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STARTLING RADON RISK COMPARISONS

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ABSTRACT

It has long been known that radon causes lung cancer in humans. Radon, in fact, has been called the greatest environmental health threat facing the nation. Despite the fact that people in the United States generally have a great fear of radiation, their attitude toward radon risk has been one of apathy. Traditional radon risk comparison data have, to say the least, been uninspired as well as unmotivating to the public. This study, using publicly-available data, compares radon risk to other pollutants, diseases and health issues that concern and motivate the public. These health data have never before been assembled together in such a dramatic tabulation, making the radon risk clearly evident and tangible. Results of a nationwide risk opinion survey will also be discussed.

INTRODUCTION

Radiation from nuclear power is perceived by many in the U.S. to be the greatest health risk we face.* Billions of dollars are spent every year on sunscreens to protect us from natural solar radiation. The EPA, the U.S. Surgeon General, NIOSH, The American Lung Association, The American Cancer Society, The World Health Organization, Consumers Union, The National Research Council's Committee On The Biological Effects Of Ionizing Radiation, and The American Medical Association concur that radon in homes and work places is dangerous.

Why, then, is the public so apathetic toward risks from radon exposure? Public perceptions range from "We don't have radon around here," to "If radon were a significant health threat,...it would be in the news a lot more than it is." Health Physics Society policy-makers have said that radon is not a serious health risk (but neglect to add, "compared to smoking").

Traditional presentations of radon risk data have not motivated the public. Scientific professionals have difficultly communicating technical concepts to the public simply because their style of providing information (logic-based, thinking) is different from how most people gather information and make decisions (emotion-based, feeling). It has been demonstrated that an

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* Risk table courtesy Porter Consultants, Inc., Ardmore, PA.

audience will believe a charismatic, entertaining presentation, whether the information is correct or not (Mossman 1990).

Since the public is not motivated simply by being presented with radon risk information, as has been proven by EPA experience (Fisher 1990), another communication approach is needed. The problem lies not with the quantity of radon risk information presented to the public, but with the quality or relevance of the information.

This study compares the health risks of radon exposure, not to smoking (which provides a perceived beneficial feeling to the smoker), and not to lung x-rays (which people cannot relate to personal risk of death), but to health risks that the public does care about.

Several preliminary statements regarding this study's data must be made:

1. The risk data cited are from publicly-available documents and information services. These data, however, have not been arranged into a format that the public understands until now.
2. It is assumed that the BEIR IV/ICRP/EPA radon risk data are correct. Leading scientists have developed these risk estimates based on a linear no-threshold dose/response relationship, which is admittedly conservative. I must, and do, believe that these scientists know what they are

doing.

3. I have not generated any raw risk data or conducted any epidemiological studies. I have only interpreted the already available information.
4. The radon risk estimates assume that only lung cancer is the cause of death. No other potential/possible organ cancers are considered.

HEALTH EFFECTS

RADON KILLS 21,000 AMERICANS (MAYBE AS MANY AS 40,000) EVERY YEAR. RADON KILLS 50-100 PEOPLE EVERY DAY, WHICH IS ABOUT 1 PERSON EVERY 20 MINUTES (Schmidt et al. 1990).

This figure is based upon EPA averaging of the BEIR IV and ICRP 50 models, the average residential radon exposure, and a 240 million U.S. population. It also includes a risk of 360 deaths per one million person-WLM, which represents an age-averaged rate for the general population using lifetable and U.S. vital statistics information. It is assumed that the person spends 75% of the day in the radon environment.

RADON IN WATER KILLS AT LEAST FOUR AMERICANS EVERY DAY. WATERBORNE RADON MAY CAUSE MORE CANCER DEATHS THAN ALL OTHER DRINKING WATER CONTAMINANTS COMBINED (Lamarre 1990, Consumer Reports 1990).

EPA estimates that between 1000 and 1800 people in the U.S. die of lung cancer each year as the result of radon contamination of well water. EPA also estimates that at least eight million people may have undesirably high radon levels in their water supply.

RADON KILLS MORE AMERICANS EACH YEAR THAN THE AIDS VIRUS (AIDS=19,161 DEATHS). UNLIKE AIDS, WHICH CAN ONLY BE TRANSMITTED BY BODILY FLUIDS, RADON CAN KILL ANYBODY (CDC 1990). **

AIDS is a disease that has this country panicked. Most areas have state and Federally-funded AIDS task forces, and Congress recently appropriated a three-billion dollar research and treatment package. Because of grass-roots activism, AIDS has gone from being unknown and controversial to a household word, yet AIDS doesn't kill as many people annually as does radon.

