

# FLAMMABLE FABRICS AND OTHER FIRE HAZARDS TO OLDER AMERICANS

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HEARING  
BEFORE THE  
SPECIAL COMMITTEE ON AGING  
UNITED STATES SENATE  
NINETY-SECOND CONGRESS  
FIRST SESSION

WASHINGTON, D.C.

OCTOBER 12, 1971



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# FLAMMABLE FABRICS AND OTHER FIRE HAZARDS TO OLDER AMERICANS

TUESDAY, OCTOBER 12, 1971

U.S. SENATE,  
SPECIAL COMMITTEE ON AGING,  
*Washington, D.C.*

The committee met, pursuant to call, at 10 a.m., in room 1318, New Senate Office Building, Senator Frank Church (chairman) presiding.

Present: Senators Church, Fong, and Stafford.

Staff members present: William E. Oriol, staff director; John Guy Miller, minority staff director; Val Halamandaris, professional staff member; Patricia Carter, professional staff member; and Gerald Strickler, printing assistant.

## OPENING STATEMENT BY SENATOR FRANK CHURCH, CHAIRMAN

Senator CHURCH. The hearing will please come to order.

Mr. Oriol of the staff points out that nameplates have been arranged for the witnesses this morning. If each of you will take your place behind your nameplate, we will get underway.

I want to acknowledge the presence this morning of our ranking minority member, Senator Fong, and the newest Member of the Senate, Senator Stafford, and welcome them both to the hearings this morning.

That welcome of course extends to everyone present as the Senate Special Committee on Aging begins its inquiry into flammable fabrics and other fire hazards to older Americans.

In 1969, about 2.5 million fires occurred in the United States. More than 12,000 people died; several hundred thousand were injured; and there was estimated loss exceeding \$2 billion.

Statistics indicate that the elderly and very young children are the most susceptible to these dangers. In fact, fire and explosions constitute the most common cause of fatal accidents in these age groups.

The latest information provided to this committee by the Department of Health, Education, and Welfare does much to put these issues and the reasons for this hearing into perspective:

For overall fire involvement, the elderly, who constitute just under 10 percent of the population, account for about 30 percent of the deaths by fire.

This is a truly shocking statistic and one I can assure you we intend to do something about. The Subcommittee on Long-Term Care, under the able direction of Senator Frank E. Moss, has already held several hearings to measure the fire protections we provide our institutionalized elderly. His investigations have led to major legislation resulting in improved protection for residents of nursing homes.

While today's hearing may include some discussion of the hazards inherent in nursing homes, our primary emphasis will be on non-institutional hazards.

The subject of flammable fabrics, for example, has recently been very much in the news. The National Fire Protection Association and similar associations have provided us with some rough measure of the scope of this problem. We know that there are about 5,000 deaths yearly attributed to clothing and apparel fires and approximately 250,000 associated burn cases.

#### ELDERLY SUFFER DISPROPORTIONALLY

Once again, the elderly suffer a disproportionate share of the death and burns. In a 1969 survey of 23 States conducted by the Food and Drug Administration for the Department of HEW, it was discovered that 59 percent of fires related to clothing ignition involved those 65 and over.

Writing in 1967, Ernest E. Jullerat, Jr., manager of the fire record department of the National Fire Protection Association, noted:

Clothing fires struck the very young and the very old. Almost three times as many deaths occurred in the 0-5-year age group as in any other 5-year age group up to age 60. Past 60, the number of incidents began to rise sharply, and the post-70 age group exceeded the 0-5 age group in the number of clothing fire deaths.

The British experience is similar. Dr. John P. Bull, director of the burn research unit of the Birmingham Accident Hospital, reported that:

. . . accidents in which clothes catch fire are the main cause (90 percent) of fatal domestic burns. They account for just over half of all inpatient admissions at the Birmingham burns unit. The total case mortality for clothing burns is about 23 per cent, as compared with 3 per cent for other burns. For the elderly, the mortality rate is 73 percent. . . .

Physicians have pointed out the serious problems in giving medical treatment to burn victims, and particularly the elderly. Where clothing ignites, the probability of receiving third-degree burns is five times as high as when the clothing does not ignite. When clothing ignites, skin grafts and extensive surgery are necessary in 37 percent of the cases, as opposed to 6 percent of the cases where clothing did not ignite.

Treatment for severely burned patients assumes an inordinate amount of professional attention. The patient needs surgeons, nurses, physiotherapists, dieticians, laboratory specialists, perhaps 30 to 50 pints of blood, and a great many hours of attention.

The real tragedy is that a great many of these accidents could have been prevented with a little commonsense and some forthright policies from appropriate governmental officials.

#### ADDITIONAL CONCERN FOR THE ELDERLY

Additional statistics give us additional reason for concern about the elderly:

1. Seventy-one percent of fires occur in the home; for the elderly, it is an even 80 percent.

2. Those who live alone are the highest risks. This is another category in which the elderly are numerous, since many are widowed or have insufficient incomes.

3. They may be handicapped in some way—meaning that they are ill, medicated, or asleep.

The overwhelming impression I am left with after reading the available information and data in this area is that the elderly with very young children are inevitably cited as the acute problem group when one is talking about flammable fabrics and fire hazards in general. On the other hand, there is a distinct paucity of initiatives within responsible government agencies to provide older Americans with requisite protections.

The only standard announced under the Flammable Fabrics Act which remotely affects the elderly is the recent proposed flammability standard for mattresses.

The Department of Commerce and their advisory subsidiary, the National Bureau of Standards, clearly are placing priority developing standards protecting children. I applaud these needed protections, but I wonder why the elderly do not have priority, too.

Today, we hope to learn what can be done to reduce the risks of fire, particularly for the handicapped and elderly. We hope to learn what we can do to make our homes safer.

We hope to be able to arouse the public to the inherent dangers and to motivate responsible agencies within the Government to take protective measures. We will look into the possible need for additional legislation.

There is much we can do. The day is long past when we can ignore these serious hazards. Older Americans, whether in their own homes or in nursing homes, deserve substantial protection.

Our presence at this hearing today indicates our refusal to accept disaster as inevitable. I look forward to a constructive hearing and some positive gains in the direction of providing better protection against the hazards of death and injury by fire to our older Americans—the members of our society most vulnerable and least able to protect themselves.

The witness list this morning consists of a number of witnesses each one of whom agreed to present a spoken presentation in about 5 to 7 minutes. After each of these presentations, the hearing will then be open to general discussion by the panel.

Our first witness is Mr. Richard Stevens, the managing engineer of the National Fire Protection Association of Boston.

Mr. Stevens, before you commence your remarks, I would like to defer to Senator Fong for any statement he would like to make and then to Senator Stafford.

Senator FONG. Mr. Chairman, at this time I have no formal statement to make except that this subject which you have presented to the committee at this time is a very, very important subject. It is a very serious one for our elderly people, and I want to commend you for bringing this subject up at this time.

I know with the evidence and the testimony that will be presented here that we will be able to more fully help our aged people and to make their lives healthier and happier.

Senator CHURCH. Thank you very much, Senator.

Senator Stafford.

Senator STAFFORD. Mr. Chairman, I agree with Senator Fong. I agree this is a very important subject. I am glad that for the first time since I have moved over here I am going to be in on the beginning, the conception, of a piece of legislation and the period of gestation instead of arriving here and trying to serve as a midwife. So I am glad to be here.

Senator CHURCH. We are very happy to have you, too, Senator. Now, Mr. Stevens, please.

**STATEMENT OF RICHARD E. STEVENS, DIRECTOR OF ENGINEERING SERVICES, NATIONAL FIRE PROTECTION ASSOCIATION**

Mr. STEVENS. Thank you.

Fire experience in places where the elderly are housed and cared for indicate conclusively that the elderly present a special and unique fire problem. They are responsible for a significant number of fires due to the physical and mental circumstances which accompany old age.

In addition, their reaction to the discovery of fire does not necessarily suggest to them the need to alert other occupants of the building or to save themselves. In a fire the elderly are not only more helpless than the average person trapped by fire, but they are often transfixed by the emergency, even refusing to leave their quarters and resisting efforts to remove them from the building. Having been taken out of the building, the elderly are apt to return to the burning structure.

These characteristics, which I believe are most applicable to the discussion here, have occurred time after time in fires in buildings for the housing and care of the elderly. There are other unique problems in fire emergencies where patients are nonambulatory or are heavily sedated or strapped in their beds.

**DANGEROUS SITUATIONS COMMON TO THE ELDERLY**

The ignition of the clothing, bed clothing or the person of an elderly patient by his careless use of smoking materials is a frequent occurrence and usually is fatal. The records show that the ignition sources are matches, pipe ashes, cigarettes, and lighters. In many cases the records state that the patient has had a history of carelessness in the use of smoking materials.

It is impossible to closely supervise 100 percent of the elderly 100 percent of the time. Often the elderly place their clothing over heaters to dry. We have many instances on record of bed clothing and garments ignited from contact with heaters and other heat sources.

Sometimes the patient aggravates the problem by unsuccessfully attempting to extinguish the fire rather than seeking help or sounding the alarm.

It is not uncommon for patients to purposely set fires for various irrational reasons. In one case a 71-year-old patient used matches to burn off the restraining straps on her wheelchair and flames spread to her clothing.

In another example a 77-year-old man who had been reprimanded for not cleaning up the litter on the floor of his room, threw a lighted match into the litter. He attempted to put out the fire with other litter on the floor and cups of water.

In a very recent case, a patient apparently poured a combustible liquid on the first floor corridor, part way up the stairs to the second floor and on the floor of his room and then ignited it.

In the majority of cases studied by NFPA the patient sets a fire because he is angry with a member of the staff or with another patient.

### REACTION TO FIRE EMERGENCIES

The reaction of the elderly to a fire incident is perhaps the most dangerously unique factor that makes the elderly a fire problem.

On discovering a fire a patient is apt to ignore it, to be transfixed by it, or to seek refuge from it in his room and fail to notify anyone else of the fire.

The elderly are extremely reluctant to leave their rooms when an alarm of fire is sounded. As a matter of fact, many patients refuse to leave their rooms even though the fire is obviously threatening them. They will forcefully resist any effort to remove them from the building. Often frightened patients approached by firefighters for rescue, will begin striking firemen and have to be forcibly removed. This requires enough men to carry each patient out while prying patients' hands from doorframes and stair railings. Some of the patients may be sedated or strapped in their beds which makes it extremely difficult for firemen attempting to rescue them in darkness.

Once having been taken out of the building, the patient is very apt to return to the burning structure unless restrained. His reasons for reentering the building vary, but the most common one seems to be that he simply wants to return to his room because he is cold or tired.

### THE NONAMBULATORY PATIENT

So far, we have been talking about the ambulatory patient. The nonambulatory patient significantly adds to the problem of fire in buildings housing the elderly. The nonambulatory patient may cause a fire due to carelessness or overt acts like the ambulatory patient. Similarly his reaction to the discovery of fire is like the ambulatory patient. In a fire emergency, however, he is completely helpless and, in addition, may be sedated or strapped in a bed or wheelchair.

### SUMMARY

The facts just stated show why the elderly, housed and cared for in a building, are a unique fire problem. With the current state-of-the-art it is possible and practical to prevent multiple-death fires in these buildings.

The single fatality, where a patient ignites his clothing or bed clothing, has not been controlled and positive control is not immediately apparent. Yet it is believed that the annual number of these single fatalities far exceeds the total number of fatalities in multiple-death fires in this occupancy.

I would like to divert from my prepared statement for a moment because last week I received from the State fire marshal of the State of Oregon a compilation of fatalities and injuries in care facilities in the period November 1969 to October 25, 1971, a period of about 21 months.

This is very interesting. It represents 13 cases, 12 of which were fatal, all of which were caused by acts of smoking, all of them caused the ignition of clothing, blankets, and—well, that's it.

Now, this I think is interesting because it exemplifies what I have tried to say here, and if this record were projected throughout the United States, it would indeed represent a very significant number of fire deaths, single fatalities, in this occupancy.

Practically instantaneous detection of fire can be achieved. With fast detection and immediate staff response possibly some of these single fatalities could be prevented, particularly if clothing and bed clothing were less flammable.

I therefore suggest that the research and testing work being conducted by the private sector and by public agencies under the Flammable Fabrics Act be applauded and supported by the Special Committee on Aging.

I hasten to point out, however, that the overall fire problem with the elderly is demanding of unselfish effort by the private and public sector alike so that the elderly may live free from the horrors of fire.

Thank you very much.

Senator CHURCH. Thank you very much, Mr. Stevens.

I think later in the discussion we will want to come back to the special hazard posed by clothing and bed clothing and inquire into what might be done to reduce the hazard.

Let's move on around the panel now.

Mr. M. L. Smyth is next, consulting engineer, Tucson, Ariz.

**STATEMENT OF MARSHALL L. SMYTH, CONSULTING ENGINEER,  
TUCSON, ARIZ.**

Mr. SMYTH. Thank you, Mr. Chairman.

There are many facets to fires, and as Mr. Stevens has identified, one of the areas is bed clothing and materials that are closely associated to the individual.

Another area of concern and involved in many fires is floor-covering materials.

By a strange coincidence, I happen to live in a town where a very tragic fire occurred shortly before Christmas last year in the Pioneer Hotel in Tucson, Ariz. There were 28 deaths in that fire, and like so many of the hotel fires and institutional fires it was of very short duration.

I was asked to assist in the investigation of that particular fire and did so intermittently for a number of months.

As a result of that investigation and as a byproduct of it, some information came to light that I think may be of value to this committee. At the very least, it perhaps will stimulate some thought.

We zeroed in on the role that synthetic floor carpeting played in this particular fire. The fire was primarily limited to the hallways of this hotel, and so the combustible materials were quite readily identifiable.

Now, in discussions that I have had with a large number of fire research people around the country, there is a significant and a valid difference of opinion as to the role carpeting plays in fires or has played in the past.

Since it is controversial to a degree, and there are these differences of opinion amongst the scientific and engineering people, I feel that certainly in the world of legislation and committees such as this, you must be at an even greater disadvantage in evaluating the ideas that we members of the engineering field have.

To try to get across how flammable this one particular material can be, I have a little film here of a test we ran in a simulated section of the hotel. We made a one-third scale model of a corridor and simulated the stairwell and the floors and ceilings, and so on, and put it in this model.

I think, without further ado, I will just show you the results and let you take a look at it.

(Showing of film.)

Mr. SMYTH. We will skip some of the preliminary film that shows the construction of this model and just go right into the ignition portion of the film.

What you see now is a little bit of smoke over toward the lefthand side at 1 minute after the fire was ignited. Next we can see the amount of smoke that was generated at 2 minutes.

Ignition of this carpeting was done with one match and a little bit of lighter fluid.

At this 4-minute point, we have a flame that is about 6 to 7 feet high, and during that time about 2 feet wide.

By the time 6 minutes had gone by, the fire was beginning to die down a little, and at the 7th minute the fire was essentially just smoldering and putting out a little bit of smoke.

Senator CHURCH. Now we are seeing only carpet burning; is that correct?

Mr. SMYTH. That is correct, Mr. Chairman. This scene is just a residual view of a little bit of the carpeting fire that was left, and the residue inside the model there.

By the way, this debris is almost identical to the debris that I dug through for several weeks inside that Pioneer Hotel. The appearance was just the same. In fact, the ceiling materials used in this model were taken from the hotel, as well as the carpet itself.

I think that is enough of the film to get the idea across as to what happened.

In addition to that particular test, we ran a series of "poor man's" tests on samples of carpet that were about 3 feet square in which we were able to induce a similar time of burning out in the open. We did that with the hallway floor carpeting and then with a couple of other samples of carpet that I have here that came out of different guest rooms in the hotel. I am now delineating between hallway carpeting and room carpeting.

#### HAZARDOUS ASPECTS TO SYNTHETIC CARPETING

Both of these synthetics I have here burned in the same manner.

We also have some wool carpeting from one of the rooms, and I ran a test on the wool type of carpeting, and it turned out to be self-extinguishing when exposed to exactly the same kind of test.

This is consistent, I think, with the general character of these floor-covering materials that agencies have looked into from time to time in the past with different kinds of tests.

These particular tests put me in contact with a number of people around the country, and I became interested in the role that synthetics might play in certain types of fires. In researching history on fires for the past 5 or 6 years, I ran into six different fires that had been clearly identified as involving synthetic carpeting to a high degree and in which synthetic carpeting played a big role in the property destruction.

Most of these, as you can see in this handout that I have prepared, are documented in the Fire Journal; one of them, the Senate committee held hearings on.

All of these fires started on the floor, the origin of fire, and all of them propagated along the floor.

I think that there is a thread of consistency here. I don't mean to say that synthetic carpeting is something that you should not have; I am merely saying that the record points to the fact that there is or there may be a hazardous aspect to synthetic carpeting that has been overlooked in the past and just has not been identified.

As such, I think we have to deal with it. I don't know what the answer is or how we are going to deal with it, and I don't pretend to know. It is my opinion that we are at that stage. It is in the messy problem definition phase where there are a few of us that have these inklings but a much larger group just does not yet think that there is a problem.

I left two spaces on the bottom of this chart for a couple of more fires, two that have already happened;\* but I have not yet confirmed them sufficiently in my own mind.

One in Salt Lake City that I think was referred to earlier, the Lil-Haven Nursing Home,\*\* and there is another one down at the West Minister Presbyterian Home for the Aged in Buechel, Ky., that occurred earlier this year in which there were nine deaths. I have a sample of that carpeting.

Anyway, if those don't happen to pan out and there is not adequate information concerning those, I think by the time this winter rolls around, we will have a couple more that we should be able to put on this chart.

Senator CHURCH. Isn't it true that the hazard here is as much a smoke hazard as a fire hazard? In other words, many of these deaths, if not most of these deaths, resulted from asphyxiation due to the heavy smoke created by the burning carpet?

Mr. SMYTH. Yes, Senator, you are absolutely right. In fact, I would estimate that 90 percent of these deaths are due to either smoke inhalation or carbon monoxide or some of the other toxic gases.

I think some members of this panel are much better versed than I to discuss that aspect, but statistically speaking you are absolutely correct. Of course in some deaths there is a mutual interaction between smoke and burns, but there are very few deaths that are just due to burns.

Senator CHURCH. Just one other question. Senator Fong, at any time, if you have questions, please feel free.

\*See table I, appendix 1, p. 57.

\*\*See Trends in Long-Term Care, Pt. 16, September 29, 1971, Washington, D.C., hearings by Subcommittee on Long-Term Care.

Senator FONG. Thank you. I must leave the hearing for a little while because of another meeting.

Senator CHURCH. I understand that the Government, after a rather long period of time—has developed a so-called pill test on carpeting—has established a pill test standard.

“DO WE HAVE A TEST PROBLEM?”

I know in your paper you refer to the pill test and ask the question: “Do we have a test problem?”

You point out that the record shows that carpet from the Harmar House passed the pill test. Is that fire listed on that chart?\*

Mr. SMYTH. Yes, it is the top fire.

Senator CHURCH. In which 32 people died. The carpet passed the Government's pill test, I take it?

Mr. SMYTH. That is correct.

Senator CHURCH. What conclusion did you reach or do you draw from this?

Mr. SMYTH. Well, as I mentioned in the paper, it tells me that that test is a nonrepresentative test and does not relate to our problem. It may be a very valid test for case of ignition for a carpeting or a floor material or whatever, but it does not relate to the manner in which this carpeting burns. A much higher energy source is required really to ignite this type of carpeting.

I have learned from tests on this carpeting in the hotel that we could throw matches on the carpeting all day or cigarettes or what-have-you, and at best we would get a small fire.

To ignite this particular carpeting that I am conversant with requires something like a wastebasketful of paper, for example, turned over on it and lighted or a small amount of lighter fluid or a small amount of gasoline or some other combustible such that flames may rise a foot and a half or so and create enough radiant energy such that it goes ahead and ignites and continues self-propagating rather than self-extinguishing as with the case of wool.

So that is the delineation I see between the pill test and reality.

Senator CHURCH. So you are saying that the Government's test is much too limited to do the job that needs to be done?

Mr. SMYTH. That needs to be done for the kinds of things that we are talking about, yes.

Senator CHURCH. To eliminate the hazard of life imposed by flammable carpeting?

Mr. SMYTH. That is correct.

Senator CHURCH. Thank you.

Incidentally, your written statement and the charts that you have appended to the statement will appear in the appendix of the hearing record.\*\*

Senator CHURCH. Does that complete your testimony?

Mr. SMYTH. Yes.

Senator CHURCH. Very well.

Let's go on to our next panel witness. Dr. Irving Feller is the director of the Burn Unit, University of Michigan Medical School. Dr. Feller.

\*See table I, appendix 1, p. 57.

\*\*See appendix 1, p. 57.

**STATEMENT OF IRVING FELLER, M.D., DIRECTOR OF THE BURN  
UNIT OF THE UNIVERSITY OF MICHIGAN MEDICAL SCHOOL**

Dr. FELLER. Senator Church, I would like to thank you and the committee for the privilege of presenting our material to this committee. We at the University of Michigan and many of my colleagues are very interested and becoming more interested in the cause of the burns, although we are primarily involved with treatment.

I think the reason for this is that when we started collecting data it became so apparent to us that many of the accidents could be prevented, and for that reason my associates and myself have formed the National Burn Information Exchange, an instrument to collect data to see if we could not only learn how to take care of patients better, which is one-half of the work, but also try to lend to methods of prevention by studying etiology.

Now I think I will best depart from the statement that I have prepared and make that a part of the record, to get to some of the clinical things that I think the committee would be interested in.

Senator CHURCH. Let's do that, and we will include the full statement in the record.\*

Dr. FELLER. Let me begin then with the few slides that I have. (Showing of slides:)

Not to harp on detail, but computers have taken a major role in all types of enterprises, medicine not excluded. One of the biggest problems that we can encounter with data collection in the use of computers is that we find that after a tremendous amount of money has been spent that what we get from these machines is no better than the information that we had beforehand.

One of the other painful things that we have learned is that the sophisticated machine costing millions of dollars can give us no answers to problems unless we establish the realistic goals before the data collection begins.

In essence one must ask realistic questions, that are well defined, and then data can be collected and used to answer these questions. As I travel around the country I have learned that a tremendous amount of data is stored at a lot of expense, and oftentimes it is not being used properly.

Let me then try to show some of the basic things that we have learned as we go along here.

By using a single page, to collect data, often we limit our questions to the single page and get the most useful data.

**FABRIC FLAMMABILITY INFLUENCE BURN INJURY**

The National Burn Information Exchange, NBIE, in the last 7 years has collected data collected from 27 facilities in the United States. We used this data to find out for this particular testimony how fabric flammability influence the burn injury in burn patients. The answer is that it makes the burn more severe.

The fabric itself does not cause the burn, but if the fabric does ignite then it makes the burn more severe.

\*See appendix 1, p. 60.

This chart shows a group of patients, 4,596 cases of flame burns taken from a total sample of 10,000 samples of all kinds of burns.\*

I might add, though, that the 10,000 cases that we have collected would represent about 50 years of work for any one of the institutions involved if they had collected 200 each per year, so that method of a uniform system of data collection certainly does have its merits.

Now, if you look at this chart, and I have it explained in the text of my statement, you will notice in the first column that mortality is the more significant factor and you can see that if the clothing ignites, there is a 24-percent mortality in the group of people involved in the accident as compared to a 6-percent mortality in pair cases.

Now, what we did here was to abstract the 4,596 cases and very carefully try to line up or pair the cases by those who had similar circumstances, and those with the fabric igniting, which was 86 percent of the time. I guess the 14 percent did not have fabric ignition. So we have similar situations and very often similar ages, and we can see the mortality is 24 percent compared to 86 percent.

The next thing to look at after the mortality itself is the size of the total injury or the total burn. I might add here that we judge, all burns are not alike. We judge the size of the burn, the percentage of the body, how deep is the burn or what we call first, second, third degree.

Then, of course, the cost is important. Then another factor that we can measure with hardware is the date of the injury and the date of discharge.

The next consideration is the total burn of the patient. You see the average of 33-percent total body involvement where the fabric ignites as compared to 1 percent when it does not. We see here the full thickness when the clothing does not ignite.

The cost is \$5,000 more per patient on the average when the clothing ignites. Then you see that the hospital stay is 56 days when the clothing ignites as compared to 35 days when it did not ignite.

These data present a realistic picture that when the fabric ignites, that the injury is more severe, and the difference between a serious burn and a minor one happens to be chance. For example, if you are smoking a cigarette, as was mentioned by the previous speaker, and you drop the cigarette and the cigarette falls in your lap and the fabric is not flammable, the accident might result in a small burn. If, on the other hand, the fabric is highly flammable, then of course we have the result that you see here in this chart.

I would like to state, Senator Church, that although this committee is organized to assist in the prevention of accidents of the aged, that it is just as necessary to look at all patients of all ages because the circumstances of causes and the results of the accidents are similar.

Although it was mentioned by a previous speaker that the accidents in institutions are different because of medications and infirmities, by and large most of the cases included in the 10,000 in the NBIE are people who are injured in their homes and have similar causes of accidents.

#### FLAME RESISTANT FABRICS—COMPARATIVES

If the fabrics that they wear were protected or made flame resistant, we would have less severe injuries.

\*See chart, appendix 1, p. 62.

Let me show you the problems in both the young and old. Here is the jacket of a young boy who was playing near a brush fire. His jacket ignited and you see melted and burned fabric.

This is the label on that melted or burned fabric. It is water repellent, it is nylon, it has a lining of something that I cannot read, it has a filler of 50 percent polypropylene, and 50 percent rayon. It says "washable," manufactured overseas, and no indication of the hazard of flammability.

This slide shows the young boy 12 years old. This is initially how he appeared coming to the hospital, and the next view shows grafting. The total hospital stay resulted in a \$12,000 hospital cost.

Now, let's move to the aging. The slide shows a dress of a very healthy 74-year-old woman who was injured when she did nothing more than cook her meal, as she usually did, at home. Her husband was in the kitchen sitting at the table. The washcloth near a flame, on the burner, ignited as she had her back to the stove. When she turned and noted the accident her dress caught fire.

This woman at the age of 74 with a burn of this magnitude passed away in spite of our best efforts, 4 weeks after the ignition.

The cost was almost \$18,000.

Next, I will show you paired cases of accidents where the fabric was involved in one, as compared to another similar case where fabric was not involved. We carefully pulled specific cases to show you as best we could from the 4,000 that we have what does happen in similar situations when only fabric ignition or nonignition is included.

You see here the feet of a man who ran back into the burning building in the middle of the night to rescue his child. His age approximately 25 years, and he has burns on his feet. He was in his undershorts, and fortunately they did not ignite, but his feet burned. His burn was rather small, and grafting was not even necessary.

The next slide, please.

This is a 25-year-old woman who did the same thing, she ran back into the fire. She was wearing a housecoat which caught on fire, and she also was able to survive the resulting injury, but the cost and the difficulty to the patient I think are rather obvious inasmuch as the latter patient required several operations to close her large burn.

