equal voice and develop intersubjective meaning. The motivation behind such interaction is consensus where, ultimately, participants use words with agreed-upon meanings and understandings to explain an issue. Habermas recognizes that a real ideal-speech situation can never likely be reached, but suggests that there is the promise of reaching a consensus on meaning, or an approximation of truth, and concludes that such approximation is the best that can be expected in social science research (Habermas, 1978).

Such critical self-reflection has one intrinsic danger. Critical Theory, when turned upon itself, ends up questioning its own authority (Dryzek, 1995) creating the danger of deteriorating into relativism. Nevertheless Habermas' critical approach provides a valuable tool for social science research by stressing that meaning is constructed intersubjectively rather than by an isolated single subject. This intersubjective approach is particularly valuable in the study of policy because it is in this public and political realm that group and individual interaction looms large (Dryzek, 1995). Institutional structures, mediation, public information, participation, and consent are all key components of the policymaking process and all are practices for developing intersubjective meaning. Critical Theory, therefore, is a useful tool for examining public policy because policy is, inherently, intersubjectively composed.

The investigation began with a thorough literature search surrounding the current knowledge of the relations of science, policy and society in broad social science and science literature databases. Because of the broad and interdisciplinary

nature of the work undertaken here, the systematic review structure (Oxman, 1987) was not used because the focus of the work was on literatures that crossed over disciplinary lines and brought together broad social science concepts rather than delineating discreet and clearly identifiable bodies of knowledge. The literature search entailed a search of cross-disciplinary electronic databases (including Social Sciences Index, Sociological Abstracts, General Science Index, Applied Science & Technology Index, PsychINFO, SocioFile and FirstSearch) using keywords: sociology of science, science and society, knowledge, policy, policymaking, policy sciences, risk, society, civil society and public. Literatures were reviewed to ascertain crossover themes emerging from the bodies of knowledge and intersubjective meanings were compared between the three approaches identified in the literatures surrounding science, policy and the public.

3.4. Findings

The investigation reported in this chapter uses a Critical Theory approach to examine the underlying meanings rooted in the scientific community, among policy makers and in the public realm. Environment and health issues are generally centered on relationships between scientists who gather evidence, policymakers who set standards and policies, and the public who both influence policy-setting and live with the consequences of policy decisions. Therefore a critical understanding of each group's constructed meanings forms the basis for interpreting the broad case study of Sun Safety.

3.4.1. Scientists, Scientific Knowledge and the Sociology of Science

Historically, research into the construction and use of knowledge in scientific communities has been conducted primarily by sociologists. They see science as an

innately social activity, asserting that scientific knowledge is a cultural product and that there are no fundamental differences between science and other forms of knowledge (Woolgar, 1988). Instead, sociologists argue that through historical circumstance science has developed into a large and powerful institution where it has acquired prestige and value, particularly in Western society. Through its accumulated status science has been able to set the standards and boundaries of what is and is not acceptable knowledge and practice (Woolgar, 1988).

This sociological view of science is constructivist in nature; scientific knowledge is seen as an intellectual system resulting from a wider social and cultural milieu. This knowledge construction is rationalist because it is generally conducted according to an accepted set of methodological rules. But those rules, and any other criteria used for judging the value of knowledge, are themselves socially constructed and granted credibility through social processes such as accepted practice, group research and peer review. In a never-ending feedback loop, social processes among scientists set the boundaries of acceptable practice (such as the hypothetico-deductive model or acceptable levels for statistical significance) while historically-accepted practices constrain future research questions by defining what is 'known' and the questions that can be asked. The "discovery" of ozone depletion by Rowland and Molina in 1973 provides a good example of this process.

As explained in Chapter Two, in December, 1973 Mario Molina, a postdoctoral researcher at University of California, Irvine, calculated that CFCs would percolate into the upper atmosphere and set off a chain reaction resulting in the eventual destruction of the earth's ozone layer. This theory, proposed by Molina and his supervisor Sherwood Rowland (Molina & Rowland, 1974) was initially met

with considerable opposition by atmospheric scientists, chemists, government agencies and business. Accepted scientific knowledge stated that CFCs were inert, had no immediate effect on human physiology, and were absorbed by the earth's system with little or no effect. Rowland and Molina's findings challenged the accepted boundaries of scientific knowledge about CFCs and their environmental effects. Until 1973, there was no scientific evidence to support the ozone depletion theory for one very simple reason: until Rowland and Molina, no one had asked the question "what happens to the CFCs once in the global system?"

Immediately following the disclosure of their findings, and for many years to come, Rowland and Molina came under considerable criticism for their work. They were attacked both personally and professionally (Litfin, 1994; Roan, 1989). Their findings challenged the status quo of scientific knowledge as well as the economic interests of major corporations (Roan, 1989). Their work was accused of being unscientific and speculative and, because it was theoretical in nature, ultimately impossible to prove (Dotto & Schiff, 1978). By stepping outside the bounds of acceptable knowledge, Rowland and Molina challenged the accepted construction of "facts" around the widespread use of CFCs in industry. Over the next two decades, however, their theory gained credibility (Jasanoff & Wynne, 1998). Through a process of peer review and validation by the wider scientific community, the theory of ozone depletion became, in Kuhn's (1974, 1962) terms, 'normal' science.

The Rowland and Molina example shows how the emergence of a particular scientific knowledge cannot be separated from the social context in which it is developed (Mulkay, 1979). Scientific knowledge is not produced in a social vacuum, but rather is influenced both by other scientists and the actions and cultures of non-

scientists. Science, therefore, is interdependent with its concurrent social, cultural, economic and political institutions. Scientific theories are not fixed but historically-situated entities (Barnes *et al.*, 1996) and evidence that challenges orthodox science is accepted only when both scientists and society at large are ready. Lakatos (1978, 1976) termed these advances "problemshifts" in the accumulation of scientific knowledge. Examples of the importance of social context can be found in major scientific debates such as the Darwinian debates over evolution (Gould, 1993, 1977) and in smaller scale studies of community constructions of illness such as Smith's (1981) example of the changing social construction of Black Lung disease in a coal-mining region. These exemplars show how legitimate science is historically contingent and socially constructed (Barnes *et al.*, 1996).

One danger in the constructivist view of science is the potential to deteriorate into relativism and reduce science to a consensus product of social and political processes (Phillips, 1995). Haack (1995) addresses this danger by arguing that science can and should hold some epistemological authority by nature of its use of evidence and warrant (defined, in this instance, as the assurance of truth of what is said). Haack argues that evidence can be strong or weak regardless of who is judging the case. Likewise some scientific claims can be true or false independently of what anyone believes. This epistemological authority does not negate the inclusion of a social dimension in science, nor does the social dimension make science illegitimate. Instead, the grounds for questioning science's epistemological authority comes from the unquestioning acceptance linking science and the manipulation of nature with the positive and uplifting vision of human progress, while denying the value influences that ground scientific inquiry (Golinski, 1998).

Nevertheless, the culturally- and historically-contingent nature of scientific knowledge is important for understanding the role of science and its cognitive authority in modern society (Barnes *et al.*, 1996). As Ravetz (1996, p. 409) points out, scientific knowledge is "the outcome of a lengthy process operating through history" wherein it served an ideological function as the central point in the struggle against dogma and superstition through to the early nineteenth century (and some might argue through to today). So tangible is the historical association between science and philosophy that Ravetz concludes that the scientific revolution of the 17th century, in particular, was as much a reformation in natural philosophy as it was a move towards natural science.

Inextricably linked to narratives of modernity, science has continued to be an integral part of human progress through the 19th and 20th centuries (Rouse, 1991). Through its goal of creating order out of disorder (Latour & Woolgar, 1979), science and scientists have been idealized as rational, objective and value-free (Salter, 1988). As Irwin & Wynne note, "science is unproblematically 'scientific' — it represents the *only* valid way of apprehending nature" (1996, p. 6, italics in original). Science has been so idealized and has so risen in esteem that it is now held in high regard in modern life (Chalmers, 1982). Existing institutions such as public bureaucracies, universities, and scientific communities — reinforced by policymakers dependent on scientific 'facts' for decision making — all act to defend, promote and reinforce the supremacy of scientific knowledge over other forms of knowledge (Barnes, 1974). Linder (1995) concludes that contemporary society tends to unquestionably accept the truth-value of scientifically grounded arguments.

The epistemological authority of science in modern society is derived from at least two important sources: its idealized role as a truth-generator, and its capture by and affiliation with dominant social forces. Science has authority because of its idealized role as an illuminator of reality, a slayer of falsehoods and a generator of truth. As mentioned, scientists are ideally rational and objective truth-seekers (Longino, 1990). This truth takes the form of accumulated evidence gathered through the scientific method of observation, hypothesis generation, testing, and acceptance or rejection — generally at the laboratory level (Jasanoff & Wynne, 1998). This sanctioned method (the hypothetico-deductive model) provides legitimacy that translates across the boundaries of scientific communities, forming a standard for evaluating knowledge both within and outside one's own community (Ravetz, 1996). Adherence to accepted scientific methods then becomes the benchmark for legitimizing evidence that supports existing knowledge and for dismissing evidence that conflicts with orthodox understandings. Certainty and uncertainty are conceptualized in a probabilistic manner and communicated as statistics and numbers — themselves metaphors for facts and certainty (Stone, 1997). Through this process, science's understanding of complex issues becomes compartmentalized with small groups of specialists gathering increasingly discreet sets of specific and limited knowledge. Ideally, the knowledge is disseminated and shared, and adds to the cumulative body of scientific knowledge (see Table 3.1 on page 69).

The type of modern science discussed here has a firm grounding in Kantian dualism (subject-object, nature-culture, science-society) and perpetuates the idealized versions of the objective researcher and the inherent truth-value of scientific knowledge (Jasanoff & Wynne, 1998; Irwin & Wynne, 1996). This entrenches the

polarization of two domains: that of 'facts' (either true or false) versus those of 'morals' or 'values' (which are good or bad) (Schwartz, 1986). The result is an important distinction between facts and values, suggesting that ideology has no place in the world of information or truth. Throughout the 19th and 20th centuries, this polarization of facts and values and the resulting authority granted to facts was an integral part of human progress characterized by the modernity project. It not only privileged scientific knowledge, but granted access to this knowledge only to dominant social forces, thus stabilizing existing hegemonic social relations (Longino, 1990). But this has begun to change as the professional discourse of science is accused of being elitist and inaccessible (Chock, 1995). Non-scientists' mistrust of science is on the rise (Ravetz, 1996) and science is being increasingly de-valued (Ehrlich & Ehrlich, 1996). As this vacuum of epistemological authority increases, the knowledges of other components of society are being granted increasing legitimacy. Examples of some of these other components will be discussed further in the following sections on knowledge construction in the public and among policymakers.

3.4.2. Policymakers and Policy Analysis

Traditional views of science, based in the modernity project, see the operation of science as outside the political world of policy and policymaking. Ideally, scientists are rational, logical and objective and policymakers are politically motivated, reactive and subjective (Garvin & Eyles, 1997). If science is the search for facts and truth, then policy is the struggle over ideas (Stone, 1997). This reinforces the idea that science and policy are separate domains with distinct and

very different forms of legitimization (Jasanoff & Wynne, 1998) and, therefore, different ways of producing and defining usable knowledge.

Policy analysis and policy analytic theories have a relatively short history as compared to science. There have been three major theoretical and practical shifts in policy analysis since its inception in post-war western industrialized nations (Throgmorton, 1991; Torgerson, 1986). The first, rational policymaking, refers to the orderly administration of objective knowledge. Commonly called the 'rational actor paradigm' (Jasanoff & Wynne, 1998; Pal 1992; Heclo, 1972) it is normative in nature and sees knowledge as superior to politics in the process of policy development. In this approach, problems are to be solved through the orderly administration of objective knowledge. This idealized approach abstracts knowledge from context and argues for public policy that bypasses spatial, temporal, and cultural differences and becomes universally applicable (Jasanoff & Wynne, 1998). It is programmatic in nature and trusts in the ability of science and technology to manage and control potential problems. Developed immediately following WWII, this first approach to policymaking was embedded with ideas of modernity and progress, underscored by the concept of linear, rational human activity (Heineman *et al.*, 1990). This approach would see the CFC debates of Rowland and Molina, for example, as a straightforward technological or scientific problem to be solved through the application of more, or better, science.

However, disillusion with this programmatic approach to policy grew in the 1960s with increasing recognition that most policy decisions were made in a social, political, economic and institutional context. This led to the development of a second approach to policy, descriptive in nature, linked to Lindblom's (1959) concept of

"muddling through" and proposing that power was more important than knowledge in the policy process. In this second characterization of policy, knowledge is acquired, adapted and applied in a highly political context. The decisions of policymakers are incremental and made based on an implicit institutional context (Lindblom, 1959). Policymakers, acting in self-interest, end up making a series of small, short-term and often short-sighted decisions that solve immediate problems but fail to address the long-term implications related to this decision-making.

Litfin's (1994) description of the ozone depletion debate provides an example of this second, politically- and institutionally-contextualized style of policy. Based on the advice of industry, policymakers reviewing Rowland and Molina's ozone depletion theories initially saw alternatives to CFCs as too expensive and therefore refused to consider alternatives or to ban CFCs. It was not until alternative chemicals were developed by industry and were readily available on the open market that policies on CFC reduction began to be implemented. In this example, policymakers considered the scientific evidence of ozone depletion in the context of feasible economic alternatives before translating the knowledge into action. Short-term decisions about what would or would not be banned were made based more on economic expediency than on the long-term environmental consequences identified by Rowland and Molina.

More recently, policy analysis has advocated a third approach (Throgmorton, 1991; Torgerson, 1986) that incorporates a diversity of views and has a more participatory nature. It suggests that neither knowledge nor politics must have superiority and that the specific reality of peoples and places must take prominence. Torgerson argues that policy analysis must be not only "knowledge *of* society, but also

a knowledge *in* society" (p. 40, italics in original). This approach is manifest in a more consultative approach to problem-solving including public participation in decision-making and increased responses to public concerns. The focus, therefore, is on purposive action, highlighting the applied nature of policymaking and policy analysis.

These changing 'faces' of policy analysis (Torgerson, 1986) each delineated a different role for knowledge in policy. In the first approach, knowledge is scientific and closely linked to traditional, idealized conceptions of truth seeking for objective facts. It is linked to rationality and modernism. In the second approach, knowledge is relative, partial and used to sanction the use (and, sometimes, abuse) of power. There is the inference that knowledge is a tool used by policymakers as the capricious means to a political end. In the third approach, knowledge is contextual and instrumental — knowledge is accepted as being partial and becomes one of many tools to validate socially-acceptable policy options rather than an immutable, extant truth or a pawn in a power struggle.

Policy analysis and policymaking in the 1990s continue to be struggles over ideas based on underlying values (Jasanoff & Wynne, 1998; Stone, 1997). For this reason, science plays a somewhat ironical role in policymaking (Miller & Rusnock, 1993). On the one hand scientific facts are the justification for considerable policy decisions. On the other hand, the uncertain nature of much scientific evidence means that scientists cannot provide concrete answers to policy questions.

Most policy issues are 'messes' — interrelated sets of problems defined differently by different groups of people (Dunn, 1981). These groups, or coalitions (Sabatier & Jenkins-Smith, 1993), adopt and adapt knowledge to satisfy personal, institutional and structural imperatives. The challenge of policy development,

implementation and analysis is to bring about some kind of consensus among the parties in intractable situations regarding the nature of the problem, how it is defined, and the subsequent solution (for, as Entman (1993) notes, how a problem is defined or 'framed' sets the boundaries for potential solutions).

Evidence and knowledge in policymaking are, therefore, tools for argument and persuasion. They are merely two of the many tools for policy interaction and negotiation. Their socially-constructed nature as *facts* and *truths* (Stone, 1997) means that they are laden with values resulting in the logical conclusion that policy is, inherently, a moral endeavor (Brandon, 1984). By choosing to use, refuse or discard evidence along with the use of persuasion and argument, values are imbued at all levels of policymaking (Majone, 1989).

By understanding and recognizing the explicit role of values in policymaking we begin to understand why policymaking cannot be evaluated according to the legitimizing criteria of the scientific community which has its own definitions of 'rational' and 'logical.' But policymaking does indeed have an internal, values-based logic and rationality (Stone, 1997). It is a negotiated process taking place in an area or 'policy space' that defines a set of relationships between individuals and institutions (Majone, 1989). These negotiated relationships facilitate the development of consensus and, subsequently, policy action. The consequence is action based on underlying values (Brandon, 1984).

Majone's (1989) concept of policy space shares similarities with Kuhn's matrix or paradigm (1962) in that each issue's policy space develops its own set of historical rules, values and judgments that become embedded in the issue and are increasingly difficult to alter or revise over time. In most cases, once a policy issue is

defined or framed in a particular manner, people and organizations operate within that frame to either reinforce the status quo or to rebel for change (Entman, 1993). Even those that contest the dominant explanation take part in reinforcing the frame via their struggle against it. By participating in the issue and accepting related knowledge and evidence, the consensus definition is granted legitimacy and its reconstruction perpetuated (Schmitt, 1985). The result of this process is a policy metanarrative — an agreed upon story or way of making sense of the issue (Roe, 1994) that gains prominence as all players in the debate sanction the negotiated consensus.[1]

The political nature of policy imports an understanding and use of knowledge quite different than that of scientific communities (see Table 3.1 on page 69). Because of the continually-changing nature of scientific evidence, policymakers must act based on the availability of what is recognized as knowledge and evidence. In most instances, policymakers and analysts deal with time-sensitive issues. Decisions must be made based on the best-available knowledge given expediency and the political, social, and economic ramifications of the policy decision. The example of the delay in banning CFCs until after an alternative chemical was available shows how decisions are influenced by social, economic, and political context. Likewise, many dermatologists and public health personnel continue to recommend the use of sunscreen for skin cancer protection, despite the lack of evidence supporting that claim. In these instances, policymakers were compelled to act so as to be seen as responding to the problem. When the evidence is evaluated, certainties and uncertainties are considered for specific context of the case. Complex

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1 A more detailed discussion of framing and narratives is presented in Chapter Four.

issues are reduced to a 'need-to-act' basis and evidence assumes a justificatory role. Policymakers look for evidence and information (usually supplied by support staff) to provide the basics necessary for a policymaker to make an informed decision. The resulting knowledge is contextual, instrumental and highly political. The confidence in the applicability of the solutions is understood to be context-specific and there is general understanding that policy decisions made in one context cannot and should not be applied, carte blanche, to different contexts.

This political nature of knowledge construction and use in policymaking differs considerably from the set of rules applied in scientific communities through accepted scientific practice. Not only is there a difference in how evidence and information is judged, there is a more broad definition of what constitutes evidence in policymaking. Social, cultural, economic and political contexts and implications bear equal or greater influence over what is defined as acceptable knowledge and whether or not action should be taken on that knowledge. The dualism that makes the distinction between subject-object and science-society begins to blur as science's authority is questioned and knowledge is replaced by action as the imperative of society's decision makers.

3.4.3. Public Perceptions of Science and Risk

How the public constructs and defines usable knowledge again differs from both scientists and policymakers (see Table 3.1 on page 69). However as in the science and policy realms, how the public interprets knowledge is deeply embedded in historical and cultural contexts (Jasanoff & Wynne, 1998; Powell & Leiss, 1997).

In environmental issues, the perception of risk is key to understanding public reactions to evidence, uncertainty and complexity.

Early concerns with environmental risk focused on natural hazards (White, 1994). Such externally-based dangers (Beck, 1992) have given way to rising concerns with technological hazards resulting from human activity in the form of industrial development (Cutter, 1993). With the end of the war in 1945 and the rise of the atomic age, there was increasing public concern over the hazardousness of society (Cutter, 1993). This came, in part, from the fundamental difference between technical and natural hazards. Unlike natural hazards, technical hazards are often beyond the senses of the lay individual. Technical hazards cannot always be seen, felt or tasted and therefore the public relies more on the scientific and policy communities for guidance (Cutter, 1993). Over time this has led to the development of a 'risk industry' whose sole function is the management of public concerns over technological uncertainty (Beck, 1992). This management entails three steps:

1) identifying the potential risk
2) evaluating the potential harm, and
3) managing the risk.

These three steps are firmly embedded in the rational actor paradigm and delineate a pathway whereby potential problems are assessed and evaluated by experts, the risk is determined through probabilistic assessment, and the concerns of a public are 'managed' through effective communication (Jaeger *et al.*, 1998).

An important part of such risk issues is the tension between the risk judgments of experts and lay persons (Powell & Leiss, 1997; Margolis, 1996; Shrader-Frechette, 1991). Where experts tend to evaluate risk according to

probabilities, lay evaluations of risk are more contextual and socially constructed in relation to personal, historical experiences (Jasanoff & Wynne, 1998; Margolis, 1996). Krimsky & Plough (1988) suggest that differences in risk perceptions between experts and laypersons exist because risk evaluations are made in different arenas. For experts, risk evaluation takes place in the 'technosphere' within a tradition of scientific rationality. By comparison lay evaluations emerge in the 'demosphere' bounded by definitions of democracy and cultural rationality. This lay, cultural rationality is experiential and historically-contingent but nevertheless has an internal rationality that has tended to be discounted by experts (Stone, 1997; Shrader-Frechette, 1991). Thus there are two competing models for interpreting risk information: technical and cultural. Lay and expert perceptions differ because laypersons place importance on the cultural models while experts tend to focus on the technical (Krimsky & Plough, 1988).

What results from these differences are expert charges of public scientific illiteracy confronting public charges of technical elitism and oppression (Shrader-Frechette, 1991). This has led, on the one hand, some environmental scientists to claim that science is not valued by the public because the public is scientifically illiterate (Ehrlich & Ehrlich, 1996) and that mistrust in science is due to an immature understanding of rational analysis (Ravetz, 1996). On the other hand, however, Jasanoff & Wynne (1998) argue that public ignorance is not simply a passive neglect of science. Rather, it is an active social construction used to deal with potentially dangerous, conflicting or uncertain knowledge. Michael (1996) provides an example of how sheep farmers actively maintained technical ignorance as a way of managing social relations both inside the local community and between researchers and subjects.

Because lay expertise was not recognized by the technical experts, farmers used ignorance as a tool to deny expert views without threatening the social hierarchy.

This view of ignorance as a deliberate choice counters the claim that the public's lack of scientific understanding is "widespread and regrettable" (Shrader-Frechette, 1991, p. 5). Instead, ignorance is a reflection of how the scientific knowledge and policy agendas that co-produce and frame risky issues fail to resonate with the public. Jasanoff & Wynne (1998) identify three additional bases (other than technical ignorance) on which the public may present a legitimate rejection of science: lack of trust, irrelevance, and different models of agency.

Trust is an important component of relations within a society (Fukuyama, 1995). The uptake of technical information is dependent upon the perceived trustworthiness, or credibility, of the source (Renn, 1992; Wynne, 1980). Historically-contingent relations between institutions, groups and social classes define the trustworthiness of the source. Wynne (1996) provides an example of how farmers mistrusted expert evaluations of risk following the Chernobyl nuclear accident for two reasons. First, experts were mistrusted as individuals because they had little knowledge of local farming practices. Second, experts were mistrusted because of their institutional affiliation with a government agency that had, historically, been in conflict with local farmers. Rational models of risk evaluation and communication take for granted that credibility is granted to expert views. However, "the basic framework of public responses depends largely upon the experience and perception of the trustworthiness of relevant institutions or social actors, not upon the understanding of technical information" (Jasanoff & Wynne, 1998, p. 40).

A second reason why the public may ignore scientific knowledge is because it appears irrelevant. Fischer (1986) argues that the public embraces a normative discourse with its own distinct type of reason, logic and purpose. In this discourse, quantitative evaluations of risk can be seen as unimportant in the face of social and cultural considerations. Historically, trust and credibility evolved in local spaces between experts and the lay public as problems developed within the local social context (Jasanoff & Wynne, 1998). However broad range environmental issues cut evidence loose from local, historical moorings and increase public distrust of both information sources and the related motivations for policy intervention. Unlike the rational actor paradigm of risk evaluation, the public definitions of relevancy and risk embody both technical interpretation and the norms of social relations.

A third reason for the public rejection of science is based on the models of human agency underpinning lay perceptions. Experts assume that the public has both the freedom and the power to act on available scientific evidence (Jasanoff & Wynne, 1998). However this is not necessarily true (Michael, 1992). In fact, some scientific knowledge can be socially dangerous as in the Michael (1996) example where sheepherders preferred ignorance because adopting the scientific knowledge would have led to social conflict in the community. Since members of the public might feel that there is little or no benefit (in fact, there may be a disbenefit) in taking it on, they may eschew the considerable costs involved in assimilating the information (Jasanoff & Wynne, 1998).

Through positive ignorance, lack of trust, perceived irrelevance and differing models of agency, the public can reject science on a number of grounds. This rejection is often interpreted by scientists and policymakers as the public's inability

to grasp the 'rational' and 'logical' models underpinning science's claims-making ability (Aronson, 1984). However in the public's view, "science is marked off as one necessary, but foreign, element in a complex process of knowledge production" (Michael, 1992, p. 321). In other words, the fact that public rankings of risk differ from those of experts (Jasanoff & Wynne, 1998; Shrader-Frechette, 1991) may simply reflect fundamental variances in how different groups (as in scientists versus public groups) value the inputs in the decision-making process. Science becomes just one of the many ways of viewing the problem and technical 'facts' can be deemed less important than the social, cultural, economic, and political considerations that form the overall picture.