HUNDREDS OF THOUSANDS-OF AMERICANS LIVING IN HOUSES THAT HAVE HIGH RADON LEVELS RECEIVE AS LARGE AN EXPOSURE OF RADIATION YEARLY AS THOSE PEOPLE LIVING IN THE VICINITY OF THE CHERNOBYL NUCLEAR POWER PLANT DID IN 1986, THE YEAR OF THE DISASTER (Kerr 1989).

** Telephone conversation, AIDS Hotline, 1989 data.

NUCLEAR POWER HAS NEVER KILLED ONE MEMBER OF THE U.S. PUBLIC, YET MILLIONS OF DOLLARS ARE SPENT EVERY YEAR TO PROTECT THE PUBLIC "JUST IN CASE".

Despite widespread fear of nuclear power and radiation, few have discussed the fact that radon exposures produce higher doses than all nuclear plants, and in fact, produce higher doses than dreaded nuclear accidents. Clearly, there is a cost-effectiveness problem here. In fact, if the strict regulations covering nuclear power plants were applied to the famous Watras house, the spending of up to 9.8 million dollars would have been justified by law to eliminate the risk in that one home (Kerr 1989).

THE EPA CONSIDERS INDOOR RADON TO BE ONE OF THE MOST SERIOUS ENVIRONMENTAL CARCINOGENS TO WHICH THE PUBLIC IS EXPOSED (Schmidt et al. 1990).

RADON KILLS THOUSANDS MORE AMERICANS EVERY YEAR THAN LEAD, PCB'S, DIOXINS, AND ASBESTOS COMBINED (ASBESTOS=189 DEATHS, LEAD PAINT=7 DEATHS, PCB'S AND DIOXINS=NO HUMAN DEATHS EVER CONFIRMED) (Schmidt et al. 1990, Cassens 1987). ***

*** Telephone conversation, National Center for Health Statistics, 1987 data.

USING ORANGE DYE NUMBER 19 IN LIPSTICK IS BANNED BECAUSE IT HAS A ONE IN 19 BILLION CHANCE OF CAUSING CANCER, BUT THREE OF EVERY 100 PEOPLE EXPOSED TO RADON AT EPA'S ACTION LEVEL WILL DIE OF LUNG CANCER (Kerr 1989).

Radon is a Group A carcinogen, which means that there are human data proving it causes lung cancer in people. Only a few other carcinogens such as asbestos, benzene, and vinyl chloride are proven to kill humans. Group B carcinogens have produced cancer in laboratory animals, and include dioxins, PCB's and chlordane. Group C carcinogens have limited animal data. Only Group A carcinogens have been shown to cause cancer in humans.

Congress has, in the past, directed EPA to regulate toxic and cancer-causing substances (e.g., The Toxic Substances Control Act), and has given EPA authority to set maximum permissible concentrations; thus, there is a precedent for EPA to establish maximum contaminant levels.

Even the lowest estimates of the risk make radon's radioactivity the biggest killer among environmental hazards. The lifetime risk of dying of radon-related lung cancer dwarfs the lethal risks of typical exposures to asbestos, pesticides like ethylene dibromide, and air pollutants like benzene (Kerr 1989).

IT IS ESTIMATED THAT ALMOST AS MANY AMERICANS DIE FROM RADON EACH YEAR AS FROM DRUG-OVERDOSE INCIDENTS (24,000), YET THE PRESIDENT HAS DECLARED A "WAR ON DRUGS", AND THE ADMINISTRATION IS SPENDING BILLIONS OF DOLLARS ON THE "TERRIBLE DRUG PROBLEM" (National Institute on Drug Abuse 1989, extrapolated to entire population).

There is no doubt that drugs are a severe problem, leading to robbery, murder, and other crimes. Drug abuse directly or indirectly affects a large number of people. It must be kept in mind, however, that only one billion of those "drug war dollars" would go a long way toward abating the entire population's radon risk.

RADON KILLS ABOUT AS MANY AMERICANS EVERY YEAR AS DRUNK DRIVING, (25,000) YET DRUNK DRIVING IS A CRIMINAL OFFENSE. #

RADON KILLS MORE AMERICANS EVERY YEAR THAN HANDGUNS (HANDGUNS=17,000 DEATHS, INCLUDING ACCIDENTS AND CRIMES). ##

Drunk driving and firearm accidents are considered especially heinous by activists because they are preventable. MADD and

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Telephone conversation, Mothers Against Drunk Driving Hotline representative, 1989 data.