Here is a case which very clearly demonstrates fabrics involvement in the injury. This is a young electrician approximately 30 years old, in his thirties, who was working at a high-voltage panel. A short-circuit occurred, and the flash that went past him caused what we call first and second degree burns of his forearms and his face. He was wearing large leather gloves that went up to the midforearm and wearing a heavy cotton shirt with torn-off sleeves that protected his body.

He was out of the hospital in less than 3 weeks. No grafting was necessary.

Let me show you an identical situation of a young electrician of the same age, a man who was doing exactly the same thing, only a flash occurred that came out of the fuse box, set his flannel shirt on fire, and you see the results here. A 40-percent injury. He was in the hospital for quite a few months, and has since required many operations to get him back to his work.

The next slide.

Now, what happens if you do have flammable protected clothing? Flame protected clothing is being used in certain professions. A race car driver, during competition, crashed and the gasoline tank exploded. He was wearing a flame protective jumpsuit, and the only areas that were burned were his face, hands, and feet.

His gloves and his boots burned and actually melted, but his body was protected. This is an example of what protection is afforded by flame protected clothing.

On the other hand we have one case where the race car driver did not have the protective clothing at the time of his accident. He suffered a complete body burn, and this young man died of his injuries.

#### AGE AS A FACTOR IN SEVERITY OF BURNS

Now, this slide I think demonstrates the age as a factor, in severity of burns.

The older patient succumbs to smaller burns because of the following:

The general aging processes have already set into motion. For example, hardening of the arteries. A burn, even though small, exerts a tremendous amount of stress on the body, and this will, with the hardening of the arteries, cause organ system failure such as a heart failure or stroke.

The National Burn Information Exchange has provided sound statistical information on burns. For the first time we have been able to establish standards for burn patient care. Prior to this time, each physician only had relatively few cases to evaluate our treatment and therefore we had no solid data base.

Now, with the 10,000 data base of cases collected from around the country we can see what actually happened to these people in different age groups.

Five age groups have been selected by computer analysis to determine the effect of age on survival. A patient 75 to 100 years old with a burn of 40 percent has no chance of survival at this time. At the other extreme when the patient is 5 to 34 years old he would have an 85-percent chance of survival with the same size injury.

Now, this is for burns by any cause; it makes no difference if it is flame burn or electric burn. The stress is there and the cause of death.

Now, the next slide.

This slide explains the causes of death. The aged patient died from heart disease or stroke and pneumonia which should be the most likely result from the injury.

I think that I have used my 5 minutes. Thank you.

Senator CHURCH. Thank you very much, Dr. Feller.

In the FDA testimony the witness describes a new sampling technique for collecting information on burns. Are you aware of this technique, Dr. Feller? Is the FDA working with you in connection with this technique?

Dr. FELLER. The technique for selecting fabrics? Is that the question?

Senator CHURCH. It is a new sampling technique that the FDA is apparently experimenting with concerning information in connection with burns. Are you aware of this?

Dr. FELLER. Yes, I am aware of several of the projects going on. We do collect fabrics. The fabrics that you saw on the slides were submitted to the FDA about 4 years ago. We suggested to the FDA that they collect fabrics and started the program for them. We have I think sent over a hundred samples to the bureau. Exactly what has happened to them I don't know because I never had a feedback on how they were tested. We have tried to submit these fabrics to testing to demonstrate how these fabrics would compare by testing.

Now, since then I know that the FDA field men have been collecting fabrics and cases. How much they have collected, I don't know. We have more that have not been picked up for some reason. I understand that 1,700 man-years was expended last year to collect 1,000 cases. This would be a cost of over \$400 per case, the cost by the WBIE is \$25 a case. The WBIE has been abandoned by the FDA. Another case of waste of Government funds.

Senator CHURCH. Well, we will have a chance to get into that more deeply in a few minutes.

Thank you very much for your testimony, Dr. Feller.

Our next panel witness is Dr. Ann Phillips, associate professor of surgery, Harvard University Medical School.

Dr. Phillips.

**STATEMENT OF ANNE WIGHT PHILLIPS, M.D., ASSISTANT IN SURGERY, HARVARD MEDICAL SCHOOL\***

Dr. PHILLIPS. Senator Church, we are meeting to consider the who, how, why, what, when, and where of burns in the aged and to determine what we can do to prevent them.

Taking the simplest first, Who are the aged? Are you aged? To be aged from the social security point of view a man has to be 72, but from the viewpoint of burns he is aged before 50. We are on the skids at 40. In a study of nearly a thousand burn patients admitted to the Massachusetts General Hospital in Boston over a 17-year period (1939-57), the largest extent of burn survived by anyone over 40 years of age was 40 percent of body surface.

With each advancing year the size of burn that caused death became smaller. No one in their sixties lived long after flames seared 36 percent of his or her body surface. A 23-percent burn, which is considered minor in a young adult, was fatal to patients above 70 years of age. Over 80, a 20-percent burn was insurmountable.

Forty-five percent (nearly half) of the deaths in the series occurred in patients who were more than 54 years old, although they constituted only 16 percent of the total burn admissions.

*How are the elderly burned?* The National Fire Protection figures, cited by Mr. Stevens, put "careless" smoking at the top of the list, and our data, although far from complete, amply support the finding that cigarettes are involved. But whether that smoking is "careless" or not, we will consider in a moment.

The next most common causes of burn fatalities in our series were being "trapped in a burning building," followed by fires started by alleged stove explosions or cooking accidents and by boiler explosions.

\*See supplemental statement, appendix 1, item 3, p. 63.

The figures commonly given on explosion and fire injuries give an exaggerated picture of the extent to which explosion plays a part in our fire deaths. At least in the Massachusetts General Hospital experience there are many, many more deaths from flames than from explosions.

How many apparently accidental burns in the elderly are actually self-inflicted, we do not know. Three old people in our series attempted suicide by igniting their clothing. One was schizophrenic. One knew he had cancer, and one was in pain from a condition known as trigeminal neuralgia.

When they are burned, elderly people tend to be burned more severely than their juniors. Only 4 percent of those under 55 years of age had burns of more than 55 percent of body surface, while 10 percent of the elderly suffered such extensive burns. The difference is statistically significant. The greater difficulty the elderly have in moving rapidly to escape the fire may account in part for it, and, in some cases, a diminished ability to perceive the danger until too late may also play a role.

*Why are the aged burned?* An astounding 71 percent of the elderly patients in our series were in poor or bad health when they were burned. So-called "careless" smoking in the elderly may be due to loss of coordination, shaking of the hands, reduced pain perception, diminished vision, disturbed comprehension due to illness or to the inattention and forgetfulness that often go with senility.

Smoking was responsible for 40 percent of the deaths in the MGH series. Of those fatally burned while smoking, one was drunk, two were ill with incurable diseases, three are thought to have had a stroke at the time of their injury, and many others were sick in bed. One was actually in an oxygen tent, when a visitor gave him a cigarette, in spite of the "No Smoking—Danger!" signs.

Among the MGH patients were Chester, Blanche, and Mrs. P. Chester, aged 55, had had several minor strokes and was burned while experiencing another.

Blanche, aged 76, had had two previous strokes and was smoking, although blind. Just how her clothing caught on fire, no one knows. Her landlady, a spry old girl of 80-odd years, found her in flames and extinguished the blaze, endangering her own life in the process. Blanche died within 23 hours; her landlady, happily, survived.

Mrs. P., our third case, trembled, making it difficult for her to hold a cigarette. She was afflicted with chorea, a little known disease, which afflicted one of the original so-called "victims" of the Salem Witches in the 17th century. She died just after breakfast one day when her regular morning cigarette ignited her clothing, burning 95 percent of her body.

Obviously, Chester, Blanche, and Mrs. P. were all high-risk smokers.

*What burns when the elderly catch fire?* The worst offenders are housecoats, negligees, pajamas, trouser cuffs, sleeves, and loose-fitting garments, especially those made of lightweight, loosely woven fabric. The edges are the first to catch fire. Where clothing fits snugly, as at the belt, for example, there is often an unburned band of skin beneath. Women's clothing ignites more easily than men's.

Flames should not be considered the only cause of burns resulting from fires. Surprisingly, the afterglow may be hotter than the original

flames and may cause serious burns. One old lady was brought into the hospital wearing a girdle that was still smoldering. The flames had been extinguished, but the burns went merrily on. In that case it would have been better if modesty had taken a back seat in the first aid of the aged burn victim.

Of the various fabrics, cotton is said to be the most dangerous, but which are the real culprits—flammable fabrics or the cigarettes and the match?

*When are the elderly burned?* In the MGH series, the alcoholics and the suicidal people were burned late at night, in the lonely hours. Those hurt in house fires were burned around 5 o'clock in the morning. But the biggest loss of life occurred between 7 and 10 a.m., 42 percent of those who died being burned at the beginning of their waking day. Thirty percent were burned between 12 noon and 4; only 7 percent between 4 and 10 p.m.

The elderly are apparently at their safest in the latter part of the day. Whether this is because they are more alert in the afternoon and evening, or whether the higher morning mortality is simply a reflection of their tendency to wear the more flammable night clothing well into the morning, is yet to be determined.

#### FACIAL BURNS ARE MOST DANGEROUS

*Where are the elderly burned?* Does it make any difference what part of the body is burned? Yes, it does. Burns of the face are of ominous significance. Burns may occur on all parts of the body, as the victim turns to avoid the heat, but they are most common on the hands and arms, the face and the front of the trunk. In our series, deep burns around the nose and mouth were present in almost all of those who died of burns. Old people suffered facial burns more often than the young.

This brings us to a word of caution: Beware the facial burn. If you are ever caught in a fire, cover your face, for with the facial burn generally goes the inhalation of smoke, and death stalks the patient with a damaged airway. Even a healthy young person of military age, who normally would have a 50-50 chance of surviving a burn as large as 60 percent of body surface, may succumb from a 10-percent or even a 7-percent burn if his airway is injured.

When one inhales smoke, the lining of the airway is irritated. Multiple ulcerations appear, and in many cases the respiratory tract becomes completely stripped of its lining cells. Accompanying this loss of cells is the loss of the little hairs, or "cilia," as they are called, which normally sweep dust and bacteria out of the airway. In the absence of those protecting cilia, irritating particles, debris, and bacteria may accumulate in the respiratory tract.

The irritation leads to swelling of the airway walls, and the smaller passages tend to become obstructed, which causes the air cells beyond to collapse. Air, with its life-giving oxygen, can no longer reach some of the cells. In addition, if the patient is in shock, some of the air cells which do have an air supply, may not be supplied with blood. Oxygen, arriving at a bloodless air cell, fails to reach areas of the body where it is needed.

Not only the air passages, but the air cells themselves may fill up with carbon particles, fluid and debris, further obstructing oxygen

flow. Similarly, the walls of the air cells may become swollen, hindering the transfer of oxygen from the air cells to the blood capillaries.

Furthermore, the inhaled air may be poor in oxygen and rich in carbon monoxide, the fire consuming the oxygen and producing carbon monoxide as a product of incomplete combustion. Carbon monoxide usurping the rightful place of oxygen on the hemoglobin molecules in the blood, further reduces the amount of oxygen carried to the victim's brain and other tissues, distorting both his judgment and his coordination, so that escape becomes difficult or impossible. We might compare the transfer of oxygen from the air cells to the tissue by the hemoglobin molecules with the transfer of passengers from the Washington National Airport to the city by taxicabs. At the airport the tall people have preference and take the first taxicabs to arrive. Similarly carbon monoxide has priority over oxygen for passage on the hemoglobin in the red cells to its destination at the tissues.

Invasion of the airway by bacteria will cause further swelling of the airway walls, further congestion, further obstruction and further diminution in the oxygen exchange.

### SMOKE DAMAGE TO THE LUNGS

Curiously, the causes of smoke damage to the lungs have not been adequately studied. We know that irritant gases causes damage. Among the harmful products of combustion are sulphur dioxide, nitrogen dioxide, hydrogen cyanide, hydrogen chloride, ammonia, phosgene, and many others. With the advent of the plastics industry, we have added a whole new gamut of respiratory irritants. The role of particles, however, has never been adequately investigated. There is evidence to suggest that they may play a larger part than that for which they are normally given credit.

Among the fire victims reaching the Massachusetts General from the Coconut Grove fire in Boston, for example, there were three who had covered their faces. Those three, and those three alone, had no respiratory complications, yet toxic gases should have passed completely through the protective covering. Particles were stopped by the cloth mesh. There is a real possibility that there may be acids or other chemicals adsorbed on the smoke particles which may cause the damage. The heat itself is apparently not an important factor in lung injury except where steam is involved.

How important is this damage to the lungs? Is it something we can sweep under the rug and forget, or is it something we must take into consideration in our attempts to reduce suffering and death in our elderly citizens? The answer is that it is tremendously important.

Smoke inhalation injuries and wound infections are running neck-and-neck as the principal killers of the burned patient today. In the MGH series 42 percent of all the fatally injured burn victims died primarily of respiratory tract injury. Any decisions made to reduce flame deaths in the elderly must take smoke production into account.

*What can we do to reduce fire hazards for the elderly?* Should we require them to wear clothing treated with flame retardants? Since elderly people wear much the same clothing as other adults, wouldn't it be necessary to protect all adult clothing with flame retardants, and if so, would the expense be prohibitive? To what extent could we hope

to reduce fire losses and injuries in the aged if flame retardants were mandatory only for the occupants of hospitals and nursing homes? For information on expense the committee will need to ask elsewhere, but it should be understood that the majority of burns in the elderly occur at home. Only three elderly patients in the MGH series fell in the category of hospital or nursing home occupants, the balance being burned outside such institutions.

A vital part of the flame retardant question is the control of smoke. You are doubtless familiar with the old adage "Where there's smoke, there's fire." But where fire is suppressed, smoke is often increased. This concept is not new. The Indians made use of it, smothering their fires with damp blankets to make smoke signals. The smoke hazard must make us "rush slowly" when it comes to writing legislation concerning the use of flame retardants. We must be sure that exposure of the treated cloth to heat will not produce irritating, choking smoke which could be as great a hazard as the flame. In short, we must be sure the cure is not worse than the disease.

Another question on which we should have information in advance is whether adding fire retardants to clothing or bedding changes their texture and pliability sufficiently to have an adverse effect on old people's bed sores. Skin, when subjected to long-continued pressure, breaks down. Even a wrinkle in a bed sheet may cause the skin to ulcerate. The resultant sores can become infected to the extent that in some cases they pose a hazard to life. Most of the currently available flame retardants produce some change in the "hand," or general comfortableness, of the fabrics to which they are applied. We need to know, before making regulations, whether these changes in fabric texture and pliability present any additional danger to the bedridden.

We must also determine, if we can, whether attacking the problem of burns in the aged through the use of flame retardants offers us the best hope of saving lives and reducing suffering for the expense involved. Are there other means to the same result which might be as or more effective?

One last thought on the use of flame retardants: the argument has probably been raised that the public will not buy flame retardant fabrics unless required to do so. In a department store trial mothers apparently failed to buy fire resistant nightwear for their children although it cost only a dollar more than the untreated night clothes. It would be interesting to know how the flame-resistant garments were advertised. Since human beings have two common failings: they believe that disaster is something that happens to other people and they tend to ignore fine print, the advertising must be vivid, yet use of grim real life photographs of burned children might be bad for business. Perhaps the fabric protection story could be told effectively, but without undesirable emotional impact, by using pictures such as the one which appeared on the cover of the kit for the Conference on Burns and Fabrics in 1966. Here (witness hands a copy to the chairman) is a picture of two dolls before a birthday cake, one in a protected and the other in an unprotected party dress. The flammability of the unprotected dress is shown dramatically by the mounting flames, yet one can regard it dispassionately, knowing that at the moment it is only a doll that is burning.

## FIRE SAFETY PRACTICES

By what other means can we hope to reduce suffering and deaths due to fire? We might consider a ban on smoking in the elderly or disabled—a horrendous decision and probably unenforceable. We certainly should ask the clothing industry to stop manufacturing negligees and house coats with floppy sleeves. Perhaps, also, we should approach the cigarette and match manufacturers. Fire deaths in the aged might be reduced 40 percent if the cigarette industry produced safer cigarettes or cigar holders and the match industry safer matches. For the high risk smoker, including all blind smokers, those who have difficulty coordinating, and those who have had repeated strokes or heart attacks, development of a fire-resistant coverall to be worn when smoking should be considered.

Probably the greatest step we can take in fire prevention, however, and one which should be pursued vigorously while use of the various flame retardants is being investigated, is to increase education in fire safety. Our citizens must be alerted to the high fire risk to the elderly and especially to the elderly smoker. Senior citizens should be taught good fire practices and cautioned about the major fire hazards. Since many of them remain glued to their television sets all day long, spot films, carried as a public service, offer the greatest possible elderly audience exposure. Senior citizens clubs and other organizations might also be helpful in organizing a continuing education program. Special emphasis should be placed on the handling of matches and cigarettes and correct procedures in lighting a stove or boiler. Too many people do not know that if the first match fails, they should turn off the gas before lighting the second match.

## FIRE EDUCATION

Lest it prove difficult to teach old people new tricks, fire education should be improved in our public schools, where children are growing up to be aged someday. Iowa, Minnesota, and New York have excellent fire education programs. New York requires 15 minutes of fire education every week from kindergarten through high school, while Iowa requires a whopping 60 minutes a week. Unfortunately, many of the other States have no fire education program, whatever. Alaska, for example, admits to offering no fire education, despite the highest life and property loss rate in the Nation. Teaching the young, who must soon care for the aged, may pay ample dividends. It should be just as well known that "cooking in your nightclothes is dangerous" or that "stroke victims should not be left alone with cigarettes," as it is that "you should never leave a child alone with a box of matches." Future housewives should be urged to wear close fitting and, preferably, fire resistant clothing in the kitchen, and to demand fire-resistant clothing for their children.

Smoke evasion should be included in this educational effort, informing the public of the importance of protecting their face in a fire. Many of us have been taught to throw a rug or blanket or coat around a burning victim, but very few have been told that, if possible, they should bring it down in such a way as to push the smoke and flames away from the victim's face and airway.

One other hazard to the aged which we should consider is that of the high-rise apartment building. The possibility of trying to evacuate a high-rise building containing elderly people is a grim one. Use of present day elevators is contraindicated because of the danger of being carried to the fire floor or trapped in a smoke-filled atmosphere, and to bring the elderly down 30 or 40 flights of stairs, while firefighters are toiling upward in the opposite direction, might take hours. With old people, who did not wish to be evacuated, the task might be insuperable. Unless high rise buildings are provided with fire safe islands of safety within them, we should advise elderly people to seek their residence elsewhere.

In closing, I must repeat that the major culprits in burns of the elderly are not the flammable clothing, but the cigarette, the match, and the incompetency of the smoker. Cigarettes and matches should be devised which will self-extinguish the moment the fingers holding them relax.

Thank you.

Senator CHURCH. Thank you very much, Dr. Phillips.

I think your testimony certainly does bear out the special vulnerability of the elderly to burns and the likelihood that they will suffer more severe burns than other age groups.

Dr. PHILLIPS. Thank you.

Senator CHURCH. Our next panel witness is Dr. Irving Einhorn, who is director of Flammability Research Center, University of Utah.

#### **STATEMENT OF IRVING EINHORN, M.D., DIRECTOR, FLAMMABILITY RESEARCH CENTER, UNIVERSITY OF UTAH**

Dr. EINHORN. Thank you, Senator Church.

I am going to discuss several areas, but they will all fall under the category of physiological and toxicological effects to humans prior to

During the past decade we have spent a great deal of time evaluating the cause of fire, especially in plastic materials and in retarding these materials. Recently we have categorized 358 test procedures worldwide in which I believe only four or five of these are worth the paper they are written on.

They do not consider, in most cases, the total fire situation. A good example of this would be the fact that in virtually all of these tests the oxygen concentration or air passing over the sample during the fire exposure either remains constant or is increased in some cases.

In an actual confined space, fires such as in a nursing home, automobile, aircraft, quickly lose the oxygen available and the combustion products become the result of high concentrations of carbon monoxide where the materials are present.

I have a series of slides.

(Showing of slides.)

The first one or two may be a little bit off in size but basically this shows the fire process is rather complex. We have both thermal processes and chemical processes which will lead to decomposition, and then to combustion.

The condition of combustion is a series of continuous ignitions.

Now, down in our stage four we have nonflaming degradation, which would be smoldering. We have incomplete combustion, high smoke. The actual flame propagation, the physical response of shrinkage, melting, charring, dripping, and then finally the effect on individuals, the potential physiological hazards.

This is a fabric which essentially does not support combustion. On the other hand it may have high heat characteristics. The use of these materials, they make them thick enough to act as a thermal barrier. Pilots oftentimes take them off in flight.

This is another material which chars and also cracks.

Finally, a very hazardous material, nylon-type, which melts and drips.

If you look at the effects to an individual who had a nylon shirt on, you can see the type of burn that took place on his hand; the result after extensive skin grafting.

Another picture of a woman showing a very severe burn. She had on a nylon blouse and just bent over a gas stove. And here again you see the long-term response of skin grafting and the physiological effects to the individual if she does survive.

#### FACTORS LEADING TO DEATH

Now, factors leading to death in a confined-space fire are summarized here. Direct consumption by fire, extremely high temperature, absence of oxygen, presence of carbon monoxide and other gases, presence of smoke, development of fear.

More recently our group at the research center, coupled with our medical faculty, have listed actually six causes in the order that we feel they are important.

The first and most important is the absence of oxygen and presence of carbon monoxide. An individual carries out normal body functions in the requirement of 21 percent oxygen. When this drops to 16 percent oxygen, he becomes slightly fatigued. At 12 percent he loses rationale. Somewhere around 6 and 7 percent he dies in a short period of time, 3 to 5 minutes. This is at ambient temperature.

If we consider the high temperatures in common typical fires, we would find the typical home fire reaches 500 degrees in 5 minutes, a thousand degrees in 10 minutes. A human can survive for a short period of time.

Couple the loss of oxygen, presence of carbon monoxide, and the temperature, and then the survival time is short.

In a two-story bedroom home, with the bedroom door open survival time is 3 to 4 minutes, with the bedroom door closed would be 10 minutes.

We then have the presence of smoke. Smoke prevents orderly egress from a fire area and also prevents the firemen from locating the source of fire and fighting it effectively.

Flame would be next, and finally the exposure to toxic gases.

The short-term and long-term effects on body systems and organs. Actually we take all these together and we have a real fire system.

This is a smoke chamber 18 by 18 by 31 inches. We have in this particular case a measure of a small sample weighing 4 grams. It burns readily.

If we fire retard this material, the smoke increases from approximately 15 percent obscuration to about 35 percent obscuration. We plasticize, and we have a secondary dripping.

Now, if we go to the rigid materials which are commonly used in installation, we see that the rather newer materials burn rather readily, are totally consumed in 15 seconds, they produce about 85 percent smoke.

Fire retard this material, and we see that 1 gram of material, which is four hundred and fifty-fourths of a pound, will completely obscure the chamber in a period of 1 second.

If we look at the decomposition gases, we go from approximately 60 parts per million.

This material does pass the U.L. test with the rating of 20.

If we looked then on the dose response curves for chemical agents and consider the L.D. 50, we can use this as some measure of evaluation of toxicity exposure.

Coworkers listed a dose toxicity rating where they ranged all the way from less than 5 milligrams of material.

If we look at a typical frequency response of smoke to major and minor peaks, the major is a distribution which we would expect to see in a fire. The question is: What is a short peak?

We have already heard the effects regarding hemoglobin. In the elderly, where you have such diseases as arteriosclerosis, 45 to 50 percent oxygen-carrying capabilities may be actually deterrents, and these people will succumb more readily than a normal healthy individual.

Here we see a study of 3,145 single-fatality fires conducted by the NFPA; 525 of these victims were clothing fires, 2,620 were nonclothing fires.

The interesting aspect to us is that 88 out of the 525 in clothing fires were resultant from gas or smoke exposure. Approximately 1,300 or half of the nonclothing fires resulted from gas or smoke.

Where did these fires occur? 307 smoking in bed; 237 smoking in upholstered furniture; about 842 playing with flammable liquids; and quite a number undetermined.

## FIRE RETARDANT COATING

Now, we are very much interested in some of the work recently completed for the National Aeronautics and Space Administration. In this case TACA was used as a fire retardant coating. It is suggested, also, that it be used on aircraft seating.

We received in our analysis very high concentrations of this material, about 100 times more toxic, high concentration of hydrogen chloride. In fact, the hydrogen chloride was severe enough to cause the covering of the eyeball to be seriously damaged in 15 seconds.

The cause of death was still carbon monoxide poisoning, but even though we did not have the fire, we can cause the death of animals in 15 seconds in a relatively ambient temperature situation.

Studies have been going on at our medical school in tissue culture to show the effect of various components.

The effect of various materials condensing on the skin of animals is also being studied.

We can see certain abnormalities in the nucleus of various cells, here a group of nerve cells.

Reference was also made to particulate matter. We have found a very interesting phenomenon. The particulate matter contains a high concentration of free radicals. Normally in a chemical free radical actually disappears in a very short period of time, but we have found that some of these radicals have lives of 5 to 7 weeks. These are permitted to move into the mucous membranes. They will work in contact with body systems, and abnormalities may develop.

In addition to this, there are high concentrations of aromatic materials found on the surface of the particles.

This is an analysis by the University of Michigan on the normally considered self-extinguishing products. We find a high concentration of carbon monoxide, a high concentration of actually about 58 percent is a good fire retardation.

Now we are interested in the effects of hemoglobin. In the 0- to 10-percent range, we have no signs or symptoms, but as the complexing reaches the 50- to 60-percent level, we have a series of convulsions, as we have seen in our laboratory animals, and beyond 50 percent, we can have death in very short periods of time. In the 80 to 90 percent, death in less than an hour.

Some studies were made in laboratory animals.

The first column is a concentration of carbon monoxide, the time required in the second column was 20 percent, 50 percent in third animals, and then the effects in man 20 and 50 percent.

I might point out we don't know very much about 50-percent humans, because of the obvious consequences.

Let's look at some of these statistics, and we have more recent ones published. We find in some cases these are actually longer than shown here.

If we expose ourselves or an animal to 1,000 parts per 1 million at CO, at ambient temperature, the animal, gully rat, will reach 15 minutes. It requires 240-minutes' exposure to reach 50 percent.

The figures for humans are 50 to 300, and this varies upon the health and condition of the human.

At 10,000 parts per 1 million concentration, the 20-percent level is reached in 1 minute, the 50 percent in about 5.

Let's take a look at some of the materials in household areas.

The acrylic carpet in a burning situation has about 11,000 parts per 1 million of CO and about 100 parts per 1 million of the wool carpet which relatively is self-extinguishing and slow-burning has 19,000 parts per 1 million CO.

This alone in ambient temperatures would produce a 50-percent complexing in humans in less than a minute. Coupled with the other survival time, it would be in seconds even at ambient temperature.

Another factor we see here is that in this particular case in the smoldering-mattress-type fires, people tend to move away from the fire source, but because they are exposed to high concentrations of carbon monoxide, they die in periods of 30 to 40 minutes, where it might take three to five hours for the mattress to ignite.