This discussion of public understandings of science point out the fundamentally different ways that the public, as compared to the scientific community or policymakers, evaluates evidence and constructs usable knowledge. First, the public's access to evidence openly derives from both formal and non-formal sources. In addition to scientific assessments, the public gathers evidence from lay sources (such as oral histories) as well as from media sources. In some cases the public attaches greater credibility and trust to these lay sources than to scientific sources (Shrader-Frechette, 1991). While non-formal sources also play a part in information transfer among scientists, such 'non-scientific' processes are perceived by scientists as a lesser form of rationality and tend to be hidden from public view.

The evaluation of evidence by the public also entails a rationality that can differ from scientific rationality (see Table 3.1 on page 69). The public legitimizes supporting evidence by relating it to social and cultural realities — to a 'received

wisdom' that is embedded in social rationality rather than in the rational actor paradigm (Jaeger *et al.*, 1998). Likewise, conflicting evidence is dismissed on the basis of common sense and whether it resonates with the public's interconnected view of the world. In the public realm, conceptualizations of certainty and uncertainty are highly polarized: issues are either certain or uncertain. The understanding of complex issues is limited by circumstance and sources. The resulting knowledge is tacit, experiential and individual (Polanyi, 1964) and applied to local circumstances and the complex web of social relations.

For the public, science is "just one way of viewing the world, not the best, nor the only, just one" (Cutter, 1993, p. 10). Instead of being passive receivers of scientific evidence, members of the public "maneuver around science in a variety of trajectories" (Michael, 1992, p. 330) and employ a number of social and political interpretations of evidence that can either validate knowledge, dismiss it or create a new knowledge based on an individual's own perceptions and bounded reality. Thus, the public both defines the issues suitable for public action and also incorporates knowledge beyond that produced by the scientific community (Jasanoff & Wynne, 1998). The public is involved reflexively in helping to identify, call attention to, validate and dismiss knowledge and evidence as it resonates within a broad definition of social relevance.

The preceding discussion has characterized scientists, policymakers and the public in abstract, ideal views with neat and clear distinctions. This is, of course, a chimera. In reality, all groups generate facts; all groups tell stories; and all groups engage legitimate knowledge in a contextual manner. However the characterizations

of scientists, policymakers and the public do prove useful for illuminating epistemological distances between the groups.

As discussed earlier, science perpetuates the dualisms of subject-object and science-society as it tries to maintain its epistemological authority in the modern world. Policy, by comparison, blurs the dualistic distinctions revealing the social nature of decision-making wherein knowledge is replaced by action. The public, by contrast, conflates the dualisms. Subjects and objects are interconnected parts of public life; scientific knowledge and evidence become one more input into a broad definition of 'what matters.'

3.4.4. Summary of Findings

Table 3.1 presents a summary of the discussion on knowledge and evidence in the scientific community, among policymakers and in the public arena. This table is not meant to be a conclusive definition of the use of knowledge and evidence in the three groups. Rather, it is a guidepost for identifying some of the epistemological distances between scientists, policymakers and the public.

As the table shows, the three groups not only have different (though sometimes overlapping) sources for their information, but there are also visible disparities in each group's criteria for legitimizing supporting evidence and dismissing conflicting evidence. These begin to shed light on how a single environmental issue can be interpreted as a different problem by different groups — they each use evidence with slightly different legitimating criteria within their own realm. When that legitimating criteria is applied to other realms, the conflict between the groups emerges.

TABLE 3.1
The Use of Knowledge and Evidence among Scientists, Policymakers and the Public.

	Scientists	Policymakers	Public
Origin of Evidence	Scientific Studies	Availability	Popular Sources
Legitimization of Supporting Evidence	Adherence to Scientific Method	Political, Social & Economic implications	Received Wisdom
Dismissal of Conflicting Evidence	Adherence to Scientific Method	Expediency	"Common Sense"
Conceptualization of Certainty & Uncertainty	Probabilistic	Context-specific	Polarized (certain or uncertain)
Understanding of Complex Issues	Compartmental	"Need to know"	Limited by sources
Resulting Knowledge	Specific & Limited	Political, Contextual & Instrumental	Tacit, Experiential & Individual
What is done with the Knowledge	Added to cumulative body of knowledge	Applied to current situation and context only	Added to body of personal experience
Rationality	Scientific	Political	Social

The three groups also display considerable differences in how they conceptualize certainty and uncertainty, as well as in their way of understanding complex issues. Scientists appear to follow the rational actor model, using probability to operationalize uncertainty and compartmentalization to deal with complexity. By contrast, policymakers seem to adopt a more political model based on context and evaluating complex issues on a need-to-know basis, weighing it

against the more 'objective' knowledge provided by science. The public's conceptualization of uncertainty seems more straightforward than the others, seeing issues in a polarized certain-uncertain manner. This is due, in part, to the public's conceptualization of science as one component in the social, cultural, economic and political context.

All of the above differences play out in the type of knowledge that results, and how that knowledge is applied. Due to its compartmentalized nature, scientific knowledge is specific and limited, and it is used to add to the greater body of understanding (cumulative knowledge). Policymakers' knowledge is contextual and instrumental; it is applied to the current context only. The public's knowledge, by contrast, is tacit, experiential and individual. It is added to the body of personal experience to help revise and reformulate how individuals and groups understand their particular worlds.

Finally, these modes of evidence evaluation and knowledge use can be summarized by the forms of rationality embraced by the three groups. Scientists, based on a history of subject-object distinction, adopt the scientific rationality that is often considered to be the norm of objective knowledge in the modern world (Shrader-Frechette, 1991). Policymakers, operating in the messy arena bridging science and public life, embrace a political rationality that blurs the subject-object distinction (Stone, 1997). The public, by contrast, embraces subjectivity in a social rationality that places all knowledge and choices in the social realm (Rayner & Malone, 1998).

3.5 Discussion

Traditional models of policymaking define the role of science as the truth-seeker and the creator of objective knowledge (Yanow, 1996; Heineman *et al.*, 1990) and role of policymakers as political actors in the manipulation of power (Stone, 1997; Majone, 1989). However this model of "speaking truth to power" (Wildavsky, 1987) makes at least four important assumptions. First, it assumes an uncomplicated and linear flow of facts and ideas from scientists to policymakers and then to the public (Yanow, 1996). Second, this model infers differential power among the players. The knowledge producers (scientists) employ considerable power in the agenda-setting arena; the knowledge users (policymakers) exercise less power as the transmitters and applicators of information; and the knowledge receivers (the public) are powerless and passive recipients (Yanow, 1996; Boggs, 1992). Third, this model assumes that each group acts in conjunction with its archetypal role and that practice reflects the ideal. Such an assumption seldom holds up in the real world of policymaking (Yanow, 1996). Finally, this model of policymaking privileges knowledge and evidence and assumes that it has primary influence on the decision-making process. Once more, this assumption is not always true (for a discussion of this, see Majone, 1989).

Reality is, in fact, much more complicated. Over the past several decades, the enlightenment vision of 'truth' has been increasingly questioned by the public. That enlightenment vision sees the steady accumulation of scientific knowledge as the best and most viable means for understanding (and therefore controlling) the natural world. Such a vision has been linked to industrial development and concepts of modernity over the past century (Beck, 1992). As discussed earlier in this chapter,

this view holds scientific rationality as the benchmark against which all knowledge must be judged and assumes that society as a whole shares the scientific definition of 'truth' and rationality. Thus, there are specific roles for each group in the recognition and selection of problems as well as in the delineation of possible solutions. Science identifies and outlines problems to be solved, policymakers choose from the alternatives, and the public is presented a solution. This model implicitly assumes that all groups have similar interests and definitions of what is in the public interest. It also assumes that all voices involved in the debates operate in naked self-interest and that they share an overarching definition of scientific rationality.

However the Table 3.1 on page 69 shows that while such shared definitions *can* exist between scientists, policymakers and the public, they do not necessarily *always* exist. In fact, policymakers and the public have forms of rationality quite different from scientists, including their own specific, albeit legitimate, versions of evidence and knowledge. In a circular and cumulative manner, these different forms of rationality have begun to encroach on the hegemonic power of scientific rationality in modern society. This is due, in part, to the increasingly complex and uncertain nature of problems in late-modern, industrial society (Beck, 1992). Such complexity and uncertainty means that science becomes one of many ways (instead of *the* way) of understanding the world. Science itself, and its operation, become open to questioning and its hegemony is undermined.

One useful way of understanding science's hegemony is through an evaluation of ideology and its role in the exercise of power in society. In *The Power of Ideology and the Ideology of Power*, Therborn (1980s) discusses "the operation of ideology in the organization, maintenance and transformation of power in society"

(1980, p. 1). He defines ideology very broadly as the medium through which human beings live as conscious actors and give meaning to their world. By this definition, ideology includes everything from simple everyday ideas to broad intellectual concepts or doctrines. Therborn goes on to state that science, like art, history or law, is another reflection of ideology. He notes that,

> "the constitution of a particular discourse called science means neither that its practice is or will remain immune from the subjectivity of its practitioners, nor that it is incapable of affecting the subjectivity of the members of society, of functioning as ideology" (1980, p. 3).

In this definition, Therborn recognizes science as one of the many discourses that reflect and reshape ideology as well as itself being influenced by the ideology of the society in which it is embedded. This view of science as linked to ideology sheds new light on the recognition by some that science is becoming increasingly shaped by society's preferences. This new type of science, simultaneously called "mandated science" (Salter, 1988), "trans-science" (Harrison & Hoburg, 1994), or "science-in-particular" (Michael, 1992) refers to the process whereby social actors define problems for which science should seek the appropriate solution from a limited set of feasible options. According to Litfin (1994), the negotiations surrounding the signing of the Montreal Protocol on Ozone Depleting Substances in 1989 are a clear example of mandated science in practice. While scientists were responsible for identifying ozone depletion, it was social, political and economic constraints that pointed the research direction for solutions in the form of alternatives to CFCs. Likewise, the potential for increased rates of skin cancer has meant an increased drive to understand the biological bases behind the disease and a growing public health effort to reduce UV exposure. This new, revised and contextual role for science clearly

embeds it in the mutual construction and re-construction of science in society (Shackley *et al.*, 1996).

Ideology, according to Therborn, operates as an interpellator of humans as subjects in the social and physical world through a process he calls subjection and qualification. Therborn provides the following explanation:

> "The amorphous libido and manifold potentialities of human infants are subjected to a particular order that allows or favors certain drives and capacities, and prohibits or disfavors others. At the same time, through the same process, new members become qualified to take up and perform (a particular part of) the repertoire of roles given in the society into which they are born, including the role of possible agents of social change... Although qualified by ideological interpellations, subjects also become qualified to 'qualify' these in return, in the sense of specifying them and modifying their range of application." (Therborn, 1980, p. 17)

Thus the reproduction of social organization involves a necessary fit between subjection and qualification. Ideologies both subject and qualify individuals and groups by concurrently telling them, relating them back to, and making them recognize *what exists*, *what is good*, and *what is possible*.

By helping define *what exists*, ideologies also define the corollary: what does not exist. Ideology defines who we are and what the world is like (including nature, society, men, women and so on). By defining what exists (and does not exist), ideology helps individuals develop identity in relation to the outside world and sheds spotlights, or highlights, on some parts of the world, while hiding other parts of the world in darkness or shadows. In the context of this case study, ideology has been crucial in the growing acceptance of skin cancer and ozone depletion as 'real' problems. While dissenting voices continue to express themselves, there now exists a strong consensus that ozone depletion *exists* and therefore requires seeks a solution.

Likewise, where it was once just another form of cancer, skin cancer has recently become a major public health problem and raised to the status of 'epidemic' (Glass & Hoover, 1989).

By helping to define *what is good*, ideologies structure and make normal our desires. What is good also includes what is right, just, enjoyable, attractive, beautiful, necessary, and so on. Again, the definition of what is good also defines its opposite — what is not good. Once more, in the context of the case study, *what is good* is socially-situated within the broad context of environmentalism and individual moral behavior. Nature is good; nature is beautiful; nature is necessary; therefore nature (or the 'natural' state of the atmosphere) must be maintained. It must be noted that debates over ozone depletion seldom involve a denial of the inherent 'goodness' of the natural environment, rather they circulate around differing definitions of what constitutes the natural state of the atmosphere. In the public health arena, *what is good*, has been defined as individual moral responsibility for protective behavior (Garvin & Eyles, 1997).

Ideologies also help define *what is possible* by helping us understand our place in our world, the patterning of that world and how we might change it. Through seeing *what is possible*, individuals and groups give shape to their hopes, ambitions and fears. More practically, ideology defines *what is possible* through the mitigation and adaptation strategies considered feasible by society as it is presently constituted. In other words, we actually can and often do change the outcomes based on how the problem is defined. In the context of ozone depletion (and, to a similar extent, public health messages surrounding skin cancer), *what is possible* is a reversal of a detrimental process. This takes the form of redemption, whereby past

bad actions and their dangerous outcomes can be ameliorated through present and future choices and actions.[2]

Through the relating and reinforcing of *what exists, what is good,* and *what is possible,* ideology subjects individuals and groups to a set of values and a historical context. Concurrently, individuals and groups qualify the ideology according to what they see happening in their world. Rein (1983) states that there are many situations where 'facts' and 'values' conflict. In these situations, there are three options: 1) to accept the fact and question the values, 2) to challenge the fact, or 3) to alter the value to incorporate the fact. As shown in Chapter Two, this process of conflict between facts and values, and the concurrent ideological process of subjection-qualification, is clearly apparent in the early debates over Rowland & Molina's ozone depletion theories. This process also appears to be in operation surrounding skin cancer and Sun Safety where, in a situation lacking physical and scientific evidence, values based on individual behavior and public health personnel acting to protect the public are motivating the development of prevention messages.

Ideology, as it operates through this process of subjection-qualification, is therefore no simple possession. Rather it is a complex social process both structuring and itself being restructured by human actors. It is historically, socially and materially determined while still being reproduced through human agency. For this reason, the three modes of ideological interpellation have temporal and spatial components. What exists can include what has existed, where the present is seen as part of a historical process. What is possible can be either what currently exists or

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2 For a discussion of the moral and redemptive issues involved in ozone depletion and skin cancer, see Garvin & Eyles, 1997.

what is potential or conceivable. What is good and right can change from now to then. And all three can have different meanings everywhere, somewhere, here, elsewhere, now or then. Ideology, according to Therborn, therefore plays a key role in the organization, maintenance and transformation of power in society through the subjection-qualification of human actors via the reflexive constitution of *what exists*, *what is good*, and *what is possible*.

The defense of a given order or structure to society is found in the intertwining of Therborn's three modes of ideological interpellation. Over the past century, that given order has been based on the hegemonic role of science. Science has been the key form of legitimizing *what exists* (via evidence), *what is good* (human control over nature) and, subsequently, *what is possible* (rational action). This conception is equivalent to Habermas' notion of *empirical-analytical* sciences. And, as Habermas has noted (1978), this form of knowledge does, and should, provide only a partial knowledge. Over time, there has been an increasingly explicit effect of *historical-hermeneutic* sciences as manifest in the increasing influences of policymakers and the public in problem identification, definition and solution. It is this increasing influence of Habermas' *historical-hermeneutic* sciences and the associated interpretive meanings in everyday discourse that have begun to undermine the hegemony of science's technical interpretation of society and its problems.

It must be remembered, however, that the power exercised through hegemony is not one-sided. Gramsci reminds us that hegemonic domination seldom takes place without consent (Adamson, 1980). The constant tension and struggle over competing ideologies, according to Gramsci, is really a hegemonic struggle over ideas. While science has recently had the power to define the problems of

society, other components in society have equally granted that power and, at least at a very basic level, acquiesced to scientific hegemony. Both policymakers and the public took part in the granting of cognitive authority to science in modern society through ideologically-based, unquestioned acceptance of the truth value of scientific arguments as 'facts.' Through the subjection-qualification process (Therborn, 1980), the epistemological authority of science was both asserted and granted. Once established, science and scientists came to represent a particular social group seeking to maintain and perpetuate hegemonic influence over society (for a discussion of Gramsci's ideas about how social groups perpetuate hegemonic influence, see Adamson, 1980). One important conduit of this hegemony has been international epistemic communities (discussed in greater detail in Chapter Four).

However hegemonic influence depends upon shared ideology, and ideology is subject to constant flux. As ideology changes over time and space, what exists, is good and is possible is constantly shifting (Therborn, 1980). These changes are manifest in subtle alterations in what society values. The increasingly uncertain nature of many problems (particularly environmental ones), means that science is decreasingly able to provide concrete solutions to complex problems (Tesh, 1993). In a perpetual process of feedback loops, science begins to lose some of its epistemological authority by failing to provide concrete and valued solutions to problems. Lack of trust in science (and its claims-making ability) increases and both policymakers and the public turn to alternative forms of knowledge and evidence for ways to make sense of the world. In an attempt to reassert its authority, some scientists attempt to provide more simple and more certain answers. When those

answers prove to be oversimplified or inaccurate (as often happens in environmental problems), lack of trust in science increases and the cycle perpetuates itself.

3.6 Conclusions

The idealized roles of scientists as rational, policymakers as political and the public as capricious present oversimplified versions of reality. The findings of this nested investigation, as presented in Section 3.4, show that these groups do validate evidence and utilize knowledge in somewhat different ways, based on alternative definitions of rationality. That rationality is, necessarily, ideologically-based. However this does not negate the opportunity for scientists to behave politically or in response to social context. Neither does it preclude the public from being rational and political; nor policymakers from being rational and socially-motivated. However the mutual construction and co-construction of these groups means that they themselves use such caricatures and idealized definitions to set themselves off against one another. In that historically-grounded process, science has traditionally been granted the hegemonic power to define society's problems and guide its potential solutions. But as ideology changes over time and across space, the hegemonic power of science, linked to the abstract concept of modernity, has begun to weaken and there is an increased questioning of science's ability to solve complex problems.

This chapter has provided a discussion of the nature of the epistemological distances between scientists, policymakers and public, and presented an explanation of those differences in the context of use of evidence, definitions of knowledge and rationality, and the role of ideology in society. The next chapters (Chapters Four and

Five) present two substantive examples of the operation of knowledge, evidence and rationality as nested investigations in the Sun Safety case study. Chapter Four examines national differences in Sun Safety (skin cancer prevention) programs in Australia, Canada and England, and represents the intersection between science and policy. Chapter Five subsequently examines local Sun Safety program implementation in Ontario, Canada and represents the intersection between policy and the public.

CHAPTER FOUR: INTERNATIONAL INVESTIGATION
Between Science and Policy:
Sun Safety in Australia, Canada and England[1]

4.1. Introduction

Within the case study of ozone depletion and skin cancer, Chapter Two provided a policy reconstruction of the issues surrounding this environmental health issue. Chapter Three presented the first nested investigation in the study: a theoretical examination of the use of knowledge and evidence amongst scientists, policymakers and the public. It concluded that ideology plays a critical role in defining knowledge and information. This chapter, Chapter Four, moves the case study from critical analysis (or theory) to a substantive example of how the theoretical issues presented earlier play out in practice. This chapter presents the second nested investigation as a substantive example of how international evidence regarding ozone depletion and skin cancer gets translated and transformed into Sun Safety policies in different countries. The discussion begins with an introduction of the tools used throughout the investigation: epistemic communities, framing and narratives. The chapter then moves to a brief explanation of the methods used in this nested investigation, followed by the presentation of the findings. The chapter ends with a discussion explaining the framing and narratives comprising Sun Safety

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1 Portions of this chapter are revised from T. Garvin, 1998. The framing of skin cancer and ozone depletion in Australia, Canada and England. *Environmental Health or Healthy Environments: A Policy Paper*. Working Paper Series 11. McMaster Institute of Environment and Health, McMaster University: Hamilton, Ont. pp. 14-30.

programs in Australia, Canada and England and the role of ideology in the interpretation of information by international experts and by national policymakers.

4.2. Background

The study of national differences in Sun Safety policies entails an examination of how the body of internationally accepted information regarding skin cancer gets adopted and adapted in specific national contexts. The following discussion provides background information on three related analytic concepts. The first, epistemic communities, examines how groups of scientists at the international level are capable of influencing the policymaking process — particularly in situations of considerable uncertainty. The remaining concepts, framing and narratives, are valuable tools for understanding how a single body of international information can evolve into national policies with considerable differences.

4.2.1. Epistemic Communities

The concept of epistemic communities was first introduced to explain how information gets translated into policy action in complex international environmental problems (for an example, see Haas, 1989). Defined as a network of experts with an authoritative claim to policy-relevant knowledge (Haas, 1992a) and competence in a given area, an epistemic community generates consensual knowledge around uncertain issues (Hannigan, 1995; Haas, 1992a), making such issues amenable to policy intervention. Specifically, an epistemic community can be defined by the following four characteristics (from Jasanoff & Wynne, 1998, p. 51):

- shared normative and principled beliefs providing a values-based rationale for the community's proposed social actions

- shared causal beliefs, including professional judgments linking causal explanations to possible policy actions
- shared notions of validity including intersubjective, internally defined criteria for establishing valid knowledge
- a shared policy endeavor based on a commonly recognized set of problems to be solved.

By this definition, an epistemic community is a group of experts held together by common technical expertise but, more importantly, by a shared set of principled (values) and causal (explanatory) beliefs. Though an epistemic community need not, by definition, be composed entirely of scientists, the very nature of shared causal beliefs and the shared experience of technical training means that most epistemic communities consist primarily of experts with scientific backgrounds (Hannigan, 1995; Haas, 1992a). The power and influence of an epistemic community comes via its ability to wield knowledge for policymaking in a situation where information is, or appears to be, at a premium.

Over the past decade the term epistemic community has referred to a spectrum of groups. At its most broad definition, it has been used to refer to people with a shared faith in the scientific method (Holzner & Marx, 1979). More narrowly, it can be aligned with Fleck's (1975) concept of a "thought-collective" and Kuhn's (1962) notion of a paradigm or a community sharing "an entire constellation of beliefs, values, techniques and so on." However broadly or narrowly they are defined, epistemic communities are characterized by their value orientations and by the way that they promote their own normative or policy commitments (Jasanoff & Wynne, 1998). This sharing of causal as well as normative beliefs sets epistemic

communities apart from mere interest groups and political organizations (Litfin, 1994).

Traditional policymaking literature sees international agreements as the outcome of negotiations between state powers, each operating in its own interest (Litfin, 1994). But in uncertain situations, knowledge can be at a premium; it becomes a strategic resource as politicians seek out authoritative advice on which to base policy choices (Hannigan, 1995; Haas, 1992b). In short, issues with great uncertainty generate a need for information. As a problem grows in scope and visibility, the public increasingly calls for action. State actors, lacking information, turn to scientists. In response to the call, scientists or other experts with specific policy-relevant data (such as epistemic communities) provide information that meshes with their own expert values and agendas to guide the policy process to a preferred end. State actors and policymakers gain credibility through the authority provided by the scientists and the scientists gain policy influence by exercising their authoritative claim to policy-relevant knowledge. The concept of the epistemic community is particularly useful in capturing this complex and inter-related connection that evolves over time between scientists and policymakers (Hannigan, 1995).

This is not to assume that the adoption of information from an epistemic community is always straightforward and unproblematic. There are many options for the uptake of scientific information into the policy process and the power and influence of an epistemic community can be circumscribed by any number of contextual factors (Litfin, 1994). For example, scientists can be ignored by the policymakers or policymakers can co-opt scientific information for political ends; the

voices and concerns of the scientists simply may not be heard over the more prominent, extraneous (often political) variables in the issue; or scientists can simply refuse to explicitly address the policy implications of their research and therefore make their own information appear irrelevant. So rather than seeing an epistemic community as *the* influence in a policy situation, it should instead be viewed as one of the many actors capable of being influential.

Nevertheless, the potential power and influence of the epistemic community is considerable (Haas, 1992a). Chapter Three discussed the historically-defined authority granted to science in modern society. Epistemic communities tap into that authority via their expertise, using their specialized knowledge to impel policy movement in directions synchronous with their own values by providing estimates and measurements of a problem in the absence of certitude. Such quantification has the appearance of objectivity but is, essentially, itself value based. First, quantification makes the problem more amenable to change by making it 'understandable.' It provides credibility through the application of numbers even though, as Stone (1997, 1988) reminds us, specifying numbers is itself a political act. Second, quantification accords the epistemic community the ability to define the problem and identify actions to solve it.

The process of identifying the potential health effects of ozone depletion is an example of such a process. Chapter Two explains that the international Sun Safety community predicts that there will be an average 1-2% increase in skin cancer rates with every 1% decrease in stratospheric ozone (Urbach, 1997; van der Leun *et al.*, 1995). Despite the considerable uncertainties explained in Chapter Two, these numbers move the discussion from uncertainty and ambiguity, implying an inability

to act on the issue, into that of greater certainty, not just allowing action, but requiring it. In Therborn's terms, the link between skin cancer and Sun Safety is defined as *what exists*. By linking the environmental problem to an emotional health effect such as skin cancer (rather than cataracts or immune system dysfunction) ozone depletion, it is defining *what is good* — action to solve the problem. Concurrently, *what is possible* is defined by the proposed action: international consensus on reducing ozone depletion. This all takes place despite considerable evidence suggesting that the skin cancer effects of ozone depletion will not be seen for decades and may possibly be ameliorated by changes in behavior and social practices (Armstrong & Kricker, 1994). In this way, a core group of international experts is capable of defining the problem in such a way that the only feasible solution is one that corresponds to their own values (or, in Therborn's terms, ideology). In effect, the epistemic community applies its knowledge to define the policymaking which is, primarily, a moral endeavor (Brandon, 1984).