Risk table courtesy Porter Consultants, Inc., Ardmore, PA.

other organizations mount huge campaigns to prevent these deaths, yet little public or private funding is available to help prevent radon-related deaths, which are also preventable.

COSTS

A LUNG CANCER PATIENT COSTS AMERICAN SOCIETY THREE THOUSAND DOLLARS A DAY (MINIMUM) IN MEDICAL EXPENSES ALONE, FOR A TOTAL OF 50 TO 60 THOUSAND DOLLARS UNTIL HE/SHE DIES. ADDED TO THIS IS THE COST TO SOCIETY OF REDUCED OUTPUT, SICK LEAVE, ETC. OF ALMOST 100,000 DOLLARS PER CASE. THIS AMOUNTS TO AROUND 2.6 BILLION DOLLARS SPENT ON THE RADON VICTIMS WHO DIE EVERY YEAR (USEPA 1989). ###

ON THE OTHER HAND, THE COSTS TO AMERICAN SOCIETY TO REDUCE RADON TO ACCEPTABLE LEVELS IN ALL EXISTING HOMES IS MUCH LESS THAN THE COST TO SOCIETY FOR SUCH PROGRAMS AS SMOKE DETECTORS AND SEAT BELTS (RADON=$15,000-47,000 PER LIFE SAVED, SEAT BELTS AND SMOKE DETECTORS=$250-600,000 PER LIFE SAVED, OTHER ENVIRONMENTAL PROGRAMS=$500,000-7,000,000 PER LIFE SAVED) (Strom and Mallon 1990, EPA 1990).

A health physicist opined that public money spent on radon would be better spent on feeding starving Africans or housing

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Telephone conversation, Blue Cross/Blue Shield representative.

the homeless. This may be true, but it is also naive, as is telling a child to finish his/her dinner because there are starving children in the world. Just as that child's unfinished food would not be used to feed starving children, money that could have been spent on radon is not going to be spent where it "gets the most bang for the buck." No, that money will be spent on a different environmental health hazard that has not killed as many people as radon. Radon is a relatively inexpensive health threat to test for and remediate. Perhaps this country should try for "more bang," as a more cost-effective use of funds.

GOVERNMENT ACTION

THE INDOOR RADON ABATEMENT ACT SET A NATIONAL GOAL TO REDUCE INDOOR RADON LEVELS, BUT NO REGULATORY LIMIT. DESPITE WIDESPREAD AVAILABILITY OF TESTING AND MITIGATION SERVICES, LESS THAN 3% OF HOMES, LESS THAN 1% OF WORKPLACES, AND FEW SCHOOLS HAVE BEEN TESTED BECAUSE THERE ARE NO REQUIREMENTS OR INCENTIVES TO DO SO (EPA 1990).

The EPA, OSHA, and most states have refused to enforce maximum permissible levels for radon. EPA was directed to set maximum limits for radon in water by 1987, but has yet to do so. Many states still deny that buildings in their state have elevated radon levels and are a health risk. Those states that do have

regulatory programs often decrease the amount of testing and mitigation, due to the high cost burden to radon companies to fully subsidize the state program, something that is unprecedented for a public health issue of this magnitude.

IN SWEDEN, ONLY WHEN THE NATIONAL GOVERNMENT BECAME INVOLVED BY SETTING REGULATIONS AND MAXIMUM LIMITS, DID THE MASS MEDIA AND POLITICIANS SHOW INCREASED INTEREST IN THEIR RADON PROBLEM. NOW 53% OF EXISTING HIGH RADON HOMES HAVE BEEN REMEDIATED, AND AN IMPRESSIVE 95% OF NEWLY BUILT HOUSES ARE BELOW THE REGULATED LIMITS (Swedjemark 1990).

Other major countries of the world are moving to aggressively address the radon issue through regulation. The Atomic Energy Control Board in Canada has set annual exposure limits for radon, for both occupational exposures and the public (Bhawani 1989). Under the Euratom Treaty, the Commission of the European Communities has recommended maximum indoor radon levels for its member states. Ireland, Germany, and the United Kingdom have all adopted strict regulatory limits. Only the U.S. lags behind in developing an ambitious programs to deal with radon exposures. Other industrialized nations are willing to face the issue head-on and take regulatory action.

PUBLIC OPINION SURVEY RESULTS

As part of the study, I wanted to test public perception of radon when given a few of the above-mentioned statistics. A survey form was developed (Figs. 1-2) that asked individuals to rank various health risks in order from 1 (most deaths per year) to 12 (fewest deaths per year). So as not to bias the individual's perception, some attributes of radon were then listed as those from a new environmental health threat called TOXICA, which was stated to:

Kill more Americans each year than the AIDS virus;

Be naturally occurring and found in homes, schools and work places;

Kill one American every 20 minutes;

Kill more Americans every year than asbestos, lead, dioxins and PCB's combined;

Be easily abated or removed for the same cost to society as installing smoke detectors in all homes.