This is a mattress at Lil-Haven. You will notice the bed clothes are practically white, very small amount of soot deposit on the walls. This

room had no evidence of actual fire, and this was typical in the cases where the other three victims died.

We feel that a great deal more work must be done in the evaluation of the total fire hazard. We study the physiological response. In many cases we have attempted to study these responses in high concentration, and we do not have mechanism involved.

We now have a program coupled with our medical school. We are studying the effect on muscle and nerve response systems and organs, and the effect of concentration of these various fire gases.

I might point out that in the case of smoke, legislation is being prepared which uses as the basis a fireman wearing a gas mask.

A number of tests have been devised, and this is certainly one important aspect of the smoke problem. On the other hand, the acroleins in wool at a 1-percent level will cause the eye to tear and therefore, even at a very low smoke concentration, or a long density time, you will still not see the exit sign.

This is again a plea for the needs of more national tests which really consider the total fire response.

Thank you.

Senator CHURCH. Thank you very much, Dr. Einhorn.

I hope we can get into some discussion of what materials are available now that represent an adequate answer in terms of fire resistant materials that don't introduce new problems of the kind that you have described. Are there such materials available that are both fire resistant and don't have these other drawbacks?

Dr. EINHORN. There are several aspects of this. First of all, the moment we fire a retardant material, whether we put into the material a type retardant to react to the gas, mace, or whether we use a phosphorus-based material to develop char structure, we are actually in both cases inducing an incomplete combustion, and as a result of this the nature of the product becomes much more dangerous in the toxicity aspect, and the concentration of smoke increases almost exponentially.

There are new materials that are being investigated, the highly aeromatic, like the poly products that the Air Force is looking at for flight suits, essentially do not combust. They produce little smoke and small concentrations of gases. These are expensive materials.

We are doing some work. We think we have made some progress on new materials where we are modifying the structure where we have no fire retardant.

We had one test, joint with the National Aeronautics and Space Administration, which was 2 years ago, where a C-47 aircraft was burned at the Otis Air Force Base. There were two sections of this 50-foot cabin, one insulated with conventional materials and one with fire-retardant materials. This plane was surrounded by 5,000 gallons of floor fluid.

The conventional part of the aircraft was completely destroyed in 20 seconds, and this would be ranging in the work we are doing at between 20 and 90 seconds. At the end of 10 minutes, when the fire was put out, the test section was totally intact, the aluminum burned off, but the temperature did not exceed 165 degrees Fahrenheit, which is survivable, and the gases inside have supported life.

So this is one approach in the use of new materials.

Senator CHURCH. Thank you very much.

Dr. EINHORN. Thank you.

Senator CHURCH. Our next panelist is E. James Stavrakas, manager of the Merchandising Testing Center, J. C. Penney & Co.

**STATEMENT OF E. JAMES STAVRAKAS, MANAGER, MERCHANDISING TESTING CENTER, J. C. PENNEY & CO.**

Dr. STAVRAKAS. Senator, when I wrote the comments which I have submitted for this testimony, I was completely unaware of the nature of the other panelists on the program. Consequently, I think you will find that my comments will represent an opening up of the view. I think the speakers have addressed themselves very validly and forcefully, but under a somewhat microscopic view. Representing a national retailer, I hope I can bring to the committee's attention an open view, without imprecision, but I think nevertheless with a great deal of relevance.

I have been with the Penney Co. for 10 years, and for 8½ years I was manager of soft goods testing and was responsible for the evaluation and testing of all our apparel and home furnishings merchandise. I am pleased to have this opportunity to comment on fabrics as a potential fire hazard to older Americans and to share with you our experiences in the development and merchandising of flame-retardant textile products.

The Penney Co. is concerned with our customers' safety. We cope with the real and potential hazards inherent in any consumer product through the awareness of our highly skilled buying departments supported by the professionalism of the engineers and technicians in the testing center and the technology of the various industries who produce the merchandise that we offer to the American public.

I believe it is a fair statement to say that we are the largest retailer of textile products in the United States, and we believe it is a fair statement to say that our customers constitute a very comprehensive cross-section of our society. Consequently, we believe it is significant that we have had no evidence that the flammability of fabrics poses a special hazard to older Americans.

We say this, of course, in terms of this larger view.

Now, the relationship of fabric flammability to the hazard of a burn injury is one of the least understood subjects in textile technology. To date, we know of no research or studies which have measured or clearly defined the contribution of a fabric to this hazard. The fact that fabrics are flammable does not in and of itself constitute a hazard.

The great variety of fibers, fabrics, garment styles, clothing assemblies, ignition sources, and exposure conditions which comprise the physical dimensions of the problem are obvious factors to be dealt with.

Additionally, there are the human factors of age, sex, maturity, education, emotional response, and health.

Then consider the combinations of possible interactions of two or more of all these physical and human elements, and you begin to gain some insight into the enormous complexity involved in any attempt to identify and cope with this hazard in a substantive manner.

As I mentioned earlier, we have no evidence that the flammability of fabrics constitutes a special hazard for older Americans. Within

this age group, however, it is certainly reasonable to expect that a higher percentage of people are infirm or disabled. For that special sector within the older age group, it would appear that the flammability of fabrics could be a special hazard.

The Department of Commerce, through the Office of Fabric Flammability in the National Bureau of Standards, together with the Department of Health, Education, and Welfare, have been studying burn injury statistics for the past several years, and they may be in a position to determine whether or not a special hazard exists for this particular category within the older age group.

Determining whether or not a special hazard does in fact exist is the first step, and it will require considerable effort and very careful analysis. The next step is the formulation of an adequate and appropriate response to such a finding. The technical and merchandising problems associated with any attempt to provide a significant degree of protection against burn injuries to older Americans are very substantial.

A considerable degree of misunderstanding is prevalent among people interested in eliminating the risk of burn injuries. It has not been possible, for example, to fireproof textile fabrics. To an extremely limited extent, certain types of cotton fabrics can be chemically treated to render them fire retardant. Heavyweight cotton and some cotton flannel can be so treated.

Over and above the increased cost of such treatments, there is the problem of degradation of the fiber resulting in reduced wear life, loss of comfort, and in most cases a change in the esthetic qualities normally associated with cotton.

#### FIRE-RETARDANT PROPERTIES NULLIFIED

In addition, there is the very real problem of laundering such treated cottons, which I think should receive a great deal more attention than it has heretofore. It is possible, under controlled laboratory conditions, to demonstrate the durability of fire-retardant treatments to multiple launderings. However, in the hands of the consumer there are many normal laundering practices and environmental conditions which can nullify the fire-retardant properties of treated cottons.

The use of nonphosphate detergents, laundering in hard water areas, exposure to sunlight, and use of chlorine bleaches have been found to, separately or in combination, adversely affect the flame resistance of treated goods.

The availability of flame-resistant synthetic fibers is extremely limited. At this time, Nomex® nylon represents a good degree of protection, and as you may know has been used by astronauts, fighter pilots, and racing drivers. The current cost seems prohibitive for general use, and it is limited in the types and styles of fabrics that it can be used in.

It is possible to demonstrate by means of a vertical burn test procedure that some 100 percent nylon or 100 percent polyester fabrics are flame resistant. That is to say, when the source of ignition is removed, those fabrics will generally be self-extinguishing. However, in a garment assembly where such a fabric will come in contact with

undergarments and/or with the body, the flame will propagate and can result in burn injuries.

Some modified acrylic fibers and a Japanese polymer blend of 50 percent polyvinyl alcohol and 50 percent polyvinyl chloride are being considered for the children's sleepwear market.

These materials have not been utilized in the apparel field in the United States, and a considerable effort is underway to determine their suitability as candidates to meet the new Department of Commerce flammability standard for children's sleepwear.

At this point, I would like to share with you some of our experiences with flame-retardant merchandise in the area of children's sleepwear, work clothing, and mattress pads. In the past few years, we have made available through our mail-order catalog the following types of merchandise:

1. 100 percent fire-retardant cotton flannel in children's sleepwear.
2. 100 percent Nomex nylon children's sleepwear.
3. 100 percent Nomex nylon matched sets in work clothing.
4. Fire-retardant mattress protector.
5. Fire-retardant pillow protector.

These items received similar emphasis and space coverage in the catalog as their nonfire retardant counterparts. The sales results were extremely small. While the substantial increase in retail price of the Nomex nylon garment would obviously be a deterrent to sales, the treated flannel sleepwear was only \$1 higher in retail than the regular \$2.98 sleepwear.

The fire-retardant mattress protector was \$1 higher in retail than our nonfire-retardant top-of-the-line \$6.49 mattress pad. This nonfire-retardant pad outsold the fire-retardant pad by a factor of 3 to 1, and both had equal exposure in the catalog. At the retail store level, the fire-retardant mattress pads were shipped to 19 stores on a test basis. None of the stores reordered.

Our poor merchandising experience with flame-retardant items to date is not unique. Many retailers have reported similar results with their effort at retail and in catalog. We believe that the public has rejected this form of safety in consumer products since the degree of fire risk or concern is relatively small.

Legislation in the area of children's sleepwear was feasible because of the readily identifiable nature of this line by size. Such is not the case for the aged since they obviously wear the same range of sizes in clothing as the rest of the adult world, and their needs in home furnishings are indistinguishable from those of other age groups. It does not appear feasible, therefore, to merchandise textile products for the aged.

The facts of the case as we know them have necessarily brought us to a negative position with respect to any recommendations for action on the part of the retailer or legislator related to the aged as a specific group within our population.

However, there is one area in which the committee could effectively take some action to provide additional protection to the aged, and that is in the hospitals, nursing homes, and other institutional facilities in which the aged are sequestered.

## SAFETY FEATURES FOR INSTITUTIONALIZED ELDERLY

Within the institutional framework, it should be possible to provide safety features on a total environment basis. Thus, the building structure and support facilities, together with the interior furnishings, bedding, and apparel could be designed, remodeled, or replaced to conform to the requirements necessary to reduce all fire hazards for this sector of our society.

Thank you.

Senator CHURCH. Well, with regard to this last statement that relates to institutionalized elderly and protection against fire hazards, my attention has been called to an article that appeared in the Washington Post that had to do with the Veterans' Administration equipping its 105-hospital system with Nomex pajamas even though they cost about \$10 a pair, as compared with about \$3 a pair for cotton nightwear.

Nomex proved more economical on a per-wear basis, withstanding 1,600 washings to 60 to 80 washings for the cotton.

So, from the standpoint of hospitals and old-age homes, nursing homes, and that kind of thing, is it possible that the nonflammable Nomex might even be more economical?

Mr. STAVRAKAS. Yes; I think it is very possible. In fact, I have worked on this problem, and I think it is clearly on a per use basis a more economical thing. It is rather extraordinary to get this benefit at a lower cost. Moreover, the ability of the product to withstand an institutional type of laundering is also excellent, whereas the same would not be the case for treated cotton, for example.

I think Nomex has a very substantial contribution to make in that specific area.

The Veterans' Administration has taken the lead on this, and we hope to see it expand in other areas. We work with people at various State agencies on this problem.

Senator FONG. In your merchandising department do you advertise very clearly that these are inflammable or retardant materials?

Mr. STAVRAKAS. Yes, Senator.

Senator FONG. And the customer knows that he is buying one thing versus the other?

Mr. STAVRAKAS. Yes. However, it is a very difficult thing to advertise flame retardancy because the consumer extrapolates the flame retardancy into a total protection against all forms of burn injuries.

For example, in work clothing, where we did use Nomex and we advertised its fire-retardant properties and that it would withstand certain temperatures, we also put into the copy that it was possible, if you dropped molten metal on such a fabric, that it would burn through and melt apart.

Unfortunately, the consumers didn't read that, so that welders felt that this would be an excellent product for them. The welder bought the Nomex as a protective vehicle, and indeed it was a protective vehicle, but he was looking for a different kind of protection. He was looking for protection against the molten material from his welding activities, and Nomex could not provide that kind of protection.

The consumer, then, misunderstood the intent and returned the garment to us and was very unhappy.

Senator FONG. You were talking about inflammables relative to children's wear.

Mr. STAVRAKAS. Yes.

Senator FONG. Is it plainly visible to the buyer that there is a difference between the two?

Mr. STAVRAKAS. Yes. We advertise it as a fire-retardant cotton flannel which will not continue to burn once the source of ignition is removed.

Senator FONG. Even with that advertisement, you find it wouldn't sell?

Mr. STAVRAKAS. In terms of the children's sleepwear, Senator, the experience was very, very poor. We found that about the only persons who buying it were grandmothers who spent a great deal of time reading the catalog, and they thought this was a nice idea for their granddaughter or grandson, and that was cotton flannel.

When you get to the more expensive Nomex, the experience is quite unsatisfactory from a retailer point of view.

Senator FONG. Thank you.

#### NEED FOR PUBLIC AWARENESS

Senator CHURCH. That is rather surprising to me, that your fire-retardant pajamas for children, for example, have not been selling well.

Mr. STAVRAKAS. Well, in my office building our testing center is on display every day, and we have literally thousands of consumers walking through. I very often stop and introduce myself, and I inquire if they have any children, and they normally each have about ten, and I ask them, "Well, do you know that your child's pajamas burn?" And they stop and they say, "Well, yes, but doesn't everything?"

I say, "I have this marvelous product for \$1 more I can give you which will not burn." They say, "Well, we won't pay it." They don't exhibit the same emotional response to that kind of a hazard as they may to many other hazards.

Indeed, here in Washington a doctor made a study on a burn center in which he interviewed, I believe, 200 parents whose children had been in the burn center, and when they very frankly discussed this, the parents admitted that had they had the opportunity before the burn injury to make a flame retardant versus a nonflame-retardant garment where the flame retardant was at a higher price, they admitted they would not take it.

It is a question of awareness.

Senator CHURCH. Dr. Feller has his hand up. We have one more panelist.

Dr. FELLER. One thing I just can't let go by. You made the statement that because the sales were low, you took this as the public's recognition of the fact that there was no need. All I can say is that the position is not what you say. I say as a physician the smoking hazard which has been well known to the physicians for many years is such that we know there is no question about the fact that people die from smoking.

Now the public has a free choice if they want to smoke or not, especially the adults. When you link this to children, you have an unpro-

tected segment of the population, and you use the public's judgment, without having the constant data before them, and this is a problem, they cannot make an intelligent choice.

The fact that your company markets the product I think is commendable, but when you make the conclusion that because of the public's reaction there is no need for the product, I think you have a very serious problem.

Mr. STAVRAKAS. If I led you to that conclusion, I am sorry; but my conclusion is not that there is no need; I am saying the public is not aware of this need.

The leading retailers are attempting to put flame-resistant products into the children's sleepwear line. My only problem is finding a way of doing this, and believe me, if I can't get satisfactory results from the entire industry—in fact we comb the world for it—then I can tell you that this is very validly the status quo. We are very limited in what we can do, but we are doing everything we can.

Senator CHURCH. Well, I think that the obvious conclusion is that there is a certain responsibility on the Government to establish standards that give reasonable protection and then to require that those standards be obtained and observed by each person.

It is not just a question of putting out any kind of material and letting the consumer decide what he wants to buy if some of it is extremely hazardous to the children, elderly people, and others.

There is a Government responsibility here, and that of course is what we intend to look into because we did pass a Flammable Fabrics Act about 3 years ago and had expected that the Federal agencies charged with the responsibility of administering that act would establish some standards that would give some measure of protection to the consuming public.

There has been practically nothing done, and we want to find out why.

Now our last panel witness is Dr. Armond Goldman, who is from the Shriner's Burn Institute in Galveston, Tex.

Dr. Goldman.

#### **STATEMENT OF ARMOND S. GOLDMAN, M.D., SHRINER'S BURN INSTITUTE, GALVESTON, TEX.**

Dr. GOLDMAN. I will present some evidence that burn injuries in our country are a special public health problem. Burns have been considered as an accidental event which cannot be controlled.

I take the view that that pessimistic view will not lead to a solution of the problem.

My concept is that burns is a disease which has many similarities to other diseases. I will, therefore, attempt to describe burns as a disease and to compare it to other diseases to see if an understanding of the disorder in that way leads to methods of controlling the problem.

(Showing of slides.)

Dr. GOLDMAN. One of the findings that was remarkable to me was that the death rate due to burns in the United States exceeds that of **virtually every Western European country and our neighbor, Canada.**

*Death rates for fires, explosions, and hot substances in 1960-62*

Country :	Fatalities per 100,000
Canada -----	3.6
United States -----	4.2
Japan -----	2.0
Czechoslovakia -----	1.4
Denmark -----	.9
France -----	1.7
West Germany -----	1.3
Netherlands -----	.8
Sweden -----	1.2
Switzerland -----	1.6
England and Wales -----	1.6
Australia -----	2.3

This excessive burn mortality in our country does not appear to be due to poor reporting within Western European countries. In fact, the reporting in some of these countries is better than our's.

Senator CHURCH. That is an astonishing statistic.

Dr. GOLDMAN. Further information concerning those statistics can be found in the American Public Health Association monograph "Accidents and Homicide" by Albert P. Iskrant and Paul V. Joliet, Harvard University Press, 1968.

Another astonishing fact is that the frequency of burns in our country is greater than the occurrence of poliomyelitis in the peak year of epidemic poliomyelitis. In 1954 there were 589 deaths and somewhat over 18,000 crippled cases of polio in this country.

Now how does this compare to burns?

**POLIOMYELITIS EPIDEMIC (1954) VS BURN EPIDEMIC (1970)****Poliomyelitis\***

18,308 Paralytic cases

589 Deaths

**BURNS**

50,000 Crippled cases

8,000 Deaths

\* Vital Statistics, United States Department Health, Education, and Welfare.  
National Office Vital Statistics, Vol. 2, 1954

The figures are conservative. In 1970 there were at least 8,000 deaths and at least 50,000 crippled cases from burns. There is no question that burns occur in epidemic proportions in our country.

Let us review what was done to prevent polio, and let us see if the example of the solution of polio can be applied to burns.

In the first place, the epidemic nature of poliomyelitis was recognized. This generated a great effort in this and other countries to solve the problem. This led to the funding of studies to identify the responsible agents for that disease.

In that particular instance the agents turned out to be infectious, and once identified, it was only a question of time before immunizing agents were developed by attenuating the original virulent viruses.

Step one, recognition of the epidemic; step two, identification of the agent; step three, the attenuation of the agent; and step four, the nationwide application of a satisfactory immunizing agent.

Are there any comparisons in that regard to burns. I think that there are some.

The burn epidemic in this country has largely been a silent one. The public is unaware of the danger as has been brought out by many other speakers on the panel.

This is an epidemic which has been hidden from the public.

Children and adults, the elderly, are admitted to the hospitals. One gathers that many of the injured victims in fact are shunned by society.

What are the agents which are responsible for burn injuries? Our study at the Shriner's Burns Institute in Galveston, Tex., has been limited to children from many parts of the country. These children were admitted because of large burns.

The principal ignitors in order of frequency were matches, open fires, gas heaters—usually open space heaters, gas hot water heaters, and kitchen stoves.

Igniting agents	Ignited materials		
	Total	Clothing	Flammable liquids
Matches.....	107	42	40
Open fires.....	94	28	56
Gas heaters.....	86	66	4
Water heaters.....	47	1	38
Kitchen stoves.....	23	16	5

The main agents of combustion were clothing and flammable liquids.

We found in our own study of serious burns in children that over 63 percent were involved in clothing burns and some 30 percent with flammable liquids. At times, both flammable liquids and clothing were responsible.

#### PRINCIPAL AGENTS OF COMBUSTION

It seems to me that even though there are still some unanswered questions regarding the agents that are involved, some points are clear. The principal agents are (1) flammable fabrics, (2) flammable liquids, (3) unguarded space heaters, (4) gas hot-water heaters and (5) other relatively unsafe home appliances. These are agents which can be largely attenuated.

This is a picture of an open space heater that was taken from the home of one of our patients whose 70-percent burn occurred because the child's sleepwear caught fire on the unguarded grill. The child died 2 months later.

We are not the first country to face the question. Great Britain in the 1960's passed a Children's Nightdress Act and a Safeguard Act for space heaters that did reduce the severity of the injuries. Similar regulations should be activated in the United States such as specific regulations for space heaters and hot-water heaters. For instance, there are many instances where flammable gasoline vapors are ignited by the pilot light or the burner from a gas hot-water heater. The resulting explosion causes extremely serious injury to the individuals involved. It should be mandatory that such appliances be placed strategically so that the chance of explosion would be greatly reduced.

The question of flammable fabrics is a very difficult one. There is not a simple answer for all clothing. In that regard the Federal Government needs to put forth a great deal more effort into the study of flame-retardant fabrics. I hope that there would not be a division of study according to ages of the victims or the agents concerned. It would be better to have a single Federal agency to consolidate the study of burn injuries and to examine specifically the feasibility of flame-retardant fabrics.

Senator CHURCH. Thank you very much. That was very interesting testimony, Dr. Goldman.

I might suggest that the discussion phase of this hearing might address itself first of all to the reason why burns are hazardous to such epidemic proportions in the United States.

If your chart is accurate, certainly one of the most urgent questions is: Why should we have four times as high a rate of casualties in burns in the United States as in the Netherlands, for example?

Yes, Dr. Phillips.

#### HIGHER MORTALITY FROM FLAME BURNS

Dr. PHILLIPS. One possible explanation of our higher mortality is the higher incidence in America of flame burns. In Great Britain scalding liquids are a major source of burns, whereas in this country, although we have many scalds, they are rarely as extensive as flame burns and seldom cause death. A second explanation may be that we have more flame burns because we use more heat in our homes. We have our burns. The British have their chilblains. A further reason for lower flame deaths in Britain is that they have enacted a law requiring guards on all heaters. Based on the statistics from the southern part of this country it would appear we need such a law as well.

One other factor in favor of the British: Half of their patients are burned out of doors, where breezes dissipate the smoke. They are thus less prone to the highly dangerous smoke inhalation injuries.

A similar study would show differences in burn population between North and South in our own country. In New England, where it is so cold that most people have central heating, we do not see the space heater injuries that are so common in Texas. The Texas doctors, on the other hand, have many more patients who are burned out of doors and thus are spared smoke inhalation injuries. Wound infections are more common in areas where the climate is hot and moist than where the air is cool and dry.

The doctor suggested that all Federal fire programs might well be coordinated under one agency. He might be interested to know that Congress has voted and President Nixon named a National Commission on Fire Prevention and Control. This Commission is in action at the moment and is trying to correlate information obtained from all the agencies involved in fire activities. However, it is charged with making its recommendations to Congress within 2 years on how to reduce losses from fires and it lacks funds to carry out all the doctor's suggestions.

Dr. GOLDMAN. It seems to me that one will have to consolidate the efforts at burn prevention. I do not see for the moment that that is forthcoming. Perhaps we will hear more about that.

Dr. PHILLIPS. We have part of our committee trying to obtain information on all the Federal efforts and bring them together so that they will know what is being done. There is a tremendous amount on fire problems being done.

Dr. GOLDMAN. I think that the increased frequency of burn injuries in the United States, in part, is due to the flammable liquids and unsafe appliances in our homes. However, there may be social factors peculiar to our country that are important as well.

Senator CHURCH. We certainly ought to investigate and determine what the causes are for the difference in the numbers of burns in this country as compared to other comparable countries in Western Europe. I think that is a very surprising statistic.

I also think that the Federal Government could play a role in establishing safety standards. At least within the province of interstate commerce the Federal Government could prescribe against open air burners or require certain safety devices on open air burners that would have to move through interstate commerce.

It is not necessary for us to sit back and wait for every State or community to adopt precautionary regulations or statutes on the subject.

#### NUMBER OF FIRES PER POPULATION

Dr. EINHORN. In studying several aspects, we find some rather interesting statistics. A 10-year analysis for number of fires per population in 1960, 11.8; in 1969, it was 12. The high point period was 13.1 in 1963, but the average was 12.1, so the total number of fires is relatively constant.

Of course we have had a tremendous increase because of another interesting point. After we study and put on computers the total analysis of all fires in the Salt Lake City area now we have looked at the State of Utah and a number of other States. In Utah we have a total of 300,000 in the city itself about 1,600 fires plus or minus each year. Ninety percent of those fires occurred in the month of August.

Senator CHURCH. In the month of August?

Dr. EINHORN. When we went back to look at this, we found that the month of August runs approximately 30° hotter as the end of our long dry spell. Looking at surrounding States, we see similar statistics at about the 75-percent level in Arizona, and the same rough statistics in other surrounding States.

One small article which appeared in the Society of Engineering Journal showed that the number of fires from New York was twice the yearly average, August 15-September 15. So it would seem that there is a pattern developing.

There is a proposal out now to study this on a national basis, but if there is this high concentration in a relatively short period of time, it seems that we could direct fire prevention at least for that relatively high peak and make some progress.

Senator CHURCH. Dr. Feller.

Dr. FELLER. That is an interesting point you bring up because one of the things we looked at in the 10,000 cases was seasonal and monthly variation. As a matter of fact, we looked at weekly variations, and when you look at 10,000 cases in the United States there is none.

I too, had the impression that in my area, for example, we had more burns in the wintertime than summertime because more people were living inside and using fire for heat. That is not true. We have a concentrated population sample which shows that there is no seasonal variation.

Dr. EINHORN. This may well be a humidity factor, but this is in the surrounding States.

Dr. FELLER. Senator Church, I would like to introduce some more information that I brought along for this committee which we extracted from our cases on the age group 64 to 100 since we are involving the old people, and it might have some bearing on Dr. Goldman's excellent material on the number of burn accidents in the country.

Now, when you look at these people from around the country, you will see there on the righthand side how they were injured, that plain burns involved 79 percent of all of these cases, and we had 824. You have 824 patients 60 to 100 years as a group of 9,918. That is pretty close to 10 percent; 79 percent, flame.

Now drop below, and we picked out not the exact numbers but the most typical ways these people hurt themselves, and that might be an answer in part to what we are discussing. They were igniting fires, building up existing fires, lighting fires. The fire could be the gas stove, it could be the hot water heater, it could be trash burning. These are the mechanisms.

They were smoking in bed. That was the largest percentage of the older people and for the middle-age people, and that is why I say discriminating about the others does not seem to fit when we look at the total population.

Brushing against open fire, brushing against the stove, and you see there throwing fuel on fire. That is the improper use of combustible fluids that Dr. Goldman was referring to.

Now I would like you to go to the left-hand column where we describe who gets burned. You see the age and sex.

Let's look at it another way. Breaking down these cases into victim type is a system of analysis that occurred to us when we looked at these data. How are these people involved in the cause of the accident?

One group is the victims of their own actions. Something that the patient did that caused the accident was true in 71 percent of the cases. This is true for all age groups.

The second group is where the past medical history is more significant. Older people cannot get away from the fire fast enough and therefore the ignition of clothes took place. In other cases the patient may have a seizure and fall into a fire.

The third factor is the innocent bystander—7 percent. The innocent bystander of course is near somebody else when he is set on fire.

The intended victim is only 1 percent of the older victims and the smallest percentage of all. That is the case where the patient was deliberately set on fire by someone else.

The rescue operation is very small. By and large, the total population, rescue operations caused very little damage because firemen and other rescue workers are trained to avoid this.