There are a number of critiques of the epistemic community concept, primarily that it does not explore the exercise of power in policymaking (Litfin, 1994). By divorcing knowledge from the power that gets exercised through it, the epistemic communities approach is eventually reduced to a theory of agency where knowledge-based experts exercise their power solely through their possession of and access to information (Litfin, 1994). By ignoring the role of power, the approach becomes a normative description of the rational, policymaking paradigm.

A second critique suggests that the concept of *episteme* is far more important than epistemic communities (Edwards, 1996). Epistemes are deeply held cultural beliefs that are widely shared by and generally unquestioned in society. As part of a

historical era, epistemes are responsible for defining the patterns of international behavior and epistemic communities are merely reflections of the more important, historically-contingent episteme. More important than the epistemic communities themselves may be the social and cultural commitments and conditions that encourage the coalescing or cohering of these groups and allow these groups to influence political actors (Jasanoff, 1996). As discussed in Chapter Two, the hegemony and power of an epistemic community is not one sided. As with science on a much broader level, the power of an epistemic community comes from the power and legitimacy granted to it by the remainder of society.

A final critique suggests that epistemic communities actually entail considerable epistemic dissension that gets glossed over for instrumental reasons. Differences do exist in the epistemic community, but they are hidden from view (Litfin, 1994). Since the modern liberal state is wholly dependent on politicians using science and scientists to secure public assent for governmental authority (Ezrahi, 1990), the epistemic community is merely a way of portraying consensus in conditions of scientific uncertainty. Science, then, gets drawn into the public's desire for political action and the democratic state's need for legitimization (Habermas, 1978). This results, in practice, in science getting drawn into political debates where it is used to articulate and justify existing interests and conflicts (Litfin, 1994).

Despite its shortcomings, the concept of epistemic communities remains useful when exploring the incorporation of knowledge in situations of uncertainty. The focus on shared causal and principled beliefs, coupled with common notions of validity and common definitions of policy problems, helps to delineate how groups of scientists with different areas of expertise can find common ground in defining

and solving policy problems. Though the epistemic community approach leaves the role of power untheorized, it does explicate how specific groups with policy-relevant knowledge can be effective levers in the agenda-setting and policy coordination process (Jasanoff & Wynne, 1998).

4.2.2. Framing & Narratives

The epistemic community approach has primarily been applied to the international context; however epistemic communities operate at levels other than the international community by providing the evidence around which state and local actors define and evaluate policy options. This process of defining and evaluating is referred to as 'framing.' Framing, credited to the work of Erving Goffman (1974), is an interpretive process used to define a problem, diagnose the cause(s), make a moral judgment on the issue, and suggest potential remedies (Entman, 1993). It is an "interpretive schema that people use in social situations to answer questions such as 'what is going on here?' or 'what is appropriate for me to do here?'" (Martin, 1997; p. 467). As a way of understanding social reality (Goffman, 1974), framing is itself a reflection of Therborn's (1980) notion of ideology as framing is the process through which individuals and groups make explicit their tacit definitions of *what exists*, *what is good* and *what is possible*.

When first introduced, Goffman's framing theory came under criticism because it identified frames as being extant, immutable, and a priori, suggesting that once an issue was framed in a particular way it became impermeable to change (Schmitt, 1985). However studies of both individuals (Kahneman & Tversky, 1984) and institutions (Sabatier & Jenkins-Smith, 1993) show that both people and groups

change the way they interpret issues across space and over time. Because individuals and organizations negotiate multiple realities that are layered upon one another (Schmitt, 1985; Gandy *et al.*, 1997; Mazey & Richardson, 1997) an issue can be framed differently in different places, and issues can be changed or re-framed over time (Schon & Rein, 1994) based upon context.

All issues have some kind of history. Even for supposedly new issues, similar cases or other precedents provide a history for defining how the issue should be framed. Traditional understandings of belief change and persuasion (as discussed in Majone, 1989) argue that change on an issue comes about primarily through the addition of new information. But framing can change perceptions of issues not only through new information, but also by revising the ways that existing information is *weighted* in the consideration of an issue (Entman, 1993). Different aspects of a single issue can be weighted differently depending upon a national or local context, explaining how and why similar issues appear differently in particular places. This concept of weighting is particularly important in understanding the framing of Sun Safety programs in Australia, Canada and England, as will be discussed in more detail later in this chapter.

Entman (1993) provides four specific functions of issue framing: defining problems, diagnosing causes, making moral judgments, and suggesting remedies. To do this, framing works through the communication process by defining both the salience and selection of information. Information is made more salient in a number of ways from simple placement or repetition of information to association with culturally relevant or familiar symbols (Entman, 1993). Selection of information is equally important because it can either divert away or call attention to specific

aspects of an issue. As Entman notes, "most frames are defined by what they omit as well as include, and the omissions of potential problem definitions, explanations, evaluations and recommendations may be as critical as the inclusions in guiding the audience" (1993; p. 54).

In most cases once an issue is framed in a certain manner, people and organizations operate within that frame to either reinforce the status quo or work for change. By participating in a frame, people grant it legitimacy and help perpetuate its reconstruction (Schmitt, 1985). Therefore framing effects are based on more than just the new information presented on an issue. Instead, "frames operate by activating information *already at the recipients' disposal,* stored in long-term memory" (Nelson *et al.*, 1997; p. 225 italics in original). When new information is received, it enters an existing context; new information is layered upon existing realities and past framing of information and related issues. Framing, therefore, can be seen as a way of encoding information reflecting a struggle between various values and beliefs in a manner similar to the rhetoric of claims-making (Hannigan, 1995; Aronson, 1984).

In diagnosing, evaluating and prescribing action on an issue, frames have four specific locations in the communication process: the communicator, the text, the receiver and the culture (Entman, 1993). An issue is continually and constantly framed and re-framed in all four locations through debates around causation, evaluation and solution (Entman, 1993). *Communicators* in this process decide what to say about an issue guided by underlying belief systems (both their own and society's). The *Text* is the manifest messages containing keywords, images, and other thematic reinforcements of specific facts or judgments. The *Receiver's* thinking

is guided by social context and may or may not reflect the thinking of the communicator or the text. Finally, the *Culture* is the stock of commonly-invoked words and images that reflect the common discourse or thinking of a group (Entman, 1993). Through these four locations, frames are communicated, reflected and reinforced around any particular issue.

A number of devices have been identified in framing. Gamson and Modigliani (1989) delineate five rhetorical devices: metaphors, exemplars, catchphrases, depictions and visual images. These correspond to Stone's (1997) discussion of the use of symbols in framing policy issues wherein stories, synecdoches, metaphors and ambiguity are critical for representing complex issues. Both discussions center on symbolic representation in the framing of issues and how unspoken, shared explanations of how the world work are powerful tools both located within and used by participants in the framing process. For many, the use of metaphors is particularly important in calling on embedded societal myths and stereotypes (Stone, 1997; Lakoff & Johnson, 1980) and are critical flags in identifying stories or narratives (Coffey & Atkinson, 1996).

Frames, as they develop over time, turn into storylines (Gamson & Wolfsfeld, 1993) or narratives (Roe, 1994). As reflected in contested frames, different players in an issue develop different ways of explaining or making sense of an issue. Over time, the various parties interact and a problem becomes stabilized as the parties eventually accede to an evolving dominant story or explanation (Roe, 1994). While this appears straightforward, it can be (and often is) a conflictual process culminating in a metanarrative, or shared drama, explaining how the world works (Lipschutz, 1996).

According to Stone (1997), problems are usually structured as narratives: they have a beginning, a middle, and an end; they have heroes, villains and victims; they incorporate some kind of change or transformation. Roe (1994) takes the definition further by explaining narratives as having many forms. As *stories*, they can be scenarios with a beginning, middle and end (similar to Stone's (1997) definition above) or arguments with premises and conclusions. A narrative that runs counter to the issue's dominant story is called a *counterstory*, while a narrative that does not adhere to the above requirements (such as a circular argument) is a *nonstory*. Finally, Roe (1994) identifies the *metanarrative* as an agreed-upon way of making sense of an issue that makes it amenable to change or policy intervention. In some issues, Roe states, the interests and values of the various parties are so polarized that there is no middle ground, thus no hope for compromise. In such cases the best option may be to abandon the search for a consensus and, instead, recast the polarization into a new story (a metanarrative) that is acceptable to all parties and makes the issue more amenable to intervention. Through the development of the metanarrative, complexity, polarization and uncertainty are reduced (Roe, 1994).

An example of how this has been done in Sun Safety is the way in which skin cancer has been cast as a problem of individual exposure in most countries. As was discussed in Chapter Two, most public health programs try to reduce skin cancer risk through education campaigns telling individuals to protect themselves from the sun despite considerable complexity regarding skin cancer causes and considerable uncertainty and polarization about what might actually prevent skin cancer. Nevertheless there is a strong metanarrative that education programs targeted at changing individual behavior not only work, but will result in long term reduction in

skin cancer rates (for a discussion of these pubic health issues in the Canadian context, see Wilson *et al.*, 1999).

4.2.3. Summary

There are many influences on the policymaking process. In conditions of uncertainty, epistemic communities play an important role in providing authoritative information to decision makers and, thus, are capable of influencing the nature of the policy outcomes. However epistemic communities are not the only, nor necessarily the most important, influence. National differences in Sun Safety programs reflect the effect of social, political and economic context on information uptake. This process, called framing, results in different explanations, or metanarratives, at the various national levels. The remainder of this chapter provides a nested investigation of this process. The following section explains the methods used for the investigation. The remainder of the chapter presents the findings and discusses those findings in the context of epistemic communities, framing and metanarratives.

4.3. Methods

This international investigation, nested within the larger case study of ozone depletion and skin cancer, examines how scientific information has been translated and transformed into health policy in three countries: Australia, Canada and England. Located at the intersection of science and policy, the primary mode of data collection for this nested investigation was expert interviews (n=15) supported by a review of current policy statements for each country. Data from the expert interviews are used to compile case records, which were then used to interpret the influence of international information on the programs in each nation as well as how the Sun

Safety was framed and its resulting metanarrative. Once compiled, case records and interpretations were shared with interviewees and their comments and concerns incorporated into the final analysis.

Information for this investigation came from interviews with health promotion personnel, epidemiologists, dermatologists and atmospheric scientists. Environmental and atmospheric scientists are responsible for the development, construction and framing of ozone depletion and ground-level ultraviolet radiation as scientific problems. Epidemiologists and dermatologists take the scientific information and determine human health impacts by medicalizing this issue and establishing the biophysical effects of the environmental problem. Both these are considered members of the scientific arena. By comparison public health officials have the responsibility of communicating the scientific and medical information to the general public. All three of these groups play important roles in the development and transmission of environmental health problems (such as skin cancer) and therefore all three groups were included in the study.

4.3.1. Participant Selection

Participants were selected using a snowball sampling procedure beginning with participation in international conferences on skin cancer. Participants were considered suitable for inclusion in the study by fulfilling two criteria. First, they had to hold respected positions within their area of expertise (i.e., Director or Coordinator). Second, interview participants had to have been identified and recognized by at least two colleagues through the snowball procedure. Table 4.1

TABLE 4.1
Solicited and Actual Expert Interviews (#)

Expertise	Australia		Canada		England	
	Solicited	Agreed	Solicited	Agreed	Solicited	Agreed
Health Promotion & Policy	4	2	4	3	2	1
Epidemiologists & Dermatologists	3	1	4	2	4	2
Atmospheric Scientists	3	2	4	1	2	1
Total	10	5	12	6	8	4

identifies, by location and expertise, the number of participants originally identified for participation (n=28) and those included in the final sample (n=15).

The main reasons given by the thirteen potential participants who declined to be interviewed included being too busy (5), no longer interested in Sun Safety (4), not available because retired or on long-term leave (3), and not permitted by supervisors to take part in the study (1). Though they refused to take part in structured interviews, four of the declining experts did agree to informal, "off-the-record" telephone conversations or provided written responses via letter format or electronic mail. In all cases, confidentiality was assured to respondents. Where respondents agreed to be cited, names have been included in the text of this chapter and on the citation list.

4.3.2. Interviews

Interviews were conducted between June, 1995 and May, 1998 and were conducted either face-to-face (6) or via telephone (9). Each interview was between 30 and 90 minutes in length and covered a number of topics concerning the evolution of skin cancer and Sun Safety programs in the home country and around the world, the respondent's personal involvement in programs, and opinions on the nature and strength of the evidence underlying the programs (for a copy of the questioning path, see Appendix A). With the permission of the respondent, interviews were tape recorded and transcribed verbatim.

Interviews took a "informal conversational" format (Patton, 1990), which is also called the "semi-structured" format (May, 1993; Miller & Crabtree, 1992). This format consists of a series of loosely structured issues to be discussed through the course of the interview. This format is considered to mediate between the fully-structured interview wherein data is extracted through a set series of questions and the open interview based on the telling of life stories (May, 1993). Instead, the semi-structured interview uses an interview guide as a checklist to ensure that relevant issues are covered and the respondent is given the latitude to discuss the general topic as he or she sees fit. This process ensures that the same general information gets covered in the interview but also allows the interview to take a less formal, conversational style (Patton, 1990).

The primary advantage of the semi-structured interview is that it allows people to answer questions and pursue ideas on their own terms, using their own language, within a general structure that permits comparability between interviews (May, 1993). This is particularly helpful when respondents are providing historical

data (Cresswell, 1994). But the unstructured nature of the interview can also be a disadvantage as the interviewer must relinquish a certain amount of control during the interview process (May, 1993) and the information obtained is 'filtered' through the interpretation of both the respondent and the interviewer (Cresswell, 1994).

The use of the term "expert" (as opposed to "key informant") to identify interview respondents in this study merits some discussion. Key informants are generally used in ethnographic research and refer to important members of the community through which researchers gain access and understanding (Gilchrist, 1992). In some instances, key informants are gatekeepers and serve to validate the researcher's presence (for an example, see White, 1943). In almost all cases, key informants are considered to have considerable knowledge and understanding of the community or situation; he or she may be a translator of language, culture or both; and the key informant is generally a person with whom the researcher develops a special bond (Gilchrist, 1992). On one hand, the interviews conducted during this study could be seen as a foray into the "culture" of the epistemic communities surrounding ozone depletion and skin cancer. The respondents did have considerable knowledge about the research topic and the international community. On the other hand, however, most respondents conducted the interviews in technical, scientific language with little translation either necessary or provided. These interviews also took place only once, and sometimes not even face-to-face, which provided little opportunity for a relationship to develop between researcher and respondent. For these reasons, the interviews conducted for this component of the project have been termed "expert" interviews rather than "key informant" interviews.

A continuous sample procedure was used to request interviews and early respondents identified later respondents for participation. After 15 formal interviews (and four instances of informal conversation or correspondence), data collection was stopped as the sample was deemed adequate due to data saturation. Data saturation refers to the tendency of the researcher to get "the same (or similar) information on repeated inquiries" (Leininger, 1994 p. 106). In this particular case, data saturation resulted from two sources. First the international community working in the area of Sun Safety is very small (estimated by respondents as anywhere from 20 to 40 individuals worldwide). Therefore a sample of 15 formal interviews represents between one-half and two-thirds of the available universe of respondents.

The second source of the data saturation came from the strong cross-national links identified within and among recognized experts in the field. During the snowball sampling procedure respondents freely provided names and contacts of researchers that not only concurred with their own views on Sun Safety, but also openly identified the names of those contacts that might disagree or might have differing views. The tight links identified within the small international Sun Safety community allowed for a number of dissenting voices and differing views resulting in data saturation in a relatively small (n=15) group of interviews.

4.3.3. Policy Documents & Promotional Materials

In addition to expert interviews, policy documents were examined to ascertain timelines of important events in policy development for each country. Policy documents were obtained either from interviewees themselves, or via information posted on internet home sites identified and recommended by

participants. Those documents provided by interviewees included promotional materials such as leaflets, pamphlets, brochures and posters which outlined the primary Sun Safety messages promoted in each country.

Electronic documents were retrieved from three main sources for each country. First, the website homepage was searched (using keywords: skin cancer, sun safety, ozone depletion, and UVB) for three major institutions in each country. The first search examined the home pages for institutions providing the primary source of Sun Safety health promotion materials in each country: the Anti-Cancer Council in Australia, Health Canada in Canada, and the Health Education Authority in England. The second search examined the home pages for institutions responsible for providing UV and ozone-related information: Bureau of Meteorology in Australia, Environment Canada in Canada, and the National Radiological Protection Board in England. Finally, additional sites of key players in each country were examined. These included sites for Dermatology Associations in all three countries, national cancer associations in Canada and Australia, and the Ministry of Health site in England. Documents retrieved electronically consisted primarily of press releases spanning 1997-1999 and large policy statements summarizing program development[2]. Both electronic and printed policy documents were used to confirm the accuracy of information provided in the interviews.

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2 For examples of electronically retrieved policy documents, see ACCV 1996; HEA, 1998a-d; and Health Canada, 1999, 1992.

4.3.4. Data Compilation (Case Records)

Transcribed interviews were assembled by country. Data from the interviews was reviewed and information tabulated to create a timeline of Sun Safety program development and information, thus creating a case record for each country. Case records are compilations of data brought together to construct a primary package of information regarding the situation under study (Patton, 1990). According to Stenhouse (1977 p. 19),

> "A case record should make no concessions to the reader in terms of interest or communication. It is a condensation of the case data aspiring to the condition that no interpreter requires to appeal behind it to the raw data to sustain an interpretation."

Once the case record for each country was compiled from the interview data, information was cross-checked against policy documents. Credibility of the data was further assured by returning summarized case records, along with a request for permission to cite, back to interview respondents. Respondents were given the opportunity to change or clarify points in the case record and, therefore, ensure that the final summary of events and activities was accurate.

4.4. Findings

This nested investigation had two primary findings. First, the investigation uncovered an international epistemic community surrounding Sun Safety that exhibited many of the characteristics included in the epistemic community critiques (such as dissension and the reflection of a historically-dependent episteme). Second, the investigation found differences in Sun Safety programs in Australia, Canada, and England that shows how information was framed differently in each country and resulted in national differences in narratives.

4.4.1. The Sun Safety Epistemic Community

The snowball sampling procedure and expert interviews identified a group of researchers and policy personnel involved in international Sun Safety who meet the basic criteria of an epistemic community. The fact that this epistemic community appears to have reached a consensus does, however, hide considerable dissension. This dissension is a reflection of the problems identified previously regarding how epistemic communities are conceptualized and defined. The following discussion explains the nature of the Sun Safety epistemic community and explains how that community can exist despite conflictual relations among its members.

Throughout the interview process, these experts identified a number of connections both across nations and across specialized areas in the Sun Safety community. While this might first seem to be an artifact of the snowball sampling procedure (as will be discussed later), it also represents the considerable linkages at the international level. Figure 4.1 presents the web of relations identified by nationality.

This web represents instances where participants identified working with another colleague in some professional capacity around Sun Safety. The web represents linkages that include working together on some form of collaborative project (i.e., C1 and A2, B4 and B5, C3 and C4), attending training sessions together in the past (i.e., A3 and B3, B2 and C1), or consulting one another because they work for the same agency (i.e., A4 and A5, C6 and C7). This figure shows that Australian participants, by far, show the most linkages with other experts, both at national and international levels. Canadian and English respondents show considerable national linkages but fewer relations at the international levels.

Figure 4.2 presents the same information by area of expertise as well as by international versus in-country linkages. This figure shows that Epidemiologists and Dermatologists, followed by Health Promotion specialists are the most active Sun Safety experts at both the national and international levels. The expert webs of relations presented here identify Australian experts as having more international and in-nation linkages than either the Canadians or the English. In addition, Epidemiologists and Dermatologists are shown to have more linkages outside their own area of expertise than do Health Promotion experts or UV & Atmospheric Scientists. These findings regarding linkages between experts are not entirely unexpected. The nature of the snowball sampling procedure means that there will be

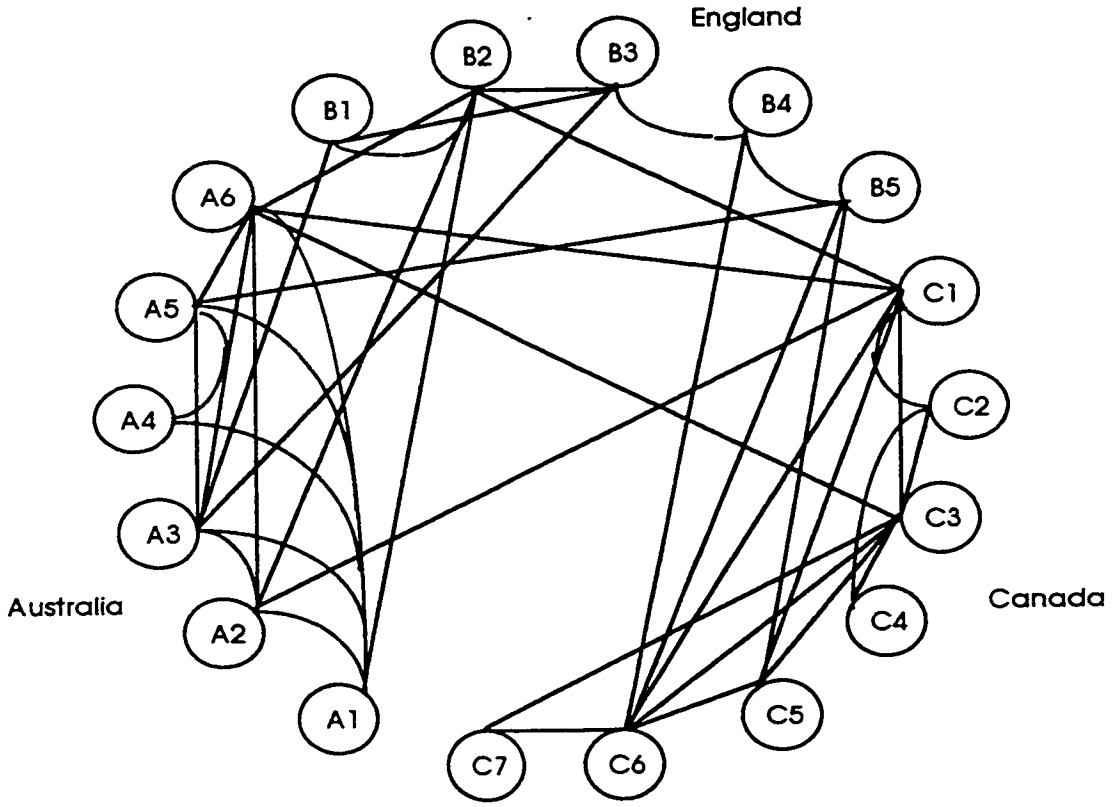

FIGURE 4.1
Links between Interview Respondents by Country

connections between respondents as they identify one another as "experts". However the fact that such connections exist tells us little about the nature of the relations.

Epistemic communities are defined as sharing causal and principled beliefs in order to influence the policy process in conditions of uncertainty. Chapter Two showed that there remains considerable uncertainty in the Sun Safety arena and despite this, the community of international experts has been successful at moving forward the policymaking process based on a specific set of causal relations (the 'skin cancer cascade') as well as principled beliefs (it is best to act to *do* something). Despite such shared beliefs, respondents did not necessarily share the same approaches to Sun

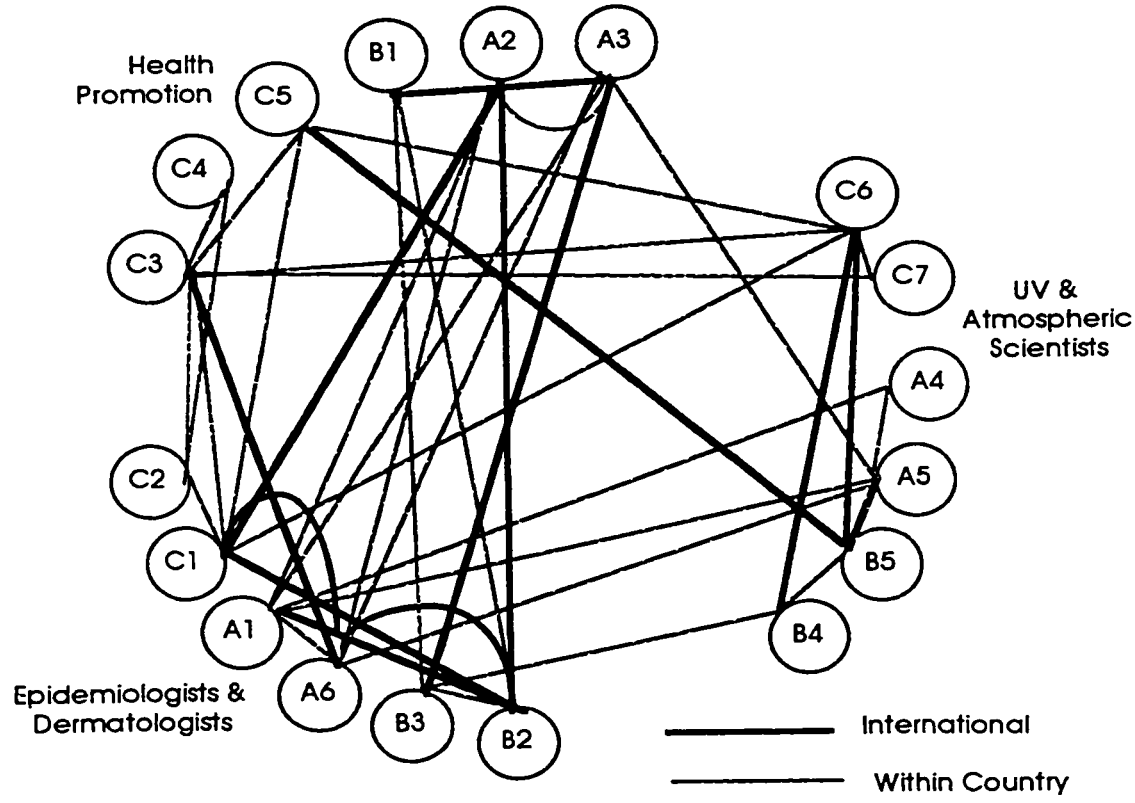

FIGURE 4.2
Links between Interview Respondents by Expertise

Safety, nor did they all interpret and apply evidence in the same way. In fact, interview data identified cleavages along two lines: professional and national.