Individuals were then asked to re-rank the risks, this time including TOXICA. The true rankings and number of deaths per year are shown in Fig. 2. A set of yes-no questions was also asked, which included:

The Federal government should spend more money on TOXICA than on AIDS. (yes-no)

The Federal government should regulate maximum allowable levels of TOXICA. (yes-no)

The Federal government should require all homes, schools and

workplaces to be tested for TOXICA levels. (yes-no)

The survey was distributed to 100 each of: state radiation officials, randomly selected radon companies nationwide, people in Indiana, people in Eastern Pennsylvania, and medical doctors in Eastern Pennsylvania.

The results of this survey are shown in Figs. 3-6. The overall response rate was 7.6%, with state radiation officials as the highest respondents (17%). A large majority ranked TOXICA as one of the top three health threats, while very few people ranked radon in the top three (Fig. 3). Although no one ranked radon as the number one threat, 17% overall ranked TOXICA as number one (Fig. 4). Several state radiation officials realized that radon and TOXICA were one and the same, and noted this on their surveys. A majority of the "public" (i.e., excluding radon companies and state officials) ranked radon as one of the three least significant health threats, while few responders ranked TOXICA in the last three (Fig. 5).

A strong majority of all respondents feel that more Federal funds should be spent on TOXICA than on AIDS, maximum regulatory levels should be set for TOXICA, and testing should be required by the Federal government (Fig. 6). TOXICA is perceived as a significant health threat, while radon is not.

SUMMARY

Radon poses a greater health risk than any other environmental pollutant. While Federal agencies have been tip-toeing around the issue (so as not to overly alarm the public), more people in the U.S. die each year from radon than from most other "scary" risks, including the AIDS virus. A public opinion survey shows that radon by another name is thought to be dangerous. People also feel that the government would take steps to protect them if radon were really dangerous.

A new approach to informing the public is necessary; perhaps a little fear would prompt some action. Should not the public be concerned (upset/disturbed) if an American dies every 20 minutes from a preventable disease?

Regulation is needed. The U.S. lags far behind other leading industrialized nations in addressing the radon issue. From a cost effectiveness standpoint, a fraction of the money currently spent to protect the public from possible nuclear power plant accidents would save many more lives if spent on solving the radon problem.

It is hoped that this study's information will be used for public information, to influence government policy and spending, and to inform those in the medical and other health related fields. If the information is shocking, if it makes people feel uncomfortable, so much the better. A spark of controversy may wake people up and

pay attention to this serious health issue.

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This is side one. Please begin on this side.

SURVEY/QUESTIONNAIRE

We are constantly being bombarded with information regarding health threats. Every day we read about acid rain, high blood pressu. , assault rifles, alcohol, drunk driving and the like. How does this affect the way we think? We're trying to find out. This survey is being sent to you as part of a study which is attempting to determine how significant new information acts to change an individual's opinion. Your answers will be used to help influence legislation and government policy. The survey is divided into two parts. Part One, on this page, lists 12 different health and environmental dangers. You are asked to rank, in the order you believe is most important, the seriousness of each threat. (1 causes the most deaths, 12 the least). On the reverse side is a similar list. This one, however, imagines that a new environmental threat, TOXICA, has been discovered. You are again being asked to rate the relative danger of each threat, this time including TOXICA among them.

Please rank these risks 1 through 12 according to your perceptions of deaths per year in the United Sates (#1 = most deaths per year).

HANDGUNS _____	LEAD _____	ASBESTOS_____
AIDS VIRUS _____	PCB'S _____	DIOXINS _____
DRUG ABUSE_____	DRUNK DRIVING _____	SMOKING _____
RADON _____	NUCLEAR POWER_____	ALCOHOL _____

Please check your feelings below:

I believe that the Federal Government should spend more money on eliminating all of the environmental and health dangers listed above_____ only the top three _____ six _____ nine_____ none_____ .

I believe that the Federal Government should regulate maximum allowable levels of all of the environmental and health dangers listed above _____ only the top three_____ six _____ nine_____ none _____ .

I believe that the Federal Government should require all citizens to participate in safety programs designed to eliminate these environmental and health hazards from homes, schools and workplaces. Yes _____ No_____.

Please turn this form over and complete the other side.