You see 9 percent are unknown victim types.

## OBVIOUS AREAS FOR GOVERNMENT STANDARDS

Senator CHURCH. What this suggests to me is that there are certain obvious areas where the Government ought to be involved.

Take, for example, the number of burns that are caused by cigarette smokers in bed. Here is a very large number from what you say of the total, and clearly here is a special area where nonflammable mattresses, sheets, bedding, linen, blankets, and so on, and in addition to night clothing, takes on a particular importance. Isn't that true?

Dr. FELLER. Yes.

Senator CHURCH. Would you not think this is an area where the Government ought to look for setting standards right away? Obviously, this is where so many people are getting burned.

Dr. FELLER. Yes, I support your statement. Several of the people here stated today that more information is necessary, more facts, more figures, more tests before we can set standards.

I disagree with that 100 percent. We have enough data available.

Dr. PHILLIPS. I am on it.

Dr. FELLER. I am sure that we now have the data we need. If we could consolidate and properly analyze what we have, we could save hundreds of thousands, if not millions, of dollars, and much time.

One of the objections, one of the criticisms I would have with the existing agencies is that duplication of effort is tremendous. I am in contact with a few of these agencies, and many of them are doing the same thing. There is considerable duplication of effort and poor management.

I think this is unintentional. I don't think that people deliberately do this, it must be subconscious, making jobs for themselves in some cases, and in other cases they are motivated by other things. I don't think the Government agencies make sufficient use of the expertise that exists in the country that would be available on a volunteer basis.

When I have problems to solve at the university, and I can't do the statistics, for example, I recognize the problem, I go across the street to our public health department where experts in statistics and who say, "You are wasting your time, you better get at it that way or that."

When I have other problems, I go to the University of Texas in Houston where there are other experts in special statistics.

I think that our Government does not use this type of talent sufficiently. We have a little thing started here, another thing started here, fantastic duplication, and the cost per case of some of the studies that are being carried out is overwhelming.

Senator CHURCH. Dr. Feller, we have had a flammable statute on the books now for several years, and I am told that only one standard has been established by the Federal agencies, and that relates to night clothing for children, and that has been postponed for a couple of years.

There is still work being done on the possibility of promulgating some kind of a standard on mattresses, and nothing really has been done.

Clearly Congress intended that something should be done when it passed the act. We got several large Federal agencies involved; they have been working at it for 3 years' time or thereabout. When was the act passed?

Amendments were passed in 1967. So, here we are in 1971, and we have only one single standard.

I mean that seems to me quite unbelievable.

Mr. STAVRAKAS. Senator Church, can I defend the Government for a minute? That is unusual for big business.

Senator CHURCH. They are going to have the opportunity to defend themselves in a minute.

Mr. STAVRAKAS. I have heard this statement before, and I have worked with the National Bureau of Standards, with the Department of Commerce, with the FDA, and so forth. I really don't think you can say they have not done anything.

First of all, there is a little game goes on where legislation is passed and they are not given any money. So that is point A.

Finally, when they are given some money, they are asked to attack a problem, the dimensions of which are really not clearly understood.

I would love to take some of my friends in the medical profession and tell them, "Gentlemen, you have 1 year to cure cancer, and if you don't cure it, we are going to throw you in the nearest jailhouse."

I mean that is the kind of thing that we have here, and to think that it is a casual and easy thing to do is simply not rational.

Now, the agencies have come up with this children's sleepwear, and it is a very difficult thing to achieve. We have supported it wholeheartedly, the whole industry has. We have worked with them to show the way that it is possible to achieve this objective. There is a limited objective, but we hope from this limited objective to expand it. Once we are able to do it in sleepwear, we hope we will be able to expand it in other areas, but they have done that.

We already have certain mattress pads which act as thermal barriers. We know the customers are not buying them, but we are offering them.

We support the approach that this should become a Federal standard.

The carpet standard has been knocked around by a lot of people as has the flammable fabrics test, but you have to understand what the objective was. The objective of the carpet test was not to withstand the holocaust, you know, gasoline fire or molten paperbasket full of papers, the objective was to minimize the hazard in the home of a child dropping a match, or a cigarette, or something falling out of the fireplace.

So there is a limited objective, and a worthwhile one, but it was not addressing itself to the kind of problem that the engineer who testified earlier pointed out very well.

The flammable fabrics test addressed itself to an extraordinary thing within the textile community, and that is the rayon torch sweater wherein the slightest exposure to ignition and the individual was burned like a torch.

So we kept those fabrics off the market, and the Congress so ordained.

The Congress has never suggested or implied that the flammable fabrics test distinguish within the whole population of fabrics what is more hazardous than another. This is where the work that Dr. Einhorn and everyone else here is doing is beginning to address itself.

I think the healthiest thing that happens, I am very impressed with

Dr. Goldman's approach as viewing this as of epidemic proportion so that we can generate the kind of attention that it requires. I think it has been hidden.

I know we are very interested in doing something about it. I don't think that we can do nothing.

Senator CHURCH. Wait a minute. Are you satisfied that progress has been made? Do you think it has been sufficient? The purpose of this hearing is not to indict anyone, it is to find out what the facts are.

It may be that the agencies charged with the responsibility have not had the necessary funding. But it strikes me that not a great deal of progress has been made considering the time that has gone by and the very particular areas of hazard that ought to have been given high priority.

Take, for example, the testimony we have had this morning on these nylon gowns, these loose-fitting gowns that are worn by women who go down and turn on the stove in the morning, and the large percentage of burns that occur in that kind of clothing.

It seems to me that there are particular areas of hazard that could have been singled out, and by now we ought to have established at least one Federal standard somewhere along the line.

Mr. STAVRAKAS. Well, the one I think which has been established and is a very significant contribution is the children's sleepwear.

Senator CHURCH. I understand that has not taken effect yet.

Mr. STAVRAKAS. It becomes effective a year from this forthcoming July, but we have an additional year during which time we can label the garment as being in noncompliance.

The reason for that year is a simple one. We have been charged to do something we are not capable of doing, and we are accepting this challenge of getting it done by having this extra year. If they were to tell us, "You don't have the extra year, you have to be in business by July of 1972," I can assure you we would be out of the children's sleepwear business. That is the only option we would have.

Dr. FELLER. You are selling it now. You just told me you had it in the catalog and you didn't sell it.

Mr. STAVRAKAS. I have it in the catalog. Would you like me to tell you the sales?

Dr. FELLER. No; I am saying it is available to use.

Mr. STAVRAKAS. You are talking about a cotton flannel as covering the entire sleepwear market.

Dr. FELLER. I don't know. What percent is flannel?

Mr. STAVRAKAS. Very small; 70 percent of this business is knit cotton, 100-percent-knit cotton, sleepwear, with the little plastic feet that the children live in. We cannot treat that product today. We are moving heaven and earth to find some alternative.

Senator CHURCH. Yes, Dr. Einhorn.

#### PILL TEST STANDARD—A START

Dr. EINHORN. I think to go back to the fire, the standard that was passed, I don't think we like the pill test, but it is the first start. The material passed that test. In fact, we took the material and put it in

direct contact with a Bunsen burner for 60 seconds, and then we removed the burner, and it went out. Taking the same material and putting the accelerant on it that was used to start the fire, we found that the material would burn 6 inches in 14 seconds with the flame height of about a foot and a half. And this is what caused the death, this is essentially fire up the hall area.

Now we had an unusual situation at Lil-Haven. It is very seldom that we will have an alarm go in to a fire station, have a fire truck come back from a fire a few blocks away and be there in 1 minute, have the battalion chief arrive first and tell on radio where the people are, and have the fire extinguished within 10 minutes.

This was a very immediate response, yet six lives were lost and 12 were injured. Of the six who died, none had burn injuries. So even there the very best wool carpet would have failed the test the way this fire was ignited.

In fact, I daresay that if we took concrete and poured that material on there, you would have had a pretty fast fire.

Now, there was something done in two weeks with the law. The State of Utah passed a law which was much more severe than the Life Safety Code. Any building that housed two patients—not four—would be completely sprinklered.

So I think at least there has been an action taken.

No test standard, whether it be much more severe, would have stopped this type of fire. You have a 75 rating, or even better, with that accelerant. That is one problem.

I think Dr. Tribis, in his paper that was given some time ago, really pointed to the problem—What is the risk?

Given the risk and given ignition, propagation, what is the probability of injury?

You have to almost look at it. I agree there are plenty of statistics available. I think you can learn a little bit. I think we could get the record today from any State and come up with a lot more information of what we are doing and have a better picture.

I think in the aspect of physiological response, too often the autopsies call it VO poisoning, and that is all we go on.

I am not convinced that some of the trace materials, though, synergistically increase the points in a fire. This is something that we are addressing ourselves to, but this takes time and effort to do it.

Dr. GOLDMAN. I would like to make a few comments on some points that have been raised about Federal agencies.

Federal agencies have been very helpful and have sought us out on a number of occasions in the last several years. I also have gathered from some of my conversations, that in order for them to do the job, more funding will be required since the problem is so large.

Senator CHURCH. Now we had originally invited the Government's people to participate on the panel, but they indicated the preference to testify separately, and I think it is time that we hear from them, because it is time for them to present the case that the agencies have to make, certainly on this Flammable Materials Act, and what they have been doing to try to implement it.

While the Government is moving to the witness table, we will take a short recess.

Senator CHURCH. The hearing will come to order, please.

We have next Richard O. Simpson, Deputy Assistant Secretary, U.S. Department of Commerce; Edward B. Finch, Assistant Director for Textiles and Furs, Bureau of Consumer Protection, Federal Trade Commission; and Malcolm Jensen, Director, Bureau of Product Safety, Food and Drug Administration.

**STATEMENTS OF RICHARD O. SIMPSON, DEPUTY ASSISTANT SECRETARY, U.S. DEPARTMENT OF COMMERCE; EDWARD B. FINCH, ASSISTANT DIRECTOR FOR TEXTILES AND FURS, BUREAU OF CONSUMER PROTECTION, FEDERAL TRADE COMMISSION; AND MALCOLM JENSEN, DIRECTOR, BUREAU OF PRODUCT SAFETY, FOOD AND DRUG ADMINISTRATION**

Senator CHURCH. Now it has been suggested to me and I certainly do concur that in view of the lateness of the hour that the prepared statements that you gentlemen have should be submitted and made part of the record at this time and we will just proceed directly with questions.

(The statements follow:)

**PREPARED STATEMENT OF RICHARD O. SIMPSON, DEPUTY ASSISTANT SECRETARY FOR PRODUCT STANDARDS**

Mr. Chairman and Members of the Committee, I am Richard O. Simpson, Deputy Assistant Secretary of Commerce for Product Standards. I appreciate the invitation to appear here today to explore issues related to fire dangers to the elderly.

The Department of Commerce has a major fire program, the objective of which is the reduction of death, injury and property damage from fire. The National Bureau of Standards provides the technical base for this program through its research and accident investigations. Information on actual fires is obtained by analysis of burn case reports provided by the Department of Health, Education, and Welfare in compliance with requirements of the Flammable Fabrics Act, by discussions with other investigators and study of their reports, and, in exceptional cases, by sending NBS investigators to the scenes of the fires. Among the fires investigated by NBS staff are those involving the Lil-Haven Nursing Home in Salt Lake City, Utah, and the Harmar House Nursing Home in Marietta, Ohio. In view of the interest expressed by members of this Special Committee, I would be pleased to make available copies of our findings pertaining to these tragic events.

The NBS investigators cover all aspects of each fire: source of ignition, the fire growth and development, extinguishment, building design, materials used in construction, detection and alarm systems, sprinklers, fire department response, and the interactions of these various factors.

We try to evaluate the hazards developed in the fire, particularly as they relate to the age, physical and mental abilities, and activities of the individuals exposed to risk by the fire.

We are concerned with the total fire problem, but in view of the time limit, my remaining remarks will respond to the four specific areas related to fabrics listed in your invitation to present testimony.

**INCREASED VULNERABILITY WITH INCREASED AGE**

Our analysis of hundreds of detailed wearing apparel burn case reports show clearly that the very young and the elderly are injured by burning clothing more frequently than would be expected from their proportion in the total population. The elderly wear clothing of the same fabrics and in the same size ranges as do younger adults and teenagers. Obviously, the elderly tend to be less agile, physically and mentally, and, therefore, less able to avoid the circumstances that may lead to a fire or to react swiftly to protect themselves against injury once their clothing is ignited.

The amount of detailed information available on interior furnishing fires is not as large as that on apparel fires. However, there are indications that in fires of this type the elderly are more frequently injured as compared with other age groups.

When interior furnishing fires do occur, the elderly (as the very young) are not as capable of protecting themselves from injury. The problem of reducing this vulnerability is being attacked in three ways by the Department. One is by the work we are doing related to building safety standards and design. Two, in the area of fabrics or interior furnishings we have been implementing our responsibilities under the Flammable Fabrics Act and have issued a children's sleepwear standard, two carpet and rug standards, and a proposed mattress standard. We expect to propose a standard for blankets in the next few months, and we are studying tests for standards in other areas of apparel and interior furnishings. Three, we are attempting to reduce the hazards of common sources of ignition, chief among which are smoking materials and kitchen ranges. Although the Flammable Fabrics Act does not provide authority for mandatory standards on ignition sources, we have initiated discussions with the American National Standards Institute and industry groups on possible voluntary standards on kitchen ranges, matches and cigarette lighters which account for some 49% of clothing ignitions.

#### NBS STUDY OF CARPET HAZARDS

NBS is studying the fire hazards that develop in a corridor, because of the importance of a safe exit from a building. We are examining corridors as a system including: floor coverings (not limited to carpets), wall coverings, ceilings, air drafts, temperature, humidity, corridor height and width, and the interactions among these factors. The objective of the study is to identify the fire hazards in corridors, in order to determine the optimum means of having fire-safe corridors. Corridor safety may be improved through the use of less combustible materials. However, efficient fire- and smoke-detection and extinguishing systems should not be overlooked as major contributors to corridor safety. NBS, in its overall fire program, is investigating these areas at the same time that it is studying the performance of materials in existing tests to relate the tests to the hazards. Among the tests being studied are the "tunnel test" which was long ago developed for evaluating ceiling materials but is now also used for wall and floor coverings, and the "chamber test." Existing tests have not been quantitatively related to hazards in actual fires and these relationships must be established if the tests are to provide real protection measures. The Department's carpet standard, DOC FF 1-70, is related to the actual hazards from small ignition sources, but is not intended to predict performance of carpets exposed to large ignition sources such as a burning room.

We are still in the first year of this three-year study, which is supported by NBS, the Social Security Administration, the Social and Rehabilitation Service, the Health Services and Mental Health Administration, and the Veterans Administration. The Underwriters' Laboratories and the Man-Made Fiber Producers Association have each provided research associates who are working on the project in the NBS Office of Flammable Fabrics and the Carpet and Rug Institute has supplied carpets pursuant to the Department's specifications. At this stage, our conclusions are only preliminary. However, it appears that the burnout of a normally furnished room will expose a corridor to fire of such intensity that almost any combustible in the corridor will become involved. This has reinforced our decision to investigate the use of detectors and automatic extinguishers as protective devices for corridor safety.

#### SHEET AND BLANKET HAZARDS

Bed fire hazards seem to be most pronounced among the middle-aged, particularly in the 45- to 55-year span, with lesser hazard to the elderly. Specific accident cases on blankets represent a smaller sample, but are consistent with the greater experience with all bed components. Mattresses are the major source of hazard when a bed fire is started by a smoldering cigarette. Blankets or other covers are important if a flaming source of ignition is present. Sheets represent less likelihood of being the item first ignited.

## AMENDING EXISTING LAW

We have no new recommendation for amendments to the laws administered by the Department of Commerce. We are proceeding as rapidly as possible in implementing the Flammable Fabrics Act which directly relates to reducing vulnerability of all citizens to hazards of fabric and interior furnishing fires.

It is clear that proper fire protection for the elderly can only result from thorough understanding of all major factors involved. We need better understanding of building design, materials of construction, materials for furnishings, patterns of use and exposure to fire risk. The NBS fire program is addressing these problems with a sense of high priority and urgency. We anticipate that the technical output of the NBS program will find application in such basic documents as the Life Safety Code of the National Fire Protection Association. This Code represents a consensus opinion of the minimum protection that should be provided in a building, recognizing different levels of occupancy. Although building codes are established by state and local governments, they have become a matter of national interest. The national government should encourage the States and localities to uniformly adopt and enforce at least such minimum requirements.

The Department of Commerce and the National Bureau of Standards are not authorized to set mandatory standards for buildings. For many years NBS has provided a major technical input in standards development, through participation in national voluntary standards and model code committees. These voluntary standards and model codes form the base for most of the legal codes set by the States and local jurisdictions. The NBS effort has been formalized in the past few years by providing the secretariat as well as technical support to the National Conference of States on Building Codes and Standards. The Conference has already had a significant effect in furthering the goal of coordinating and unifying building and fire codes.

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PREPARED STATEMENT OF MALCOLM W. JENSEN, DIRECTOR, BUREAU OF PRODUCT SAFETY, FOOD AND DRUG ADMINISTRATION, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. Chairman and Committee Members, I am Malcolm W. Jensen, Director of the Bureau of Product Safety, Food and Drug Administration, Department of Health, Education, and Welfare. I consider it a pleasure to appear before you to testify on Flammable Fabrics and the Older American.

The Bureau of Product Safety was formed as a major organizational unit of the Food and Drug Administration during the fall of 1970 with a broad mission to reduce product-related injuries and deaths occurring in and about the household, schools, and other areas of activity and recreation.

The Flammable Fabrics Act, originally enacted in 1953 and significantly amended in 1967, is designed "to protect the public against undue risk of fire leading to death, injury, or property damage arising out of the ignition of articles of wearing apparel and interior household furnishings." Under Section 14(a) of the Act, "The Secretary of Health, Education, and Welfare in cooperation with the Secretary of Commerce shall conduct a continuing study and investigation of the deaths, injuries, and economic losses resulting from accidental burning of products, fabrics, or related materials." In practice, the Food and Drug Administration investigates burn injuries involving fabrics and provides this information to the Department of Commerce to assist them in discharging their responsibilities under this Act.

Information on burn injuries involving fabric ignition comes principally from hospital records. Hospital permission is sought to interview the patient, because records seldom indicate the source or cause of the burn. Permission normally is readily given. A followup visit then is made to the home of the victim to identify the cause of the burn. If it is found that the injury resulted from the burning of fabric, a detailed interview and investigation is made in an effort to identify all circumstances, including the source of ignition of the fabric.

We try to obtain a remnant of the garment or other fabric involved. Unfortunately, in many cases, none is available, because it either has been completely consumed or has been discarded. Thus, we are unable to meet in full the demands of the Department of Commerce for samples of fabrics involved in burn injuries.

During 1970, a nationwide surveillance program covering flammable fabrics investigations was developed and issued to the 17 FDA Field Offices. This pro-

gram, combined with investigations conducted by special field units and by educational and hospital contract sources, yielded approximately 1,000 flammable fabrics investigations by the end of fiscal year 1971.

A list of the contracts we maintain to supplement our in-house capability in the flammable fabrics field is submitted as Attachment I.

We also have undertaken a bold new step in injury surveillance to attempt more nearly to meet data needs. Our new system, called the National Electronic Injury Surveillance System, will provide hard data on injuries in a manner differing from past efforts in three significant ways.

First, because the system is based on a statistically valid sample of hospital emergency rooms across the Nation, reported data can be used as a basis for national estimates of injuries treated in such facilities with far greater accuracy than has been possible before. We plan ultimately to add hospital inpatient and physicians' office treatment data to the system. These sources also will be based on valid statistical sampling frames to broaden the spectrum of injuries under surveillance and to increase the hard data base.

Second, data will be transmitted electronically from each reporting unit on a daily basis to our computer here in Washington, where it will be reviewed continuously for potential flammable fabrics cases. As a result of this daily notification, field personnel will be able to conduct in-depth investigations of such accidents within 24 to 72 hours of the injury, while accident details are still fresh in the minds of the victims or witnesses and while samples of burned fabrics may still be obtainable for laboratory testing.

Third, as remedial programs are carried out in "trial" areas, daily reporting will facilitate evaluation of their effect in reducing or preventing burns suffered because of fabric flammability.

We estimate that there are 3,000 to 5,000 deaths and 150,000 to 250,000 burns associated with flammable fabrics each year. Through April 1971, 1,602 investigations of fabric-related accidents have been made by the Department of Health, Education, and Welfare. Of this total, 357 involved no injury, so that the information I am presenting today is based on 1,245 cases in which there was injury or death.

One of the most important observations to come from these data pertains to the aged victims. Persons of 65 years and older account for an estimated 9.9 percent of our country's total population, but they include 14.7 percent of flammable fabric burn victims as reported to the Bureau of Product Safety. This trend is especially apparent among females of 75 years and older who represent 2.3 percent of the total population, but 5 percent of the victims—which is more than twice their percentage in the population.

For overall fire involvement, including flammable fabrics, the elderly, who constitute just under 10 percent of the population, account for about 30 percent of the deaths in our Nation involving fires.

Disabilities such as senility, mental retardation, mental illness, and other physical and mental conditions afflicting elderly victims in our investigations increased significantly—by four times—the risk of death from flammable fabrics burns.

Another indication of this problem is revealed in an analysis of 239 deaths related to clothing ignition reported in 23 States for 1969. About 59 percent of these deaths involved people 65 and older.

Accident locations for the elderly are principally their own residences, resident institutions, and public buildings, with the majority being their own residences. Clearly, resident institutions rank second as location of accident among the elderly, and this bears out the importance of the need for greater control of the resident institutional environment.

The President has recognized this problem and has proposed and is taking actions to improve the quality of care at nursing homes and extended care facilities. We are part of this effort.

Cooking and activities associated with smoking account for the majority of product-caused fabric ignition injuries and deaths among the elderly.

Fairly typical of cases involving the elderly are these summaries from detailed investigations in our files:

A 78-year-old woman sustained fatal burn injuries when her cotton flannel nightgown and cotton housecoat ignited as she was cooking breakfast on the gas stove in her kitchen. The sleeve of one of her garments caught fire as she reached across the stove. She died 14 days later in a hospital from second and third degree burns to approximately 33 percent of her body.

A 79-year-old woman dropped a match on her dress while attempting to light a cigarette. She tried to remove her dress by undoing the buttons down the front. Failing at this, she went to the kitchen to get water. By this time, flames were up to her face. She suffered second and third degree burns to approximately 40 percent of her body and died less than two months after the injury.

These and many other cases illustrate the vulnerability of the elderly to clothing ignition accidents. Analysis of the cases involving the elderly point out three significant factors:

(1) The increased likelihood of the elderly to be exposed to situations which present the risk of clothing ignitions due to reduced levels of physical and/or mental vigor, and their reduced ability to respond promptly and effectively once clothing ignition occurs.

(2) The tendency for many elderly females to live alone, making it likely that there will be no one else present to assist in the event of an emergency.

(3) The higher risk of mortality from clothing ignition accidents among the elderly due to their reduced ability to tolerate the traumatic effect of extensive burn injuries.

The Bureau of Product Safety of the Food and Drug Administration is doing everything feasible, within available resources, to provide the Department of Commerce good hard data in sufficient quantity to form the basis for technically sound flammability standards.

Thank you Mr. Chairman. I shall be pleased to attempt to answer any questions which you and the Members of your Committee may have.

#### ATTACHMENT I

##### CONTRACTS

National Burn Information Exchange, University of Michigan, Ann Arbor: Study of burn injuries including flammable fabrics, \$52,000.

University of Iowa, Iowa City: Epidemiological investigations in a rural area of injuries related to consumer products including flammable fabrics, \$7,000.

United States Public Health Service Hospital, New Orleans, Louisiana: Study to determine consumer acceptability, retention of fire retardant qualities, and durability of, treated fabrics, \$5,000.

University of Pittsburgh, Pittsburgh, Pennsylvania: Epidemiological investigations in an urban area, of flame burn injuries including flammable fabrics, \$17,550.

American Burn Association, Private Medical Organization: Program to refer flammable fabrics cases for investigatory followup, No Cost.

Senator CHURCH. First of all, you have listened to the panel discussion and you have listened to the commentary back and forth, and if there is anything you would like to say about the problems that you have encountered and the progress that you have made before we get into the questions, please feel free to do it now. Mr. Simpson.

Mr. SIMPSON. Mr. Chairman, I did listen with a great deal of interest. There were several points which need clarification that did come up during the presentations of the previous speakers. I assume most of them will be corrected during this question and answer session. Therefore, I won't go through my notes on the individual items but, at the end of the session, if any of the items that I would like to correct for the record are not involved in questions and answers perhaps I could address myself to them at that time.

I would like to agree with several of the witnesses who have stressed the technical complexity of the fire problem when you are dealing with wearing apparel or when you are dealing with building fires. At the National Bureau of Standards we have a comprehensive fire program which is described in my prepared testimony submitted for the record. We also, like many of the prior witnesses, believe that it

is necessary to look at the fire problem from the overall systems concept. We particularly have some work underway in our corridor testing facility which might be of interest to this committee.

#### PILL TEST A GOOD STANDARD

There have been several prior witnesses who have tried to identify the role of floor coverings, particularly carpets, in major fires. The Department of Commerce carpet standard, Doc-FF 1-70, the so-called pill test, has been criticized by some witnesses and then defended by Mr. Stavrakas, and I do wish to thank him for that. He is quite right in stating that the pill test was designed to correct against a specific hazard, and it was not designed to correct against the situation we find in a fire holocaust, and for the record I would like to state that it is a good standard and it is entirely appropriate for guarding against the risk from small ignition sources.

This is a first generation standard. As part of a continuing effort we have a research program underway at NBS to try to determine the role of floor coverings, and not only floor coverings but wall and ceiling coverings as well, in the kinds of fires such as Lil-Haven. We have conducted recent experiments at NBS corridor test facilities with various carpetings on the floor and a simulated room burnout. The fire raged down the corridor consuming all combustibles.

I might also say also we have conducted the same test with a brick floor and all other conditions constant and similar situations occurred. The fire propagates down the corridor almost with the same speed and intensity. You cannot isolate one part of the corridor material such as carpeting as the major contributor to that kind of a problem. The role of fire detectors and of extinguishment cannot be overlooked. We would be glad to talk about our fire program in more detail if the Chairman desires.

As to the specifics on children's sleepwear or anything else, I am sure they will be brought up in questions and answers.

Senator CHURCH. First of all, the New York Times on January 25 of this year said that the National Bureau of Standards is running out of research money and that this problem is holding up issuance of flammable fabrics standards. Is this the situation?

#### \$3 MILLION FIRE PROGRAM

Mr. SIMPSON. Mr. Chairman, I suppose everyone who runs a research program will tell you he does not have enough money. I can tell you the facts. Our flammable fabrics research program is approximately \$1.2 million. That is appropriated money plus other agency money. We have a Fire Research and Safety Act where we have approximately \$900,000, and we have approximately \$900,000 in our Building Research Division, generally working with Operation Breakthrough, in the fire area so we have about a \$3 million fire program in the National Bureau of Standards.

Senator CHURCH. Are you asking for more money, or do you regard that as adequate?