Professional cleavages took the form of both disciplinary disagreements and personal animosity. For example, some respondents suggested names of other experts that they said disagreed with their own approaches while others expressed concerns about how personnel outside their own area of expertise evaluated evidence:[3]

> "...I think that there are some very good brains in the research but there are lots and lots of other people who really don't believe in evidence and just like to make glib statements. If you speak to most dermatologists, you may find that they will tell you things that they believe to be true but it's almost, you know, because the next guy told him that and people will accept things in a fairly uncritical manner. You've only got to have one or two fairly strong characters who go around saying things without substantiating them and, you know, people tend to believe what they say." (Susan, UV scientist, talking about dermatologists)

> "... For example, the Atmosphere Environment Service [of Environment Canada] has published on UVB levels in Toronto showing that it has changed in the past. So what do we see? Are we actually being exposed to higher levels of UVB at ground level? They were saying, oh, ozone has depleted so many percent, so it means that we'll amplify skin cancer so many percent. It's awful, it's a nightmare... I suspect also that, and I know this, that pollution will stop UV. So here downtown in the city with a lot of traffic activity, even if you have 10% more UVB a kilometer higher in the city, at ground level it doesn't matter. You won't die from UV, you'll die from pollution." (Walter, Health Promotion, talking about UV scientists)

> "The sun exposure is a real mess and it has been a concern for quite a long time. In the study I mentioned, 10 pages on sun exposure... you're looking through it knowing that you probably will have exactly the same problems as everybody else... One aspect says that we spend too much money looking at sun exposure and look at what kind of results we have. Because you can't conclude anything from it. It's one aspect that the data is so bad and another that we spend so much money on it." (Darren, Dermatologist talking about Epidemiologists)

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3 Due to the controversial nature of this information, pseudonyms have been used in this portion of the chapter to ensure confidentiality. Quotes were selected for inclusion that represent similar sentiments expressed by at least one other respondent during interviews.

As a result, the web of relations reported here may be representing related professional and operational interests. As was discussed earlier in this chapter, differences do exist in epistemic communities but they get hidden from public view for instrumental reasons (Litfin, 1994). Despite this dissension, this international community of Sun Safety experts has continued to retain sufficient authority to influence international policy as evidenced by consensus documents such as those produced by the World Health Organization and the World Meteorological Association (WHO, 1998a, 1998b, 1996).

When asked about the logistics of working with other professionals in Sun Safety, cleavages emerged as experts from the three countries identified differences in intra- and inter-institutional linkages. At these national levels, informal links between individuals and organizations were recognized as very important but not necessarily particularly strong. They did, however, identify the desire to communicate a consistent and common message to the world outside their own community:

> "We don't always work together because the people with interests in skin cancer all know each other. We all know a little bit about what's going on in each group. Also, we may not all be directly involved in what's said about, what public health messages are delivered. We all meet all the time at international and national meetings. We have an agreement almost in what we put across but everybody is free to say what they like..." (Evan, England)

> "I wouldn't necessarily call them a coalition, because in my mind a coalition means that you are working together on a common goal. I think there are a number of agencies that work in the area independently and then there are a number of agencies, the major players that we have already talked about, who come together a couple of times to look at developing a common message that can go to everybody so that the public are not confused." (Colin, Canada)

> "The National Dermatology group contributes financially to the national campaign and they are represented on the committee. At the state level... [there are] close allies... who basically act as consultants to me in relation to skin cancer issues that are considered to be outside of my area in terms of knowledge, so yes, there is certainly a close collaboration... but the difference I know particularly between Australia and Europe and I don't know in relation to America is that the people who are running the health promotion campaigns generally in Australia are people with a marketing background or an education or community development background..." (Angela, Australia)

Within this international community of Sun Safety experts, individuals appeared to bring with them ideologically grounded assumptions about how groups and institutions should and could work together. These included the recognition that dissension and discord can (and perhaps should) exist, but that the face shown to the public should be one of consensus and certainty. These assumptions appear to relate directly back to the differences in how scientists (versus policymakers and the public) identify and value evidence and knowledge as discussed in Chapter Three.

Sun Safety experts in the international epistemic communities openly admit their professional and personal agreements in private, but are careful to keep them hidden from the public. One Canadian respondent showed how different interpretations of risk result in disagreements over how to develop policy:

> "And I've heard a lot of things even from main scientists over there saying... trying to confront me with the fact that, you know, you have a party in your backyard and everybody is invited to swim. Of course, you have a nice swimming pool but there's a big shark in the swimming pool. Do you like your friends? What do you tell them? At the time I was shocked by this! I didn't react... I don't remember exactly what I said, but I insisted that there was a certain knowledge that was not safe to use for policies and that we should be careful. What I should have said is that, yes, come on guys, be the guest of honor, invite everybody to jump in the swimming pool and I am sure that this shark will only eat 12 persons out of 100,000 that jump in the pool. He's not very hungry. Yes he's dangerous for the person who will get eaten, but do you enjoy swimming more? You have to evaluate the risk and benefit of your policy. And that's not easy to do." (William, Canada)

Several expressed considerable distrust in the media as a translator of information to the public:

> "I'm sure that many people are confused, that's why perhaps the media continue to run this fairly simple story about sunlight and skin cancers... although in scientific meetings I think amongst ourselves we can discuss our uncertainties, our doubts and our concerns about some of these simplistic theories which we really wonder where their basis in fact lies. We tend perhaps to stick together as a community and not rock the boat..." (Grant, England)

> "They [the media] misquote us all the time. They misquoted me last year saying sunscreen causes skin cancer and I didn't say that so I don't trust them very much and that's going to be a very big issue, of trying to get the information across in such a way that (a) it comes across correctly, and (b) the public can understand what we are actually saying." (Paul, Australia).

> "... if you were a journalist, I wouldn't be saying to you now what I have said to you because what I've said to you expressed a lot of uncertainties in the data and maybe a degree of cynicism by the whole subject. If you were a journalist, I would be tossing out to you this sort of chivalrous saying "so use sunscreen and wear a hat" because if I didn't, you would just pick up on all these other things that I've said and you'd write an article saying "scientist says that it's all a load of rubbish" or whatever." (Grant, England)

Through the course of the interviews, Sun Safety experts revealed an international community that recognized its own ability to shape the policy process through its specialized expertise and knowledge. While members indicated that they do not always share common assumptions, they admit that the goal of the community is to present a common consensus to the pubic in order to maintain their own credibility and authority in the policymaking process.

The Sun Safety epistemic community, therefore, does indeed share causal and principled values in that it publicly agrees to the view that sunlight causes skin cancer and that the problem is best solved through advocating moral behaviors such as individual sun protection and working to protect the environment. It also agrees

— at least in public — that current data are sufficiently valid evidence for policy intervention. Finally, most international documentation links skin cancer to ozone depletion in only a speculative manner, indicating that it is much too soon to judge effectively the long-term health implications of this environmental issue (examples of these metanarrative statements can be found in WHO, 1996; van der Leun *et al.*, 1995; IARC, 1992)

This public face of epistemic consensus, however, disguises considerable dissension in the community. Such dissension does not infer that the group does not meet the criteria of an epistemic community, rather that it supports the critique that *all* epistemic communities contain dissension that gets hidden from public view (Litfin, 1994). That dissension comes, in part, from the different disciplinary influences of scientists emerging from specific areas of expertise. But, as will be shown in the remainder of this chapter, it also comes from the interpretation that scientists *bring with them* to the international arena. Those interpretations are influenced by the national framing and narratives surrounding Sun Safety in their home countries. As they are brought to the international forum through experts, such frames and narratives influence the construction, co-construction and re-construction of information regarding Sun Safety at the international level.

The following three subsections present the case records on Sun Safety program development in Australia, Canada and England. Each of these sections tells the story about Sun Safety in a particular country. The recounting of these case records is followed by a discussion of these findings in the context of their framing and the resulting national metanarratives.

4.4.2. Sun Safety in Australia

Australia has the most well-developed and successful Sun Safety programs in the world. A country slightly smaller in geographical size than the United States, Australia's population of about 18 million is primarily located close to the coast in the south and east of the country. Australia has a moderately strong federal government that shares powers and responsibilities with the six states and two territories. A population that is 80% Caucasian, the bulk of those of British descent, coupled with a climate that is hot and tropical in many parts of the country, means that a substantial portion of the Australian population is at risk of contracting skin cancer (ACCV, 1996).

Skin cancer first became recognized as a public health problem in Australia as early as the 1950s when epidemiological data began showing extremely high rates throughout the population (A2)[4]. By the 1960s and into the 1970s these rates were the highest in the world and concerns deepened as skin cancer, typically a disease of the elderly, was increasingly occurring in younger members of the population. A flurry of epidemiological studies were undertaken to identify the main causes and risk factors associated with skin cancer (Sinclair, 1997). Much of this research formed the basis of the international skin cancer prevention and Sun Safety programs that we see today.

Australian Sun Safety programs are developed and administered at the state level though information and practices are openly shared across the country (Sinclair,

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4 Where permission to cite has been granted by interview participants, actual names have been used and are included on the citation list. Where permission has not been granted, codes represent sources. The coding identifies country of origin (A=Australia, B=England, C=Canada) and interview/correspondence number.

1997). Programs are mainly the responsibility of the state Anti-Cancer Councils or Agencies which are responsible for other health promotion campaigns including smoking, cervical and breast cancer screening and other programs (Sinclair, 1997). These are non-profit organizations funded through a federal granting scheme, private and corporate donations and, in some states, through a progressive tax levy on cigarettes (Sinclair, 1997). For example the Anti-Cancer Council in the State of Victoria receives the bulk of its funding (for all programs) from a three dollar a pack levy on cigarettes. That money is funneled directly to the Anti-Cancer Council and must be used for cancer research, prevention and health promotion campaigns. Use of the funds is not limited just to the prevention of smoking but is used to fund all cancer prevention messages, including Sun Safety and skin cancer (Sinclair, 1997).

The public health messages of the State Anti-Cancer agencies are developed and implemented by broad teams of professionals. While epidemiologists, dermatologists and radiologists are involved in the compilation of evidence regarding risk and behavior, the programs themselves are developed and implemented by experts with backgrounds in marketing, health education and community development (Sinclair, 1997). In addition to the State agencies other groups take part in communicating different components of the skin cancer message. Pharmaceutical companies, through their promotion of sunscreen, stress protection; Dermatologists sponsor screening clinics for the public at local beaches and popular outdoor activities; fashion designers have developed full length, sun protective "body suits" to replace skimpy bathing suits at beaches and pools. While these other groups are responsible for some parts of the Sun Safety message, it is the marketers, educators and community development personnel at the state agencies that are key in

the construction and communication of skin cancer prevention strategies (Sinclair, 1997; A1).

The first large-scale Sun Safety program was started in Australia in 1980 (Harvey, 1995; Marks, 1992). The Slip! Slap! Slop! campaign encouraged individuals to "slip" on a shirt, "slap" on a hat and "slop" on some sunscreen based on evidence that increased exposure to the sun increased one's risk of skin cancer. Aimed at the general population it became the basis of a long term series of health promotion messages (Marks, 1992). During that time special targeted messages were also directed at vulnerable populations including children, parents of young children and outdoor workers. More recently the phrase has been adjusted to Slip! Slap! Slop! and Wrap! to encourage people to "wrap us" and cover their skin as an additional sun safe practice (A1). Subsequently this was revised to Slip! Slap! Slop! and Slide! as the message advocated 'sliding into the shade' as an additional protective measure. Another recent addition to the public health messages is SunSmart[5], a new program aimed directly at teenagers (ACCV, 1996; Marks, 1992).

Today the core messages in Australian Sun Safety programs are to cover up and avoid the sun during peak hours of the day (ACCV, 1996). A number of regulatory changes stress these goals and impose strict limitations on individual freedoms. For example. most schools have a *No Hat - Play in the Shade* policy that is strictly enforced. If children are not wearing the hats that are part of the school uniform, they must play in a covered area (Sinclair, 1997; A2). Recess times and sports activities have been rescheduled so that children and youth are not out in the

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5 Updated examples of Australian Sun Safety programs and guidelines are available on the ACCV website at: http:\\www.accv. org.au

sun between 11 am and 3 PM — the times when the sun's rays are the most intense (Marks, 1992).

The production and sale of products related to Sun Safety has also been highly regulated (ACCV, 1996). Until 1996 sunscreen manufacturers could only produce products with an SPF (sun protection factor) of 15 and no more. In the 1997 austral summer the regulations changed and SPF 30 or more is now permitted and recommended for individuals in very high-risk categories (Sinclair, 1997).

Public health promoters justify the SPF limit in three ways. First, public health officials worry that sunscreens with high SPF factors give individuals a false sense of security. The more powerful sunscreens, officials argue, can encourage people to stay out in the sun longer because they can do so without burning (Sinclair, 1997; A1; A2). The second concern is that there is little evidence that sunscreens directly reduce the risk of skin cancer (Donawho & Wolf, 1996). We do know that sunscreens reduce the incidence of sunburns and that number and severity of sunburns are related to some kinds of skin cancers. However it is not possible to conclude that sunscreens prevent skin cancer (Donawho & Wolf, 1996; A1). Finally, sunscreens have only been around for about 15 to 20 years. There is no way to know what the long-term effect of daily use of sunscreen will be until enough time has passed to see a cohort effect (A1). There was some concern expressed by Australian experts that SPFs higher than 15 could potentially damage the skin — especially that of very young children. Since sunscreens with a 15 SPF effectively block out 94% of the sun's rays (Sinclair, 1997), this was seen by public health officials as providing sufficient protection. An additional regulation states that all sunscreens must include both UVA and UVB blockers — a requirement not in place in most other countries

(Sinclair, 1997). Other products subject to regulation include materials and clothing that claim to have sun-blocking attributes, and shade structures for home and business use.

In addition to the core messages of covering up and avoiding the midday sun, Australian Sun Safety messages also encourage public construction of shade and the individual use of sunscreen (ACCV, 1996). However we should note that the use of sunscreen is considered a last resort by Australian public health officials, not the first line of defense (Sinclair, 1997; A1). This is quite different than the messages promoted in other countries such as Canada, as will be shown later.

Ground level UV readings are provided in many Australian locales but public health officials shy away from incorporating the UV Index in primary sun avoidance messages. In fact, in the state of Victoria public health officials fought to prevent local television and radio stations from buying their own instruments and providing hourly UV measures (Sinclair, 1997). The public health officials successfully argued that readings were highly volatile and site-specific and might result in increased sun exposure due to faulty or inaccurate measurements. The Australian Radiation Laboratory takes UV readings for a number of stations around the country. These are provided for some of the evening TV weather bulletins (Hicks, 1998). Through a program begun in 1996, the Australian Bureau of Meteorology disseminates forecasts of UV for the next day. These forecasts are meant to give an indication of the strength of the sun and the need to practice avoidance (Hicks, 1998; A5). UV predictions are not made for beyond the next day, nor are current readings publicized (Hicks, 1998; A5). "Time to burn" messages are neither provided nor promoted via media sources (A2; A5).

The link between ozone depletion and skin cancer is explicitly avoided in Australia (Sinclair, 1997; A2; A4; A5). Instead, the UV Index is used as a general reminder that sun exposure is dangerous and announcements are not seen as a tool for individual defense, rather they are seen as a way to keep the message of Sun Safety in the public's mind (Sinclair, 1997; A2; A4; A5). This could be due, in part, to the fact that skin cancer became an important problem in Australia long before the 1986 discovery of the Antarctic "ozone hole" and the subsequent concerns about ozone depletion. But it is also due to the concerted effort by public health officials to disentangle the environmental issue from the public health problem (Sinclair, 1997; A2). Australians have taken a very strong position that any potential increases in skin cancer rates that might result from lower ozone and higher UV levels can and will be easily mediated by changes in behavior and cultural norms (Sinclair, 1997; A2). Their primary message remains that skin cancer is caused by people being out in the sun too much, not by environmental degradation (A2). The social constructions that encourage tanned skin have been addressed, quite successfully, by Australian Sun Safety campaigns and the result has been lower reported sunburns and a reduced social tolerance for deeply tanned and sunburned skin (Lupton & Gaffney, 1996; ACCV, 1996).

In summary, Sun Safety in Australia focuses on behavior change through advocating individual behavior and through addressing the social constructions linking tanned skin to health and well-being. The primary messages center on avoidance through covering up and avoiding the sun, with sunscreen use advocated as a last resort. Public programs are publicly funded and well-developed. The link between ozone depletion and skin cancer is expressly avoided in Australia and there

is strong regulatory control over products (i.e., sunscreen and clothing) as well as the messages conveyed to the public (e.g., UV Index readings).

4.4.3. Sun Safety in Canada

Canada began its Sun Safety programs almost a full decade behind Australia. It wasn't until 1990 that skin cancer, skin cancer prevention and Sun Safety made the Canadian public health agenda. With an area slightly larger than the United States, 90 percent of Canada's 29 million inhabitants are situated within 165 kilometers (75 miles) of the US border. Historically, Canada's federal government has been moderately strong, though that has weakened somewhat over the past decade in response to increased regionalization and stronger calls for more power at provincial levels. The distinct division of powers between the federal government and the governments of the ten provinces and three territories outlines health funding as a federal responsibility, but health program implementation is the responsibility of the provinces and territories. The bulk of Canada's population (87%) reports European ethnic origins (Census Canada, 1996), but this tell us little about the skin phenotypes of the population as Europe represents quite a mix of population from areas such as the British Isles, the Mediterranean, Eastern Europe, Western Europe and Scandinavia. Unlike Australia, Canadian public health officials don't know the proportion of Canadians at high risk for skin cancer (blond or red hair, blue eyes, light skin, propensity to freckle) because data on race is not collected. In addition, Canada's immigration rate is about 4.5 per thousand — almost double that of Australia and more than 15 times higher than England — and much of this immigration is from parts of the world with low at-risk populations such as Latin

America and Asia. The potential for this immigration to change Canada's ethnic and racial mix could have implications for skin cancer rates in the future (C5). For all these reasons, it is very difficult to estimate the number of Canadians at-risk for skin cancer (C5).

From the early 1990s, the visibility of Sun Safety and skin cancer prevention messages has been on the rise. Concerns with skin cancer first arose in Canada in the mid-1980s in studies of melanoma incidence in outdoor workers (Gallagher *et al.*, 1987). But it wasn't until 1990 that the Canadian Dermatology Association (CDA) began to implement widespread prevention campaigns to the general public. The early 1990s saw the return to Canada of a young dermatologist trained in Australia who brought back with him the epidemiological and program information in wide use in Australia (C1). At about the same time, scientists in the United States and around the world released information predicting not only substantial depletion of the earth's protective ozone layer, but a possible 2% increase in skin cancer rates with every 1% decrease in stratospheric ozone (Longstreth *et al.*, 1992). The concurrence of these and other events raised public awareness of skin cancer in Canada and brought to the public's view the link between skin cancer and ozone depletion.

In 1992, Health and Welfare Canada (whose name was later changed to Health Canada) brought together a number of individuals and agencies with an interest in skin cancer and Sun Safety for the First Symposium on Ultraviolet Radiation-related Diseases (Gibbons & Anderson, 1992). The Symposium recommended that Health Canada coordinate with other Canadian agencies to develop a set of consistent, positive and credible messages surrounding Sun Safety

and ultraviolet radiation (UVR). A subsequent workshop, held in September 1994 and organized by Health Canada and Environment Canada with the assistance of the Canadian Cancer Society, brought together over two dozen organizations involved in preparing and disseminating public health information about UVR (Mills & Jackson, 1995).

The workshop resulted in a set of consensus statements summarizing what is known about UVR exposure, the associated health risks, and strategies to reduce exposure. The workshop also produced a set of associated core public health messages to be used in the development and implementation of Sun Safety programs throughout Canada (Mills & Jackson, 1995). Follow-up studies have shown that these consensus statements were useful in providing consistent public health messages following the workshop (Ramsingh & Mills, 1997). In 1996 a Second Symposium and Workshop updated the scientific and technical information resulting in a revised and updated set of core Sun Safety messages (Mills *et al.*, 1997). Once again these were disseminated for use in Sun Safety programs throughout Canada.

The symposia and workshops on UVR messages were particularly important in the development of Canadian Sun Safety programs because Canada, unlike Australia, has no single, central home for Sun Safety (Mills, 1998; C1; C2). Rather, skin cancer prevention and the associated Sun Safety messages are the responsibility of a coalition of researchers, agencies and organizations. The Canadian Health Care system defines public health education and health promotions as, primarily, a provincial responsibility. To further complicate matters, some provinces (such as Alberta and Ontario) have recently decentralized public health services and now designate it a municipal responsibility. While Health Canada continues to play a

guiding role in promoting Sun Safety at the national level (Mills, 1998; C1; C2), there is no national level Sun Safety program (C2).

The lack of a single, central home means that Canadian Sun Safety messages have a number of sources, each with their own funding. The Canadian Dermatology Association (CDA) and the Canadian Cancer Society (CCS) are the two most important sources of Sun Safety information (C1). To a lesser extent the pharmaceutical companies (via advertising sunscreen products) and public health branches, mainly through child health programs, also promote Sun Safety and skin cancer prevention. Finally, Health Canada, in cooperation with Environment Canada, provide a number of Sun Safety messages related to ozone depletion and the UV Index.

The Canadian Dermatology Association (CDA) has a budget of about $300,000 per year for skin cancer but this is not only for prevention efforts but also for screening programs and early detection (C1). In addition, the CDA also receives free advertising and promotional television and radio time for an estimated annual budget of about one million dollars (C1). The main focus of the CDA is primary prevention, particularly for children, and early detection for adults who have already experienced considerable exposure over the years (C1). These programs take the form of annual focused campaigns for specific at-risk populations. The target population changes each year and past programs have been directed at outdoor workers, children, beach visitors and similar specialized groups (C1). Historically the CDA has been a strong advocate of sunscreen, however over the past several years they have increasingly promoted clothing, timing of exposure and overall avoidance as the best way of reducing sun exposure (C1).

The Sun Safety budget of the Canadian Cancer Society is difficult to determine because the CCS is a non-profit organization and much of its work is carried out by volunteers. The CCS has an educational program called "SunSense Awareness" and provides all the materials necessary for volunteers to conduct seminars in schools and for local organizations. These presentations are generally made on request and the primary message is prevention through avoidance of UV exposure (Canadian Cancer Society, 1995). The Canadian Cancer Society's Sun Safety program — SunSense — adheres to the standard set of Health Canada and the Australian Slip! Slap! Slop! messages. Interestingly the Cancer Society stresses the importance of sunscreen use and very tightly links its danger messages to ozone depletion. Promotional materials clearly indicate that skin cancer rates in Canada will increase with ozone depletion and that one's risk of contracting skin cancer will increase in the future. This is striking in comparison to the Australians who take great pains to avoid this message (Sinclair, 1997).

As might be expected, pharmaceutical companies in Canada promote a Sun Safety message encouraging the use of sunscreen with a high sun protection factor (SPF). Unlike Australia, where sunscreens are highly regulated, there are no real regulations and only limited controls on sunscreens in Canada (McLean, 1992). The first control is on the protective claims companies can make about their products. While pharmaceutical companies cannot claim that sunscreen reduces the risk of skin cancer, they can advertise that their products reduce the risk of skin damage such as wrinkles and sunburn. Producers must conduct laboratory experiments to set SPF factors for their products, but legal test systems vary and the same product can have a different SPF value depending upon the test used (McLean, 1992). SPF also varies

according to application procedure, exposure to water or sweat, and according to the different ultraviolet spectrums being measured (such as UVA versus UVB). In Australia such uncertainties have been overcome by limiting companies to advertising SPF values of only 15 and 30 and by regulating that all sunscreens must provide both UVA and UVB protection (Sinclair, 1997). In Canada there is no such limitation even though, as in Australia, there is some concern that the use of SPF numbers on sunscreens may actually overrepresent the protectiveness of the products (McLean, 1996). Nevertheless, there is little control or checking of the advertised SPF values in Canadian sunscreens (McLean, 1992).