When you have completed this survey, please fold it so that the Environmental Risk Survey address is showing. Staple the survey and drop it in the mail. Thank you for your participation in this survey. If you desire a copy of the survey results, please send a self-addressed, stamped envelope to the address on the other side. Results will be available in the fall of 1990.

FIGURE 1

This is Side Two. Please begin on Side One.

Part Two: How does the introduction of new information affect your attitude about deaths per year?

A new environmental threat has been discovered. The Environmental Protection Agency has named it TOXICA. In less than a year, it has been discovered that TOXICA:

---Kills more Americans each year than the AIDS virus;
---Is naturally occurring (not man-made), and is found in homes, schools and workplaces;
---Kills one American every 20 minutes;
---Kills more Americans every year than Asbestos, Lead, Dioxins, and PCB's combined;
---Can be easily abated or removed for about the same cost to society as installing smoke detectors in all homes.

Please re-rank these risks 1 through 13 according to your perception of deaths per year in the United States (#1 = most deaths per year). Remember to take the environmental threat TOXICA into account in your deliberations.

HANDGUNS	8	17,000	LEAD	10	7	DIOXINS	13	0
AIDS VIRUS	7	19,000	PCB's	12	0	RADON	(6) 5*	21,000
DRUG ABUSE	4	24,000	DRUNK DRIVING	3	25,000	ASBESTOS	9	189
TOXICA	(5) 6*		NUCLEAR POWER	11	1	ALCOHOL	2	100,000
SMOKING	1	120,000						

Please check your feelings below:

I believe that the Federal Government should spend more money on eliminating all of the environmental and health dangers listed above_____ only the top three _____ six _____ nine _____none _____.

I believe that the Federal Government should regulate maximum allowable levels of all of the environmental and health dangers listed above _____only the top three_____ six _____nine_____none_____

I believe that the Federal Government should require all citizens to participate in safety programs designed to eliminate these environmental and health hazards from homes, schools and workplaces. Yes_____ No _____.

I believe the Federal Government should spend more money on TOXICA than on AIDS. Yes_____ No_____.

I believe the Federal Government should regulate maximum allowable levels of TOXICA. Yes _____ No_____ .

I believe the Federal Government should require all homes, schools and workplaces to be tested for TOXICA levels. Yes_____ No_____.

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 0065 COOPERSBURG, PA

POSTAGE WILL BE PAID BY ADDRESSEE

Environmental Survey
P.O. Box 288
Coopersburg, PA 18036-9990

FIGURE 2

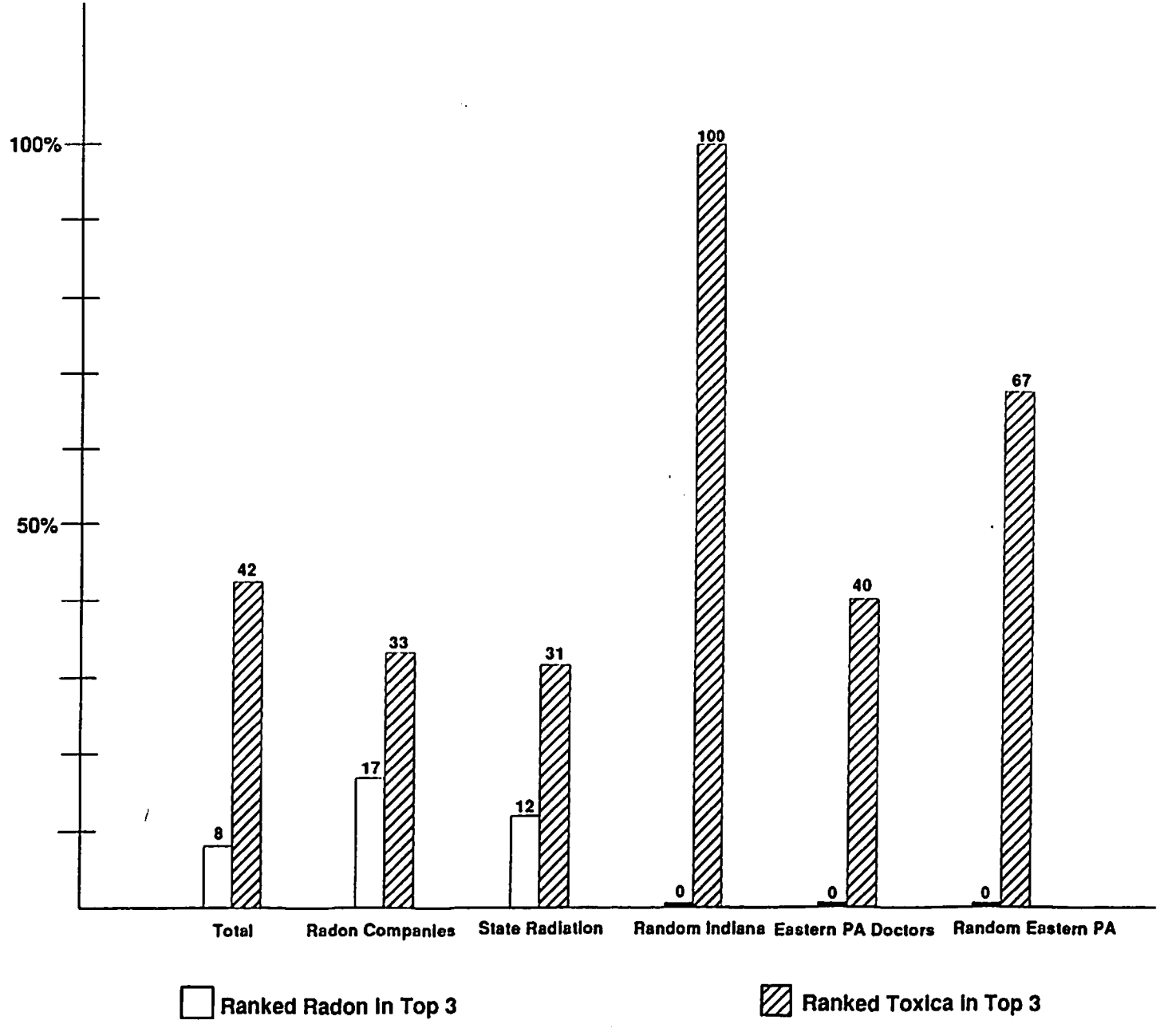
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Figure 3

