

INFECTIOUS DISEASES

Summative Evaluation Report

Marian Koshland Science Museum of the
National Academy of Sciences (NAS)

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Infectious Diseases
Summative Evaluation Report

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INTRODUCTION

In the spring of 2006, the Marian Koshland Science Museum of the National Academy of Sciences (NAS) contracted with the Program Evaluation and Research Group (PERG) at Lesley University to conduct a summative evaluation of their new exhibition, *Infectious Diseases*. The exhibition was funded through a Science Education Partnership Award (SEPA) grant from the National Center for Research Resources, a component of the National Institute of Health (NIH), and opened to the public in March 2007.

PERG evaluators conducted a summative evaluation of *Infectious Diseases* in April and May 2007. PERG staff also conducted some front-end interviews at Boston's Museum of Science in February 2006 and completed some preliminary interviews at Koshland in May 2006, to get a sense of visitors' interest in and understanding of the topic, and to help staff develop the final exhibition.

According to project staff at Koshland, the primary goals of *Infectious Diseases* are to:

- Help visitors understand why infectious diseases continue to cause problems and pose challenges for mankind—including the rapid evolution of microorganisms, the overuse/misuse of antibiotics, and issues of land use and economics
- Help visitors understand what actions they can take to help control the spread of infectious disease
- Pique visitors' interest in the topic of infectious disease and stimulate questions

Infectious Diseases is designed to remind visitors that though progress has been made in terms of both public health and knowledge of various diseases, we still face many challenges. The exhibition is focused on six main concepts: characteristics of microbes (viruses, bacteria, fungi, and parasites), host-microbe interactions, vaccines, anti-infectives, evolution, and the global burden of infectious disease/gains in life expectancy over time.

Infectious Diseases is geared toward non-scientists. It is “intended for non-scientist adults in the general public, teachers, school groups at the level of middle school and above, journalists, and policy makers” (Project documents).

EVALUATION

In order to assess visitors' interest in and understanding of the *Infectious Diseases* exhibition, PERG evaluators carried out a series of activities at Koshland. These activities were focused on the questions listed below. The evaluators focused primarily on the 'big questions':

- Did visitors gain some new understanding of the processes that cause infectious diseases to spread?
- Did they know what they can do and what government officials, medical personnel and scientists can do to treat, control, or eradicate infectious diseases?
- Did they make connections to their lives outside of the museum?
- Did visitors identify topics of interest related to infectious diseases, which can serve as a basis for the museum's programming/presentations?

EVALUATION ACTIVITIES

In order to obtain this data, our fieldwork consisted of several activities, described below.

EXIT INTERVIEWS

PERG evaluators completed 32 exit interviews with 43 respondents, during April and May 2007. Visitors were chosen at random after going through all or most of the exhibition. About 2/3 of these visitors were interviewed in a one-to-one format; the remainder were interviewed in pairs or groups of 3. Of our 43 respondents, 10 were children under the age of 18. Approximately 8 of our exit interview visitors were from outside the United States, including Mexico, Argentina, the Philippines and Ghana. Some of these individuals currently reside in the US.

INTERACTIVE OBSERVATIONS

Evaluators conducted 15 interactive observations (IOs) with randomly selected visitors. We used the IOs, in which a PERG evaluator joined single visitors or small groups during their visits to *Infectious Diseases*, to get a sense of how visitors interacted with the exhibition. Specifically, we asked visitors to "think out loud" and share their thought processes and reactions to the components. The IO format allowed us to gain more insight into how visitors used the components in the exhibition, and to observe their discoveries and questions related to the content. We accompanied 5 single visitors, and 23 visitors in pairs or groups of 3. Approximately 8 of our visitors were from outside the

United States, including Great Britain, Mexico, Argentina, Belgium and South Korea. Some of these individuals currently reside in the US.

FOLLOW-UP PHONE INTERVIEWS

After their visits to *Infectious Diseases*, Koshland Museum staff asked some visitors if they would be willing to complete a brief (10–15 minute) phone interview shortly after their visit. We completed 15 phone interviews with 15 visitors throughout the United States. Most (11) of these visitors were interviewed within 1 week of the museum visit; 4 visitors were interviewed between 1 and 2 weeks after their visit. These visitors had not completed exit interviews or IOs, and had no previous contact with PERG staff. The follow-up interviews were conducted to determine if visitors had thought about the exhibition since their visit, and if they had made any connections between *Infectious Diseases* and their lives outside the museum.

Note: All phone interviews were done with adults.