A second control on sunscreen in Canada has to do with its definition as an over-the-counter drug (Mills, 1998). Because sunscreens affect the biology of the skin (which is an organ), they are designated as a drug in Canada (McLean, 1992). Therefore there are limitations on who can administer sunscreens. For example, daycare workers can only apply sunscreen that has been provided by a parent and supported with express parental consent. Likewise, parental consent may be needed to use sunscreens at children's camps, schools and other outdoor activities (Mills, 1998). Pharmaceutical companies attempt to overcome this limitation by developing products specially-designed for children and by marketing those products at parents as well as at older children.

The final set of Sun Safety messages received by Canadians come from Health Canada, which stresses prevention (Mills, 1998). Health Canada promotes four Sun Safety strategies, all of equal importance: minimizing exposure during midday, seeking shade, covering up and using sunscreen. These four strategies adhere quite closely to the Slip! Slap! Slop! and Slide! campaign in Australia (C1).

However, unlike Australia, Health Canada does not promote any one strategy above the others. What is noticeable about the Health Canada messages is their link to environmental issues. Some of Health Canada's brochures and advertisements are partially by Environment Canada and therefore reference Canada's UV Index while most others include ozone depletion at least in passing in their text.[6] Once again this is in opposition to the Australian experience where explicit links between ozone depletion and skin cancer are expressly avoided.

The main messages that make up the Sun Safety program in Canada result, at least in part, from the sources of those messages. Dermatologists produce annual focused campaigns and target screening as well as prevention. Their primary prevention messages are avoidance and covering up, followed by sunscreen with the use of shade stressed much less (C1). The Canadian Cancer Society and Health Canada advocate a set of prevention messages along with the use of the UV Index as a tool for evaluating dangerous exposure times. Meanwhile pharmaceutical companies focus almost exclusively on the use of sunscreen as a primary preventive practice. For the most part, the general Canadian message is to use sunscreen and avoid the sun during high exposure times — particularly those times as defined by the UV Index. Less important are the messages to cover up and to seek the shade.

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6 The tight linkage between ozone depletion, the UV Index and skin cancer is evident in much of the Sun Safety material distributed in Canada. Brochures showing these linkages include "SunSense" (Canadian Cancer Society), "It's Your Health: Preventing Skin Cancer — It's up to you" (Health Canada), "Suncare Program" (Health Canada), and "UV and YOU — Living with ultraviolet (Environment Canada). These and other examples of the ozone depletion/uv/skin cancer linkages can be found at the following websites: Environment Canada (www.ns.ed.gs.ca/udo/uv), Health Canada (www.hc-sc.gc.ca/ehd/catalogue/general/iyh/ skin_cancer.htm) and the Canadian Cancer Society (www.cancer.ca/info/pubs/content/sunse2.htm).

What is unique and important about Sun Safety messages in Canada is the emphasis placed on the UV Index and its use as a tool in skin cancer prevention.

Canada was the first country to develop a UV Index. Announced in May, 1992 by Environment Canada, the national institution responsible for providing weather and environmental information, the Index provides predictions of daily local readings of ground-level UVB. The Index was developed with money from the Green Plan — a national environmental initiative implemented in the early 1990s (O'Toole, 1994). The Index uses a scale of 1 to 10 to predict the local UVB levels for the following day. These predicted levels are then linked to public health messages about the potential length of time to burn and recommended avoidance behaviors (Han *et al.*, 1995). The Index translates complex scientific information into a readily-understood public health action plan geared to these individual behaviors. Since its development the Canadian Index has been used as the standard for a global solar UV index by the World Meteorological Association and the World Health Organization (WHO, 1998a). It has become the basis for the development of similar indices in Australia, the UK, the United States and many parts of Europe.

The development of the Canadian UV index took place outside of the more broad debate over Sun Safety and was, in fact, implemented by the Atmosphere Environment Service (a part of Environment Canada) as the result of research already underway on ground-level UVB measurement (C6). This environmental agenda, in turn, was supported by the general public because of increasing concerns over ozone depletion (O'Toole, 1994). The development of the UV Index did have some noticeable public health effects beyond the Index itself: Environment Canada has funded a number of brochures outlining the importance of protecting one's skin

from UV (C7). For the most part, however, the development of the UV Index took place outside of the public health arena, although public health officials were consulted. But, overall, the Index was more concerned with providing data to support scientific and public concerns about ozone depletion rather than with preventing skin cancer. Some concerns identified by the Canadian public health personnel during the development of the index (that the readings are very site-specific, highly variable and might actually promote unsafe behaviors, rather than prevent them), were the same concerns identified by their Australian counterparts in developing Australian Sun Safety programs and messages.

In summary, Sun Safety in Canada is characterized by its focus on individual preventive actions. It is delivered by an array of groups that meet occasionally to generate consensus documents. The primary messages center on appropriate individual behavior through avoiding the sun during high UV periods (as identified by the UV Index) and wearing sunscreen. Programs are loosely coordinated with the little national public funding supplied through Environment Canada. The link between ozone depletion and skin cancer is quite strong in Canada and but there is little regulatory control over most Sun Safety-related products and messages.

4.4.4. Sun Safety in England

As compared to both Australia and Canada, Sun Safety efforts in England are relatively new, though skin cancer rates have been increasingly steadily over the past several decades (B2; HEA, 1998a, 1998b). The United Kingdom (UK), comprised of England, Scotland, Wales and Northern Ireland, has a temperate climate moderated by winds over the North Atlantic current. It has the dubious distinction of boasting over

half its days as overcast and has a reputation for wet and rainy weather. The UK has a strong central government, and unlike Australia and Canada which have three levels of government (federal, state or provincial, municipal), England's government has only two levels: national and county. Therefore the central government has a strong influence over the 39 counties and 7 metropolitan counties in England. The population of the UK as a whole is about 58.5 million and about 46 million of these live in England. Social, political and economic changes over the past decade have radically altered the vacationing habits of the British and this, coupled with rising skin cancer rates, have sparked interest in Sun Safety and skin cancer prevention (B2).

England, like Canada, is a relative newcomer in the implementation of Sun Safety messages. Skin cancer was first noticed as a public health problem in the late 1970s and early 1980s (Pemberton, 1996; B2). At this time epidemiologists and dermatologists began to notice increasing rates of melanoma and non-melanoma skin cancers (Pemberton, 1996; B2) Since that time melanoma rates in England have increased substantially (B3; B4) and by 1998 it was the second most common form of cancer in the country (HEA, 1998a). In response to these rising rates, interest in skin cancer prevention and Sun Safety grew with the first large scale Sun Safety campaign launched in 1989 (Cameron & McGuire, 1990; Pemberton, 1996). Since that time, annual Sun Safety campaigns have focused on various aspects of skin cancer prevention including clothing, sun avoidance and shade construction (Pemberton, 1996; B3).

The main impetus for the increasing visibility of Sun Safety programs in England came via the National Department of Health in their 1992 *Health of the Nation* report (Pemberton, 1996; B2; B3; B4). This report, along with the Green and

White papers preceding it, set targets for preventable diseases in the United Kingdom by the year 2005 (DoH, 1998a) including incidence and mortality rate targets for melanoma and non-melanoma skin cancers (B2; B3). Between 1992 and 1997, the *Health of the Nation* was "the central plank of health policy in England and formed the context for the planning of services" provided by the National Health Service (DoH, 1998a, p. 1). Since that time the strategy has been revised and updated to address social and structural constraints to healthy behavior and to incorporate a population health perspective (DoH, 1998b). This new approach includes the following strategies to address skin cancer prevention and Sun Safety (DoH, 1998b, Chapter 4):

- encourage individuals to reduce sun exposure and cover up in the sun
- ensure children are not exposed to too much sun
- encourage attendance at cancer screenings
- provide information on the health risks of too much sun
- ensure rapid treatment for diagnosed cancers
- continue to encourage international action on ozone depletion

British Sun Safety programs are developed and administered, for the most part, by the Health Education Authority (HEA). Until 1996 the HEA was simply a bureaucratic arm of the national government responsible for implementing all public health promotion campaigns in England. Over the past several years, however, that changed. Instead of simply assuming these health promotion responsibilities, the HEA must now compete with other public and private agencies for annual contracts to administer health education campaigns for various concerns such as breast cancer, heart health and skin cancer (Pemberton, 1996). Though these contracts have gone

out for public tender, the HEA has managed, thus far, to acquire them for Sun Safety. The most recent mandate of the HEA states it is:

> "a special health authority within the NHS and has a statutory responsibility to advise Government on health education issues. It is the national center of excellence for health education research and expertise and, through its campaigns, publications and work with health professionals, encourages the public to adopt healthier lifestyles" (HEA, 1998c).

Sun safety messages are also circulated by other organizations including the Society of Dermatologists, the Imperial Cancer Research Fund (ICRF) and sunscreen manufacturers (Pemberton, 1996; B2; B3).

Like the Australians, most of the public health campaigns in England are developed and run by professionals with a background in marketing, advertising and community health (Pemberton, 1996). Also like the Australians a strong central agency continues to be responsible for conducting a coordinated information campaign and others, such as dermatologists and cancer researchers, are seen as supplemental to that central health information source (Pemberton, 1996; B4). This is in stark contrast to Canada where Dermatologists and cancer specialists are one of the major sources of Sun Safety information.

The very first HEA Sun Safety campaign was implemented in the spring of 1989 as a part of the "Europe Against Cancer" program (Cameron & McGuire, 1990). Titled "Dress to Protect", the program was aimed at the general public and encouraged individuals to cover up when out in the sun. It was followed almost immediately by a campaign aimed a female holiday makers titled "Are You Dying to Have a Suntan" which promoted the long-term effects of sun exposure (Pemberton, 1996). While the Dress to Protect campaign resulted in widespread public

recognition of Sun Safety, the Dying to Have a Suntan program was much less effective due, perhaps, to its inability to adequately address the social constructions in England that link tanning with health and beauty (Cameron & McGuire, 1990). Over the next few years, and in response to the 1992 *Health of the Nation* report, the Health Education Authority developed a coordinated Sun Safety program titled "Sun Know How." Under the umbrella of the Sun Know How program, annual campaigns focus on a number of different aspects of Sun Safety.

In 1996 the HEA launched the Shift to the Shade campaign (Pemberton, 1996; B4). Aimed at the general public, yet focused on holiday makers, the Shift to the Shade campaign incorporated the now traditional Slip! Slap! Slop! message but with a greater emphasis on staying out of the sun by planning activities for shady areas. At the same time there was considerable emphasis placed on the private and public construction of shade. Park authorities, for example, were encouraged to move seating areas such as picnic tables and benches into shady spots (HEA, 1996). Public recreation facilities and viewing stands provided shaded areas. And even private construction of shade was encouraged through both tree planting and the building of shelters (which are also practical as rain covers). More recently, greater emphasis is being placed on clothing as a form of sun protection with fashion designers and clothing manufacturers taking on sun protection as a serious concern (Pemberton, 1996).

In the past several years the main Sun Safety message in England has been that of moderate, sensible exposure to the sun (Pemberton, 1996; B2). The primary message in the HEA's Sun Know How campaign have centered around a Sun Safety Code™ with the focal point being a warning to take care not to burn (HEA, 1998d). Likewise, dermatologists and health promotion experts report a preference for

advising moderate exposure and responsible behavior over that of total avoidance (Pemberton, 1996; B2; B4).

The strong emphasis on moderate exposure in the English Sun Safety message is explained by health educators as an attempt to deal with the reality of England's long, wet winters and the social constructions that value tanned skin (Pemberton, 1996; B4). Experts openly admit that a message telling people to stay out of the sun would simply be ignored on the first warm and sunny day of summer. Instead, they argue, the public must be encouraged to behave responsibly (Pemberton, 1996; B2). Probably as a result of the failure of the Dying to Have a Suntan campaign, the HEA stays away completely from any message that may be interpreted as a scare tactic or a message based on fear (Pemberton, 1996).

Where Canadians have linked ozone depletion and skin cancer in their Sun Safety information, and Australians have not, the English have elected to incorporate the environmental message as a minor component of their Sun Safety program. Health educators and dermatologists report that they prefer not to relate skin cancer to ozone depletion in any way (Pemberton, 1996; B2), however some health promotion materials do incorporate cautious messages regarding ozone depletion (see, for example, HEA, 1998d). In most cases, though, English Sun Safety messages avoid a direct link with ozone depletion although "time to burn" messages are reported daily on both the television and local radio (B4).

The English have also avoided the strong regulatory stance of Australia and there is little state control over such things as the wearing of hats as a part of school uniforms, the regulation of sunscreens and fabrics or (until recently) the dissemination of UV Index information. It is only within the last year that the

National Radiological Protection Board, in consultation with health promotion experts, has begun to develop a program for reporting UV levels. Negotiations are still underway for the development of a UV Index in England but it is expected that it will follow the model of the Canadian Index as adopted by the World Meteorological Association (for information on the Global Solar UV Index, see WHO, 1998a).

In summary, the English Sun Safety is one of individual moderation and reasonability in exposure to the sun. These messages come mainly from the Health Education Authority, supported by additional messages in the media from pharmaceutical companies and dermatologists. The primary Sun Safety messages are to prevent sunburn, and where possible shift to the shade and cover up. Sunscreen is advocated as a last resort. The link between ozone depletion is recognized in England, but is not a highly visible component of the overall Sun Safety message.

4.4.5. Summary

The nested investigation reported in this chapter has two important findings. First, it found a Sun Safety epistemic community linking experts across both nationality and across areas of expertise that produces a Sun Safety Metanarrative stating that skin cancer is a future public health problem and that is, most likely, only peripherally linked to ozone depletion. That this community consists of some dissension supports the critiques of the epistemic community concept suggesting that a public face of consensus in an epistemic community is a mirage hiding the considerable dissension that often takes place in a more private, scientific setting.

Second, this investigation found that the Sun Safety programs in Australia, Canada and England take forms that differ in subtle but important ways. Though all countries make use of the information supplied by the international community, that information gets translated and transformed at the national level. The result is programs that vary in primary message, in overall tone, and in how it is linked (or not) to ozone depletion as an environmental issue.

4.5. Discussion of the Findings

The past decade has seen the rise of an international community of experts around Sun Safety (C1; Mills, 1998) with shared values and goals that qualify this group as an epistemic community (see section 4.4.1). As an epistemic community, this group has been able to influence policy decisions in directions consistent with the community's shared values and beliefs as evidenced in consensus statements of Sun Safety in international documents (see, for example, WHO 1996, pp. 164-166 and IARC, 1992). These consensus statements identify skin cancer as a serious future public health problem in fair-skinned humans. This metanarrative states that solar radiation is the cause of skin cancer (both MM and NMSC) and that predictions of future rates related to ozone depletion are difficult because of skin cancer's long latency period and because of changing social norms that may mitigate present and future exposure behavior. This international Sun Safety metanarrative, however, has been translated and transformed into national narratives with some considerable differences (as presented in section 4.4.2).

The following discussion section explains the national Sun Safety narratives in Australia, Canada and England through the analytic concepts of framing and narrative construction. The section concludes by drawing together the international

metanarrative with the national narratives to explain how and why policymakers transform international information in the national context.

4.5.1. Framing and Sun Safety Metanarratives

As discussed in Section 4.2.2., framing is a way of making sense of an issue. It is a process through which problems are defined, causes diagnosed and solutions suggested. Because they are contextual, frames are in a constant state of flux. As new information is available that information can be assimilated, incorporated or denied; the weighting of the new information is dependent on the frame into which it is entering. Frames often use rhetorical devices such as metaphors and symbols as well as visual images and, through these, can develop into storylines (or narratives) over time. The following discussion revisits this concept of framing to show how a single body of international Sun Safety information has resulted in different Sun Safety programs due to national preferences in framing and narrative construction.

4.5.1.1. Framing and the Sun Safety Narrative in Australia

Australia's Sun Safety narrative states that skin cancer is a significant public health problem; everyone in Australia is at risk and therefore constant public vigilance is required. Information provision is highly centralized and there is tight regulation around products making claims of sun protection. This framing can be seen as a result of the high at-risk population in Australia, the country's strong regulatory framework as exercised through powerful state-centered public health agencies, and the historical importance given to the development of skin cancer prevention programs.

Because the bulk of the Australian population lives along the south and east coasts of the country the majority of public health messages can be concentrated in the three states that are home to most of the people: Queensland, Victoria and New South Wales. The high proportion of Australians of white, European heritage and the historically high skin cancer rates also mean that a large portion of the population either knows someone, or knows of someone, with skin cancer, increasing the individual relevancy of the problem. This personalization of the problem helps the public put a face to the problem and rallies support behind widespread public initiatives.

As compared to other countries (such as Canada) the framing of skin cancer as a public health problem in Australia has allowed Sun Safety messages to remain separate from ozone depletion for a couple of reasons. First, the recognition of skin cancer as a public health problem (both by experts and by the public) predates the environmental issue of ozone depletion. Second, Australia's strong regulatory framework has granted state agencies strict control over the content of public messages. Those messages, for the most part, have been constructed by community development experts rather than by scientific, medical or technical personnel. The messages, therefore, have defined Sun Safety as a social and behavioral issue related to the social constructions of tanned skin, rather than as a strictly medical or as an environmental issue. The strong regulatory framework in Australia has also made it easier for policymakers to control products and messages related to Sun Safety from the manufacture of sunscreens to school policies about recess and outdoor activities.

As the world leaders in skin cancer prevention, Australian experts in the international community have been pivotal in increasing international awareness of

Sun Safety. As Sun Safety messages return to Australia from the international arena, they are brought into a social context highly sensitized to Sun Safety and skin cancer. Because of this they are, in framing terms, *heavily weighted* to be defined as a public health problem (for a discussion of weighting in framing, see page 88). In the context of framing, therefore, Sun Safety in Australia has *communicators* that are specialists in marketing and community development and therefore willing to situate Sun Safety in the broad context of public activity. The *receivers* are part of a general public primed to hear how to protect themselves against skin cancer because of the high incidence of the disease. The *text* of the message, therefore can be strong and authoritative, both because of the extent of the problem and because of the authority granted through the State Cancer Authorities' ability to define the discourse of skin cancer. Finally, the Australian culture is one that might advocate individual rights, but still grants considerable regulatory control to institutions involved in Sun Safety.

4.5.1.2. Framing and the Sun Safety Narrative in Canada

Canada's Sun Safety narrative has subtle but important differences from that of Australia. Canada's narrative states that skin cancer rates are on the rise due to ozone depletion and that individuals must not only protect themselves from the sun but also work to reduce environmental damage in order to be safe (for a more detailed discussion of the Canadian narrative, see Garvin & Eyles, 1997). This narrative can be seen as a result of the timely relationship between rising skin cancer rates and ozone depletion, the lack of a central home for Sun Safety messages and the unknown levels of public skin cancer risks.

In Canada, as compared to Australia and England, environmental concerns over ozone depletion and wider public health campaigns concerning skin cancer both had considerable concurrent public visibility during the late 1980s. Not only did the two issues gain wide visibility, they were also conceptually linked through funding mechanisms at Environment Canada that encouraged a linking of environmental issues with health issues, culminating in the implementation of the UV Index in 1992. As a result it has been difficult, if not impossible, for Canadian communicators to disentangle the public health message of Sun Safety from environmental concern about ozone depletion. In any case, it has only been since 1997 that any attempt has been made to separate the messages in most circles. The Canadian Cancer Society, for example, continues to tell people that ozone depletion is responsible for increasing skin cancer risks and rates (see Canadian Cancer Society, 1995), a statement that would not be made in Australia.

There are also other framing effects that have influenced the Sun Safety message in Canada. The country's decentralized political structure and the relatively weak regulatory strength (as compared to Australia) has meant that Sun Safety and skin cancer prevention are the responsibility of specific groups and organizations who, under the broad guidance of Health Canada, promote their own messages. Finally, the ill-defined nature of at-risk populations, as well as a physical climate that leads to short, intense sun exposure has made the widespread distribution of Sun Safety and skin cancer prevention messages especially difficult in Canada.

In a comparative sense, skin cancer concerns remain relatively low in Canada with the result that information coming into the country via the Sun Safety epistemic community has generally been *weighted* relatively low. But Sun Safety concerns are

increasing along with skin cancer incidence rates and Sun Safety concerns are also starting to change in response to the changing Canadian context. Part of the rise in incidence can be explained by Canadians' increased tendency to spend part or all of the winter months in warmer areas such as Florida and Arizona in an attempt to alleviate, or completely avoid, the long, cold winters. The short, hot summers mean that many Canadians, after a long winter hibernating are more than willing to indulge themselves in the sunny outdoors. The result is that Canadians tend to experience intense, intermittent sun exposure in comparison to the Australian's year round cumulative exposure. For Canadian Sun Safety experts, this has meant a re-evaluation of the international messages and a reformulating of them to meet the specific needs of the Canadian context.

The result of that reformulation has been Sun Safety messages framed somewhat differently than those in Australia. The *communicators* are a coalition of groups including medical personnel, pharmaceutical companies and the Canadian Cancer Society. In addition Canadian UV environmental scientists are important communicators of Sun Safety messages. The *receivers* of Canadian Sun Safety messages are, in general, not particularly sensitized to increasing skin cancer rates. They are, however, sensitized to environmental issues. It is not surprising, therefore, that the *text* of Canadian Sun Safety messages often provide references to ozone depletion and the UV Index, and the relatively straightforward protective behavior of wearing sunscreen. Finally, the Canadian *culture* is one that does not support central decision-making authorities and therefore Canada does not have the same regulatory control seen in Australia.

4.5.1.3. Framing and the Sun Safety Narrative in England

The Sun Safety narrative in England differs again from that in either Australia or Canada. The English narrative states that individuals should behave responsibly in the sun. They should try not to get burned; they should seek shade; they should cover up. In other words, the English narrative is framed as one of moderation and results from the relatively mild and wet English climate, the lack of high visibility of skin cancer, and the institutional mandates for Sun Safety program activity.

The nature of the English climate means that the general public anticipates spring and summer and the sunny days that are a part of these seasons. In addition, there is a growing tendency for the English (like many Canadians) to seek vacations in hot and sunny locales. Sun Safety personnel acknowledge that their credibility as communicators rests on the recognition that many people will simply ignore strongly worded messages to avoid the sun completely. Because skin cancer rates are much lower in England than in hotter climates such as Australia, it is not perceived by the general public as a widespread problem. For these reasons, campaigns utilizing strongly-worded messages or scare tactics are simply not feasible (as seen by the failure of the Dying to Get a Suntan campaign).

The fact that Sun Safety messages come from a single, government sanctioned agency means that a consistent message is disseminated and that this message is received within a social context that grants legitimacy to the source (the Health Education Authority). In England the additional information from dermatologists and sunscreen manufacturers are seen as complementing the Health Education Authority (HEA) message and further legitimizing its primary message. Motivation for Sun Safety activity has not been based on high skin cancer incidence (as in Australia), nor

on environmental links (as in Canada), but rather has been a response to targets set in the White Paper, *The Health of the Nation*. This document identified four common cancers for which targets were set and stated that the goal was "to halt the year-on-year increase in the incidence of skin cancer by 2005" (DoH, 1992).

In the context of the earlier discussion on framing locations, England is much like Australia in that its *communicators* are personnel trained in marketing and health promotion. However, unlike Australia, the *text* is one of moderation and reasonable behavior. This is due, in part, because the *receivers* of the message are neither highly sensitized to skin cancer, nor are they predisposed to receive messages of total sun avoidance. Instead, the messages of moderation are situated within a *culture* that sees moderation as appropriate and therefore some sun exposure is acceptable.

4.5.1.4. Summary

Differences in Sun Safety programs in the three countries reflect the various ways that international evidence is incorporated based upon how it is framed — in other words on the differences in *communicators, receivers, text* and *culture* and that this framing affects both problem definition and solution (see Table 4.2).

This discussion has shown that though a set of consensus messages regarding Sun Safety may emanate from the international epistemic community, there are differences in how those programs appear at the national level. The discussion has also shown that the social and culture contexts into which information and knowledge are received (as discussed in Chapter Three) can, through framing and narrative construction, affect what information gets highlighted and what gets lost as it moves from the scientific arena to the policy arena in a particular social context.

TABLE 4.2
Framing and narratives of Sun Safety in Australia, Canada and England.

	Australia	Canada	England
Framing Locations			
Communicators	Marketing/Health Promotion Specialists	Coalition of physicians, companies & public health	Marketing/Health Promotion Specialists
Receivers	Sensitized to skin cancer prevention messages	Sensitized to environmental messages	Not sensitized to skin cancer, don't want to hear avoidance messages
Text	Strict avoidance and protective measures	Personal protection & environmental change	Moderation and reasonable behavior
Culture	Grants regulatory control to authorities	Little regulatory control granted to authorities	Little regulation, moderation is appropriate
Narratives			
The Problem	Skin cancer is a major public health problem	Skin cancer is an environmental problem	Skin cancer is a minor (but growing) public health problem
The Solution	Everyone must be vigilant; must reduce social approval of tanned skin	Personal protection (sunscreen) and environmental rehabilitation	Moderate sun exposure and reasonable (minor) protective behaviors

4.5.2. International Metanarratives, Epistemic Communities, Framing and National Narratives

Traditional models of rational policymaking suggest that an epistemic community influences policymaking via its exercise of power through knowledge (for a discussion of this, see Litfin, 1994, p. 40-50). As discussed in Chapter Three, this infers a particular power relationship where the public or policymakers can take part in early problem selection, but it is the scientists (in this case, the epistemic community) that have control over guiding the definition, cause and potential solutions (see Figure 4.3). In this arrangement, the knowledge producers (the epistemic community) exert considerable power through their ideologically-constituted definitions of *what exists*, *what is good,* and *what is possible.* The knowledge users (policymakers) exercise less power in their roles as transmitters and applicators of the information and the knowledge receivers (the public) are powerless and passive recipients (Yanow, 1996; Boggs, 1992).