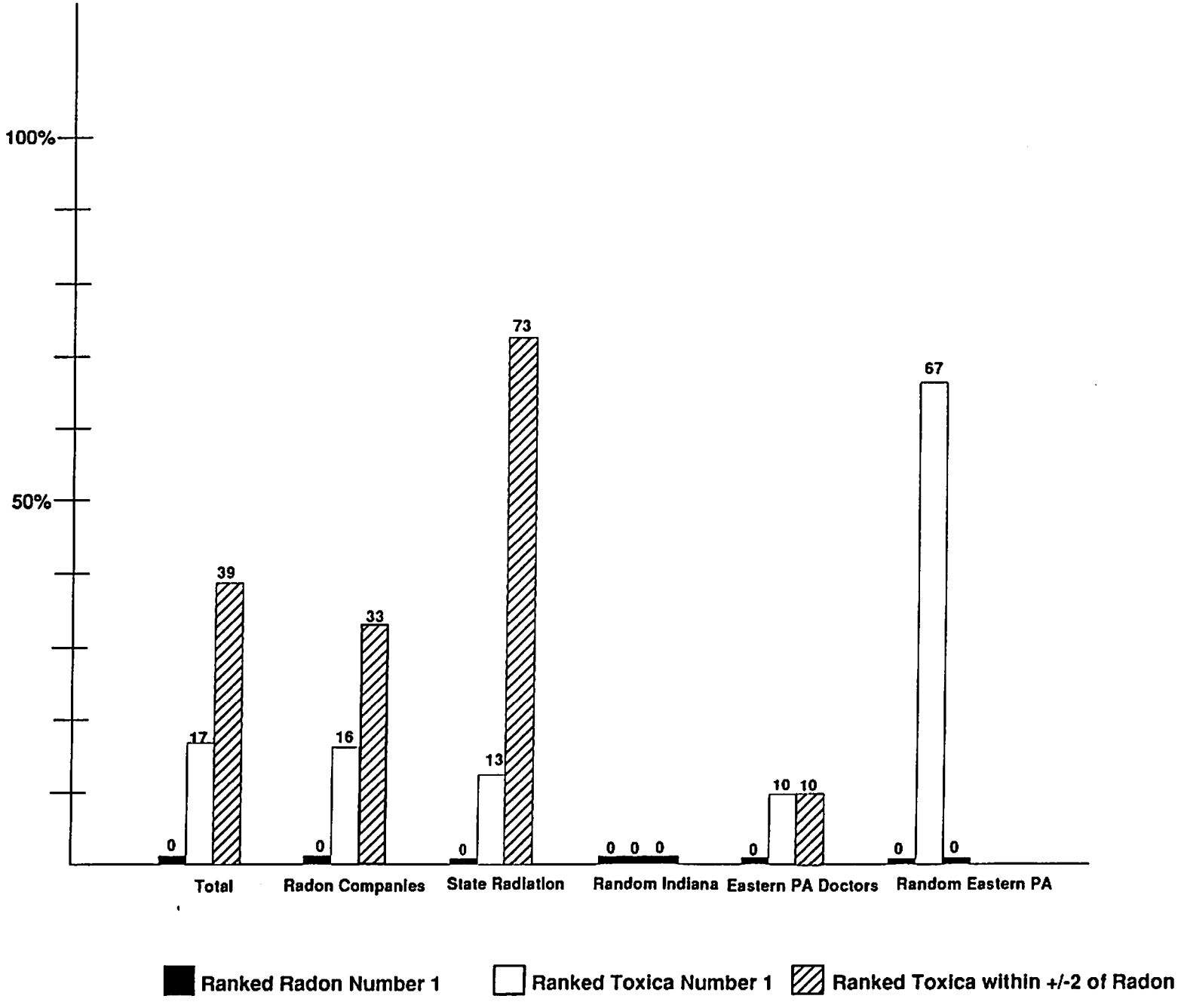
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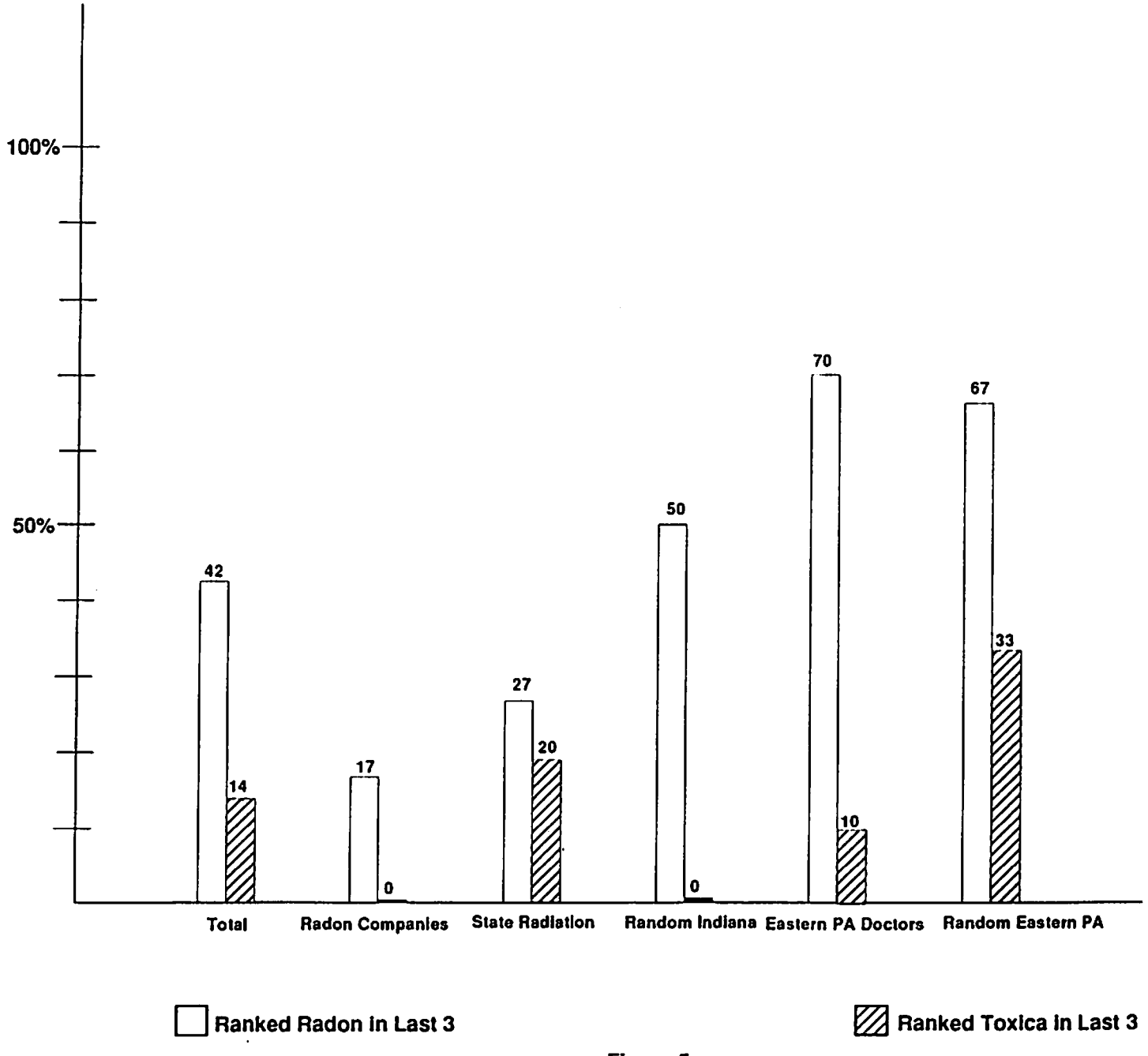
Figure 4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