Mr. SIMPSON. Mr. Chairman, I am not sure what our last appropriation request was. I have to defer. I really don't know the answer to that.

Senator CHURCH. Do you know, Mr. Jensen?

Mr. JENSEN. Mr. Chairman, let me preface this by saying I was with the National Bureau of Standards 19 years before I moved to the Food and Drug Administration. I believe a substantial increase of funds for the fire program was requested by the President, and the amount that was received was correctly described by Mr. Simpson.

Senator CHURCH. Well, what about Dr. Feller's point that we already have enough information at hand to begin establishing some of these standards?

Mr. SIMPSON. Mr. Chairman, I might say that if you are referring to the Flammable Fabrics Act, we do work with the information at hand. What we really know is that most all textile fabrics, when ignited, will burn but I think we have known that for at least a hundred years. That, however, does not tell us a great deal about the solution to the problems though. Mr. Stavrakas, as well as others, have indicated the complexity of fire retardant treatments. He quite rightly described that the first wearing apparel standard, for children's sleepwear, becomes effective in July of next year and allows a year of labeling.

Yet even the current state of the art in fire retardant technology has some inherent problems. Washing with hard water and soap will diminish fire retardancy as will excessive exposure to ultra-violet rays and washing with many nonphosphate detergents. It is not a simple question, it is not a simple answer, but yet we felt it was worthwhile going ahead.

What we are dealing with is the wish to have technology exist that really does not exist, and we cannot wish technology into existence nor can we legislate it into existence.

Senator CHURCH. Are you acquainted with the standards that the Canadian Government will soon require on all blankets and sheets and other bedding imported into Canada to meet flammability standards that they have set?

Mr. SIMPSON. Not in great detail but I am familiar with our work in the area of blankets, mattresses, and sheets.

Senator CHURCH. I was wondering whether the Canadian standards, since we do not have any in this country and they apparently are about to establish their own, whether this would mean that products manufactured without such standards in the United States would be banned in Canada. Have you looked into this at all?

Mr. SIMPSON. Sir, I cannot speak about that direct. We do have very effective liaison with the Canadians both in reciprocal visiting of laboratories and through the private sector activities such as ASTM. We also are about to set standards and we have issued a proposed standard on mattresses which we think will make a very significant contribution. We are in the process of preparing a standard on blankets. We will probably not prepare a standard on sheets although we will consider the effect of sheets as contributory to the ignition source in a mattress fire.

Senator CHURCH. How soon will all of this happen?

Mr. SIMPSON. The proposed standard on mattresses was published about 30 days ago. We received many suggested revisions in the standard. We anticipate we will go ahead at a rapid pace, with hopefully a final standard this year. When we establish the final standard on mattresses it will by law take effect 1 year later.

## ARE PRESENT PROCEDURES SUFFICIENT?

Senator CHURCH. Do you regard the present procedures as established by law sufficient? Do you have any recommendations to make? Do you think there will be any changes in the law that might be helpful to you, your agency?

Mr. SIMPSON. Mr. Chairman, as in our prepared statement we did say that we have no new recommendations for changes in the existing law, the Flammable Fabrics Act. We have previously testified on some suggested amendments to the act which deal generally with premarket testing, sampling, et cetera, and I can provide that for the record if you like. We have nothing new to suggest.

Senator CHURCH. You are speaking of the likelihood that a standard will be promulgated on blankets.

Mr. SIMPSON. Yes, sir.

Senator CHURCH. Coming here.

Mr. SIMPSON. Yes, sir.

Senator CHURCH. The Consumers Union advised the public this April against buying blankets containing any rayon. This conclusion was based upon new tests which convinced the Consumers Union that it is ease of ignition, not whether the flame spreads in 4 seconds or 14 seconds, that should control the blanket flammability.

Do you have any comment on that observation?

Mr. SIMPSON. As you point out Mr. Chairman, there are several things that you might look for in a test. One is certainly ease of ignition, one is rate of flame spread, one is heat transfer as has been pointed out by previous witnesses. What we hope to do in our program is to develop a standard that closely parallels a real life situation and that is appropriate to the hazard you are trying to correct against. I am not sure of all of the details in the blanket standard but it certainly will be an ignition test. We think the hazard, for instance, is different with a blanket than with the mattress, which is a smoldering toxic gas producer. The blanket is not that type of problem, the hazard is due to flame exposure.

Senator CHURCH. You heard the panel discussion on the question of space heaters. How do they figure into your research, or are you looking into this particular hazard and are you making any tests now to determine what you might do in this field?

Mr. SIMPSON. Mr. Chairman, I do mention that in the prepared statement. The Flammable Fabrics Act gives us only the authority to deal with problems of writing standards on fabrics. However, we recognize that there are many factors to be looked at when examining the total fire problem. Of course to have an accident, you have to have a source of ignition, you have to have a person exposed to the ignition, you have to actually have the ignition occur and you have to have propagation and injury, and there are many places along the line in this chain of events where you might effectively deal with the problem.

Analyzing the data that comes to us from HEW and other sources we feel that matches, spaceheaters and I believe kitchen ranges as a group constitute about 49 percent of the sources of ignition. Although we don't have the authority to deal with those under the Flammable Fabrics Act, we are approaching these problems through the voluntary standards method.

Senator CHURCH. What I wanted to get at, I recognize that the Flammable Fabrics Act pertains to fabrics, but if it is true that these open space heaters constitute a very serious hazard, why wouldn't it be advisable to broaden the legislation in such a way as to give you authority to deal with open space heaters, for example?

Mr. JENSEN. May I address myself to that, Senator?

Senator CHURCH. Yes; Mr. Jensen.

Mr. JENSEN. The legislation submitted to the Congress and being considered by the Senate Committee on Commerce would permit the Secretary of HEW to address himself to any products to be used in homes, residences, schools, or recreation areas that were unreasonably hazardous. After 2 weeks of hearings I believe the committee put out Committee Print No. 1.

Senator CHURCH. And this legislation does have the endorsement of the administration?

Mr. JENSEN. Yes, sir; S. 1797 is the administration bill.

Senator CHURCH. Bill, do you have some questions you would like to ask?

Mr. ORIOL. Yes; Mr. Chairman.

#### EFFECTIVE DATE FOR MATTRESS STANDARDS

How long will it be before the mattress standard goes into effect? I am not quite sure of that.

Mr. SIMPSON. The mattress standard is in the stage between the proposed standard and a final standard. We publish a proposed standard as is required in the statute. We allow a period of time to receive comments from those interested in and affected by the proposed standard. We have received numerous comments dealing with the test method itself and suggestions to improve or change the test method. There is an evaluation of those comments made by the Department of Commerce before the final standard is published.

Since we have not analyzed all of the comments received, I cannot tell you the exact date but as I stated previously we hope to publish the final standard before the end of this year. When that final standard is published, it will take effect 1 year later by the law.

Mr. ORIOL. You mentioned before that in establishing the pill test on carpeting you were trying to deal with real live situations.

Mr. SIMPSON. A real life situation.

Mr. ORIOL. With a real life situation. In that Pioneer Hotel fire, according to the witness we had, it was a very real life situation that large amounts of carpeting when exposed to large amounts of heat seemed to ignite very markedly. Now I notice from your testimony that it has taken you 3 years to conduct a study of flammability of carpets when exposed to large ignition sources. Why is it necessary to take that long, and how are you going about it?

Mr. SIMPSON. Mr. Chairman, it has not taken 3 years. We describe a 3-year research program. We are in the first year of the 3-year research effort. Part of the problem is funding. It is a very expensive way to conduct tests to find out what happens in a real life situation. Our corridor test facility has been recently completed. It is a full scale testing facility, and we are testing not only carpeting but other contributors to a fire hazard such as you find at Lil-Haven or some of the other fires.

As I mentioned before, we have found, for instance, that with almost any kind of carpet in the kind of fire such as you had at Lil-Haven the fire propagates down the corridor very fast, very hot, with lots of smoke and toxic gases. We have also found in the same test with brick on the floor, no carpeting at all, the fire propagates almost as fast with almost as much heat and intensity. So we cannot really blame carpeting for that kind of problem.

The selection of all materials is important—those used on the floor, those used on the wall, those used on the ceiling. But material selection alone is not the answer. We recommend in Operation Break-through, for instance, that all doors in apartments be self-closing. I think you will find in the Harmar House fire had the doors been closed you would have reduced some of the deaths. This is an indication.

We would also recommend looking at sprinkler systems, as well as fire detection and early warning systems. It is a total fire situation that must be looked at. We are addressing ourselves to this total fire situation as part of our research effort. Our corridor tests cost about \$5,000 each time you ignite one of these and you learn a bit of information. You have to vary the conditions to learn the next bit of information.

Mr. ORIOL. When the bits of information are significant, do you immediately feed that into some sort of information system so it can be shared?

Mr. SIMPSON. It is completely shared in the literature and through the voluntary sector.

#### PILL TEST ENFORCEMENT

Senator CHURCH. We have established the so-called pill test effects in discussion this morning.

Mr. SIMPSON. Yes, sir.

Senator CHURCH. What effect does that have and how is it enforced?

Mr. SIMPSON. I will defer on enforcement questions to Mr. Finch.

Mr. FINCH. Would you like to go into that now, Mr. Chairman?

Senator CHURCH. Yes.

Mr. FINCH. The pill test itself came to the Commission for enforcement purposes on April 16, 1971. At that point the Federal Trade Commission had no idea whether or not the carpet industry, which had known of the test for 1 year previous to that date, would be complying with it or not paying any attention to it or just what the situation might be.

Shortly after April 1971 we had several of our investigators go into the northwest corner of Georgia which I understand comprises probably in the manufacture of carpet maybe 80, 85 percent of the carpet made in this country. We found from that survey of just say 12 mills, that four, five were manufacturing carpet which did not conform to the pill test. Now the pill test is merely a test whereby you place a methenamine pill in the center of each eight 9 by 9 samples of carpet, ignite the pill which burns for approximately 2 seconds. You just let it burn, there is no time element involved. If it burns to within 1 inch of the edge of the 8-inch diameter of the metal flattening frame used in the test, you have a failure.

Of the 12 original mills we visited we found four or five which were marketing carpet of a type which did not conform to this test. The

Commission is in the process right now of proceeding against those four or five in its enforcement responsibility. That involves removal of the carpet from the market immediately, notification of customers, that type of thing, but the primary obligation of course is to remove the carpet from the market.

Having had that result of this very cursory survey we recommended to the Commission that we should take a total look at what is going on in the area. Without getting into too many specifics because it is an enforcement problem and some information is still confidential, the number of firms that we have found marketing carpet by our screening tests indicate 70 to 75 firms still marketing carpet which does not conform to the very simple pill test.

I must add at this point that the Commission knowing that this is a new standard and that there are a lot of people who will want to get into the act for various reasons, the Commission has not up to the present time taken any formal action with regard to recall until a valid test is performed in its own lab here in Washington by its own personnel and the results are reviewed by its personnel. We are taking this position because of the fact when you get into the area of a recall of a carpet by a manufacturer you are speaking in terms of hundreds of thousands of dollars in some instances. Technically that is what the Commission has done in regard to its enforcement of the carpet standard with regard to the large carpets—that is, in excess of 24 square feet.

#### FEDERAL STANDARD FOR CARPET LABELING

Senator CHURCH. Now since you found in a preliminary way such a high degree of nonconformance, does this suggest that other devices might be used? For example, is there a labeling requirement, anything of that kind, in which the manufacturer would have to certify that the carpet met the Federal standard?

Mr. FINCH. In the large carpet standard the primary obligation on the manufacturer is that he not market a carpet which does not pass the pill test.

Senator CHURCH. Does the law require labeling?

Mr. FINCH. To the extent of labeling there is no requirement that a carpet be labeled in this area of larger than 24 square feet. It simply either meets the standard or you cannot market it.

However, if you market a carpet which is larger than 24 square feet and if it is of a type which would normally fail the pill test, I hate to pick on any particular type because many of the fibers today will fail if not properly treated or manufactured in such a way so as to conform to the standard. Let's assume that a particular carpet will normally fail. If a manufacturer puts a substance in the carpet which will then enable it to pass the pill test, then there is a labeling requirement. He must put the letter "T" on the label which is merely a device to assist the Federal Trade Commission in its enforcement efforts. There are no labels to indicate highly flammable if washed and so forth for carpets subject to the large carpet standard. However, before that carpet which has been treated with a flame retardant may be marketed, it must be submitted to a washing test of 10 times, after

which it is again subjected to the pill test and after which it must still pass before it can be marketed; otherwise, it cannot be marketed.

Senator CHURCH. Perhaps I better address this question to you, Mr. Jensen. An Associated Press story in July pointed out that the 1967 Flammable Fabrics Amendments makes the Commerce Department responsible for standards setting, the Federal Trade Commission responsible for enforcement, and the FDA responsible for research. President Nixon's Consumer Advisor, Mrs. Knauer, was quoted in the same story as saying that such division of authority can lead to a bureaucratic mare's nest with each agency accusing another of being responsible for any shortcomings.

Is that in fact what is happening?

Mr. JENSEN. First the story is not correct. The Food and Drug Administration has no research responsibilities per se. Our job is to investigate, to collect data, and to make these data available to the Secretary of Commerce.

Senator CHURCH. That is research, isn't it?

Mr. JENSEN. It would be a loose interpretation, certainly we are responsible for gathering information. Research generally is defined as searching for truth.

We have testified before, Mr. Chairman, that there are problems in the division of responsibility, clearly, but the greatest problem perhaps is in obtaining the necessary resources. We have been woefully unsuccessful at HEW in obtaining the resources. Commerce's success is about the same.

I think the administration has been giving consideration in the Reorganization Act by the President to a consolidation. The Senate Commerce Committee, in Committee Print 1 of the Consumer Product Safety bill, brings this about by simply repealing the Flammable Fabrics Act.

Senator CHURCH. So you think that such organizational defects as may now be present are likely to be corrected in this new approach?

Mr. JENSEN. Certainly if the thoughts of the Administration or the present approach of the Commerce Committee print is followed, it would.

Senator CHURCH. Yes, Mr. Simpson.

Mr. SIMPSON. Mr. Chairman, if I might just offer a comment, without directly talking about the advisability or suitability of either consolidating or leaving things as they are. I think many of the witnesses this morning, and I concur, stressed the importance of looking at the entire fire problem. We have heard about nursing home fires and the role of carpeting, the role of extinguishment and of other things. We do have a fire research program that is fairly comprehensive in the Department of Commerce now and it is in its embryo stage. We are very much interested in the research effort which is made up of flammable fabrics research that we do; our effort under the Fire Research and Safety Act; and the fire work we perform in our building research division. They are all related. Technologically there is no reason to separate them. They are all part of the overall program.

Senator CHURCH. I think that makes sense.

Mr. Oriol.

## PREMARKET TESTING OF PRODUCTS

Mr. ORIOL. Just one question of Mr. Simpson.

I believe you said before the administration's consumer product safety bill, which I believe is S. 1797, does provide for premarket testing of products.

Mr. JENSEN. No.

Mr. ORIOL. It does not?

Mr. SIMPSON. No.

Mr. ORIOL. But the other bill introduced by Senators Magnuson and Moss does provide for premarket testing.

Mr. JENSEN. It is not clear what is intended for new products by the National Commission on Product Safety's bill.

The administration bill does not provide for premarket clearance, it provides for a system by which laboratories could be accredited or certified and then those laboratories would be in a position to provide for clearance of a product according to its conformance to a mandatory standard.

Mr. ORIOL. Yet when Mr. Finch was talking about the action on carpeting it sounded a lot like premarket testing.

Mr. FINCH. When I was speaking of the preliminary testing I was speaking of the act of the FTC investigator going into a mill, looking at a line of carpet, taking a sample of what he feels is suspect and preliminarily having it tested at a lab which is not necessarily authorized, certified or otherwise used by FTC except for a screening purpose. If we get the determination that that carpet is suspect, we would then obtain further samples of this carpet from the mill or its customers, which action is necessary for the FTC to proceed, we would then test it in our own lab in Washington and at that point the formal enforcement procedures of the Commission would commence.

Now there are two bills presently in Congress, H.R. 5698 and S. 364, which are identical and both of which would require or make it mandatory that everything subject to the Flammable Fabrics Act be pretested prior to its introduction into commerce. That is distinguished from our preliminary investigating in the carpet aspect. H.R. 5698 and S. 364, if passed by this Congress, will require a pretest and maintenance of records by every manufacturer and importer of a product subject to the Flammable Fabrics Act before its introduction into commerce. Now on H.R. 5698 I believe the hearings have been concluded. On S. 364 I don't believe hearings have been held but OMB has been given the FTC's comments at least.

Mr. ORIOL. Mr. Jensen, in your prepared testimony you describe a new reporting system based on sampling which the FDA is about to or is now implementing, and Dr. Feller in his testimony discussed an existing reporting system which apparently they are drawing upon. Now in establishing your system are you building it upon what now exists, or are you setting up an entirely new system?

Mr. JENSEN. Their system is very much a part of ours. A member of my staff serves as secretary of the organization. Our new system, called the national electronics injury surveillance system, covers all product-related injuries on a sound statistical sampling basis. All of those that come to the emergency room in different hospitals are included, and, of course, it goes beyond the Flammable Fabrics Act and the Toy Safety Act. We are working with industry to bring about voluntary

standards relating to safety of products to which consumers are exposed.

MR. FINCH. May I make a comment?

Senator CHURCH. Yes, Mr. Finch.

#### CANADIAN FLAMMABILITY STANDARDS

MR. FINCH. There was a question submitted to Mr. Simpson concerning our interrelationship with Canada on flammability. Dr. Douglas Bennett, who is the head of the flammable fabrics section of the Canadian Government, receives a copy of every one of the press releases put out by the Federal Trade Commission on flammability, and in fact in recent months he has informed me that they have been able to stop the importation into Canada of products found flammable in the United States. So I thought I might try to ease your mind in the area of our very close neighbor to the north. We do work very closely with them, as I am sure Mr. Simpson does also.

Senator CHURCH. Have they established standards of their own in this field ahead of us?

MR. FINCH. No; they are not ahead of us. They are behind us in this area. They have standards for blankets which require a 7-second burning as opposed to our 3.4 but this does not go into effect for another year. They are working on a textile fiber products identification act—we have assisted them in writing it. They are not really ahead of us except probably in the warning label for care labeling and which is strictly a voluntary aspect as far as they are concerned. The FTC has before it the possibility of a compulsory warning label provision or rule for care labeling to be issued by it, but I don't believe that Canada is ahead in flammability as far as the effectiveness of what is being done in this country.

Senator CHURCH. Well, I think it was Dr. Phillips who observed that our capacity to think depends in part upon our capacity to sit over a given length of time. It also depends upon the demands of the stomach, and I have just noticed that it is 20 minutes to 2 by my watch, which may be wrong, but I think maybe it is long past lunchtime and we won't prolong the hearing any further.

I want to thank all of the witnesses this morning, Government witnesses and citizen witnesses and panel, for your contributions. We will try to assemble and digest some of this information and see what we can do.

Dr. PHILLIPS. Is this the completion of the hearing, there is nothing after lunch?

Senator CHURCH. Nothing after lunch. We have stayed through lunch in order to complete it at one setting.

Dr. PHILLIPS. I just would like to make two comments then.

Senator CHURCH. Yes.

#### FLAMMABLE FABRICS—EDUCATION AND DESIGN

Dr. PHILLIPS. Although it would appear that we must work slowly in the flammable fabrics field, we have smoke inhalation problems. There are two things that have emerged clearly that are things that we can do now. One is that we could get the clothing industry not to

have flopping sleeves on housecoats, and another is that we can do something about education.

I think the parallel in the forest fire field is important to point out. In 1942 we had 200,000 man-initiated forest fires a year. The little Smokey Bear program has dropped those fires to 103,000 from 200,000 and the total acreage burned from 31 million acres a year to 4 million acres a year. Education we can do now.

Senator CHURCH. I think those are two excellent suggestions and it does introduce another dimension, the dimension of design which may have as much to do with the hazard as the flammability of material itself which we have not touched upon here.

Dr. FELLER. Not to delay it too much longer but I would feel remiss going back to Ann Arbor without at least making the final statement about the fact that we do have the mechanisms and the information available, I believe, to make a big step forward—perhaps not total, I did not mean to allude to that. If 86 percent of all ages had the fabric involvement and all was law, was enforced for children of all ages, then I estimate that the minimum number of lives saved would be 3,000 and the crippled in the 20,000's. Now this is not very much.

Many of your questions were not answered directly; I don't have time to repeat them. You asked questions I could not answer "Yes" or "No."

Senator CHURCH. We are accustomed to that.

Dr. FELLER. I would hope that we have some impact. We have to rely on our Senators and Representatives to pass these laws.

I think these statements made by Mr. Simpson and Mr. Jensen, they are not aware of the fact that the information is not being used. I will go a step further and say that they are not aware of the information that is available that can be used. I am fully aware of what is available. I am not accusing these men of any wrong doing, I think they work very hard, but they are a large organization and I work with people up and down the line and I know they are not aware of what is available.

Another member that should have been here, Dr. George Crikelair from Columbia University of New York—you probably know him. I think he brings another dimension to you on the other side of the fence, my side of the fence, that I think would be very valuable to you.

Senator CHURCH. We have written to him, I am told by the staff, so we will pursue that suggestion.

Dr. FELLER. I just would like to add some information for the record for your perusal.

Mr. MILLER. Mr. Chairman.

I am sure, Dr. Feller, you would agree with the comment made by your associate, Dr. Phillips, from Harvard and the comment made particularly by Mr. Stavrakas which comes down to the point that despite all that you say, real progress requires a massive educational program to alert the public to support all of the things that are needed. Is that not so?

Dr. FELLER. That is true but we can pass simple laws, you see, that would take care of one segment of the problem and then you go on and educate the people for another segment of the problem. Passing a law that would have fabric standards that would not continue burning when they are ignited will take care of the third problem. Then we go on to educate the other problem. Over a 5-year period nothing happens. You say something did happen, we do have the infant protection. I want to be protected, you want to be protected.

Mr. MILLER. If it raises the price of the sleeping garment by \$1 or \$2 a pair, this could very well generate—unless there is a proper education foundation—into a public backlash that could defeat the efforts to achieve such protection.

Senator CHURCH. I think one thing that I learned today was the epidemic proportion of the problem as compared to other diseases. For instance, it had so much public attention that one chart showed that we have three times as many injuries overall from fire than we have from polio. In fact, it was 585 deaths from polio as compared to 8,000 deaths by fire and crippings were equally high. The contrast was equally dramatic.

I have not appreciated fully how many serious burnings occur in this country and how much more serious our problem is than that which confronts other comparable countries, highly industrialized countries in Western Europe. Obviously there is a great deal of urgency here and it can be met in part with public education which is clearly lacking.

The customer resistance, for example, to certain flame retardant fabric indicates that there is not public appreciation of the danger but also it has to be met with laws and with standards that begin to come to grips with those areas where the hazard is the greatest. We will try and pull all of this information together and pursue the various points that have been raised and to make some recommendation that we hope will be helpful to you gentlemen and perhaps even consider possibilities for strengthening the law in this area.

Mr. Simpson had a statement.

Mr. SIMPSON. Mr. Chairman, I also don't wish to prolong this but I cannot help repeating once again that we do, I believe, have most of the information that is available, at least I hope we do, describing the extent of the problem. I would like to repeat again in the wearing apparel field there is not enough known about fire retardant technology to solve the complete problem.

It is not a proper solution, as Dr. Feller suggests, to write a standard that says any wearing apparel that burns when exposed to ignition is ruled off the market. If we do that we are all going to be wearing asbestos clothes or running around nude. That does not solve the problem. The technology is just not here, it is in its embryo stages. The children's sleepwear is still fraught with problems. We hope it improves, but until then, there are very few simple solutions. I am afraid.

Senator CHURCH. Is there anyone else who wants to say anything before we close the hearing and go for supper?

Mr. SMYTH. You just mentioned the area of flammable fabric and the complexity of that problem is complex, but with regard to carpet in nursing homes or in hospitals or in hotels there are solutions to that problem right now. There are two solutions that come to mind immediately. One, is to remove the carpeting and put tile such as we have here in this arena. Second, is to put in sprinkler systems which the National Park Association has been recommending for the last 15 years. So there are solutions to that particular problem and all it requires is a group of people sitting down together and, in a matter of days, drafting up the requirements for these two institutions.

Senator CHURCH. Well, we will look further into that.

All right. If there are no further comments, the hearing is adjourned with thanks to all of you who have participated.

(Whereupon, at 1:45 p.m., the hearing was adjourned, subject to call of the Chair.)

# APPENDICES

## Appendix 1

### ADDITIONAL MATERIAL SUBMITTED BY WITNESSES

#### ITEM. 1. PREPARED STATEMENT OF MARSHALL L. SMYTH, CONSULTING ENGINEER, TUCSON, ARIZ.

In the course of investigating the underlying causes of the Pioneer Hotel fire in Tucson, Arizona, information which may be of value to this committee has come to light. This information has to do with the potential fire hazard that synthetic carpeting presents to the sleeping, the aged, the bed-ridden, and restrained individual. Our work has been directed primarily toward evaluation of acrylic carpeting used in the Pioneer. However, fire history in this country indicates that performance of other current synthetics may parallel the acrylic for all practical purposes.

As a society we have worked hard to improve man's lot in life and make his daily existence a little more enjoyable. Many of our improvements work out fine. Some, however, develop painful side effects severe enough to demand corrective action. Synthetic fiber floor carpet may be one of these advancements that brings us an unsatisfactory measure of misery. Synthetic carpets have been outstanding when it comes to durability, appearance, stain resistance, cost, etc. Most of us have them in our homes, hotels, offices, nursing homes, the locations are almost endless. We really have been happy with it. Maybe that's why we haven't searched too hard for any shortcomings. After all, who wants to give a good friend a poke in the eye?

#### LET'S LOOK AT THE RECORD

A partial review of fire case histories in this country during the last few years brings out some interesting information. Table I lists six fires in which investigations have revealed that synthetic floor carpeting was the major contributor to loss of life and property damage.

TABLE I.—FIRES INVOLVING SYNTHETIC CARPETINGS

	Deaths	Carpet type	Reference
Harmar House Nursing Home, Marietta, Ohio...	32	Nylon.....	Senate subcommittee hearings February 1970 and Fire Journal, May 1970.
Pioneer Hotel, Tucson, Ariz.....	28	Acrylic.....	Fire Journal, May 1971.
Rev. Westley Austin, private residence, Compton, Calif.	0	.....do.....	Fire Journal, March 1968.
Imperial Apartments, Nashville, Tenn.....	1	Polypropylene.....	Fire Journal, November 1968.
Private residence, Suisun, Calif.....	0	Polyester.....	Fire Journal, September 1970.
Roosevelt Hotel, Jacksonville, Fla.....	22	Nylon.....	Fire Journal, April 1964.

I would like to point out that all of these fires started on the floor and the fires propagated along the surface of the floor carpet. Two have been attributed to arson, two to sparks from fireplaces, one from a clothes closet and the other cause is unknown. (Additional details on these fires are listed on Table II and the referenced reports). During three of the fires (the two residences and the one apartment), progress of the fire along the carpet surface was actually observed by the people involved.