VISITOR SAMPLE

Total N = 86

Visitor Information	Exit Interviews	Interactive Observations	Phone Interviews
# of visitors	43	28	15
Male	17	8	8
Female	26	20	7
Children < 18	10	5	0
Adults	33	23	15

REPORT

The *Infectious Diseases* summative evaluation report addresses questions posed by the evaluators, working in conjunction with Koshland Museum staff. The report includes the following sections: Introduction; Findings; Discussion and Recommendations; and a series of Appendices, which include the protocols used by the evaluators.

FINDINGS:

VISITORS' EXPERIENCES IN *INFECTIOUS DISEASES*

Most Americans believe that infectious diseases are not a problem in their daily life; after visiting this exhibit we see that it is . . . I think more people should visit this exhibit. (Exit interview)

Infectious Diseases at the Koshland Museum is an interactive exhibition that engages a variety of visitors with a range of background knowledge in terms of public health issues and health-related topics. The museum serves many international visitors as well as those from across the United States. Almost all of our adult and teenage respondents, both from the US and abroad, as well as some younger visitors, engaged with aspects of *Infectious Diseases* and provided generally positive feedback about their experiences.

The physical set-up of the museum—its relatively small size and user-friendly organization—allows visitors to ‘take their time’ and explore each exhibition at his or her leisure. The relatively unhurried pace of the museums’ visitors, and the ‘hands-on’ nature of many components, encourages visitors to spend time and interact more fully with each component within *Infectious Diseases*.

OVERALL REACTION TO THE EXHIBITION

Visitors generally enjoyed their visit to *Infectious Diseases*. The exhibition held most visitors’ interest, and appealed to those involved in scientific and medical fields, and well as those who had limited background in these areas. Visitors discovered new information, learned more about topics such as the replication of HIV and the treatment of TB, and frequently made connections to their own lives outside the museum. Our respondents described their overall reaction to *Infectious Diseases* in exit interviews.

The following responses were typical:

I enjoyed learning about infectious disease, look at where diseases break out, how it changes over a year, what are treatments being used. I was never a biology major in college, so now I am learning about this a bit later in life. (Exit interview)

[I was] impressed [by the exhibit]; we had to do forums about the body systems in my study to be a nurse about virus or bacteria, or fungus. I found this exhibit really applied what I had learned, part of the class I took. Displays were clearly written and presented in an easy understandable manner . . . I liked the varied presentations, not just reading, the hands-on aspect, so you could go in the direction you were interested in. (Exit interview)

It's very detailed, up-to-date and well presented; covers global problems, valuable . . . To be aware of what's out there, sometimes we get sick and don't know why. (Exit interview)

After completing interactive observations, we asked respondents to share their overall impressions of *Infectious Diseases*. Again, most of these visitors found the exhibition to be interesting and engaging.

I thought it was very informative, it reminds me how much I take for granted in life, my health . . . I don't realize how many diseases can hurt you out there. (Interactive observation)

Great, the interaction pieces, the visuals . . . all very well done. I think the exhibit did a great job showing visitors about diseases that are often hidden from the world. Some of the wording needs to be fixed (measles and influenza exhibit) but otherwise it was clear. (Interactive observation)

A few visitors found the information "a bit dense" and found some of it difficult to understand.

Overall . . . this is high-end stuff. If you're into science this is awesome, but if you're visiting off the street, like us, it is too hard to understand unless you have prior knowledge of these diseases. (Interactive observation)

I found the exhibit interesting, but the interaction pieces [components] were not as easy to use as I thought they would be, specifically the TB one. Also the people who developed this exhibit assumed that the audience had prior knowledge of diseases, which the average Joe off the street doesn't [have] and neither do I. There was a lot of vocabulary I also didn't know and [it] was not explained within the exhibit. (Interactive observation)

As noted above, we conducted 15 phone interviews with Koshland Museum visitors. About 2/3 of these visitors described *Infectious Diseases* 3 days to 2 weeks after their museum visit in positive terms, as "very interesting," "pretty nice," and "informative." Several respondents described the exhibit as "small" and a few were disappointed that it was not larger.

I was very impressed. It was small. I'd like to have seen more. I read everything. Best—a gadget that moves against the wall and tells you different viruses. (Phone interview)

I enjoyed the exhibit; pretty interesting. I liked the interactive part of it. (Phone interview)

I thought it was very interesting. Though I thought the information was limited. There wasn't as much as I thought there would be. (Phone interview)

A few visitors had some difficulty remembering the exhibit, or had more neutral reactions.