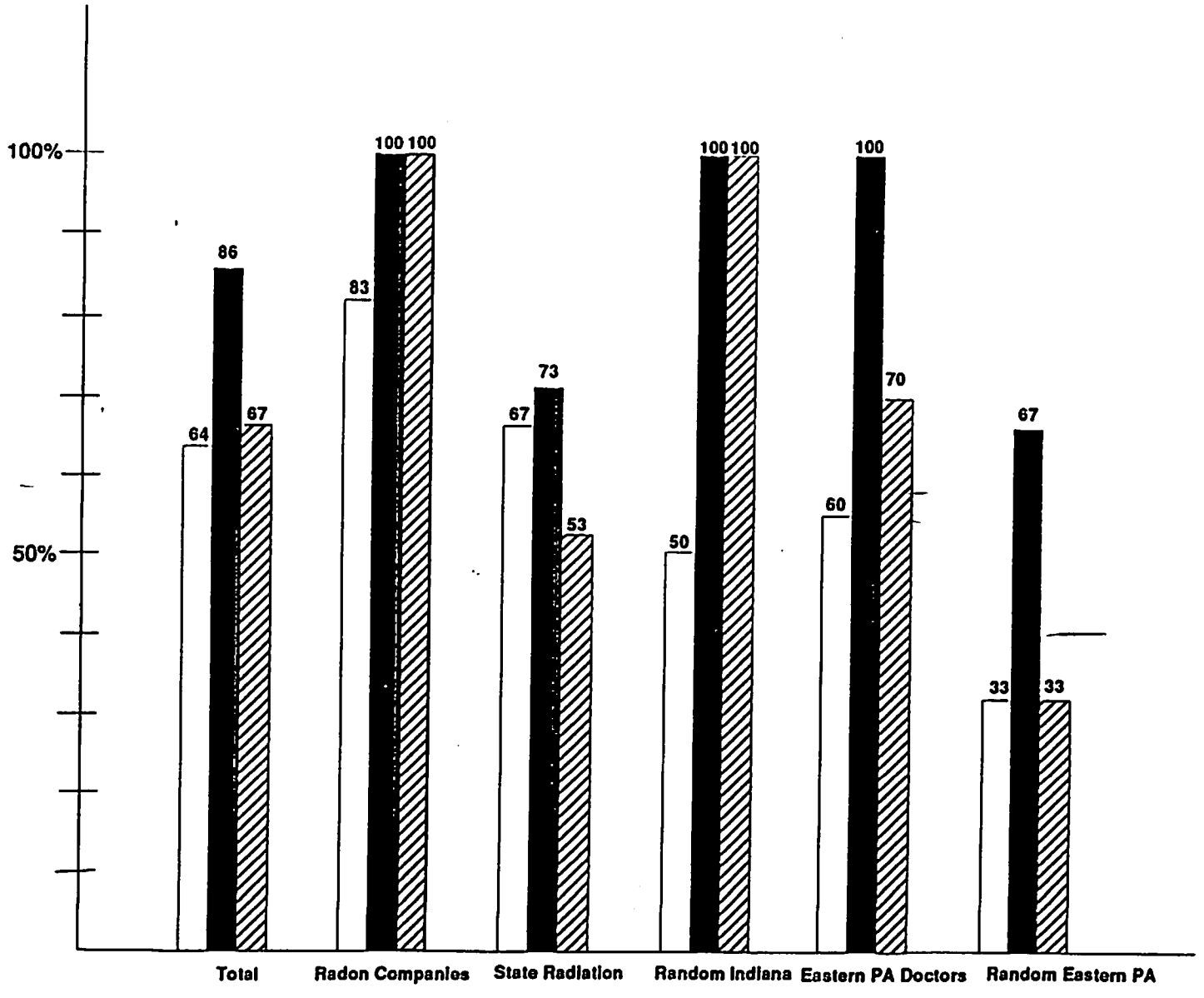
Ranked Toxics in Last 3

Figure 5



The Government should spend more money on TOXICA than on AIDS.

The Government should regulate maximum allowable levels of TOXICA.

The Government should require all homes, schools, and workplaces to be tested for TOXICA levels.

Figure 6