Not many fires, but 83 lives were lost. We ought to be able to learn something from this history, and I think we can. Take a look at the data, it seems to beg for attention. Those six fires span the spectrum of synthetic carpet fibers on the market: NYLON—ACRYLIC—POLYPROPYLENE—POLYESTER. From this one might suspect that all synthetic carpets can burn violently.

#### BUT IS IT A CARPET PROBLEM?

We seem to be in that messy stage of problem definition where some of us believe a hazardous situation exists, but a much larger group believes there is insufficient information available or that no problem exists at all.

Synthetic carpet on the floor can burn violently, but how many people have actually seen it happen? Very few. As a result, very few people are personally convinced that synthetic carpet is really hazardous, and test reports are sterile things filled with detail and little impact.

We have a short film and some colored slides of burn tests on some fairly large carpet samples from the Pioneer. These may provide some additional insight into the hazard of one type of carpet. Perhaps later we will be able to conduct a little fire demonstration on some sample carpet.

#### DO WE HAVE A TEST PROBLEM?

Find a test the carpet can pass. Put the results in the advertising brochure and push the product. Has that been the name of the game? The record shows that carpet from the Harmar House passed the pill test. Carpet from the Pioneer not only passed the pill test, but was advertised to have a flame spread of 39. Was that information of any value to us? These two fires alone accounted for 62 deaths. Surely these tests are not adequate to identify the hazardous nature of floor carpeting.

I hope that the information presented here will be of some assistance to the Committee in developing improved care for the elderly.

TABLE II.—FIRE DETAILS, SYNTHETIC CARPET FIRES

Name, location, date and time	Deaths	Carpet type	Occupancy at the time of fire	Floors in building		Origin of fire	Ignition cause	Approximate duration	Building construction	References
				Fire	Total					
Lil-Haven Nursing Home, Salt Lake City, Utah, Sept. 15, 1971, 12:41 a.m.	6	Nylon with polypropylene backing.	17	2	2	Rear of 1st floor.....	Arson (liquid fuel).	15 minutes... 7		Preliminary information from news media and fire marshal.
Harmar House Nursing Home, Marietta, Ohio, Jan. 9, 1970, 9:57 p.m.	32	Nylon with rubber backing.	46	1	1	Room 104, 1st floor.	Waste basket.....	15 minutes... 7	Masonry and dry wall.	Subcommittee hearings and Fire Journal, May 1970, p. 5.
Pioneer Hotel, Tucson, Ariz., Dec. 20, 1971, 12:30 a.m.	28	Acrylon with jute backing, jute pad.	66	8	11	Hallway, 4th floor.	Arson.....	1 hour.....	Masonry through-out.	On site investigation and Fire Journal, May 1971, p. 21.
Rev. Westley Austin, residence, Compton, Calif., Apr. 2, 1967, 2:30 a.m.	0	Acrylic.....	5	1	1	Carpet in living room.	Sparks from fireplace.	15 minutes... 7	Wood frame.....	Fire Journal, March 1968, p. 13.
Imperial Apartments, Nashville, Tenn., Apr. 5, 1968.	1	Polypropylene with jute backing foam rubber pad.	7	1	11	Closet.....	Unknown.....	7..... 7.....		Fire Journal, November 1968, p. 24.
Private residence, Suisun, Calif., Apr. 28, 1970.	0	Polyester foam rubber pad.	1	1	1	Carpet in living room.	Sparks from fireplace.	25 minutes... 7.....		Fire Journal, September 1970, p. 88.
Roosevelt Hotel, Jacksonville, Fla., Dec. 23, 1963, 7:30 a.m.	22	Nylon with rubber backing.	499	1	14	Ballroom on 1st floor.	Unknown.....	30 minutes... 7.....	Masonry.....	NFPA Quarterly, April 1964, p. 309.
Westminster Terrace, Presbyterian Home for Senior Citizens, Buachel, Ky., Jan. 14, 1971, 2:30 a.m.	9	Synthetic (type undetermined).	94	1	4	Chapel/library 1st floor.	Arson.....	25 minutes.....	do.....	Fire Journal, May 1971, p. 5.

ITEM 2. PREPARED STATEMENT OF IRVING FELLER, DIRECTOR OF THE UNIVERSITY OF MICHIGAN BURN CENTER; CLINICAL ASSOCIATE PROFESSOR OF SURGERY, UNIVERSITY OF MICHIGAN; SURGEON, ST. JOSEPH'S MERCY HOSPITAL, ANN ARBOR; DIRECTOR, NATIONAL BURN INFORMATION EXCHANGE

The physician's role is to take care of patients after an injury. Improving the care of the burned patient has been one of the primary goals for a group of surgeons in this country. During the past seven years some of these surgeons have become interested and involved with not only improving burn patient treatment but also in studying the causes of these accidents so that their incidence could be reduced. The National Burn Information Exchange (N.B.I.E.)<sup>1</sup> was founded seven years ago to gather reliable data to support both of these goals. The N.B.I.E. collects detailed data on severe burn cases treated in 27 Burn-Care-Facilities throughout the United States. In seven years we have accumulated data on over 10,000 burn cases, and have analyzed these data at the University of Michigan. We *know* how people are burned and how many of them die. We know how long each of them is hospitalized, what treatments they receive, the results of the treatment, and, the medical costs. We have undertaken rehabilitation studies in an attempt to evaluate the long term results of the burn on the survivors.

The topic here this morning is limited to flammable fabrics and other fire hazards. How much of a problem are flammable fabrics? They are a *deadly* problem in flame-burn accidents. The following supports this statement from several sources.

The severity of the problem can best be demonstrated by first considering the annual picture of burn trauma in the United States:

- 2 million Americans of all ages suffer burns;
- 200,000 have burns requiring medical attention;
- 75,000 are burned so severe that hospitalization is required;
- Approximately 70 percent of the hospitalized victims receive their burns in *flame-burn* situations;
- More than 9,000 of our citizens *die* from burns each year. Burns are the third most common cause of death from accidents next to those from automobiles and falls.

These statistics provide the broad perspective of the *national burn problem*. Let me now focus on the specific problem of *fabric ignition*.

At the N.B.I.E., we analyzed 4,596 burn cases in which the accident victims suffered flame burns.<sup>2</sup> In 86 percent of those cases, the victims' clothing ignited. Only in 14 percent of those cases did the victims' clothing not ignite. Now, what were the effects of the clothing igniting? We compared the two sets of cases in terms of five measures of severity:

1. Mortality—whether or not the burn victim survived.
2. The percent of body surface burned.
3. The percent of skin totally destroyed, thus requiring grafting.
4. The number of days of hospitalization required.
5. The average cost of medical treatment in the two sets of burn cases.

Here is what we found. The victims whose clothing had ignited—86 percent of all the cases of flame burns—were *four times more likely to die* than those whose clothing did not ignite. Twenty four percent of those patients died in the hospital, compared to only six percent of the other patients. Their burns covered *nearly twice as much of their body surfaces, and six times as much of their skin was completely destroyed*. These victims spent an average of *21 more days in the hospital*, and their average costs were *\$5,000 more per patient* than for those whose clothing had not ignited.<sup>3</sup>

Now, a natural question to ask about these cases is this: Did the clothing ignition cause those differences in severity, or were they caused by the circumstances of the accidents? In other words, did *clothing ignition* occur primarily in major fires, and *no-clothing* occur primarily in minor accidents? The answer is NO. Clothing ignition occurred in all kinds of accidents—major *and* minor.

<sup>1</sup> Feller, I.: "National Burn Information Exchange," *Surgical Clinics of North America*; Volume 5, No. 6; December 1970.

<sup>2</sup> Feller, I., et al.: "Flammable Clothing: Crisis In Burn Severity"; submitted to Office of Product Safety, F.D.A., H.E.W.; April 26, 1971.

<sup>3</sup> Feller, I., et al.: "The Annual Cost of Hospital and Physician Services in the United States for Treatment of Burns Involving Flammable Fabrics," submitted to Office of Product Safety, F.D.A., H.E.W.; 1970.

In fact, one of the most distressing findings of our study was that it is clothing ignition which converts a *minor* burn accident into a *major* burn case. Non-flame-resistant cotton clothing ignites the most easily, but many synthetic materials are not far behind. Our studies show that if clothing were made more flame-resistant, this would save the lives of about 3,000 burn-accident victims each year in this country, and would eliminate about \$125-million in burn-patient medical costs. At least 3,000 human beings needlessly die every year, simply because we do not have reasonable flammability standards for clothing.

I am often asked if the elderly constitute a significant problem group in burn accidents. They *do*. Let me explain *why*. Persons over 60 years of age constitute 10 percent of all flame-burn cases. The significant point here is this: Older people cannot survive burn wounds nearly as well as younger people. A person between the ages of 5 and 40 has a 50-percent chance of surviving burns covering 60 percent of his body surface; but a person between 60 and 70 years of age has only a *four* percent chance of surviving a burn wound of that extent. And, if they are over the age of 70, they have *very little or no chance at all* of surviving. Neither are the elderly very capable of surviving even more modest burn wounds: Consider a burn wound which covers between 20 and 29 percent of a person's body surface. Over 90 percent of burn patients who are under the age of 60 can now survive a wound of that size. *But*, less than half of the patients *over age 60* can survive a wound of that size. Too often their bodies *cannot overcome* the infections which almost inevitably accompany burn-wounds of that size. The medical reasons for this higher mortality is that the infection and stress of the burn leads to fatal infection or organ system failure, such as heart or lung disease.

At the N.B.I.E. we have analyzed the causes of *flame burns*—the situations that trigger them—and have produced 30 categories of accident situations, ranked in terms of their frequencies. A copy of these categories for all age groups is furnished here as an enclosure. Please note, that none of these accidental situations, in and of themselves, necessarily result in serious injury or death to the accident victim. *But*, when clothing ignites—and it does just that in 86 percent of such cases—the victim is four times more likely to sustain burns that kill him. The N.B.I.E. data also indicates that the *flame-burn* becomes an increasing problem with age. Therefore, the *aged* are more likely to have a *flame-burn* situation aggravated by fabric ignition.

The role of fabric flammability on burn severity and mortality is approximately the same for all age groups but the results are more devastating on the aged. There is an urgent need for manufacturing standards to assure us that the clothing that we wear is flame-resistant, and that the carpeting, the drapes, the bedding fabrics in our homes are flame-resistant. The costs of producing such fabrics are not unreasonable, and would not be any great burden upon manufacturer or consumers. Dr. George Crikelair, Columbia Medical School, has demonstrated this fact and has been trying to bring this information to our attention for the past ten years.<sup>4</sup>

In summary, the standards for fabric flammability in the manufacturing of clothing, drapes, bedding, and carpets are not effective. The existing legislation permits the continued production of unsafe consumer products and fails to give the consumer of all ages a fair chance to protect himself.

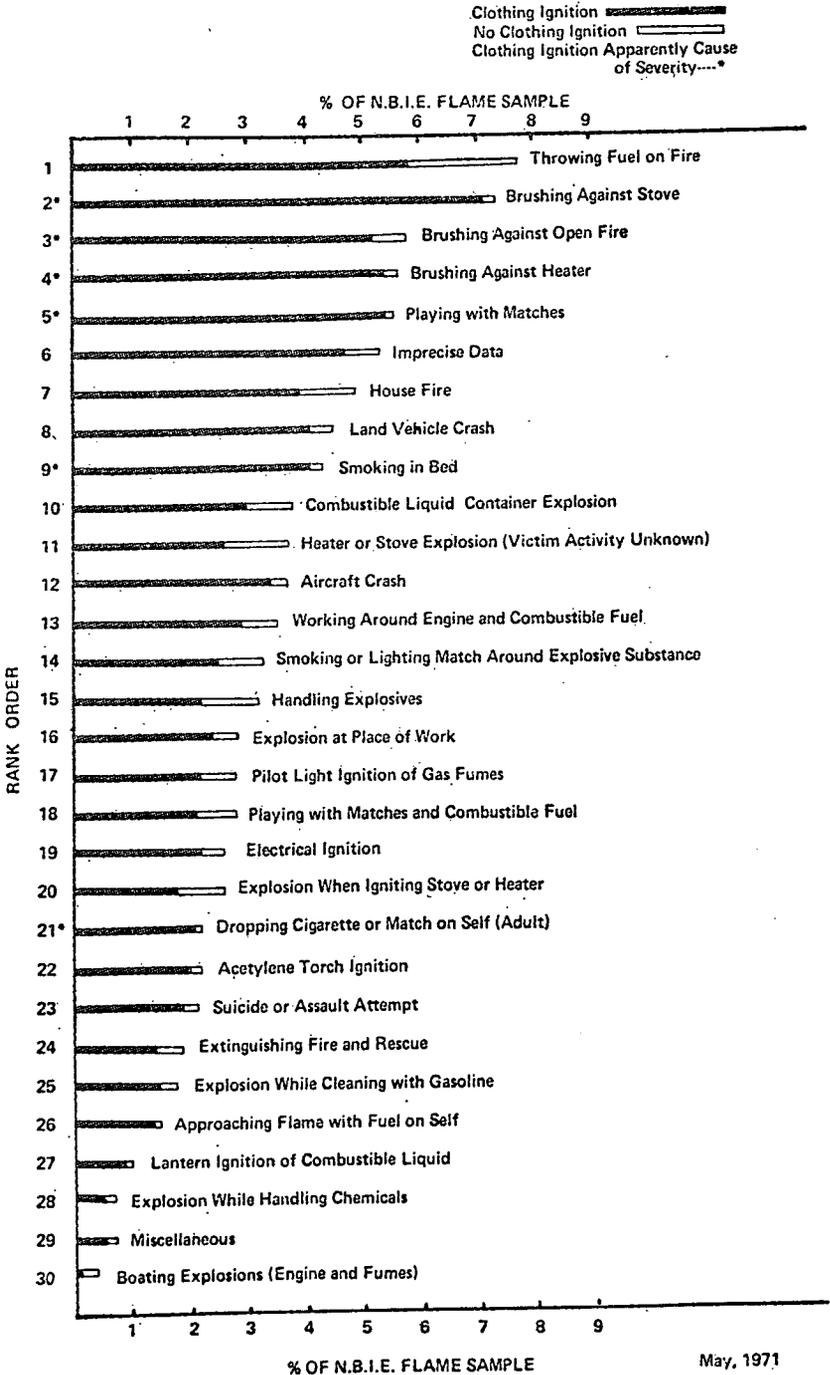
In addition, I am not satisfied with the way federal agencies are coping with problems of data collection, analysis, and dissemination in this field. What is worse, federal funds for these purposes have not been used effectively. There is waste by duplication of effort and failure to utilize appropriate experts in a campaign to reduce the *national burn problem*. In the meantime, burn-accident victims are dying and suffering needlessly.

If you want to experience the severity of the problem personally, I invite you to come to our Burn Center at the University of Michigan Medical Center. We will show you the patients and their problems. The experience could not help but *affect you*. The problem will have more meaning and you will come back here to Washington and provide us with effective legislation that would reduce the problem.

In closing, I would like to give credit to those physicians who have supported the N.B.I.E. The main contributors to date are B. MacMillian, M.D., W. Haynes, M.D., B. Pruitt, Col. M. C., J. Boswick, M.D., and G. Collentine, M.D.

<sup>4</sup> Crikelair, G.: "Action and Program for the Future"; *Bulletin New York Academy of Medicine*; Volume 43, No. 8; August 1967.

THIRTY FLAME BURN ACCIDENT GROUPS---RANK ORDER BY SIZE  
(4,596 SAMPLE CASES)



## ITEM 3. SUPPLEMENTARY REPORT BY ANNE WIGHT PHILLIPS, M.D.

At the time of the Senate Hearing on October 12, 1971, I urged that we use caution in urging legislation to require the wearing of flame-retardant fabrics by the elderly. Based on my previous experience with flame retardants I suggested that the benefits of flame retardancy might be outweighed by the possibility of airway injury due to inhalation of the increased smoke resulting from partial combustion.

Since the hearing I have had an opportunity to see at first hand some fire tests using one of the newer flame retardants, tetrahydroxy-phosphonium chloride. Two children's nightgowns of cotton flannelette, one treated and one untreated with that retardant, were placed on dolls and a lighted match was held to the bottom of the hem edge of each. The treated fabric charred for about three inches, but self-extinguished as soon as the match was removed. Since combustion was so brief, instead of the pall of smoke I had previously observed with flame retardants, very little smoke was produced.

The untreated fabric, on the other hand, ignited almost instantly on being exposed to the match for an equal period. Spread of the flames upward was rapid, singeing of the hair and scorching of the face occurring in about four seconds. On being extinguished with a carbon dioxide fire extinguisher, the flames went out, but afterglow continued steadily eating up the untreated garment, until use of the extinguisher was repeated. Smoke blackened the chin and nostrils of the inert doll mannequin. There was no such blackening to suggest a smoke inhalation hazard around the chin, nose or mouth of the doll with the treated nightgown.

This experiment indicates that if cotton flannelette is properly processed, and if the process is reproducible from garment to garment, (questions on which I have no present knowledge), cotton flannelette can be made fire retardant to the end that incomplete combustion, and hence irritating smoke production, is reduced to a minimum.

The "hand" or feel of the treated gown did not appear to be sufficiently different from the untreated fabric to deter its use. Studies of allergenicity and effect on bed sores still should be run, however. Similarly the safety of other agents with the same flame self-extinguishing, low smoke-producing characteristics should be investigated for allergenicity and injurious effect before they are recommended.

In contemplating legislation concerning flammable fabrics, an additional consideration should be given to the freedom with which fabrics transmit heat to the skin beneath. Pain is experienced by almost everyone at 180° F. If pain is felt before the clothing ignites, the person wearing it will move away from the heat. If ignition occurs before heat is perceived, because the cloth does not transmit the heat to the skin, that fabric may be more dangerous than the former, whether or not it passes the 3½ second flame spread test. A device for testing materials in this way has been developed by Factory Mutual Insurance Company.

The death by fire yesterday of 15 elderly people at a nursing home in Carbonale, Pennsylvania, lends urgency to this Committee effort.

TABLE I.—DISTRIBUTION OF PATIENTS ACCORDING TO AGE AND EXTENT OF BURN (MASSACHUSETTS GENERAL HOSPITAL)

[The aged show a higher percentage of the more severe injuries]

	Total number	Burn extent (percent)				Total
		1 to 14	15 to 24	25 to 54	55 to 100	
Age in years:						
0 to 15.....	228	80	11	6	3	100
16 to 55.....	464	76	10	10	4	100
56 to 100.....	135	59	20	10	10	100
Total.....	827					
Patients of all ages with nonfatal burns of less than 1 percent of body surface, admitted for other injuries.....	173					
Total.....	1,000					

<sup>1</sup> Note: All figures have been extrapolated to 1,000 burns from 949 cases actually observed during the period July 1, 1939 to Jan. 1, 1957.

TABLE II.—EFFECT OF AGE AND EXTENT ON THE DEATH RATE  
 [The aged fare less well than either young and middle aged adults or children]

	Number burned	Burn extent (percent)			
		1 to 14	15 to 24	25 to 54	55 to 100
Age in years:					
0 to 15.....	228	(1) -----		50	100
16 to 55.....	464	1	7	34	80
56 to 100.....	135	7	30	92	100
Total.....	827				
Patients of all ages with nonfatal burns of less than 1 percent of body surface, admitted for other injuries.....	173				
Total.....	± 1,000				

† No deaths.

\* All figures have been extrapolated to 1,000 burns from 949 cases actually observed during the period July 1, 1939, to Jan. 1, 1957.

A. Pathologic changes following inhalation of smoke :

1. Ulceration of the lining of the respiratory tract.
2. Complete loss of the lining cells together with the cilia or hairs which normally acts as brooms, sweeping debris and bacteria out of the airway.
3. Accumulation of smoke particles, cell debris and fluid in the airway. The fluid accumulates when the irritated airway walls weep.
4. Swelling of the airway walls.
5. Obstruction of the narrower passages so that air no longer reaches some of the air cells.
6. Collapse of the unaerated cells.
7. Filling of other air cells with debris which obstructs oxygen in flow.
8. Swelling of the irritated air cell walls which hinders oxygen transfer from the air cells to the capillaries.
9. Collapse of some of the air cell capillaries due to shock.
10. Further diminution in the amount of oxygen carried by the red cells circulating through the lungs due to preferential combination of carbon monoxide with red cell hemoglobin, that portion of the red cell, which normally carries oxygen.
11. Invasion of the airway by the surface route from the nose and mouth or by the blood-borne route.
12. Further swelling, congestion and obstruction due to infection with resulting further diminution in oxygen exchange.

B. Causes of lung damage :

1. Irritant gases: Oxides of nitrogen are particular offenders: Aldehydes, sulfides, prosgene, and many others are similarly damaging; With the advent of the plastic industry many new irritants enter the air on their combustion.

2. Particles: The role of the particles has never been adequately investigated, but there is evidence to suggest that they may play a larger part than that for which they are normally given credit. For example, three of the victims of the Cocoanut Grove fire, who were admitted to the Massachusetts General Hospital (a fire which took 498 lives), had covered their faces—those three and only those three had no respiratory complications while in the hospital; There is a real possibility that acids and other chemicals on the particles may cause the damage.

C. Causes of death:

1. Action of lethal gases such as cyanide, for example.

2. Lack of oxygen due to low oxygen content in the inspired air, obstructed air passages, delayed oxygen transfer across the air cell membranes, hemoglobin capture by carbon monoxide, shock and possibly disturbances of oxygen delivery at the tissues.

D. Possible means of reducing smoke inhalation injury:

1. Reduce fires by: better fire education; improved early warning systems; improved fire extinguishment techniques; more careful supervision of the high risk smoker.

2. Render clothing and bedding fire resistant, *without* producing more smoke, a difficult assignment.

3. Teach smoke evasion: (a) All citizens to be taught to protect their faces in case of fire; (b) Possible development of a low cost filter to be used by the public during evacuation of burning buildings. This presents a hazard in that overreliance on the mask may lead to more deaths rather than less.

4. Caution in the use of plastics with dangerous smoke emission in vicinity of high-risk elderly smokers.

## Appendix 2

### LETTERS FROM INDIVIDUALS AND ORGANIZATIONS

#### ITEM 1. LETTER TO SENATOR CHURCH FROM THE AMERICAN ASSOCIATION OF RETIRED PERSONS/NATIONAL RETIRED TEACHERS ASSOCIATION

WASHINGTON, D.C., December 8, 1971.

DEAR SENATOR CHURCH: The National Retired Teachers Association and American Association of Retired Persons appreciate this opportunity to submit testimony in support of our position that the elderly are an especially vulnerable group with respect to fire hazards.

Older persons, as a group, are usually less agile than the young or middle-aged and they are more likely to be confined within a structure, perhaps even in a non-ambulatory state. Therefore, special consideration must be given to the following subjects:

- I. Flammable Fabrics.
- II. Floor, ceiling and wall finishes and coverings.
- III. Nursing homes.
- IV. Homes for the aged.

The attached testimony, developed by Mr. Chet Blome of our Associations, contains a short discussion of each of the above subjects, as well as an appended bibliography and state survey of fire protection requirements for nursing homes.

Sincerely yours,

CYRIL F. BRICKFIELD,  
*Legislative Counsel.*

[Enclosures.]

#### I. FLAMMABLE FABRICS

Chapter IX of the "Final Report of the National Commission on Product Safety" calls attention to the (torch) sweater injuries as the basis of the Flammable Fabrics Act. Throughout the Chapter, however, the Commissioners constantly call attention to the "piecemeal, limited and disparate legislation."

It is recognized that the flammability of fabrics is dependent on certain basic factors such as: (1) type of fiber or fibers used; (2) the surface characteristics of the fibers; (3) the weight and weave of the material; and (4) the design of the finished product.

However, we must also recognize that before injury to a person can take place, the material must be ignited. The degree of seriousness of consequences from fire accidents related to flammable fabrics is, no doubt, greatest among children and older persons. When children are involved, it is likely that their lack of experience and tendency to panic, results in serious injury. The degree of mental alertness and physical abilities of the older person are no doubt responsible factors for serious injuries. This would be especially true of patients in hospitals, nursing homes or mental institutions, who cannot react promptly or correctly.

Therefore, it is our earnest request that your Committee give serious consideration to the following:

1. That the Flammable Fabrics Act be strengthened by an extension of the present coverage to additional wearing apparel particularly that worn by older persons;
2. That Congress either vote to fund adequately the present agencies charged with enforcing the Flammable Fabrics Act or give consideration to a restructuring of federal authority for setting standards, developing and disseminating information, and enforcement;
3. That it is our understanding, as of this writing, that an effective method of fireproofing polyester fabrics has not been perfected. Since polyesters are so widely used in clothing and interior furnishings, it is

earnestly requested that the federal agencies be encouraged to develop cooperative research programs with industry for the development of the technology necessary to accomplish flameproofing for polyester fabrics.

## II. FLOOR, CEILING AND WALL FINISHES AND COVERINGS

The annual statistics covering deaths caused by fires usually show that fewer than 20% of deaths due to fire are caused by actual burns. Over 80% of those deaths are due either to suffocation or asphyxiation. Tests in the actual burning of schools in Los Angeles, California, showed that the maximum safe time limit to exit all children from school rooms before deadly toxic gases reached a hazardous concentration in some part of the building was three minutes. Certainly then, these products should be classified, labeled, and hazardous ones banned from use in all structures.

It is our understanding that, because of the increased use of indoor-outdoor floor covering in places of public occupancy, Underwriters' Laboratories, Inc., has begun a test program to determine the potential hazards involved should a fire occur where such products are in use. When the results of the investigation are published, safety standards should be developed and incorporated in legislation to protect the public where potential hazards are determined to exist.

## III. NURSING HOMES

The tragic and unnecessary deaths of patients in nursing home fires has been well publicized. The appendix bibliography shows that much still needs to be done to provide at least minimum standards of safety for patients and staff. H.E.W. standards of safety have been promulgated and improved, now enforcement becomes the critical issue in achieving safety in nursing homes.

At the state level, less than half of the states (23) have adopted the "Life Safety Code" NFPA No. 101 and only 15 of those 23 have adopted the mandatory automatic extinguishing system requirements, as they apply to nursing homes. But we do note that of the 27 states that have not adopted the Life Safety Code, 18 have established requirements for automatic extinguishing systems for nursing homes. It is most important, however, that a state which has established requirements for safe practices and delegate administrative authority only to departments whose employees are well qualified to assume that responsibility. A group of engineers who design sprinkler systems recently called to our attention the fact that the administering department of one particular state had established design criteria for sprinkling systems to be installed in nursing homes that would have prevented the system from performing its intended function.

A new survey of state requirements for nursing homes has just been released (Nov. 1971). A copy is attached so that the data contained therein will be available for use by the Committee.

## IV. HOMES FOR THE AGED

Recognition should be given to the fact that not all homes for the aged are nursing homes. Some are without nursing care or nursing facilities. However, most of the comments contained in III above, "Nursing Homes," also apply to Homes For the Aged. Our purpose in discussing this point separately is for emphasis, in the hopes that all safety requirements for nursing homes will be made equally mandatory for homes for the aged.