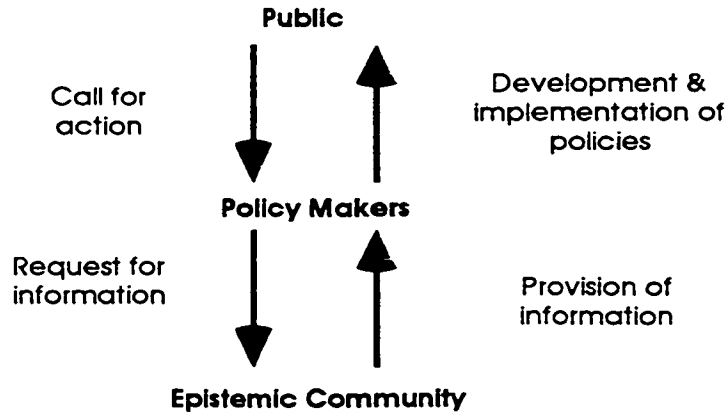

Figure 4.3:
The traditional flow of policymaking ideas

However the example of the Sun Safety epistemic community and the national narratives presented in this nested investigation has shown that an epistemic community's information and evidence is not necessarily accepted *carte blanche.* Instead, the information is carefully selected and adopted and adapted to meet the specific context of each country. As the evidence moves from the international community and its scientific rationality (as explained in Table 3.1 on page 69), it is re-evaluated by policymakers and the public according to their own sets of criteria grounded in political and social rationality.

The outcome of this process is a series of interpretations of the evidence that is spatially-, temporally- and culturally-bounded. Scientists, as experts, bring international evidence back to their home country where it is subjected to a nationally-defined and ideologically-based interpellation. As a result, each country evaluates the international evidence based upon its own, nationally-defined, standards of *what exists*, *what is good,* and *what is possible*. While policymakers may all have access to the same body of international evidence, their nationally-defined political rationality (as discussed in Chapter Three) directs their selection of appropriate and valid evidence. At the same time, the public is also evaluating both the international evidence and the evidence from policymakers according to their own criteria for social rationality (also discussed in Chapter Three). Rather than representing the rational model of policy exemplified by "speaking truth to power" (Wildavsky, 1987) as shown in Figure 4.3, the incorporation of evidence into programming takes on the relational flows outlined in Figure 4.4.

This figure shows the flows of information and ideas between the Sun Safety Epistemic community and the three countries. It reveals two important points. First, the scientific experts *themselves* cannot be completely disconnected from the influences of their country of origin. This helps to explain how Canadian Sun Safety experts continue their focus on the relations between ozone depletion and skin cancer, while Australians focus on generating evidence on the social and behavioral

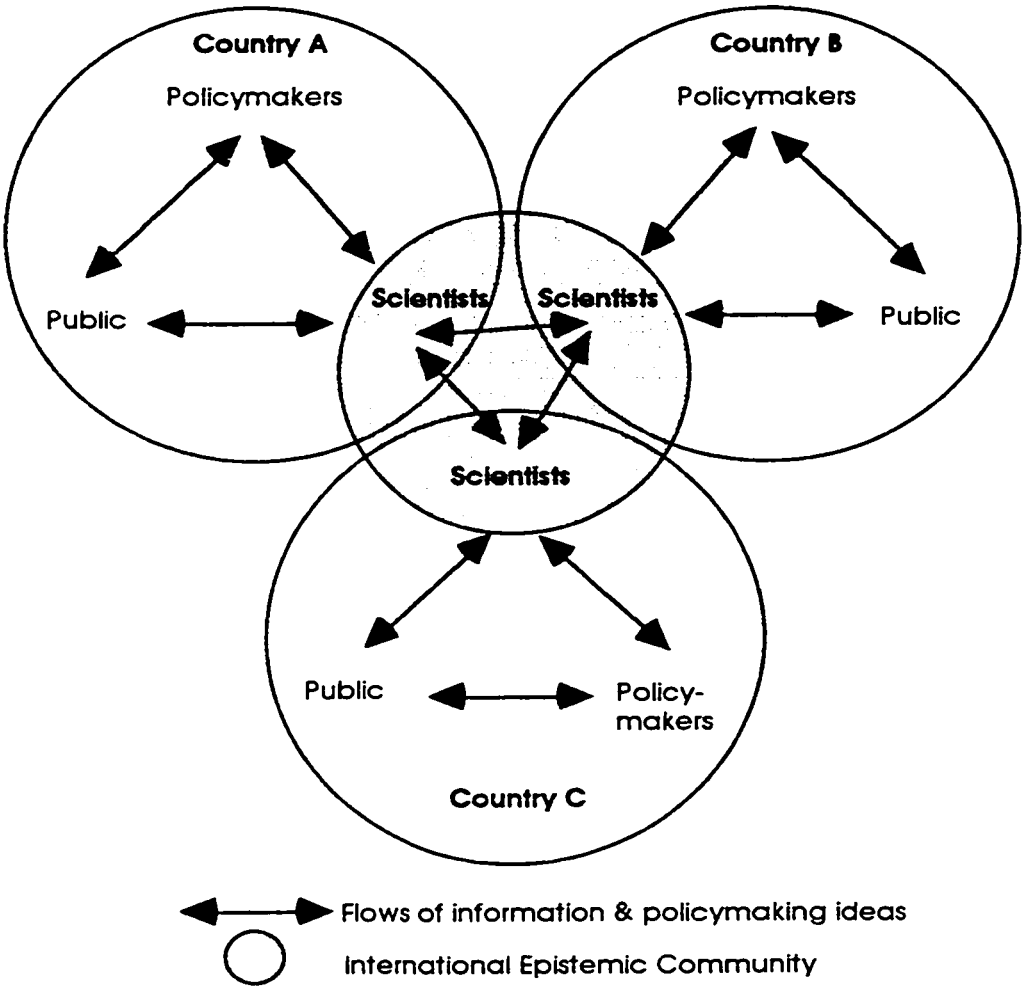

Figure 4.4
Relational flows of evidence among scientists, policymakers and the public

context of sun exposure. This suggests that scientific experts themselves bring to the international epistemic community their nation's socially- and politically-defined preferences for making sense of an issue. If nothing else, these preferences are made evident by the example that research funded in one country may not be considered important and therefore may not be funded in another country.

The second important point in Figure 4.4 is that policymakers need not always act as interpreters of information and evidence between scientists and the public. This is an important difference from the traditional model of "speaking truth to power" and will be examined in greater detail in the second nested investigation presented in Chapter Five.

4.6. Conclusions

The existence of an international Sun Safety epistemic community has not meant the implementation of similar Sun Safety programs in Australia, Canada and England. Instead, each nation has adopted and adapted the international body of evidence based upon its own social, political, economic and cultural needs. This Sun Safety example shows that an epistemic community does attempt to exert its authority through its specialized knowledge. However the power in the relationship between experts and policymakers is not one-sided as most of the literature suggests. When policymakers and the public choose to re-interpret the scientific evidence based upon their own ideologies, they evaluate that evidence according to their own definitions of *what exists, what is good* and *what is possible.* These definitions, influenced by ideology and therefore bounded by political and social rationality instead of by scientific rationality, result in subtle yet important differences in national Sun Safety narratives and the resulting Sun Safety programs.

CHAPTER FIVE: LOCAL INVESTIGATION
Between Policy and the Public: Sun Safety in Ontario

5.1. Introduction

Within the broad case study of Sun Safety, Chapter Three presented a framework outlining the different ways that the scientific community, policymakers and members of the public evaluate and interpret knowledge and evidence. It concluded that each group engages in a different form of rationality (scientific, political and social) when evaluating evidence and knowledge. Chapter Four provided an example of this by showing that information from the international Sun Safety Epistemic Community gets transformed and translated into different Sun Safety programs in Australia, Canada and England due to differences in framing and nationally-defined narratives. Located at the intersection between scientists and policymakers, Chapter Four showed that ideology plays a key role in framing and narrative construction by helping to define *what exists*, *what is right*, and *what is possible*.

This Chapter builds on the previous two by presenting the third, and final, nested investigation of the study: how Sun Safety information gets translated and transformed into programs at the local level. Located at the intersection between policymakers and the public, this chapter reports the findings of a survey of Sun Safety programs in Public Health Units (PHUs) in Ontario, Canada. This nested investigation has two specific aims. First, it will show that the transformation of

evidence and information is related to policymakers' and the public's definitions of rationality (political and social, respectively). Second, it discusses how the hegemonic influence of science (and its epistemic communities) is being challenged through increased information technology, the growth of a linked global civil society, and the time-space compression characteristic of postmodern society.

As with the previous two nested investigations, this chapter begins with background information situating this portion of the study in the social context of health promotion in Canada and Ontario. Following this is an explanation of the methods and findings of the investigation, ending with a detailed discussion of the findings. The chapter ends with a short summary and the conclusions of this nested investigation.

5.2. Background

Where Chapter Four examined international Sun Safety programs at the intersection between the scientific community and policymakers, this chapter examines the intersections between policymakers and the public. At that intersection, public health professionals take responsibility for reinterpreting science and policy to implement programs that meet local needs. Meanwhile the public, through its operations in civil society, can be recast as active participants in the policymaking process. The following background information traces the development of Public Health Promotion in Canada and Ontario, and introduces the role of public participation in policymaking through recent developments in civil society.

5.2.1. Public Health Promotion in Canada

The development and implementation of Sun Safety programs in Ontario has taken place within a more broad context of public health promotion in Canada. Over the past several decades, Canada has been a world leader in health promotion through the development and release of three important health promotion policy documents: the Lalonde Report (Health & Welfare Canada, 1974), the Epp Report (Health & Welfare Canada, 1986), and the Population Health Promotion Report (Hamilton & Bhatti, 1996).

Early Canadian interests in health promotion were first seen in 1974 with the release of *A New Perspective on the Health of Canadians* (called the "Lalonde Report" for then-Minister of Health, Marc Lalonde). As a national strategy, this report expanded the definition of health beyond the traditional framework of the biomedical system (O'Neill & Pederson, 1994). The Lalonde Report proposed that health was related not simply to access to medical care but, more importantly, through a number of additional determinants. Such determinants of health could be related to lifestyle (such as smoking, exercise and diet) or to environmental factors (such as access to indoor heat, clean drinking water, and clean air). The Lalonde Report went on to argue that health care dollars would be better spent educating and encouraging Canadians to adopt healthier lifestyles and to seek more healthy environments, rather than on more or better curative, medical care (O'Neill & Pederson, 1994). Though the Lalonde Report did little to actually change health policy or practices, it did become a catalyst that shifted the Canadian health focus from curing illness toward preventing illness and promoting health (O'Neill & Pederson, 1994).

During the 1970s, the burgeoning rhetoric and increasing emphasis on prevention and health promotion culminating in the Lalonde Report was paralleled by a restructuring of the institutional framework of Health and Welfare Canada, the primary institution responsible for overseeing Canada's federal health and social welfare programs (Pinder, 1994). By the early 1980s, Health Canada had not only changed its name but also established a Health Promotion Directorate, which began playing a major role in both redefining the concept of health and in "nurturing the ideology of health promotion" (Hayes, 1992, p. 215). Reinforced by this new bureaucratic structure, interest in and activity around health promotion increased still further in Canada.

In the Lalonde Report the locus of control for health was placed on the individual. The danger in such an approach was that health problems could then be ascribed to 'bad' or 'poor' lifestyle choices on the part of the individual, resulting in 'blaming the victim.' To address this danger the early health promotion concepts introduced in the Lalonde Report were expanded in the 1986 release of *Achieving Health for All* (or, the Epp Report — also named for the Minister of Health).

Hailed as the "new" health promotion, the Epp Report's release coincided with the first International Conference on Health Promotion, hosted in Ottawa (O'Neill & Pederson, 1994). Both the Epp Report and the call to action resulting from the conference (called the "Ottawa Charter") adopted the World Health Organization (WHO) view of health as based on enabling and empowering individuals and communities. This new movement added broad social factors to the previous model of health promotion and suggested that health could best be improved through structural changes (i.e., increased economic opportunity, better

living conditions, supportive communities) and that individual behaviors and lifestyle 'choices' are limited and constrained by social and economic circumstances (Evans, 1994). The Epp Report's determinants of health framework and the call for action outlined in the Ottawa Charter began to influence health policymakers and practitioners and widened the conceptualization of health and health promotion (Pinder, 1994).

Based on the framework of the Epp Report and the Ottawa Charter's call to action, Canadian researchers began exploring new ways of conceptualizing the interactive relationship between health, lifestyle and the social and physical environment. Developed in the late 1980s, the population health perspective (Evans & Stoddart, 1994) used a socio-ecological model to propose that health is related to life circumstances and socio-economic status (SES). It went on to argue that interventions at the population level may be the most effective use of health care resources because they target the broad, structural determinants of health status rather than simply providing cures.

A more recent development in Canadian health promotion has seen the incorporation of the population health perspective approach into the 'new' health promotion. The Population Health Promotion model brings together population health's socio-ecological model with basic health promotion strategies. Specifically, this model "shows how a population health approach can be implemented through action on the full range of health determinants by means of health promotion strategies" (Hamilton & Bhatti, 1996). Previous health promotion strategies had, by and large, targeted individual behaviors. By contrast, the new Population Health Promotion approach looks at the broad range of health determinants to focus health

promotion strategies at the level of family, community and society to try to address the underlying societal issues that influence health.

The developments and reconceptualizations of health and health promotion have developed rapidly in Canada. In just over 20 years, Canadians have moved from a strictly biomedical, curative model of health to a view that health is part of a complex web of social, political, economic, and environmental relations. This remarkable "shifting medical paradigm" (Labonté, 1994, p.77) has provided an arena for the development of a new type of health professional: the health promotion specialist. It is the health promotion specialist that takes primary responsibility for the development and dissemination of the types of health promotion and primary prevention messages that make up skin cancer prevention and Sun Safety.

5.2.2. Health Promotion and Sun Safety: The Ontario Context

In the province of Ontario, interest in health promotion goes back over 100 years (Pederson & Signal, 1994). Concurrent with the release of the Lalonde and Epp Reports, the rising interest in health promotion in Ontario in the 1970s and 1980s was encouraged by professionals working in health and social welfare (Pederson & Signal, 1994; Pederson, 1989). By the 1980s, the Province of Ontario employed a core group of professionals in the provincial Ministry of Health who were advocates for increasing the funding of health promotion and for more health promotion programs in public health units (Pederson, 1989). Working at both the provincial and local levels, this informal group of provincial health professionals not only embraced the new health promotion approaches, but worked to operationalize them along with workers in local public health units (Pederson, 1989).

At the international level, studies have identified core communities of professionals working in both ozone depletion (Haas, 1992b) and Sun Safety (see Chapter Four). As was the case at the international level, Ontario's early interest in health promotion has been recognized as driven by a core group of professionals sharing some basic beliefs and values, and successfully negotiating the administrative and institutional structures for decision-making in support of this 'new' approach (Pederson, 1989). By 1987, after years of sporadic support for various kinds of health promotion units, the Ontario Ministry of Health formed a Health Promotion Branch. Still in operation, this branch of the Ministry fosters activities and interactions between health promotion specialists, funds community-based activities, and provides resources to communities (Pederson & Signal, 1994). This institutional reorganization, established in the late 1980s, represents a structural response to the changing conceptualizations of health and health promotion in both Ontario and Canada, and represents the success of this core group of health promotion advocates (Pederson, 1989).

Such institutional response to changing health promotion theories and concepts has continued in Ontario through the implementation of a series of mandatory guidelines implemented in a political climate of service downloading (Badovinac, 1998). Early provincial mandatory guidelines introduced in 1984 and 1989 emphasized education, prevention and health promotion but remained vague about details on program content and implementation strategies (Government of Ontario, 1984; Government of Ontario, 1989). In 1997 the Ontario Ministry of Health announced a new set of mandatory guidelines for public health programs that were much more detailed and set in the context of the downloading of provincial

responsibilities to municipal governments. Through the course of the downloading exercise, funding for public health has been 'restructured' from being a provincial responsibility to that of the local, municipal governments (Badovinac, 1998). In order to maintain parity in programs across the province, the 1997 Mandatory Health Programs and Service Guidelines (Government of Ontario, 1997) define the core programs that must be funded by local government and delivered by each public health unit. These Mandatory Guidelines, among other things, instruct public health units to develop and implement a minimum delivery of targeted skin cancer prevention (or Sun Safety) programs.

Together, the history of public health and health promotion in both Canada and Ontario have bounded the development of Sun Safety programs at the public health unit level by setting the social and institutional context. Canada's influential role as an international advocate of health promotion, coupled with a professional movement of health promotion supporters at the provincial level, suggest that strong institutional support is likely for health promotion programs such as Sun Safety as evidenced by the 1997 provincial Mandatory Guidelines.

5.2.3. The Public as Civil Society

The previous discussion introduced the public health and policymaking context in Ontario and Canada. However programs such as Sun Safety are also implemented within a much broader social, political, economic and cultural context in addition to an institutional one. The public, as a component of civil society, is more than a passive recipient of such programs. Rather, members of the public can be seen as participants in the construction and co-construction of issues, problems

and solutions as evaluated through their own legitimate form of social rationality (as discussed in Chapter Three). That participation, states Walzer (1995), stems from the close relationship between democracy and civil society:

> "There is a close conceptual tie between social democracy and civil society, for the first of these calls for the self-direction of society by its members and the second represents the best possible site for self-direction — in detail, every day, by ordinary men and women." (Walzer, 1995, p. 4)

This definition of civil society bears remarkable similarity to Therborn's (1980) definition of ideology, suggesting that civil society, like law, art and history, is mirrored in and by ideology. Subjection and qualification within and between civil society at various spatial levels works toward the ideological construction and reconstruction of the postmodern society.

The term civil society refers to a historically-evolved sphere that operates outside of the state to counterbalance the state's power in society.[1] As a conception, it is new neither practically nor conceptually (Walzer, 1995). Though seen as a key component of modernity, the idea of civil society was recognized as early as the Roman Empire and developed more fully following the English Industrial and French revolutions (Hall, 1995; Mouzelis, 1995). As a component of Enlightenment society it has been linked through history to the rise of modernity in the 18th Century. At that time, increasing horizontal linkages led to the development of

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1 Conflicting definitions of civil society emerge through different ways of dividing the social world. For historical reasons, theorists such as Hegel and Gramsci saw civil society as a part of the state and Marx, who saw the marketplace as the center of society, identified civil society as operating as a part of the non-state. This distinction is presented in both Adamson (1980) and Bobbio (1979). With the rise of the global economy, modern theorists generally adopt the definition of civil society as operating outside of both the nation-state and economy (see, for example, Hall, 1995 and Walzer, 1995)

autonomous organizations able to operate free from state control. In some communities these groups represented religious dissenters while in others, most notably in England, commerce formed the basis for these secular organizations (in the form of guilds and craft alliances) (Hall, 1995). A new state-society relationship emerged via the development of civil society as power became vested in civil groups working in self-interest and against state authority (Hall, 1995; Cohen & Arato, 1992).

Seen in this historical context, civil society became recognized as a particular component of society that was able to limit the powers of the political elite operating through the state. In the 1980s civil society was primarily seen as the associational opposition to despotism — particularly in Eastern Europe. It was an area where social groups could maneuver to create a more tolerable existence in totalitarian regimes (Hall, 1995). This was exemplified by associational groups reflecting traditional civil societal organization: the labor movement (e.g. Solidarity in Poland), religious groups, and the feminist and environmental movements.

By the 1990s, civil society was recognized as becoming transnational in nature. Associated with postmodern views of the world, this global civil society (Lipschutz, 1996; Walzer, 1995) cuts across old divisions and groupings based on class distinction (such as political parties and labor unions). Called 'new social movements,' this particular form of civil society is increasingly identified as a mosaic of groups operating at local, regional, national and international (or global) scales to counterbalance governing institutions at all levels (Lipschutz, 1996; Walzer, 1995).

What is most important about global civil society in the 1990s and into the coming millennium is its ability to access and redistribute information and resources quickly and extensively. In the environmental sphere this is exemplified by the operations of international organizations such as Greenpeace and The Sierra Club who are capable of mobilizing resources (both financial and personnel) in many parts of the world. However this is not limited to environmental groups. Non-governmental organizations and loosely-affiliated international groups are developing at many levels facilitated through information and communication technologies (Lipschutz, 1996).

This conception of the public as civil society adds depth to Chapter Three's discussion of power in the policymaking process. That chapter explained that the public is generally viewed as passive recipients in the policymaking process as problems and issues are defined by scientists and solutions implemented by policymakers. While Chapter Four suggests that the public may have a limited voice in defining problems as they demand action from policymakers (see Figure 4.3 on page 138), the influence of the public is primarily via participation in issue framing and national narrative construction. Once again the public is, primarily, a passive recipient.

Reconceptualizing the public as a component of civil society changes the power relationship earlier identified between scientists, policymakers and the public. By definition, civil society operates in the non-governmental public sphere (Nielson, 1995) and is powerful enough to counterbalance state influences (Gellner, 1995). In this role it can be counter-hegemonic to the powerful interests that generally influence the state and policymakers (such as scientists, as discussed in Chapter

Three). The public is no longer seen as a passive recipient of information and public health programs rather, recast as civil society, it becomes a potentially active participant in the identification, construction and solution of problems in the public sphere (Giner, 1995). The process through which this takes place will be explained through a presentation and discussion of the findings from this nested investigation.

5.2.4. Summary

The background information presented here explains that Sun Safety programs in Canada have developed within a social and institutional context that values health promotion and disease prevention. As communicators and conveyors of information, a core group of health promotion professionals in Ontario has been instrumental in advocating the health promotion approach in that province. Meanwhile, reconceptualizing the public as a part of civil society recognizes it as a key participant in the construction, co-construction and re-construction of public programs — including health promotion programs such as Sun Safety.

The next section of this chapter reports the results of a survey of Sun Safety programs in Ontario's public health units. These findings are followed by a discussion of the survey results in the context of civil society as introduced here, and incorporating notions of ideology, epistemic communities, framing and narratives as discussed in previous chapters.

5.3. Methods

In May 1998, a four-page mailed survey was administered to each public health unit in Ontario (n=42) asking for information on local Sun Safety and skin cancer prevention programs. The purpose of the survey was to identify the timing,

motivation and primary messages communicated in local, Sun Safety programs throughout the province. The survey was conducted during the spring and summer months to coincide with the first year of program development under newly-distributed 1997 Ontario Mandatory Health Programs and Service Guidelines which identified Sun Safety and skin cancer prevention as a mandatory program (Government of Ontario, 1997).

The survey was divided into two parts and included both open- and closed-ended questions (see Appendix B). The first part of the survey (2 pages) requested information on the timing, motivation and commitment to Sun Safety as a priority in the health unit. The second part of the survey requested information on the content and form of local Sun Safety programs.

5.3.1. Survey Administration

This survey was administered to key individuals working in Sun Safety and skin cancer prevention at each public health unit. Individuals responsible for skin cancer prevention programs were identified in two ways. First, a snowball sampling method identified key individuals working in Sun Safety in six of Ontario's public health units. These individuals were contacted and asked to provide names of Sun Safety colleagues at other health units, resulting in contact names for over half of all units. Individuals at the remaining units were identified through telephone calls to each unit and discussions with managers and Medical Officers of Health.

A four-step design was used to increase response rate for the survey. On the day of survey mailing, each targeted public health employee was called and notified that the survey was on its way. For those personnel not in the office, messages were

left either with office staff or on voicemail. Four weeks following the mailing (late June, 1998), another round of phone calls were made to those public health units that had not yet responded to the survey. By August, 1998 over 80% of public health units had responded to the survey. In September, remaining public health units were contacted by FAX, provided with new copies of the survey and asked to FAX their responses. In late-September requests for participation were faxed to the Medical Officers of Health for the remaining six public health units under the assumption that either personnel changes or vacation time had made the original contact names invalid. By October, all 42 public health units had responded to the questionnaire giving a response rate of 100%.

In recognition of the time and effort required to fill out the questionnaire, contact information from the questionnaire was assembled and re-distributed back to respondents. As a result respondents were supplied with a complete list of public health personnel responsible for Sun Safety programs throughout Ontario and a list of the general types of programs and resources available at other health units. While this information was redistributed, information from the first two pages of the survey was considered confidential.

5.3.2. Classification and Coding of Variables

Since skin cancer is primarily a disease affecting wealthier populations (Bonett, *et al.*, 1989), it was expected that PHUs with higher relative income would have more programs, engage in more activity and incorporate national messages to a greater extent. Likewise, those PHUs with a greater percentage of their population at-risk were also predicted to have more activity in line with greater demands from the

public and greater importance to constituents. Finally, those PHUs with more resources, in the form of per capita expenditures on health promotion, were predicted to have greater activity in Sun Safety and skin cancer prevention as they would have more resources to devote to such programs. The following sections provide brief discussions on how each of these variables were classified and coded.