Another group of homes for the aged that cannot be classified as nursing homes is that of the mobile homes and modular homes. The safety standards for "Mobile Homes" ANSI A119.1-NFPA No. 501-B 1971 have just been revised and greatly strengthened.

Mr. Chairman, we wish to thank you and the distinguished members of the Senate Special Committee on Aging for providing us with this opportunity to present the views of the more than 3.3 million members of the American Association of Retired Persons and the National Retired Teachers Association with respect to the fire hazards encountered by older persons. We hope these comments will be of some assistance to the Committee as it investigates ways to reduce the risk of death and injury due to fire which many older people must face, especially those less agile, and those confined to institutions.

## APPENDIX A

## BIBLIOGRAPHY

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## APPENDIX B

## STATE FIRE PROTECTION REQUIREMENTS SURVEY FOR NURSING HOME LIFE SAFETY\*

The NFPA has conducted a nursing home life safety survey whose purpose was to determine the number of states that have officially adopted NFPA No. 101, the *Life Safety Code*, and the mandatory fire-extinguishing system requirements applicable to extended-care facilities such as nursing home. Questionnaires were sent to 44 state fire marshals and were completed by 41. The responsibilities of the state fire marshals of Mississippi, Pennsylvania, and Wisconsin do not include nursing home life safety. In those three states and the states without fire marshals (Arizona, Colorado, Idaho, Missouri, New Jersey, and New York), Department of Health or Department of Labor officials responsible for nursing home life safety were surveyed. Thus the data collected represent responses from all 50 states.

The mandatory provisions for automatic extinguishing systems applicable to nursing homes contained in the 1970 Edition of the *Life Safety Code* are:

*New Nursing Homes*

SECTION 10-1361. Automatic fire-extinguishing protection shall be provided throughout all hospitals, nursing homes, and residential-custodial care facilities, except those of fire-resistive or protected noncombustible construction. (See 10-132 for construction types permitted.)

*Existing Nursing Homes*

SECTION 10-2341. Automatic fire-extinguishing protection shall be provided throughout all hospitals, nursing homes, and residential-custodial care facilities, except those of fire-resistive construction or protected noncombustible construction not over one story in height.

\*This report was compiled by A. Elwood Willey from a survey conducted by the NFPA.

Each state official surveyed was asked if the provisions of the two Sections had been adopted. If the provisions had been adopted, an estimate of the number of nursing homes provided with fire-extinguishing systems was requested. Those states allowing deviations from the mandatory fire-extinguishing system requirements were also recorded. The states were also asked if their requirements went beyond the *Life Safety Code* fire-extinguishing system requirements. Those states not adopting the *Life Safety Code* were asked to report other fire-extinguishing system requirements adopted.

Fire-extinguishing system requirements for nursing homes have been included in the *Life Safety Code* since the 1963 Edition. The 1970 provisions are similar to the requirements in the 1966 and 1967 Editions, with editorial changes. The specific fire-extinguishing requirements adopted in states may vary, depending on the *Code* edition adopted.

#### SURVEY RESULTS

TWENTY-THREE OF THE 50 STATES have officially adopted NFPA No. 101, the *Life Safety Code*, in their state regulations applicable to nursing homes. Fifteen of those 23 states have adopted the mandatory automatic extinguishing system requirements contained in the *Code*. The eight others apply sprinkler protection requirements that differ in some respects from those in No. 101 (the deviations are below noted in Table 1, "Survey Results by State"). Of the 27 states that have not adopted No. 101, 18 states indicated they have automatic sprinkler system requirements applicable to nursing homes (their requirements are also noted in Table 1). A total of 41 states reported requirements for automatic sprinkler systems in nursing homes (as is noted in Table 1). Additional details are included in the following survey analysis.

#### *Adoption of NFPA No. 101, the Life Safety Code*

In addition to the 23 states that have officially adopted NFPA Standard No. 101, five are revising their nursing home regulations, with No. 101 under consideration for adoption.

#### *Adoption and Application of the Sprinkler Requirements in NFPA No. 101*

Fifteen of the 23 states that have adopted No. 101 have applied the mandatory automatic extinguishing system requirements for nursing homes. One of the 23 states, Delaware, may revise its sprinkler protection requirements to agree with No. 101. Montana and Nebraska have adopted Section 10-1361 only.

Twelve states that have adopted the automatic extinguishing system provisions of No. 101 reported the percentage of nursing homes that are in compliance with the requirements.

Compliance Percentage:	Number of States
75 to 100.....	8
50 to 74.....	0
25 to 49.....	2
0 to 24.....	2
Total .....	12

Six of the 15 states that have adopted the mandatory nursing home automatic extinguishing system requirements enforce additional provisions beyond the minimum requirements of Sections 10-1361 and 10-2341. The six are: Alabama, Alaska, Maine, Maryland, Tennessee, and West Virginia.

Three states that have adopted the No. 101 extinguishing system requirements allow deviations from those provisions. They are Alaska, New Hampshire, and Washington.

Eighteen of the 27 states that have not adopted No. 101 have automatic extinguishing system requirements that apply to nursing homes.

Have requirements.....	18
Do not have requirements.....	7
Recommend automatic extinguishing systems.....	2
Total.....	27

#### *States That Do Not Require Automatic Extinguishing Systems in Nursing Homes*

Nine states— Arizona, Colorado, Kansas, Mississippi, New Jersey, North Carolina, North Dakota, Pennsylvania, and Texas—have no automatic extinguishing system requirements for nursing homes.

TABLE 1.—SURVEY RESULTS BY STATE

State	Reporting agency or official	NFPA No. 101 adopted	NFPA No. 101 automatic extinguishing system provisions adopted	Other State automatic extinguishing system requirements
Alabama	Fire marshal	Yes	Yes	Not applicable.
Alaska	do	Yes	Yes	Requirements of uniform building code (1970) also applied (UBC requires sprinklers in all nursing homes).
Arizona	Department of health.	No; portions adopted (hospital occupancies).	No	Automatic sprinkler protection for nursing homes recommended.
Arkansas	Fire marshal	No	No	Existing wood-frame construction must be sprinkler protected.
California	do	No	No	Sprinklers required in nursing homes established after Nov. 9, 1969; facilities constructed before that date are exempt.
Colorado	Department of public health.	No; portions adopted (hospital occupancies); regulations being revised.	No	No requirements.
Connecticut	Fire marshal	No	No	Sprinklers required for frame construction.
Delaware	do	Yes	At present no; reviewing requirements.	Sprinklers required in nonfire-resistive nursing homes over 1 story.
Florida	do	Yes	Yes	Not applicable.
Georgia	do	Yes	Yes	Do.
Hawaii	do	Yes	Yes	Do.
Idaho	Department of health.	No; regulations being revised.	No	Automatic sprinklers required in existing multi-story nursing homes of other than fire-resistive construction.
Illinois	Fire marshal	No; portions adopted by reference.	No	Sprinklers mandatory in new nursing homes and in certain cases in existing nursing homes.
Indiana	do	Yes	No	Patients restricted to 1st floor in nonsprinklered buildings of heavy timber, ordinary, or wood-frame construction.
Iowa	do	No; regulations being revised.	No	1957 regulations require sprinkler systems in all multi-story nursing homes not of fire-resistive construction; all nursing homes of frame or ordinary construction with 20 or more patients must be sprinkler protected.
Kansas	do	No	No	No. 101 used as a reference; sprinklers strongly recommended.
Kentucky	do	Yes	No	Sprinklers required for wood-frame construction or in nursing homes over 1 story high of other than fire-resistive construction.
Louisiana	do	Yes	Yes	Not applicable.
Maine	do	Yes	Yes	Do.
Maryland	do	Yes	Yes	Do.
Massachusetts	do	No	No	Automatic sprinklers required in all nursing homes.
Michigan	do	No	No	Existing construction required to be sprinkler protected except where fire detection is provided or patients are ambulatory and occupy the 1st floor; new facilities—fire-resistive construction required, hazardous areas must be sprinkler protected.
Minnesota	do	No	No	Nursing homes of combustible construction occupied by more than 16 patients required to be sprinkler protected (NFPA No. 101 is also used as a reference).
Mississippi	Board of health	No	No	No requirements.
Missouri	Department of health and welfare.	No	No	Sprinklers required in existing nursing home facilities of other than fire-resistive construction.

TABLE 1.—SURVEY RESULTS BY STATE—Continued

State	Reporting agency or official	NFPA No. 101 adopted	NFPA No. 101 automatic extinguishing system provisions adopted	Other State requirements	automatic extinguishing system
Montana.....	Fire marshal.....	Yes.....	No; only new construction provisions adopted.	No requirements.	
Nebraska.....	do.....	Yes.....	do.....	Do.	
Nevada.....	do.....	Yes.....	No.....	New nursing home facilities must have automatic sprinkler protection—1970 uniform building code requirements (UBC requires sprinklers in all new nursing homes).	
New Hampshire.....	do.....	Yes.....	Yes.....	Not applicable.	
New Jersey.....	Department of institutions and agencies.	No; regulations being revised.	No.....	No requirements.	
New Mexico.....	Fire marshal.....	Yes.....	Yes.....	Not applicable.	
New York.....	Division of fire safety.	Yes.....	No.....	Sprinklers required in hazardous areas.	
North Carolina.....	Fire marshal.....	No.....	No.....	North Carolina State Building Code requires fire detection systems; sprinklers may be installed in lieu of detection.	
North Dakota.....	do.....	No.....	No.....	No requirements.	
Ohio.....	do.....	No.....	No.....	Ohio State Building Code requires sprinklers in nursing homes with over 30 patients.	
Oklahoma.....	do.....	Yes.....	Yes.....	Not applicable.	
Oregon.....	do.....	Yes.....	No.....	Nursing homes built or occupied before 1964 required to comply with 1959 edition of No. 101; uniform building code requirements applied to new construction; sprinklers in new construction required, except in sleeping areas less than 500 square feet and in surgeries.	
Pennsylvania.....	Department of labor and industry.	No.....	No.....	No requirements.	
Rhode Island.....	Fire marshal.....	No.....	No.....	All existing nursing homes of combustible construction required to be sprinkler protected (Exception: if adequate water is not available, fire detection system is required).	
South Carolina.....	do.....	No.....	No.....	State amendment to sec. 407.3, Southern Standard Building Code: sprinklers required except for "fireresistive, fireproof, or noncombustible construction".	
South Dakota.....	Department of health.	No.....	No.....	Sprinklers required for multistory protected frame construction and in certain hazardous areas.	
Tennessee.....	Fire marshal.....	Yes.....	Yes.....	Not applicable.	
Texas.....	do.....	No.....	No.....	No requirements.	
Utah.....	do.....	No; portions adopted (hospitals and educational facilities).	No.....	Regulations for nursing homes (1966): sprinklers required, except in fire resistive or noncombustible construction not over 1 story; other exceptions include allowance for detection systems or public fire protection.	
Vermont.....	do.....	No; regulations being revised.	No.....	Sprinklers required, except in 1-story nursing homes of fire-resistive construction.	
Virginia.....	do.....	No.....	No.....	Sprinklers required in existing facilities of other than fire-resistive construction; in new low-rise facilities fire-resistive construction requirements may be waived for sprinkler protection.	
Washington.....	do.....	Yes.....	Yes.....	In addition, sprinkler requirements of uniform building code are applied (UBC requires sprinklers in all new nursing homes); in existing nursing homes deviations from construction requirements allowed for sprinklers.	
West Virginia.....	do.....	Yes.....	Yes.....	Not applicable.	
Wisconsin.....	Board of health and department of industry, labor and human relations.	No.....	No.....	In new and existing facilities sprinklers required other than fire-resistive construction.	
Wyoming.....	Fire marshal.....	Yes.....	Yes.....	Not applicable.	

ITEM 2. LETTER TO MR. HALMANDARIS FROM THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE, BUREAU OF COMMUNITY ENVIRONMENTAL MANAGEMENT

CINCINNATI, OHIO, *September 29, 1971.*

DEAR MR. HALMANDARIS: It was a pleasure to talk with you by telephone on September 27, 1971 and to learn of your interest in the burn injury problem. It is stimulating to learn that others are equally concerned and actively involved in controlling this major public health problem.

This program has for a number of years been involved in carrying out community oriented programs designed to reduce the burn injury problem. Programs and activities may be grouped into four categories: (1) surveillance and epidemiology; (2) program operations—implementation of preventive programs through the conducting of (a) pilot studies and demonstration projects, (b) training and education, (c) standards, codes and regulations; (3) research; and (4) liaison activities.

The following is a brief résumé of the Division's previous major programs relating to seeking an understanding of the burn problem and the implementation of control measures. I have not included projects where burn prevention was other than the major program objective.

*1. Mississippi County, Arkansas Fire Prevention Research Project*

This burn study and prevention program was conducted in a large semi-rural county in Arkansas. It consisted of determining through epidemiological investigations the nature and extent of the problem; developing and implementing appropriate control measures and an evaluation of program effectiveness. After one year of concentrated preventive programming, burn injuries were reduced by over 50%. Educational programs involved reaching every school in the county at least four times annually as well as presenting programs before clubs, civic groups, youth organizations, and adult groups at least once a year.

One major outcome of this program was the development of a simple, inexpensive demonstration unit that has received widespread acceptance and use since its development over 10 years ago. An example of how one person has promoted the unit in a continuing program is shown by the enclosed document from the Texas Farm Bureau. One can safely say that in the past 11 years millions of persons throughout the nation have viewed and benefited from seeing this fire prevention demonstration. Hundreds of demonstration units have been built or purchased by health and health-related agencies, fire departments, universities, safety organizations and others too numerous to mention in an effort to spread the word about fires and their prevention. (See attachments 1, 2, 3\*.)

*2. State of Arkansas Burn Prevention Project*

Through the techniques learned from the Mississippi County project in community organization, a state-wide burn prevention program was initiated. During the second year of comprehensive preventive program efforts in all areas of the state, Arkansas experienced its lowest fire death rate within the decade. Those involved in community programming were public health personnel, safety organizations, fire departments, school officials and other concerned groups and organizations.

*3. Textile Flammability Conference*

The subject conference was a cooperative effort between this program and the National Fire Protection Association. The conference reviewed the effects of textile flammability from records of fires and fire casualties and discussed possible solutions to the problem. (See attachment 4\*.)

*4. Feasibility Study for Flame Retardant Fabrics*

This study was initiated in two nursing homes in Arkansas to demonstrate the feasibility and acceptability of flame-retardant fabric in consideration of (1) medical acceptability, (2) esthetic acceptability, (3) wear and tear qualities and (4) durability of flame retardance in actual use. (See attachment 5\*.)

*5. Mississippi four County Fire and Burn Prevention Project*

Through the assignment of one program person to a rural four county area in the State of Mississippi, the identification of specific fire and burn hazards previously unobserved by local fire and health persons became evident. Preventive

\*Attachments retained in committee files.

programming was initiated; however, due to the untimely transfer of the assignee, no evaluation of the project's effectiveness was made.

*6. Robeson County, North Carolina Fire and Burn Study and Prevention Program*

This project identified the need for proper home emergency medical services and a better understanding of burn causative factors within a high risk population. Through the development of a training program designed to teach community Indian leaders the techniques of fire and burn prevention and first aid, program successes were recorded.

The evaluation revealed a 65% reduction of burn injury admissions during a nine-month period for non-white children under ten when compared to a corresponding period of time. (See attachment 6).\*

*7. Birmingham, Jefferson County, Alabama Burn Prevention Project*

This was our first major attempt to initiate a burn prevention program in a large metropolitan area. The program consisted of studying the problem through an analysis of hospital records; development of preventive program tools; and organizing community action groups to present burn prevention messages to the community and into the home. The degree of reduction of injuries from burns due to this program could not be established with any certainty, but the Health Department did report a decrease of approximately 15 percent in burn fatalities from 1965 to 1967. (See attachment 7).\*

*8. Conference on Burns and Flame-Retardant Fabrics*

This Conference was a direct result of the Textile Flammability Conference related in number 3. This program played a major role in organizing and conducting the conference and the dissemination of the Conference proceedings. (See attachment 8).\*

*9. Fire and Accident Prevention Demonstration Program—Idaho Department of Health*

This three-year demonstration project revealed: (1) the effectiveness of comprehensive fire prevention programs for reducing fire hazards and increasing patient morale and sense of security in nursing homes, boarding homes and related facilities; (2) the economic gain and rewards accruing from effective prevention programs made possible by providing accident prevention consultation to care facilities throughout the State. An on-going burn prevention project in the State of Idaho resulted from this demonstration project. (See attachment 9).\*

*10. Missouri Sias County Fire and Burn Prevention Project*

The completion of a pilot burn prevention demonstration project which was initiated in a six county area Southeast Missouri in November 1966 has proven the effectiveness of the community approach to preventing burn injuries. The project was supported by Federal funds and carried out by the State and District Health Department. The initial phase of the project began with surveillance activities to determine what types of burns were occurring and to what age group. As soon as this was established, a comprehensive community action program began in the area designed to reduce or prevent fire and burn injuries. The success of this project was due primarily to the fact that the educational program was designed around the fire and burn problems experienced in the project area.

In evaluating the overall project, it was found that a significant reduction in fire death rates had occurred during the three-year project. Prior to the project, fire death rates averaged 19.2 per 100,000. At the end of the project, fire death rates were reduced to 7.4 per 100,000 thus resulting in a 61.4% reduction in fire death rates when compared to a corresponding period of time. In comparison, other areas of the state showed an increase in burn deaths as contrasted to a decrease in project area. (See attachment 10).\*

*11. The Carbon Monoxide, Fire, and Explosion Problem in Travel Trailers and Pickup Campers*

This project involved a detailed study of environmental fire and fire related hazards in recreational vehicles. The findings of the study resulted in carrying out additional studies and the conducting of educational programs to minimize the CO and fire burn problem. (See attachment 11).\*

\*Attachments retained in committee files.

*12. The Prevalence of Carbon Monoxide and Fire Hazards in a Mobile Home Environment*

Prevalent fire hazards in mobile homes were identified in this study which lead to:

- (1) identifying 16 possible approaches to minimizing the problem of CO and particularly fire; and
- (2) the continuation of investigation and educational programs by the local health agency. (See attachment 12).\*

*13. Generation of Lethal Environments in Building Fires*

Through a three year research study, information was obtained on the generation of several noxious compounds (including smoke) in building fires and their synergistic effects. This provided information essential for determining the need for building designs and materials (existing and new) and understanding the factors affecting the severity and duration of fires. (See attachments 13, 14).\*

Enclosed also for your information is a copy of our electric shock prevention demonstration guide.\* The electric shock unit was developed by program personnel and is receiving widespread use throughout the nation. We think this is an essential program for reducing burns associated with electrical current.

Our limited resources has made it necessary to place primary program emphasis in the burn area to the home, community, and particularly the child. Other areas of interest certainly include places of public occupancy, including extended care facilities. We are currently attempting to inform official and voluntary agencies, key groups and individuals as to the nature and extent of the burn problem and impart known basic safety concepts to children and their families. We are also reviewing many of our prevention activities in order to determine their effectiveness and the need for possibly redirecting some of our program's efforts. I would be happy to discuss these ideas further should you wish to do so.

This resume will hopefully give you a general idea of our previous and current activities and programs relating to fire and burn prevention. Perhaps some of these will not be appropriate for your immediate needs, but do help relate the entire spectrum of activities.

I hope this will be helpful to you in achieving your specific objectives. We will be pleased to provide additional information if needed.

Sincerely yours,

FLOYD B. OGLESBAY,  
Chief, Injury Control Branch.

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ITEM 3. LETTER FROM ROBERT E. BLANCHARD, DIRECTOR, MARKET DIVISION, AMERICAN TEXTILE MANUFACTURERS INSTITUTE, INC.; TO SENATOR CHURCH, OCTOBER 11, 1971

AMERICAN TEXTILE MANUFACTURERS INSTITUTE, INC.,  
New York, N.Y., October 11, 1971.

DEAR SENATOR CHURCH: We have recently received a copy of Mr. John E. Field's letter to you of October 6, 1971 in response to your letter of September 29th concerning the hearings to be held on October 12th dealing with "Flammable Fabrics and Other Fire Hazards of Special Concern to Older Americans." The American Textile Manufacturers Institute (ATMI) has been deeply concerned with the subject of fabric flammability for many years. We have an obvious desire to take positive industry action to reduce injury and death where a need is demonstrated, where technology exists and where the economics are practicable.

Our organization has no proprietary or reliable information to answer your first question. We do understand that you have received some information, in the best form available, from other sources. We will not repeat such statistics. Our general comment would be that undoubtedly the elderly would be prone to all types of accidents most particularly when the person is infirm, senile or in any

\*Attachments retained in committee files.

way disabled. Although we feel there is a lack of really reliable statistical information to either confirm or deny this fact, we would have to agree that a greater risk does exist for the elderly than with many other age groups, probably in severity of injury if not in number of injuries.

What new hazards may be arising for the elderly? It would be our opinion at this time that fire hazards, particularly fabric hazards, have not increased. To the contrary, it would be the opinion of our technicians that today's fabrics probably are generally less flammable than those made last year or ten years ago. It would also be our opinion that nursing homes and other similar institutions, could provide better supervision of the elderly than would be provided for those same individuals living by themselves or with other of similar circumstances.

We regret that we have not had time to fully consider any constructive suggestions for your Special Subcommittee but there are some obvious solutions to the problem. The installation of sprinkler systems in nursing homes and similar institutions could be an important one. Textile manufacturers have some limited technology whereby they can offer "fire retardant" or "self extinguishing" characteristics for a *very* limited line of fabrics. When manufacturing such fabrics, however, we must realize that at this time there is necessarily a trade off of such desirous characteristics as aesthetics, durability, economics and ease of care. Even then there is no real evidence or experience to show that burn cases in any age range can be substantially reduced by the use of protective clothing. *Reasonable* standards for interior furnishings could possibly be helpful. We wish we knew the answers and we are continuing to search for them. Until the proper fabrics arrive we feel that public education is probably the most realistic answer to reducing burn cases. You certainly must consider controls for known sources of ignition such as open space heaters.

Please do not hesitate to contact us if we can be of assistance to you in the activities of your Special Subcommittee. We thank you very much for the opportunity to make this response.

Sincerely,

ROBERT E. BLANCHARD,  
*Director, Market Division.*

ITEM 4. LETTER FROM J. B. GOLDBERG, CHEMICAL ENGINEER,  
CONSULTANT TO THE TEXTILE AND ALLIED INDUSTRIES; TO  
SENATOR CHURCH, OCTOBER 5, 1971

NEW YORK, N.Y., *October 5, 1971.*

DEAR SENATOR CHURCH: Acknowledging your letter of Sept. 29, 1971, please note that I am no longer a member of the National Advisory Committee for the Flammable Fabrics Act. However, I continue to maintain an active interest in all matters relating to fabric flammability and am presently Chairman of the Education and Legislation Committee, Information Council on Fabric Flammability.

It is generally agreed that elderly people are somewhat in the same position as young children in their inability to act quickly and cope with accidents as readily as most younger people. As you probably know, progress is being made in trying to minimize injuries sustained when apparel fabrics or mattresses are accidentally ignited, through carelessness or ignorance of the fact that most textile fabrics will burn. Without going into details, the state of the art of producing acceptable and durable fabrics which will not ignite is such that non-flammable clothing of all types is not yet available. If and when, at some future date, suitable materials reach the market, how one makes it mandatory for all persons above a certain age to purchase and wear such garments presents a difficult problem. On the other hand, more readily available are fabrics and fabric finishes for draperies, curtains, upholstered furniture, carpeting and, to a limited extent, blankets, which afford good protection against accidental ignition. I feel that such items should be used by nursing homes and similar institutions where the elderly are likely to be housed.

In my opinion, education can still play an important part in reducing the number of injuries and deaths incurred in fires of all types and your committee

may be able to take steps to publicize *preventive* measures while at the same time striving to find a cure.

Please do not hesitate to call upon me if you feel that I can be of any assistance.

Sincerely yours,

J. B. GOLDBERG.

ITEM 5. LETTER FROM DANIEL CHAUCER, VICE PRESIDENT, DIRECTOR, BUREAU OF STANDARDS, R. H. MACY & CO., INC.; TO SENATOR CHURCH, OCTOBER 8, 1971

R. H. MACY & Co., INC.,  
New York, N. Y., October 8, 1971.

DEAR SENATOR CHURCH: I completely share your concern and sentiments that reasonable and appropriate measures must be taken to prevent reoccurrences of incidents such as happened at the Marietta, Ohio nursing home. I believe they can be prevented, but I am concerned because I feel that in a large part our well-intentioned efforts are being misdirected along lines which are inadequately productive to the exclusion of more meaningful activities. The current body of thinking appears to be that fire related injuries can be reduced solely by the promulgation of standards for selected product applications. This attitude fails to take into consideration the total environmental system and its relationship to modes of flame propagation and the interrelationship of garments and furnishings worn or used in combinations. There has been much discussion of this at meetings of the Advisory Committee to the Department of Commerce under the Flammable Fabrics Act. The restrictive nature of this Act has precluded the consideration of providing residential and institutional protection through the mandated use of automatic extinguishing systems.

I do not believe that the existence of fire retardant clothing or furnishings will have significant effect on the number or severity of such instances unless, in fact, it were possible to insure that all components—textiles, plastics, furniture, wood structure, and even newspapers—were flame retardant. Such possibility does not exist and even if it did, the cost of providing this kind of protection would be far greater than that of providing automatic extinguishing systems.

I further do not believe that a group distinction should be made on the basis of "older American". Age certainly is not the sole criterion of physical ability. You spoke of "tragic consequences of fires in nursing homes and similar institutions". The persons involved are better described as disabled rather than old. As you are undoubtedly aware, there are no style or size differences for disabled or older persons, which would allow any approach such as was taken with children's sleepwear. If, however, it is your intention to provide increased protection to institutionalized persons, surely the institution can provide and mandate the use of flame retardant nightwear or other clothing.

With reference to my earlier comments about fire retardant clothing and furnishings not being the answer, some current investigations being conducted by the office of Flammable Fabrics of the Department of Commerce will be of interest to you.

Following the Marietta, Ohio nursing home fire, the Department constructed and has been testing carpets in a room and corridor enclosure simulating the nursing home. They have been able to duplicate the rapid fire ball effect that was reported in the nursing home. However, the same effect was reproduced in the absence of carpeted floors. Indications are that the flammable nature of furnishings, once ignition is initiated, is less significant than we had assumed and likely not the contributing factor to the fatalities which resulted.

The ineluctable conclusion is that tragedies such as occurred in Marietta, Ohio would have been precluded by an automatic extinguishing system, but would not have been prevented by the use of flame retardant furnishings in the absence of such extinguishing systems.

It is not my intention to suggest herein that we need pay no concern to the flammable nature of fabrics. It is instead responsive to your request for "suggestions for action by government agencies or private organizations".

Specifically, I suggest that Federal laws be enacted mandating the inclusion of approved type automatic extinguishing systems in all new nursing homes or similar institutions.

Also, the Department of Commerce should be funded and instructed to develop alternate independent systems for existing structures which cannot economically be modified to accommodate water sprinklers. Such systems could conceivably use self-contained water or other chemicals as the extinguishing medium.

Sincerely,

DANIEL CHAUCEY,  
Vice President, Director, Bureau of Standards.

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ITEM 6. LETTER FROM ARTHUR GREEN, EXECUTIVE SECRETARY,  
NATIONAL COTTON BATTING INSTITUTE; TO SENATOR CHURCH,  
OCTOBER 6, 1971

NATIONAL COTTON BATTING INSTITUTE,  
Memphis, Tenn., October 6, 1971.

DEAR SENATOR CHURCH: In reply to your letter of September 29, we are enclosing a copy of a letter sent by the National Cotton Batting Institute to the Department of Commerce in regard to its proposed flammability standard for mattresses.\*

As pointed out to the Department, we are opposed to the standard as now drawn, on the grounds that it will not truly protect the public from the dangers of fire. We think this applies especially to older people. As statistics show, many nursing home and institutional fires include those involving an open flame source. However, the proposed standard provides little or no protection from such a fire.

Older people, who might sleep on a mattress meeting the proposed standard, would be given a false sense of security, thinking they were being protected by a fully fire retardant mattress. We feel the introduction of mattresses that afford only "minimal" protection would actually, in effect, represent a "new hazard," rather than provide a full measure of safety.

In the event of a flaming fire, rather than one that smolders from a lit cigaret, those sleeping on such a mattress could be seriously injured or killed.

We hope these observations will prove of some use to your committee, and thank you for the opportunity to comment.

Sincerely,

ARTHUR GREHAN, *Executive Secretary.*

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ITEM 7. LETTER FROM G. F. CRICELAIR, M.D., AMERICAN SOCIETY OF  
PLASTIC AND RECONSTRUCTIVE SURGEONS, INC.; TO SENATOR  
CHURCH, OCTOBER 10, 1971

AMERICAN SOCIETY OF PLASTIC & RECONSTRUCTIVE SURGEONS, INC.,  
October 10, 1971.

DEAR SENATOR CHURCH: Your letter of September 29 arrived while I was away at meetings in Canada. Hopefully, this reply will be in your hands before your hearing on October 12. I would have enjoyed the opportunity to appear personally.

There is no question in the minds of the doctors who care for burned patients that the very young and elderly are most vulnerable to this injury. Even the members of the Advisory Committee to the Secretary of Commerce on the Flammable Fabrics Act agree with this. Massive numbers of data are not needed to prove this: practically one burn victim is enough to prove the point.

As pointed out in numerous places in the proceedings published annually by the Information Council on Fabric Flammability, there is a real problem involving night clothes, bedding and mattresses.

Since the publication of standards recently on children's sleepwear and according to the testimony of industry in December of last year, industry can meet the needs and supply permanent flame retardent clothing. That law which involves night clothes of only a certain size can and should be expanded to all clothing.

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\*Retained in committee files.

Certainly robes and night clothes, bedding and mattresses in all convalescent homes, government hospitals and nursing homes should be covered by law forcing the use of flame retardant materials. This will be a great step in showing concern for our people; industry must recognize their responsibility in this regard.

Please let me know the outcome of your hearing and the committee's deliberation.

Sincerely yours,

G. R. CRICKELAIR, M.D.

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ITEM 8. LETTER FROM LOUIS SEGAL, FIRE PROTECTION ENGINEER,  
STATE FIRE MARSHAL, STATE OF CALIFORNIA; TO SENATOR  
CHURCH, OCTOBER 8, 1971

STATE FIRE MARSHAL,  
*Los Angeles, Calif., October 8, 1971.*

DEAR SENATOR CHURCH: Your letter of September 29 was forwarded to me while on my vacation, and I'm hoping to get this reply to you in time for your October 12 hearing. The prospects are poor.

Since avoidance of or escape from the hazard of fire involves knowledge, emotional stability, mental competence and physical agility, it is self-evident that any segment of the population deficient in any of these attributes is more than normally vulnerable.

Obviously there are many elderly persons who lack either mental or physical competence, or both, and of course some are totally dependent on others for their safety. Therefore I believe it is unarguable that at least a significant proportion of elderly persons are especially vulnerable to fire hazards.

In this regard, it is universally recognized that physically helpless persons are non-ambulatory, and require the maximum in protection. Less well known is the fact that many physically sound but mentally deficient patients must be considered "nonambulatory" from the fire safety standpoint, often requiring more staffing to get them out, *and keep them out*, than bedridden patients.

For the same reasons as cited earlier, the less competent aged person is much more than normally vulnerable to the specific hazard of flammable clothing. Over the years, in my educational efforts, I have stressed that the clothing fire is in a class by itself, the one fire from which there is no escape, no place to run. Of all fire threats, this is by far the most personal, the one requiring the greatest presence of mind, alertness, and knowledge of what to do on the part of the victim or others.

Statistics bear ample evidence that the aged suffer far more clothing fire casualties than would be expected by their proportional share of the population. The same is true of the class of young children, and of course for similar reasons.

Regarding new hazards, it is vitally important that new products be evaluated for possible hazardous properties, and this certainly is a proper function of government. If the hazard cannot be eliminated, it must at least be disclosed, with appropriate warning for safe use. As to new fire hazards, I strongly recommend priority effort towards solving our old and well-known problems such as killer mattresses and sofas, and fire-trap construction.

For example, the inordinate attention paid recently to the supposed hazard of synthetic carpeting is in my opinion not justified by the record. It is too often forgotten that just as it takes two to tango, it takes more than a flammable material to have a fire hazard. There must also be a source of ignition. An elderly patient who smokes is far more likely to catch his robe or his pajamas or his bed on fire than one who doesn't. By the nature of its use, carpeting is very rarely exposed to a source of ignition capable of starting a fire. While I agree that less flammable carpeting is desirable, I simply contend that we have more urgent business to take care of.

For several reasons, I do not believe it is feasible to establish a stringent standard for flame resistant clothing for the elderly as has been done for children's nightwear. There is no reason, however, why institutional occupancies for the aged should not specify such articles when warranted. Every hospital and nursing home or home for aged could furnish non-flammable night clothing and robes for any patient or guest who smoked. Ideally, this protection should be provided for all, but there are many technological and economic problems in the way of achieving fire safe clothing.

I would assign the highest priority to the need, not only for the aged but for every bed in America, for fire-safe mattresses. The number one killer by fire is the smoldering mattress or over-stuffed furniture.

Finally, I believe the most urgent single need for protection of the elderly from fire in institutional buildings, assuming reasonably adequate construction, is full automatic sprinkler coverage. This, along with continual, effective training of staff for emergency procedures, would insure the ultimate in safety.

Yours very truly,

ALBERT E. HOLE,  
State Fire Marshal.  
By LOUIS SEGAL,  
Fire Prevention Engineer.

ITEM 9. LETTER FROM HOWARD PYLE, PRESIDENT, NATIONAL SAFETY COUNCIL, CHICAGO; TO SENATOR CHURCH, OCTOBER 8, 1971

NATIONAL SAFETY COUNCIL,  
Chicago, October 8, 1971.

DEAR SENATOR CHURCH: Thank you for your letter of September 29, 1971, concerning the Hearing on "Flammable Fabrics and other Fire Hazards of Special Concern to Older Americans" by the U.S. Senate Special Committee on Aging. The work and special hearings of this Committee have been of great interest to us in the past.

Of the 114,000 accidental deaths each year in the United States, nearly one-fourth occur to those over 65 years of age. The aged make up an even higher proportion of those disabled and invalided because of millions of major and minor accidents each year. The death rate from accidents among persons 65 and over is 141 (141 deaths per 100,000 population within the age group). The rate for all ages is 57.0. Among the elderly, falls (12,600) are the leading cause of death, followed by motor-vehicle (7,400 including pedestrian), with deaths due to fires, burns and deaths associated with fires (2,000) being third.

The question of why people over 65 years of age have more frequent, more disabling and more frequently fatal accidents than younger people demands a knowledge of some of the changes which come about in the body as we grow older. When considering the means of preventing accidents to the elderly we must consider the following changes which take place and greatly influence the chances of having an accident: (1) physical factors—mobility, hearing, vision, sense of smell, disorientation (physical and psychological factors); (2) tolerance factors—heat and cold, smoke, gases, shock; (3) psychological factors—memory, concentration, awareness of environment, nocturnal wandering, clinging to the past in search of security which leads to hoarding, etc.

Unfortunately, we have little information of a concrete nature concerning flammable fabrics, fires and burns to the aged. It is most likely that flammable fabrics are an important contributing factor in the total number of fire injuries and deaths involving the elderly. It is our position that every effort should be made to do everything possible to reduce the hazards resulting from fabrics which are of a flammable nature. Every effort should be made to endeavor to develop an environment free from accident causing hazards for the aging population.

Regarding new hazards arising, as more hi-rise buildings are used to house the elderly, the special fire hazards arising from such must be taken into account (ref. *Public Buildings Service International Conference on Fire-safety in Hi-Rise Buildings*, U.S. Government Printing Office: 1971 O-429-190).

We highly support extended efforts on the part of government and private organizations to investigate and substantiate the definite causes of the injuries and deaths to the aging. Funding is greatly needed to accomplish this. Funding is greatly needed for research, education and a continuing awareness and action. These are the avenues that we must travel in order to accomplish the goal of reducing the toll of lives lost and disabilities caused by accidents to the aging, as well as all age groups.

Enclosed you will find materials that may be of interest and use to you in the hearing proceedings.\* We also would reference the booklet entitled, *Life Safety*

\*Retained in committee files.

*From Fire, A Guide for Housing the Elderly*, Dept. of Housing and Urban Development, U.S. Govt. Printing Office: 1968 O-320-188.

We thank you for this opportunity to be of service to you and the Special Committee on Aging.

Sincerely,

HOWARD PYLE.

ITEM 10. LETTER FROM GEORGE S. BUCK, JR., TECHNICAL CONSULTANT, NATIONAL COTTON COUNCIL OF AMERICA; TO SENATOR CHURCH, OCTOBER 4, 1971

NATIONAL COTTON COUNCIL OF AMERICA,  
October 4, 1971.

DEAR SENATOR CHURCH: This is in response to your letter of September 29 in which you ask for comment about hazards to the elderly from flammable fabrics.

We will endeavor to answer your questions, and also will enclose a number of reprints on the subject of textile flammability which may be of use to you and other members of your committee.\* We can furnish additional copies of most of the reprints if they are needed.

1. We and others do have rather clear evidence that flammability hazards tend to be greater for the elderly than for those near the median population age. Please note the reprint entitled *The Case for Flammability*. Figure 3 shows that flammability accidents do tend to be more frequent for the elderly, although the total is not much greater than for the eleven-to-thirty age groups. However, fatalities are markedly higher for the elderly.

I doubt that the flammability accidents are much different from other accidents to the elderly. For example, one would expect the elderly to suffer more frequently from falls, and for the falls to have more serious consequences than for younger age groups.

We are continuing to survey flammability accidents, and our current data support the conclusions of the enclosed study which was made a number of years ago; children are the most susceptible to flammability accidents, but the elderly are next.

2. I do not believe that the elderly are exposed, or will be exposed, to any new flammability hazards. The entire textile industry is very conscious of potential flammability problems. The trend is to avoid any material or construction which might have a special susceptibility to flame. That does not mean, of course, that textile products won't burn. It is inherent in the nature of most fibers, and therefore, of most fiber products, that they are combustible in one degree or another.

The evidence we have indicates flammability accidents have declined in number during the past fifteen years. In addition, new federal standards for mattresses, and additional standards under development for blankets will have the effect of further reducing those accidents associated with smoking in bed.

In summary, we believe that new hazards are not arising and that flammability accidents to the elderly are declining. We can furnish additional explanation of this trend if that is desirable.

3. There are obviously a number of ways in which flammability hazards to the elderly may be reduced. Some of the more obvious may not, in fact, be the best solutions to the problem.

There unquestionably will be an effort made to require that clothing for the elderly be made fire-resistant. We think this proposal should be very carefully studied before any such action is taken. The added cost to the elderly will be quite large; the products which can be made fire-resistant are generally far less satisfactory than those they would replace; and, at least up to this time, there seems to be no easy way to differentiate clothing for the elderly from clothing which is furnished to the adult population as a whole.

Here again I could enlarge on this subject at length. Some of the reprints I have enclosed may help explain why I feel that fire-resistant clothing materials are not the answer, at least at this stage of our technology.

\*Retained in committee files.

It seems to me that there are far greater opportunities to reduce those flammability accidents which do occur, through education, better care of the elderly, and by regulation of the sources of ignition.

We have devoted 35 years of study to problems of textile flammability and fire-resistance and hope you will not hesitate to call on us for additional information that may help the deliberations of your committee. You may be sure that the cotton, textile, apparel, and retail industries are interested in cooperating with you in every possible way to prevent accidents and injuries to the elderly.

Sincerely yours,

GEORGE S. BUCK, Jr.,  
*Technical Consultant.*

ITEM 11. LETTER FROM FOSTER C. WILSON, GROUP MANAGER, PRODUCT TESTING LABORATORIES, OWENS-CORNING FIBERGLAS CORP., TECHNICAL CENTER; TO SENATOR CHURCH, OCTOBER 6, 1971

OWENS-CORNING FIBERGLAS CORP.,  
*Granville, Ohio, October 4, 1971.*

DEAR SENATOR CHURCH: In response to your inquiry of September 29, 1971, this letter and comments are directed to your Subcommittee on Long-Term Care and its study of "Flammable Fabrics and other Fire Hazards of special concern to older Americans."

By way of introduction, I am in my second term as a Member of the National Advisory Committee for the Flammable Fabrics Act. I am also Chairman of the Newark, Ohio Board of Building Standards, and Chairman of the Consumer Council of the American National Standards Institute—a non profit organization devoted to the promulgation of voluntary national standards through consensus procedures. For the past fifteen years I have managed a large industrial testing laboratory devoted to the testing and evaluation of building materials, textiles, and interior furnishings. We have one of the most fully equipped fire testing facilities in the U.S. I believe this qualifies me to comment on certain phases of your study.

Without exception, every Fire Department and every Building Code in the United States has adopted and operates under the standards established under the sponsorship of the National Fire Protection Association and adopted as an American National Standard by the American National Standards Institute (ANSI). These standards are excellent and are continually updated as new technology becomes available. The World Almanac lists, for 1969, 7000 burn deaths; 973,000 fires, and \$1,933,800,000 losses from fire in spite of these excellent standards. This does not imply that these all relate to the elderly. However, the same source lists over 1000 deaths in major fires in hospitals, nursing homes, homes for the aged, hotels, and tenements during the period from 1900 thru 1969. It is probable that half of these were 65 or older. Recent data collected by HEW shows a ratio of 4.5 burn injuries per death. This would indicate that the problem is quite severe.

A unique legislative situation exists which prevents progress in this area, yet at the same time suggests a possible solution or series of solutions. The background goes something like this:

1. Building Codes and Fire Codes are written and published in the private sector by various voluntary standards organizations but must be adopted and enforced at the State, County, and Municipal level.

2. These Codes have traditionally covered *only* the building itself. They do not generally govern the interior furnishings provided by the owner after construction is completed.

3. Very few national standards exist in the area of interior furnishings. However, this now falls under the amended Flammable Fabrics Act. The four areas specifically covered are Carpets and Rugs (for which two standards have been issued), Mattresses and Bedding, Upholstered Furniture, and Curtains and Drapes. These standards can only apply to new goods introduced into Interstate Commerce. They cannot govern existing interior furnishings.

4. To provide a higher level of protection than what is now afforded would require removal and replacement of these interior furnishings with products having a higher level of resistance to ignition and combustion.

5. To provide a uniform level of protection, and to provide protection now—not in the ten or twenty years it will take for existing interior furnishings to wear out—would require Federal action in an area traditionally left to the States.

6. The situation is then self-defeating since it cannot accomplish its intended goals within any reasonable time frame.

There are several approaches to this problem which can be considered, but perhaps a review of the problem is in order.

We must assume that the aging, elderly and infirm are less able to respond to a fire situation. It follows that their protection must come from the clothing and buildings that surround them.

Action has been taken under the Flammable Fabrics Act on Children's Sleepwear. This is possible because of the sizes involved. Similar action could be taken on all other sleepwear and clothing, but there is no feasible means to determine who will be wearing it. It would be an unenforceable situation unless the person were in a controlled situation like a hospital.

Although no good statistical data are available, indications are that good standards on interior furnishings would do much to provide protection. The Department of Commerce has issued Rules governing Carpets and Rugs. However, it is only a first generation test and does not protect from a "flashover" situation so often encountered in fires similar to the one at Harmar House, Marietta, Ohio. DOC currently is considering a Rule covering Mattresses. I consider this proposal inadequate because it does not provide for a blanket in the test. (See attached comments in my reply to the Secretary\*). Work is underway at the National Bureau of Standards on Blankets. To date no proposals have been made for a standard. Some work has also been done on Upholstered Furniture. No work has been done on Curtains and Drapes, and from the proposed priorities, none will be started in the near future.

No action can be taken by anyone until good standards are written. No ordinances for enforcement can be written at the local level until standards are available. Numerous communities, including New York City, are waiting for the standards. They will be implemented just as soon as they are available. The voluntary standards sector has taken a "hands off—let's see what the Government does" position. Yet this is the area where the best technology is available to solve the problems.

The NFPA Life Safety Code No. 101, breaks down the fire problem related to buildings into the type of occupancy. This is done for good reason. The number of lives potentially at stake in a "public" building is many times greater than in a single family dwelling. The states take recognition of this difference by writing mandatory building codes at the State level for "public" occupancy, while leaving the single family dwelling problem to the local community.

The aging and elderly may spend their remaining years in a number of these "public" type occupancies. These could be Nursing Homes, Homes for the Aged, Hospitals, Hotels, Motels, Apartment Buildings, and even the converted old home down on Main Street. Since there is a higher concentration of people in these occupancies, the hazard is greater. This suggests the possibility of "dual standards" for interior furnishings, that is, a higher level of safety required for interior furnishings used in these "public" occupancies than for the one and two family dwelling. It also suggests a different set of laws and enforcement procedures.

Summarizing the problems, as I see it, it will be necessary to (1) provide that all new buildings which will likely house the aging be built to strict fire code standards, (2) provide that all existing buildings be brought up to these standards, (3) provide standards for interior furnishings for use in these buildings, (4) provide that all new and old facilities be furnished with products which meet these standards.

Since the execution of these suggestions would require penetration of legal areas traditionally reserved for the States, it is suggested that the "model code"

\*Retained in committee files.

approach be used, with heavy reliance on the private sector. Let me illustrate how this might be accomplished.

Your Committee, operating in a "program management" function, could determine on a policy basis that the above should be executed. It could provide funds for the program to be coordinated in the private sector. Since an extremely broad spectrum of industries would be involved, and the root of the program is based on codes and standards, it is logical to consider the American National Standards Institute.

ANSI working with NFPA and other affected organizations could review the existing building codes for adequacy. If changes are needed, they could be coordinated at the National level and promptly promulgated. The National Conference of States on Building Codes and Standards has already gone on record as favoring the adoption of ANSI Standards at the State level.

The interior furnishings industries could work thru ANSI, and with technical assistance from the National Bureau of Standards thru the Flammable Fabrics Act, could establish standards for all interior furnishings related to care for the aging. National Standards could be developed for these occupancies. Although it would take years to become effective thru the Flammable Fabrics Act Rules, a "model code" could be picked up by NCSBCS, and with proper urging and perhaps financial assistance from Congress, could be enacted at the State level in a reasonably short time. This could cover existing and new nursing homes, homes for the aged, hospitals, hotels, motels, and apartment buildings.

These standards would be uniform which would benefit the manufacturing community, and could be enforced at the State Fire Marshal and Building Code level. It would provide effective enforcement in every community. Precedence of a sort has already been established in the Occupational Safety and Health Act which enables the adoption of National Standards. The key problem is whether these dwellings for the aging are in Interstate Commerce, and if they are not, then what do you do?

I do not believe that the program should be or can be effectively implemented at the Federal level. I do believe that it will require Federal assistance and backing. There will be strong objections to such a program. It can't succeed without voluntary cooperation of all concerned. By the same token, the expertise and ability to get it done lies in the private sector. A definitive statement by Congress could get it going. I believe that industry and the States would cooperate. Also, a certification program is available in ANSI, and with help from the hundreds of qualified independent testing laboratories, could provide the assurance that the products offered were in compliance with the standards. This is a problem of enforcement that would be difficult, if not impossible, for FTC.

Other approaches are thru the traditional avenues in the Federal area. Medicare payments could be used as a means to implement the standards, once established. Hill-Burton funds for hospital construction are another means. The VA can control their own facilities. However, these are limited in scope and do not always reach down to the local community where the control should be exercised.

In summary, the maximum protection to the aging from fire and related problems will come only by regulation of their total environment. It must come from voluntary action in areas outside of Federal jurisdiction. Federal help must be made available to initiate and help fund the program in the private sector. Products and technology are available to accomplish the objectives.

I am attaching some other correspondence with the Department of Commerce relating to the problem.\* Perhaps you will find them helpful.

I hope that these comments will be useful in your deliberations. I know that the organizations mentioned will be ready and able to assist in this difficult problem area. Let me know if I can be of further help.

Respectfully submitted.

FOSTER C. WILSON,  
Group Manager, Product Testing Laboratories.

\*Retained in committee files.

STATEMENT OF NELSON H. CRUIKSHANK, PRESIDENT NATIONAL COUNCIL OF SENIOR CITIZENS

Many U.S. nursing homes are deadly fire traps as the ghastly toll of lives in nursing home fires shows.

Nine persons died in a fire that destroyed a home for the aged last January 26 at Lincoln Heights, a suburb of Cincinnati, Ohio.

Fifteen persons died in a nursing home fire last October 15 at Honesdale, Pa. Six persons died in a nursing home fire last September 15 at Salt Lake City, Utah.

Within recent years, there have been fires that claimed the lives of 63 nursing home patients at Fitchfield, Ohio and 72 nursing home patients at Warrenton, Mo.

Perhaps, the most unusual of all was the fire January 9, 1970, at the Harmar House nursing home, Marietta, Ohio in which 32 persons lost their lives. This fire was confined to the room where it started. Heavy black smoke that emanated from the room's burning nylon carpeting with sponge rubber backing accounted for the tragic loss of life.

The fire hazard posed by carpeting as demonstrated by the Marietta nursing home fire has become the subject of a controversy over what test should be employed in determining the flammability of carpeting in hospitals and nursing homes.

The 3,000,000-member National Council of Senior Citizens welcomes the decision of Secretary Elliot L. Richardson of the Department of Health, Education, and Welfare (HEW) requiring hospitals and extended care facilities (nursing homes) under Medicare to comply with provisions of the Life Safety Code of the National Fire Protection Association.

This ruling applies to establishments receiving Federal funds under Medicare (health insurance for those age 65 or over) and Medicaid (Federal-State program of health services for the medically indigent) which had previously been brought under the Life Safety Code.

The Life Safety Code calls for a "tunnel test" as the standard of flammability where the fire authority having jurisdiction believes a floor covering presents an unusual fire hazard.

This test is also the standard under the Federal/Hill-Burton program for financing hospital construction and in Army, Navy, and Veterans Administration hospitals.

Under the "tunnel test" a strip of carpeting 25 feet long is affixed to the top of a tunnel one foot high, the carpeting is ignited with a gas jet and the flame spread is measured over a given time.

Meantime, the Secretary of the Department of HEW has entered into a contract with the U.S. Bureau of Standards to evaluate various carpet flammability tests.

Mr. Chairman and other distinguished members of the Senate Special Committee on Aging, the National Council of Senior Citizens considers the requirement of the Life Safety Code that facilities of wood frame and certain other types of construction be protected with automatic sprinklers to be the most significant development in area of fire safety in nursing homes.

Automatic sprinklers have achieved an over-all record of 96.2 percent satisfactory performance over a 45-year period studied by the National Fire Protection Association, according to a report on automatic sprinkler performance tables published in the July, 1970 issue of the Association's Fire Journal.

The Association bases its finding on research into approximately 81,000 fires.

The National Council of Senior Citizens considers this study by experts in fire protection convincing evidence of the need for automatic sprinklers in protecting the lives of nursing home patients and applauds the decision of the Government to make the National Fire Protection Association's Life Safety Code a mandatory standard for nursing homes receiving Medicare and Medicaid funds.

However, it is clear that implementation and effectiveness of this regulation depends largely on administrative instructions to State agencies that will administer the Life Safety Code and effective follow up procedures.

The National Council of Senior Citizens sees the need for these minimum fire safety requirements for nursing homes.

1. There must be a complete detection system and it must be hooked up to the fire department—if there is one. (Many nursing homes are located in the country at great distances from a fire department and often the local fire department is a volunteer department which itself is not manned constantly.

In the event there is no local fire department there must be an outside alarm such as a siren that is activated by the detection system.

2. The detection system must activate fire doors and smoke barriers.

3. The detection system must be in conformance with all other requirements of the Life Safety Code.

4. There must be at least one-hour protection partitions between patient rooms and all corridors.

5. The local fire department must, in the judgment of the State fire marshal, have the capacity to respond effectively and promptly to an emergency.

6. If the building is more than one story, or is classified as an "unprotected" type of structure there is to be no exception for the requirement for sprinklers.

In any event the SSA can overrule the findings of the local State agencies if they consider a building hazardous.

Also, the National Council of Senior Citizens strongly urges that the National Fire Protection Association's Life Safety Code be made to apply to intermediate care facilities under the Medicaid program.

As Senator Frank Moss, Chairman of your Committee's Subcommittee on Long Term Care, pointed out in a recent speech on the Senate floor the nursing home fires at Lincoln Heights, Ohio, Honesdale, Pa., and Salt Lake City, Utah, cited at the beginning of this statement, were intermediate care facilities and by that fact exempt from fire safety regulations that apply to skilled nursing home facilities. Intermediate care nursing homes are defined as institutions providing less than skilled nursing care but more than custodial care for residents.

The National Council of Senior Citizens favors early enactment of Senator Moss' bill—S-2924—to require application of the Life Safety Code to intermediate care nursing homes under Medicaid.

Mr. Chairman, I wish to take this opportunity to pay tribute to two outstanding members of the Senate Special Committee on Aging, Senator Moss and Senator Edward M. Kennedy, Chairman of your Committee's Subcommittee on Federal, State and community Services, for their outstanding efforts on behalf of nursing home patients as incorporated in the 1967 Moss-Kennedy amendments to the Social Security Act (requiring the Secretary of the Department of HEW to establish more effective standards for nursing homes receiving Federal funds).

Our organization has supported your Committee 100 percent in its efforts to bring pressure upon the Department of HEW to implement the 1967 amendments referred to above.

The service performed by you, Mr. Chairman, and the other distinguished members of your committee in pushing for higher nursing home standards is an example of true devotion to the public welfare. Your committee's compassion and concern for the 1,000,000 residents of U.S. nursing homes is deeply appreciated by members of the National Council of Senior Citizens.