5.3.2.1. Relative Income

There is data to suggest that both high-risk behaviors and the resulting skin cancer levels are higher in wealthier populations (Bonett *et al.*, 1989). It was therefore expected that PHUs with relatively wealthier populations would have longer-running and more well-established Sun Safety programs. As a rough measure of relative wealth of each PHU, relative income was calculated based on median household income for each county in the PHU drawn from the 1996 Canadian Census. Median household income data for all PHUs was compiled and broken into thirds. PHUs with a median household income of less than $41,000 were ranked as low; PHUs with a median household income of $41,000 to $43,999 were ranked medium; and PHUs with a median household income of $44,000 or greater were ranked high. This breakdown also corresponds to natural breaks in the grouped data for the 42 PHUs in Ontario.

These categories were designed to provide only a rough measure of *relative* median household income in PHUs and therefore some of the distinctions may first appear arbitrary. However the reliability of these classifications were ensured in several ways. The first round of data analysis classified PHUs according to 'natural' breaks in the 1996 data and corresponded to breaking the PHUs into equal thirds. To

test its sensitivity, a second round of data analysis examined median household income from both 1996 and 1992. When there was found to be no substantial difference in the classifications between the two years, the most recent data were adopted. In other words, PHUs classified as high in 1992, tended to be classified as high in 1996 and so data from the later year were used. Finally, two alternative classifications schemes were applied to each of the 1992 and the 1996 data to test for sensitivity of the classification boundaries. When the boundaries of the categories were altered, there were few changes in the resulting patterns of responses due to the overwhelming trends in the survey responses. Because the purpose of this survey was to identify general trends rather than statistical significance, the most recent data were adopted for reporting in this chapter.

For most PHUs, categorization by relative income was unproblematic as the boundaries of the PHUs correspond to the boundaries of the census regions. However some PHUs either encompass more than one census region or cross the boundaries of two census regions. For PHUs encompassing two or more census regions in their entirety, median household income was calculated through a weighted average of the two or more census units.

In three PHUs (Porcupine, Thunder Bay and Northwestern), PHU boundaries do not correspond to census district boundaries. For the purposes of this analysis, these PHUs have been treated *as if* the boundaries correspond. This is for two reasons. First, these PHUs are in the Northern part of Ontario. Population density levels for the overlapping areas are very low and the overlapping areas represent a relatively small percentage of the PHU target population. Second, the major communities located in the overlapping areas are First Nations communities and

therefore come under the direct jurisdiction of the Government of Canada rather than the Province of Ontario and its ministries. For these reasons the PHU boundaries of Porcupine have been considered to encompass only the census district of Cochrane, the PHU boundary of Thunder Bay includes only the census district of Thunder Bay, and the boundary for the Northwestern PHU includes the census districts of Rainy River and Kenora.

5.3.2.2. Per Capita Expenditure on Health Promotion

A relative measure of per capita expenditure of health promotion programs overall was calculated from expenditure data from the Ontario Ministry of Health and Census Canada to test if those PHUs with greater access to financial resources also reported greater Sun Safety program activity. Line item #24 in the 1993 Ministry expenditure report (Ontario Ministry of Health, 1993) identifies annual expenditures on health promotion for each PHU. Using 1993 population census data for each PHU, per capita expenditure values were generated for the 1992/93 fiscal year. Based on these data, PHUs were ranked as having high (greater than $0.78 per capita), medium ($0.75 to $0.78) or low (less than $0.75) relative per capita expenditures on all health promotion programs (of which Sun Safety is a part).

As was the case with relative income, these data were analyzed in a number of ways to check for artifacts of coding. First, per capita results from the 1992/93 fiscal year were compared to per capita data from fiscal year 1990/91. This resulted in considerable changes in the classification scheme as expenditure in the earlier time period were substantially lower throughout the province. However the comparison

between the relative classifications in the two periods (high, medium, low) showed different classifications in only five of the 42 PHUs.

Since there had been such a change in expenditure on public health between the two years, a second test was conducted to see if there were general patterns related to increases or decreases in expenditures. An index based on percentage change of expenditure over the two time periods showed that there appeared to be no connection between increases or decreases and any of the variables under study. Finally, the sensitivity of the boundaries for the 1992/93 codes were tested and, as was the case with relative income, the overwhelming patterns in the data appeared to be insensitive to the year examined, the change in expenditures over time, and minor shifts in classification strategies. In the end, the fiscal year 1992/93 was selected because its data were the most recent available and appeared to represent the general trends of both 1990/91 and the change in expenditure over time.

5.3.2.3. At Risk Population

Finally, it was predicted that Sun Safety programs would have been developed earlier and would have greater visibility and importance in those PHUs with a greater proportion of their population at risk for skin cancer. The potentially "at risk" population for each PHU was calculated using population and 'visible minority' data collected in the 1996 Canadian census. Since Caucasian populations are at the highest risk of skin cancer, it was predicted that those PHUs with a higher percentage of white (or non-visible minority) populations would (and should) be experiencing more activity in Sun Safety and skin cancer prevention. Once again data at the county level were aggregated to the PHU level. In this case raw data were

combined for the constituent counties to get a total population for the PHU. Numbers for the total visible minority populations were likewise combined and, based on the total PHU population, a value was generated for the percentage of the population identified as visible and non-visible minority. Those PHUs with less than 2% visible minority (98%+ non-visible minority) population were classified as having a high at-risk population. PHUs with between 2% and 15% visible minorities (85% to 97% non-visible minority) were classified as a moderate at-risk population and PHUs with 15% to 35% visible minorities (65% to 84% non-visible minority population) were classified as having a relatively low at-risk population. It should be noted that the majority of PHUs (26/42 or 62%) fell into the category of high at-risk population and none of the PHUs in Ontario have populations with more than 35% of their populations identified as visible minorities.

5.3.3. Classification and Coding of Survey Responses

The Sun Safety survey used in this nested investigation consisted of both closed- and open-ended questions (see Appendix B). Closed survey responses were collapsed according to the timing of program development (Never, Pre-mandate, Post-mandate), motivation for program development (Internal, External, Other) and whether or not Sun Safety has been increasing or decreasing in importance over the past five years (Increasing, Decreasing, Neither). See Appendix C for details on how these variables were collapsed for analysis.

In addition to the closed responses, each PHU was asked open-ended questions regarding their program development and asked to provide any additional information available about their Sun Safety activities and programs. With this

information, each PHU was ranked by Sun Safety Activity level based on reported program descriptions and target audiences. Those PHUs reporting three or more programs with specific target populations were categorized as 'high' activity; those reporting two programs targeted at a broad population, or one program with a specific target audience (generally changed on an annual basis) were seen as meeting the minimum mandatory guidelines and categorized as 'moderate' activity. Those PHUs reporting one, broadly-targeted program or no programs at all were classified as 'low' activity. It must be noted that those PHUs with little or no activity were generally those in the process of restructuring in response to the downloading of responsibility from provincial to municipal governments.

As a part of the survey, PHUs were asked to provide information on the Sun Safety programs currently in operation. Where possible, respondents were also asked to provide printed materials and descriptions of support resources used in their information dissemination. These responses and any supplied printed materials were copied, verbatim, into an electronic qualitative data management program (Nu•dist™). Responses were then coded in two ways. First, messages were coded as to whether or not they matched those of the Canadian Sun Safety metanarrative identified in Chapter 4 and the standard Health Canada Sun Safety messages. These included using sunscreen, avoiding the sun in peak hours, covering up, seeking the shade, and whether or not ozone depletion was mentioned in their materials. Second, additional groups of responses were identified as emergent themes. These included messages aimed specifically at children, Sun Safety messages linked to other health messages, and messages aimed at structural or policy change.

5.4. Findings

It was expected that Sun Safety messages would be most complex and intensely used in PHUs with comparatively high incomes (Bonett *et al.*, 1989), higher relative expenditures on health promotion, and PHUs with a high percentage of population at-risk for skin cancer. However, this was not so. The following section summarizes the lack of expected patterns found in the survey. Subsequently it presents alternative variables that might account for the timing, motivation and content of Sun Safety programs in Ontario's PHUs.

5.4.1. Activity, Motivation and Timing of Sun Safety Programs

Contrary to the literature and the expected findings, survey responses showed little clear pattern linking independent variables (relative income, expenditures or population at risk) and survey responses indicating activity levels, motivation, and timing of program development. The data presented in the following pages represents the survey responses from all public health units in Ontario. Because this portion of the study surveyed the entire universe of public health units in the province (n=42), and because the survey secured a 100% response rate, the data has been presented in its raw form rather than as inferential statistics (for a discussion of the difference between substantive and statistical significance, see Kish, 1987 and Kish, 1965).

5.4.1.1. Relative Income

Survey responses from Ontario Sun Safety personnel showed no pattern when compared to the relative income levels of the PHUs (high, medium or low) and any of the variables tested (see Table 5.1). Sun Safety program activity was distributed fairly evenly across all relative income levels and most PHUs (67%)

TABLE 5.1
Relative Income and Program Activity, Motivation, Timing and Changing Importance of Sun Safety over Time

		High Income	Moderate Income	Low Income	Total
Sun Safety Program Activity	High	4	5	5	14 (33%)
	Moderate	5	6	3	14 (33%)
	Low	5	3	6	14 (33%)
Motivation	External	3	6	2	11 (26%)
	Internal	9	8	11	28 (67%)
	No Response	2	0	1	3 (7%)
Timing	Pre-Mandate	9	9	12	30 (71%)
	Post-Mandate	2	2	1	5 (12%)
	Never	2	3	0	5 (12%)
	No Response	1	0	1	2 (5%)
Changing Importance Over 5 yrs	Decreasing	2	3	2	7 (17%)
	Increasing	8	8	10	26 (62%)
	Neither	0	2	1	3 (7%)
	No Response	4	1	1	6 (14%)
Total		14 (33%)	14 (33%)	14 (33%)	42 (100%)

reported developing their programs in response to internal factors such as demand from the public and interest by key personnel, rather than in response to the 1997 Mandatory Guidelines. This is also reflected in the timing of program development where, regardless of relative income, most PHUs reported program development as pre-dating the guidelines. Finally, most PHUs reported that Sun Safety has been increasing in program importance over time and, again, this is regardless of relative income level. Contrary to the expected findings, it appears that the relative income level of PHUs in Ontario shows little connection to the motivation, timing and development of their Sun Safety programs.

TABLE 5.2
Per Capita Expenditures on Public Health (1992/1993) and Program Activity, Motivation, Timing and Changing Importance of Sun Safety over Time

		High Expenditures	Medium Expenditures	Low Expenditures	Total
Sun Safety Program Activity	High	5	3	6	14 (33%)
	Moderate	5	5	4	14 (33%)
	Low	4	3	7	14 (33%)
Motivation	External	3	2	6	11 (26%)
	Internal	10	8	10	28 (67%)
	No Response	1	1	1	3 (7%)
Timing	Pre-Mandate	10	7	13	30 (71%)
	Post-Mandate	1	2	1	5 (12%)
	Never	3	1	1	5 (12%)
	No Response	0	1	1	2 (5%)
Changing Importance Over 5 yrs	Decreasing	4	2	1	7 (17%)
	Increasing	7	6	13	26 (62%)
	Neither	1	1	1	3 (7%)
	No Response	2	2	2	6 (14%)
Total		14 (33%)	11 (26%)	17 (41%)	42 (100%)

5.4.1.2. Per Capita Expenditure on Public Health

It was expected that PHUs with higher per capita expenditures would have greater access to resources and therefore show greater program activity, early program development in response to internal factors, and a static or decreasing importance of Sun Safety as compared to other programs because of earlier program development. Instead, program activity appears to be evenly distributed across relative expenditure categories (see Table 5.2).

TABLE 5.3
Population At Risk (PAR) and Program Activity, Motivation, Timing and Changing Importance of Sun Safety over Time

		High PAR	Medium PAR	Low PAR	Total
Sun Safety Program Activity	High	9	2	3	14 (33%)
	Moderate	9	2	3	14 (33%)
	Low	8	3	3	14 (33%)
Motivation	External	9	2	0	11 (26%)
	Internal	16	3	9	28 (67%)
	No Response	2	1	0	3 (7%)
Timing	Pre-Mandate	19	2	9	30 (71%)
	Post-Mandate	4	1	0	5 (12%)
	Never	2	3	0	5 (12%)
	No Response	1	1	0	2 (5%)
Changing Importance Over 5 yrs	Decreasing	2	2	3	7 (17%)
	Increasing	18	3	5	26 (62%)
	Neither	3	0	0	3 (7%)
	No Response	3	2	1	6 (14%)
Total		26 (62%)	7 (17%)	9 (21%)	42 (100%)

5.4.1.3. Population At Risk

As was the case with relative income and relative expenditures, there seems to be no clear pattern linking increased Sun Safety activity, motivation, timing and importance with the levels of population at risk in each public health unit. If anything, a pattern appears that is opposite to the expected findings. It was expected that those PHUs with a greater proportion of Caucasian population would have greater program activity with earlier development in response to recognized risky populations. However Table 5.3 shows that the link between at-risk population and program development is not so straightforward.

In motivation, more PHUs with relatively lower expenditure levels did report developing programs in response to the Provincial Guidelines (6 low expenditure PHUs versus 3 high and 2 medium). And more PHUs with high or medium relative expenditures reported that Sun Safety programs are decreasing in importance (4 and 2, respectively as compared to 1 low expenditure PHU reporting decreasing importance). While these differences are worth noting, they do not appear to represent a clear pattern linking program activity, timing, motivation and importance with relative expenditures by PHUs.

First, program activity level appears to be evenly distributed across PHUs regardless of relative proportions of populations at risk. Thirty to 40% of thePHUs with medium and high PARs reported external motivation, while all low PAR PHUs reported internal motivations. These findings are directly opposite of expectations that PHUs with high at-risk populations would have developed Sun Safety programs in response to local demand or internal personnel identifying high risk groups. Likewise, all PHUs with low at-risk populations reported that their Sun Safety program development pre-dated the provincial Mandatory Guidelines while PHUs reporting development post-dating the Guidelines were those with medium or high PARs. Finally, as was expected, PHUs with higher at-risk populations reported that Sun Safety appears to be increasing in importance over time.

5.4.1.4. Related Findings

In addition to identifying general trends in the survey data, responses were also mapped by PHU to identify any potential diffusional or distributional patterns in timing, motivation, and program activity throughout the province. Neither the

characteristics of the PHUs (relative income, relative expenditure, population-at-risk) nor the survey responses (activity level, motivation, timing, changing importance) revealed identifiable patterns during the mapping exercise.

While the independent variables provide little explanation for the development of Sun Safety programs in Ontario's PHUs, the survey responses did present trends[2]. When compared against one another, PHUs showed patterns in their levels of activity, motivation and timing of program development and their indication of whether or not Sun Safety is of increasing or decreasing importance (see Table 5.4). For example, most PHUs (over 70%) reported developing programs prior to the release of the 1997 provincial mandatory guidelines and also reported program development as motivated internally either by key personnel or staff interested in Sun Safety (33%), public concern in the health unit (19%) or some other internal factor (17%). In total, almost 70% of PHUs reported Sun Safety program development was the result of internal motivations and was not due to the externally-driven 1997 provincial mandatory guidelines. Finally, the majority of PHUs (62%) reported that Sun Safety has been increasing as a priority over the past five years.

5.4.1.5. Summary

These survey findings reveal a pattern of early Sun Safety program development in response to internal motivations within most of Ontario's PHUs. As

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2 Statistical analyses (χ_2) were run on the survey data to test for significance between variables, however the small size of the universe (n=42) and the overwhelming trends in the relationships required considerable collapsing of categories in order to generate a viable statistical measure. Given that one of the main tenets of this project is that scientific rationality is one of many ways of making sense of issues (rather than the most important way) and that the analysis did not identify new or unexpected trends or relationships, results of the statistical analysis are not reported here.

TABLE 5.4
Activity Level and Motivation, Timing and Changing Importance of Sun Safety over Time

		High Activity	Moderate Activity	Low Activity	Total
Motivation	External	4	4	3	11 (26%)
	Internal	10	10	8	28 (67%)
	No Response	2	0	3	3 (7%)
Timing	Pre-Mandate	10	10	10	30 (71%)
	Post-Mandate	0	3	2	5 (12%)
	Never	3	1	1	5 (12%)
	No Response	1	0	1	2 (5%)
Changing Importance Over 5 yrs	Decreasing	1	3	3	7 (17%)
	Increasing	11	9	6	26 (62%)
	Neither	1	1	1	3 (7%)
	No Response	1	1	4	6 (14%)
Total		14 (33%)	14 (33%)	14 (33%)	42 (100%)

shown in Table 5.4, regardless of current activity level, most PHUs reported internally-motivating factors, relatively early program development and Sun Safety as increasing in importance over the past five years. Those PHUs with lower activity did tend to report more external motivation and were more likely to report that Sun Safety is decreasing in importance over the past five years.

While the survey data shows little clear pattern linking independent variables such as relative income, relative expenditures and at-risk population, it does reveal a pattern of highly to moderately active PHUs with programs underway prior to the Ontario Ministry of Health 1997 guidelines and in response to community-based factors. This will be discussed further in Section 5.5.

5.4.2. Sun Safety Program Messages

Open ended responses from the survey, in conjunction with program materials provided by PHUs, were used to identify both the content and intensity of Sun Safety messages used at the public health unit level in Ontario. In total, 37 PHUs (88%) provided message information and seven of those (19% of responding PHUs) included printed program materials with their responses.

Responses and program materials were theme coded in two ways. In the first round of coding, responses were grouped according to the key messages advocated by Health Canada and comprising the Canadian Sun Safety Narrative (using sunscreen, avoiding the sun in peak hours, covering up and seeking the shade). In addition, responses indicating a relationship to ozone depletion were also identified. The second round of coding identified emergent themes from survey responses. This process identified three primary emergent themes: (1) the linking of Sun Safety with other health promotion messages; (2) messages centered on protecting children; and, (3) messages indicating a focus on changing policies regarding Sun Safety. Table 5.5 summarizes these findings which are discussed in detail in the following subsections.

5.4.2.1. Canadian Narrative Messages

Of the 37 PHUs providing information on the content of Sun Safety program messages, all (100%) reported adopting, in some form the Health Canada general messages explained in Chapter Four (see Table 5.5). Where specific messages were identified, the preferred message was to use sunscreen (57% of responding PHUs), followed by the messages to cover up (49%) and avoid the sun during peak hours (41%). The least popular of the avoidance messages was to seek the shade (identified

Table 5.5
Sun Safety Messages in Ontario's PHUs

Message	# PHUs using message	% Responding PHUs (n=37)	Avg. use per PHU using*
Canadian Metanarrative Messages			
General Health Canada Messages	37	100	1.8
Use sunscreen	21	57	2.2
Avoid the sun in peak hours	15	41	1.7
Cover up	18	49	2.0
Seek Shade	11	30	1.4
Link with ozone depletion	4	11	1.5
Additional Sun Safety Messages			
Protect children	23	62	2.5
Sun Safety linked to other health messages	16	43	1.6
Advocating policy change	10	27	2.1

* Avg. use calculated as: # of reported uses/# PHUs using the message

by only 30% of responding PHUs). Finally, the link between ozone depletion and skin cancer was reported as included in the Sun Safety messages of few of Ontario's PHUs (only 11%).

Over half of Ontario's 42 public health units (53%) reported operating more than one Sun Safety program and less than half (47%) reported operating one or no program; therefore a simple reporting of the number of PHUs adopting a message

obscures the intensity of message use and the visibility of a particular message in the community. Table 5.5 also identifies the intensity with which each message is used. It shows that the message to use sunscreen is advocated by 57% of Ontario PHUs and that they use the message, on average, in 2-3 different local level programs per PHU. While the general Sun Safety messages from Health Canada are used less intensely (1-2 programs per PHU), they are used in all units reporting program information.

Of particular note are the responses regarding covering up and links with ozone depletion. While less than half of PHUs reporting including covering up as a message, when it was included, it was used comparatively intensely (twice per unit). By comparison, the message linking Sun Safety messages with ozone depletion was not only used in few PHUs, but those PHUs report using it in only one to two programs each, despite the fact that ozone depletion is an important component of the Canadian Sun Safety narrative identified in Chapter Four.

The data from Table 5.5 show that the general Health Canada Sun Safety messages also identified as part of the Canadian narrative in Chapter Four are used widely, but not the most intensely. In contrast, the messages to use sunscreen and cover up in the sun are used less widely, but are used quite often in the PHUs that do choose to use them.

5.4.2.2. Additional Sun Safety Messages

In addition to the Sun Safety messages of the Canadian narrative, Ontario's PHUs also reported using additional messages in their programs. Table 5.5 also identifies the additional messages emerging from the Sun Safety survey. Of these,

the message to protect children from the sun was used by most PHUs (62%) and was used most often (an average of 2.5 times per PHU). This means that the message to protect children is used more often than any of the standard Canadian narrative messages identified in Chapter Four. This is in line with internationally-available epidemiological evidence (primarily from Australia) suggesting that a reduction in childhood sun exposure can reduce lifetime risk of contracting skin cancer.

Other messages used by PHUs included a concerted effort to link Sun Safety to policy change issues (such as increasing shade protection as is done in England) as well as incorporating the Sun Safety message into other health promotion messages and programs (i.e., Healthy Lifestyles, Healthy Babies, Active Living). These two additional messages again point to the influence of internationally-available evidence suggesting that changes to the structural environment and linking protective behavior to other lifestyle issues may be the most effective way to encourage long-term changes in exposure behavior. These additional findings suggest that many of Ontario's PHUs were gathering information from many different sources — including international ones — and that they did not rely solely on Canadian information for program development.

5.4.3. Summary of Survey Findings

The survey of Sun Safety programs in public health units in Ontario had two main findings. First, it found that there was little clear pattern linking program development and activity to the 1997 provincial Mandatory Guidelines. Instead it found that most programs at the local level were developed *prior to* the 1997 Guidelines and therefore did not appear to be motivated by directives from

policymakers. Program development at the local level also did not appear connected to characteristics of the local population or health unit (i.e., higher income, greater expenditures on public health, or high at-risk population). Instead, Sun Safety programs appeared to be developed when key personnel at the PHU level identified the need through either personal interest or increasing public demand for information.

Second, the survey found that content of the local messages, in addition to the timing of program development, was not necessarily driven by the Canadian national narrative and national policymaking preferences. While national narrative messages were employed in the programs, they were outnumbered by additional messages that had been adopted by local program developers. The additional messages closely reflect information readily available at the international level, but not necessarily included as important components of the Canadian narrative and included specific messages aimed at protecting children, those linking Sun Safety to other health issues, and messages advocating policy change around Sun Safety.

5.5. Discussion

These findings suggest that the relational flows of information found at the intersection between scientists and policymakers (as seen in Chapter Four) are also taking place at the intersection between policymakers and the public (See Figure 5.1). In some cases, those flows are bypassing the policymakers and moving directly from the scientific, epistemic community to the public (thus driving public demand for information and programs) and in others they represent the movement of information between publics and policymakers and bypassing the international community. An example of the former situation might be individuals reading about

skin cancer risk in a newspaper or finding information on the internet. An example of the latter might be a public health nurse whose interest is piqued by attending a conference and finding out what kinds of programs are taking place in other localities.

Most importantly, these relational flows of information question the traditional model of "speaking truth to power" (Wildavsky, 1979) that sees

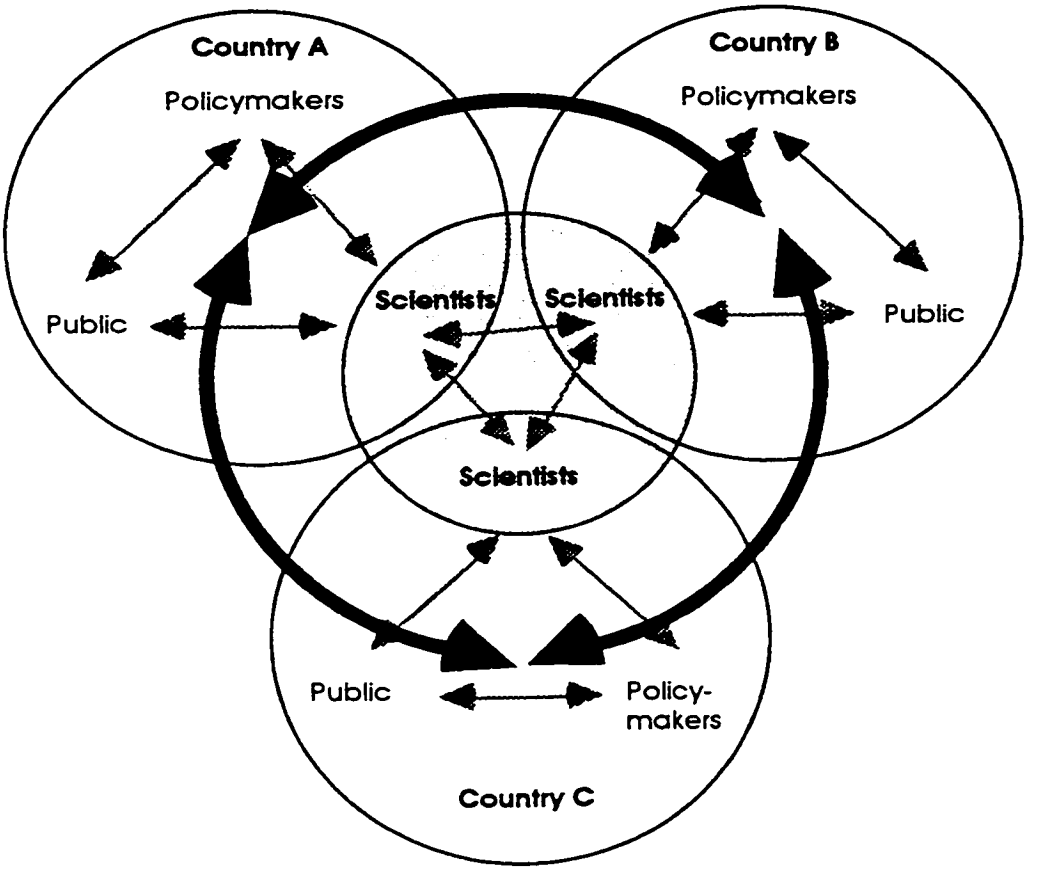

Figure 5.1
Relational flows of evidence between groups and countries

policymakers as interpreters between the scientific community and the public. Instead, the findings of this survey suggest that information regarding skin cancer and Sun Safety originally bypassed policymakers at the provincial level in Ontario. In terms of timing, the 1997 provincial Mandatory Guidelines followed after local program development was already taking place. Thus, the 1997 Guidelines can be seen as a way of codifying and validating activity *already taking place* at the local level.

Responses from the Sun Safety survey explain how and why this took place. Among PHUs reporting internal motivations for early Sun Safety program development, two driving factors were identified: key personnel interested in Sun Safety, and public demand for information. For example, one PHU reported that its Sun Safety programs were developed solely due to the interest of a contract worker:

> "We hired staff on contract who had previously worked in some aspects of cancer prevention, including UV rays. During her stay with us she was instrumental in promotion of the subject." (Eastern).

Another PHU provided an example of public demand for information by explaining that Sun Safety programs were developed in its community because a highly-visible local politician was diagnosed with skin cancer. This local incident increased public calls for action. Other PHUs noted that information available via media and other electronic sources (particularly the internet) has been critical in driving public demand for information about skin cancer prevention and for community-based Sun Safety programs.

These examples show that the public, as it exists in communities, is not a simple passive recipient of evidence and information but is actively engaged in identifying problems, weighing evidence, and calling for solutions. Due to advances

in technology and communication (Castells, 1989; Harvey, 1989) the scientific evidence at the international level is increasingly available to the public — even in their own homes via the international media (CNN, Newsworld and the like) as well as through the internet.

As happens at the national level, evidence regarding skin cancer and sun safety is interpreted at the local level and is spatially-, temporally- and culturally-bounded by the social rationality used by the public to evaluate information. Just as scientists cannot be disconnected from the ideological influences of their home countries, so also are national and provincial policymakers influenced by locally-based ideologies situated in communities.

What results is a complex interaction of scientists (through the Sun Safety epistemic community), policymakers (working with nationally-framed stories or narratives) and the public (working as a counter-hegemonic force through civil society). This represents a form of ideological subjection-qualification identified by Therborn (1980) and discussed in Chapter Two. Local communities and local program personnel are subjected to the international and national narratives on Sun Safety. Those narratives are qualified according to local social rationality and are adapted and reconstructed in program development. Thus the local definitions of *what exists* (skin cancer), *what is good* (prevention of morbidity and mortality) and *what is possible* (local programs to combat the problem) are reflected in the actions and statements of the public health unit. The resulting program is an intertwining of the international metanarrative from the epistemic community, the national narrative from the policymakers, and the local narrative as interpreted in the local context.

The increasingly powerful role of the public in this process cannot be underestimated. Giner (1995) states that the participatory framework of modern democracies is predicated on a strong and viable civil society working to counterbalance state power. As discussed in Chapter Three, that state power has been linked to the enlightenment vision of 'truth' related to scientific hegemony and the rise (and fall, some would argue) of modernity over the past century. The increasingly complex and uncertain nature of problems has created room for questioning the validity of science's interpretation of the world. The hegemony once granted to science by an unquestioning public is now being reclaimed. As the hegemonic power of science is revoked, other forms of rationality — including political and social rationality — gain increasing legitimacy.

Several characteristics of the postmodern (as opposed to the modern) world have facilitated this process. First, a rise in information technology has meant that information is increasingly and more rapidly available to people outside the expert, scientific world. Harvey (1989) argues that this technology has resulted in a "time-space compression." In this compression, experts or policymakers are no longer required as interpreters and translators of scientific information for the local context. Instead, individuals can use their televisions, radios or (more and more) computers to directly access technical information from anywhere in the world. In the context of this project, the time-space compression could be experienced by an individual in a small town in rural Canada who is able to access complete epidemiological, medical and program information on Sun Safety in Australia that is based on research spanning over two decades. The access is immediate and 'virtually' complete. As

more information is available from different sources, the variable nature of evidence becomes more evident and science's hegemony is open to questioning.

A second feature of the postmodern world that is undermining the hegemony of science is the growth of information as a commodity in the marketplace (Castells, 1989). Treating information as a product has meant a reduction in the privilege granted to science and its ability to define 'truth' and 'facts.' If evidence becomes a commodity available to the highest bidder, then all evidence becomes suspect. Increasing recognition of the social influences on science has reduced its credibility and science's seeming inability to meet the requirements of political and social rationality has also opened it to greater criticism.

Finally the increasing importance of the trans-national, or global, civil society (Walzer, 1995) has also been contributing to the reduced hegemony of science in the postmodern world. As economies, societies and cultures are increasingly intertwined in the process of globalization (Giddens, 1991), the world becomes a mosaic marked by a multiplicity of meanings. This polysemic nature of the postmodern world makes explicit the ideological differences previously hidden from view. In the case of Sun Safety, there are a multiplicity of views available to interpret the issue: internet websites from groups as different as the World Health Organization, the World Meteorological Organization, community health groups, environmental non-governmental organizations and many others all provide information regarding skin cancer and possible environmental causes.

As discussed in Chapter Three, ideology not a simple possession. Rather, it a process of subjection and qualification through which humans define *what is exists, what is good* and *what is possible.* As information flows increase within and between

locally-situated publics operating in civil society, they are increasingly able to question the hegemony of science and its ability to define the problems in society. In its place, policymakers and the public (as operating in civil society) are seizing the opportunity to redefine issues according to their own forms of political and social rationality.

5.6. Conclusions

Chapter Four showed that it is a fallacy to assume that international information is adopted and applied in the same way in different national contexts. In a similar way, this chapter has shown that the flow of information from the national to the local level is likewise complex and relational. This nested investigation of Sun Safety programs at the public health unit level in Ontario has shown that concerns and issues operating at the local level, derived in part through access to international information via the time-space compression of postmodernism, drove the demand for information and program development at the community level in Ontario. These local programs became part of the *text* and *culture* (in framing terms) of Sun Safety in Ontario which, in turn, is contributing to a reconstruction of the framing and narrative development of Sun Safety in Canada as a whole. Throughout this process the public has been an active participant in the construction, co-construction and re-construction of skin cancer and Sun Safety in Ontario.

CHAPTER SIX: SUMMARY AND CONCLUSIONS
Evidence, Policy and Practice: Implications for Environmental Health and Global Environmental Change Issues

6.1 Overview

This thesis has woven together a complex and interconnected case study of Sun Safety history and program development tracing the adoption, interpretation and transformation of information from the international, scientific level to the national, policymaking level and further to the community and public. It has shown that scientists, policymakers and the public each employ their own different, albeit legitimate, forms of rationality for evaluating evidence and composing knowledge. It has also shown that evidence is translated and transformed according to situationally-defined needs as it moves through international scientists, national policymakers, local policymakers and the public. Finally, it has shown that this process is neither linear nor simple. Rather the process is composed of complex interactions consisting of a series of relational flows in which ideology plays a key role in framing issues and developing credible explanatory stories or narratives.

6.2 Summary of the Thesis

Chapter One presented an overview of the thesis and outlined the structure of the case study of Sun Safety, explaining that this thesis is situated within the broad context of human dimensions of global change and environmental health issues. Designed as a series of nested investigations within the case study, this thesis adopts

the primary theoretical perspective of symbolic interactionism and has three main objectives:

1) To bring together the disparate literatures surrounding the use of evidence and knowledge by scientists, policymakers and the public;
2) Using that literature, to generate a critical framework for understanding the epistemological distances that prevent consensus among those groups in complex, uncertain issues; and
3) To apply that framework to case study of Sun Safety, to understand the transformation of internationally-accepted information at the nexus between:
    i) international scientists and policymakers, and
    ii) policymakers and local program outcomes.

The first two objectives are addressed in Chapter Three, the first nested investigation examining the different forms of rationality used by scientists, policymakers and the public. The final objective is addressed in Chapters Four and Five, which provide practical examples in two nested investigations of Sun Safety programs at the international and local levels.

Chapter Two provided a historical grounding for the case study through a policy reconstruction of the issue framework surrounding ozone depletion, skin cancer, and Sun Safety public health programs. Using the Skin Cancer Cascade as a heuristic, this chapter examined the series of logical claims employed by the international community to develop an metanarrative 'explaining' rising skin cancer rates around the world. The Skin Cancer Cascade states that ozone depletion is taking place and, as a result, increasing ultraviolet radiation (UVR) is reaching the earth's surface. Since skin cancer is thought to be an outcome of UVR exposure, it is

expected that skin cancer rates will increase as a result of this ozone depletion. Therefore public health programs must be put in place to mitigate the potential health effects of ozone depletion.

However there is considerable uncertainty at each level of the Skin Cancer Cascade story. While consensus has increased over the past decade, there are still dissenting scientific voices regarding the long-term extent and environmental effects of ozone depletion. Due to lack of historical data, proof of a causal relationship between ozone depletion and increasing ground-level UVR is lacking and mitigating factors (such as ground-level ozone resulting from pollution) are difficult to factor into the analysis. In addition, skin cancer is only one of many potential health effects of ozone depletion and there are some predictions that, in the long-term, skin cancer may be far outweighed by other effects such as immune-system deficiency and cataracts. Finally, there is little evidence that the public health and prevention programs advocated will have any effect on skin cancer rates in the future. The chapter concludes that the Skin Cancer Cascade story is rife with uncertainty but, as the story moves through the stages of 'being told,' it is embedded with increasing certainty.

Chapter Three presented an explanation for this increasing certainty through the first nested investigation in the case study: a theoretical exploration of the epistemological distances between scientists, policymakers and the public. It explained that each of the three groups (scientists, policymakers and the public) have specific forms of rationality related to ideological interpretations of *what exists, what is good,* and *what is possible* (Therborn, 1980). In uncertain and complex issues,

each group can be seen as falling back into an idealized role where scientists are perceived as rational, policymakers as political, and the public as capricious.

In the historically-grounded process of problem solving in modern society, science has traditionally been granted the hegemonic power to define society's problems and to guide the potential solutions. Yet scientists themselves are a part of society and therefore are subject to the ideological process of subjection-qualification. In this process, individuals and groups (in this case, scientists) are subjected to social norms and accepted behaviors. Meanwhile they and other members of society are able to qualify those norms by generating new information and engaging in new activities. Through this process of subjection-qualification ideology plays out in social relations and everyday activity.

As ideologies change over time and across space, the hegemonic power of science, linked to abstract concepts of modernity, have begun to weaken as the granting of that hegemony by other parts of society begins to be revoked. Policymakers and the public are increasingly questioning science's ability to solve complex and uncertain problems. In the place of scientific rationality, the political rationality of policymakers and the social rationality of the public are gaining increasing influence.

The theoretical investigation presented in Chapter Three concluded that ideology — as a process rather than as a simple possession — is key to understanding the controversies of complex and uncertain environmental health and environmental global change issues. The framework presented in Table 3.1 is a first step in bringing together the disparate literatures on the sociology of science, policy and policy development, public understandings of science, and risk. Its conclusions,

stating that scientists, policymakers and the public have differing yet equally valid forms of rationality is a critical step in bringing together the various social science disciplines involved in studying environmental health and global change issues.

Chapter Four presented the second nested investigation in the case study and the first example of how the theorized relations play out in practice. Located at the nexus of international scientists and national policymakers, this chapter traced the translation and transformation of scientific evidence about ozone depletion and skin cancer into Sun Safety public health programs in Australia, Canada and England. It showed how each nation adopted and adapted the international body of evidence based upon its own social, political, economic and cultural needs.

Three key analytic concepts were used in this chapter: epistemic communities, framing and narrative construction. Epistemic communities are international groups of like-minded experts that, through their expertise, are able to guide policy decisions in situations of uncertainty. This chapter concluded that the considerable dissension within and among international Sun Safety experts is an example of how such disagreements are, as Litfin (1994) argues, an inherent component of an epistemic community. While the community may have internal dissension (as its private face), it continues to present a consensus to the outside world (as its public face).

The consensus of the international epistemic community is then adopted and adapted, or 'framed,' to meet the situationally-specific needs of each country. In Australia, Sun Safety was framed as a public health problem because of the high at-risk population, the visibility of skin cancer as a public health problem, and the timing whereby skin cancer was identified as a problem long before ozone depletion

was recognized. By comparison, Sun Safety in Canada is more identified (at least at the national level) as an environmental problem linked to ozone depletion. This framing comes from the low visibility of skin cancer as a public health problem, the concurrent identification of ozone depletion and skin cancer as public concerns, and the institutional funding mechanisms that encourage environment and health linkages. Finally, Sun Safety in England is framed as a minor, but growing, public health problem that can be addressed through moderate and reasonable behavior. This framing results from the comparatively late identification of skin cancer as a public health issue (post-dating ozone depletion), and a public not sensitized to skin cancer and therefore unwilling to hear forceful messages about changing behaviors and practices.

This chapter concluded that the traditional, rational policymaking model of "speaking truth to power" (Wildavsky, 1979) oversimplifies the relational flows of information taking place in complex and uncertain issues such as Sun Safety. While the epistemic community does attempt to exert its authority through its specialized knowledge, policymakers and the public are able to reinterpret this evidence based on their own ideologies and evaluate incoming information according to their own definitions of *what exists, what is good* and *what is possible*. These definitions are bounded by political and social rationality and result in important, yet subtle, differences in Sun Safety policies and programs.

Chapter Five continued to trace the flow of evidence and knowledge in the third nested investigation: a study of how information gets translated and transformed into local Sun Safety programs in Ontario, Canada. Located at the intersection between policymakers and the public, this investigation found that the

relational flows of information taking place at the international level are also taking place at the local level.

This chapter concluded that the public is far from a passive recipient of evidence and information. Rather, it is actively engaged in identifying problems, weighing evidence and calling for solutions. Specific characteristics of the postmodern world, including increasingly powerful information and communication technology and the consequent rise of time-space compression, have empowered the public and given new voices to the components of civil society. The hegemony traditionally ceded to scientific explanations is coming under greater questioning as the public has better and faster access to information and differing views from around the world. The resulting relationship is a complex interaction of scientists (through the Sun Safety epistemic community), policymakers (operating within nationally-framed narratives) and the public (acting as a counter-hegemonic force through civil society).

Brought together, these three nested investigations (situated within the larger case study of Sun Safety) have provided an example of how science's hegemony is weakening in a polysemic postmodern world where information is easily available to all parties via technology. As a result, ideologies become increasingly important as the subjection-qualification of individuals at the local level is influenced by direct access to international information. The postmodern time-space compression (Harvey, 1989) has also meant a conflation of subjects and objects in public life and the increasing popularity of the view that science is just one of many inputs into the broad, social definitions of 'what matters.'

6.3 Contributions of the Work

The work presented in this thesis makes substantive, methodological and theoretical contributions. The substantive contributions come from the detailed case study of a single uncertain and complex issue that appears to link environment and health: Sun Safety. As global environmental issues are increasingly recognized as influencing the social, economic and physical health of human populations there is a growing need to understand how and why internationally-formulated information gets translated and transformed at national and local levels. This study, therefore, provides an example of how to move beyond a strictly scientific interpretation of an environmental health issue to situate it within broader social science concerns.

As a case study, this work is based on the in-depth analysis of a single subject in order to generate general concepts for future research. Therefore the main contributions of this work are theoretical. The primary theoretical contribution is found in the framework developed in Chapter Three's theoretical investigation. This framework advances our understanding of the different ways that scientists, policymakers and the public evaluate evidence and information in complex and uncertain issues. Specifically, it outlines how scientists engage in an evaluative process of 'scientific rationality' that has traditionally been granted status as the truth-generator in modern society. By comparison, policymakers use a political rationality to evaluate evidence. This rationality is bounded by context and motivated by a policymakers need to be seen as working to solve problems. Finally, the public uses yet another rationality, social rationality, to evaluate evidence based on individual experiences and social context. Brought together, the work in this thesis shows that current policy processes are predicated on a shared (if not a common)

discourse and that the different rationalities that underlie interpretation may be at the root of conflict between scientists, policymakers and the public, particularly in issues entailing considerable complexity and uncertainty.

A second theoretical contribution brings together the concepts of framing, and narrative construction to extend the definition of the epistemic community. The work presented here shows that epistemic communities can (and probably should) entail considerable internal dissension as they bring to the international venue the framings and narrative explanations of their home countries. Rather than seeing the epistemic community definition as flawed, it should rather be redefined to include such internal differences.

A third, and final, theoretical contribution has been the incorporation of broad social science concepts such ideology, hegemony and power into the literature on global environmental change. The very fact that global change occurs in places and spaces means that such changes must be situated in the wider context of social life. This work shows how such concepts can add to the environmental literature through a richer understanding of how problems are constructed, co-constructed and reconstructed in place and over time.

In addition to the substantive and theoretical contributions noted previously, this thesis also makes a final important contribution through employing qualitative, mixed methods to an uncertain, global environmental health issue. It shows how complex problems call for a variety of modes of inquiry — theoretical, interpretive, critical and others — and shows that those modes can be woven together in the construction of a single story about 'what happened.'

6.4 Directions for Future Work

Due to the exploratory nature of this work, it opens a number of avenues for future work. First, the case study itself could be extended to examine local programs in Australia and England as well as in Canada. Such further investigation would clarify the relations between national narratives and local programs and give greater depth to the identified links between framing, narratives and ideology as it operates in a local civil society. A second option within the case study would be to expand it to include other countries widely involved in Sun Safety at the international investigation (such as Germany and the United States). The countries included in this study were specifically chosen due to their shared histories and values. The inclusion of other countries into such a study would allow for the incorporation of differing state-society relations in the analysis.

The most valuable future research, however, would be the extension of this work to other global and environmental change issues. Global warming, acid rain, deforestation, biodiversity, population growth and other such complex and uncertain international problems are good examples of the concerns to which this type of analysis could be applied.

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APPENDIX A

Questioning Path for Expert Interviews

Section One: Background

1a) Could you give me some background information on what you do?

- What is your official title?
- Does this title reflect what you really do?
- What kind of work do you do?

(For in person interviews: Do you have a business card?)

1b) When did you first begin to be involved with skin cancer and sun safety?

- Has the type of work you do changed over time? If so, how?
- Why do you think that's so?

1c) What are some of the specific ways that you think your work promotes sun safety?

Section 2: National Sun Safety Policy and Development

2a) What can you tell me about the evolution of sun safety concerns in (Canada) (England) (Australia)?

- When did it generally become important?
- Why do you think that happened?
  - related to ozone hole?
  - growing concern with cancer?
  - environmentalism?
  - other social forces?
- How high a priority was it at first? What about now?
- Has there ever been a dispute about the importance of sun safety?
  - who were the proponents?
  - who contested these ideas?
  - how was the dispute resolved?

2b) **In (Canada, England, Australia), who is responsible for setting Sun Safety policy?**

- Who is responsible for implementing it?
  - does it have a champion?
- How effective, in your view, are these (agencies, groups, individuals)?
- Do you think that others should take responsibility for sun safety? Who? Why?
  -national vs. local
  - medical vs. social agencies
  - society vs. individual

2c) **What are the main ways that sun safety is promoted?**

- Which do you think are the most effective programs right now?
- What do you think are the success stories from the past?
- Can you think of any specific difficulties with past or present programs?
  - problems that you managed to overcome?
  - problems left unresolved?
- What do you think are the success factors for promoting sun safety?
- You mentioned earlier that you are involved with _____ programs. What value do you think those programs have?
  - scientific
  - social
  - medical
  - political

Section 3: Critical Appraisal

3a) **What would you like to see done to increase sun safety in (Canada, England, Australia)?**

- Do you know of any specific differences between programs that you are operating in (Canada, England, Australia) and those operating in the other two countries?
- Why do you think those differences exist?

3b) **What do you think about some of the information coming out at conferences that questions some of the previous assumptions about skin cancer?**

- exposure before 16 & questions of recall bias (Helios study?)
- a plateau in skin cancer rates and expected decreases in future in Australia. Do you think this will happen elsewhere?
- inability to determine if sunscreens make a difference
- increasing importance of UVA vs. UVB
- potential damage to immune system more important than skin cancer

3c) **In an era of competition for shrinking health care and health promotion dollars, how important do you think skin cancer is compared to, for example, heart disease, breast cancer, or AIDS?**

- Will it become more or less important over time?
- What do you think will make that happen?

3d) **What do you think is the value of sun safety, per se?**

- in a non-comparative sense, do you think that sun safety programs provide value to society? Are they worth doing?
- Why or why not?

APPENDIX B
Sun Safety Survey of Public Health Units (PHUs) in Ontario, Canada

Sun Safety Activity Questionnaire

All responses on these pages will be treated as confidential.
Please answer the following questions to the best of your ability.

When was sun safety identified as a priority by your public health unit? (Check one)

- ☐ Never, Sun Safety is not a priority
- ☐ Within the past year Date: _____
- ☐ Within the past two years Date: _____
- ☐ Within the past five years Date: _____
- ☐ Prior to 1993 Date: _____

What was the single most important motivation for identifying sun safety as a public health priority? (Check one only)

- ☐ Rising incidence rates in the community
- ☐ Public concern
- ☐ Directive from the provincial Ministry of Health
- ☐ Directive from Health Canada
- ☐ Key PHU personnel interested in sun safety
- ☐ Other: (please identify) _____

_____

_____

Approximately how many personnel are involved in sun safety programs?

_____

Taking into consideration all personnel involved in sun safety, how many person-hours **per week** (averaged over the year) are devoted to sun safety in your public health unit?

_____

Consider the present allocation of personnel and resources to all programs in your unit. Rank the following programs according to the priority assigned by your unit over the past 12 months (1=highest priority, 10=lowest priority)

____ Eating and Nutrition
____ Food Safety/Inspection
____ Healthy Lifestyles
____ Heart Health
____ Immunization
____ Other:_____

____ Maternal & Child Health
____ School Programs
____ Smoking & Smoking Cessation
____ Sun Safety
____ Workplace Safety

Ideally, personnel and resources should be assigned according to the best and most efficient use for a community's health and well-being. In your opinion, what **should be** the priority assigned to the following programs (1=highest, 10=lowest)

__ Eating and Nutrition
__ Food Safety/Inspection
__ Healthy Lifestyles
__ Heart Health
__ Immunization
__ Other: (please identify)
__ _____

___ Maternal & Child Health
___ School Programs
___ Smoking & Smoking Cessation
___ Sun Safety
___ Workplace Safety

Over the past 5 years, has sun safety become an increasing or decreasing priority?

- ☐ Increasing
- ☐ Decreasing

Why is that?

_____

_____

_____

_____

The Province of Ontario has recently made Sun Safety a priority for public health. What is your opinion of this?

_____

_____

_____

_____

_____

_____

_____

_____

_____

At present, how many sun safety programs are in operation at your health unit?

_____

Thank you for taking the time to fill out this questionnaire.
Please use the registration sheet and detailed program pages to itemize your current programs for sharing with other health units.
Feel free to attach additional pages if necessary.

Registration Sheet & Detailed Program Pages

Please provide your name and contact information on this page.
Feel free to attach a business card if that is more convenient.

Name _____

Affiliation/Title: _____

_____

Mailing Address: _____

_____

_____

_____

_____

Phone: _____

Fax: _____

E-mail: _____

The following pages ask you to detail sun safety programs currently underway in your unit. Please remember that the information in these pages will be made available to other public health units. Attach additional pages if necessary.
Feel free to attach any program materials you wish to share.
Thank you for your time.

Name of Sun Safety Program _____

_____

What division of the Public Health Unit takes primary responsibility for this program? _____

Target Audience (circle all appropriate groups)

Total Population	Adults	Teens
Children	Infants	Parents
Outdoor Workers	Recreational Tanners	Vacationers Tanning Lamp/S

_____

Program Goal _____

_____

Primary Message(s) communicated _____

_____

_____

Program Start date _____

Program End date (or ongoing) _____

Community Partners working with the Public Health Unit on this program _____

_____

_____

APPENDIX C
Classification Schemes for Survey Responses

Table C.1
Closed Response Classification Schemes

Q/A	Collapsed Classification
Q: When was sun safety identified as a priority by your public health unit? (TIMING)	
A: Never, Sun Safety is not a priority	Never
Within the past year	Post Mandate
Within the past 2 years Within the past 5 years Prior to 1993	Pre Mandate
Q: What was the single most important motivation for identifying sun safety as a public health priority? (MOTIVATION)	
A: Rising incidence rates in the community Public concern Key PHU personnel interested in sun safety	Internal
Directive from the provincial Ministry of Health Directive from Health Canada	External
Other	Other
Q: Over the past 5 years, has sun safety become an increasing or decreasing priority? (IMPORTANCE)	
A: Increasing	Increasing
Decreasing	Decreasing