I was mildly interested, more interested in Global Warming. (Phone interview)

I can't say there was any part I liked best. (Phone interview)

WHAT STOOD OUT

About 1/3 of our respondents talked about what specifically “stood out” during their visit to *Infectious Diseases*, and what they liked best. These visitors most frequently mentioned the HIV video and other information about HIV; the TB-slider component; information about bacterial resistance and the evolution of bacteria; Malaria; the Global View component; information on polio and smallpox; and the Bacteria, Virus and Fungi slider component.

F: I liked learning about the rate of HIV in Africa. I didn't know how bad the problem was before.

M: How viruses reproduce, I thought this part was new and interesting.
(Exit interview)

F1: HIV; I liked the details that were presented in the video about the diseases and all the problems that was addressed in the film and difficulty of the treatment.

F2: I like the bacteria one, showing how they mutate so fast; I didn't realize how much they mutate, how often mutation occurs, how fast before they mutate.
(Exit interview)

For me the TB exhibit was most interesting. I didn't know how that worked or that if you didn't receive adequate treatment you could die in just 12 months.
(Exit interview)

I probably liked the Global View [most]. I didn't realize that viruses were going on all over the world. [I was] shocked to learn about all that exist just in Africa.
(Exit interview)

Our phone interview visitors generally enjoyed the exhibition, but gave few specifics. Several visitors mentioned the Bacteria, Virus and Fungi component and the HIV-related videos.

Pretty informative, especially for people who do not know a lot about medicine or science. The video about the HIV I liked the best. (Phone interview)

I thought it was pretty good, very informative and up to date. The one you could go to different countries and see what was recent there, that was interesting, like the [Global View] where they found bubonic plague in Denver. [I liked] the ones with the scenario and the red dots—those were good, but you couldn't really change the scenario—just watch it play out . . . (Phone interview)

The fact you could move parts of the exhibit. I liked the one where you could make scenarios depending on what you did. Different choices and what would

happen. You could visually see what impact different things have. Another part—you looked at what was wrong with people [Bacteria, Viruses and Fungi]. I remember sliders, but not the details. (Phone interview)

VISITOR ENGAGEMENT

Given the size and set-up of the Koshland Museum, the evaluators were able to informally observe visitors as they moved through *Infectious Diseases*, in addition to joining visitors during our interactive observations. (We did not do formal tracking studies). Visitors commented on the hands-on, interactive nature of the exhibition, and almost everyone found something to engage their interest, as noted below, in excerpts from our interactive observations:

Single visitor at TB component:

[Visitor touches Russian prisoner scenario . . . has no problem with what button to push]

F: Wow, he survived if I continue to give him the dosage daily. Makes sense.

[She tries the African woman scenario.]

F: Makes sense that she doesn't get cured . . . because I didn't keep my finger on the button and the antibiotics were not consistent and the TB comes back . . . this is a cool exhibit, I like that it's interactive.

(Interactive observation)

At Malaria:

M: Look here [to evaluator]. This is the visual model I talked about earlier that I made when I was in grade school; it shows the life cycle of the mosquito. I like how it shows the mosquito and the person and how they get infected . . . it helps me understand transmission much better.

(Interactive observation)

Need for More Information or Clarity

While visitors found much that interested them in *Infectious Diseases*, they sometimes became confused or frustrated by some of the components. This became evident during the interactive observations, when some of our participants were unsure of what to do/and how to operate the slider at the TB component, and had difficulty understanding the wording/information presented at several other stations.

Influenza/Measles

[Woman looks at explanation and has a hard time understanding the text.]

F: I'm not quite sure what they're trying to say.

[They push a few buttons, but look puzzled and move on.]

(Interactive observation)

Influenza/Measles

F: To be honest, I'm confused by the wording of this [display]. Two-percent of what, and fewer than what? It doesn't make sense.

(Interactive observation)

TB

[F doesn't realize she needs to slide console. Then she slides it but only pushes button a few times. The patient (Russian) dies. She tries curing the American, keeps button pressed, he recovers.]

F: That's not a surprise, we live in America.

[She tries to cure the African patient, keeps button pressed . . .]

F: The point is that if we had medicine we could do it [cure the patient], but you rely on the delivery system.

(Interactive observation)

Visitors frequently mentioned the TB component as difficult to physically move and to fully understand, though they found it to be interesting. Some visitors were helped by museum docents, while others eventually figured out how to move the slider themselves. Several visitors were confused by the dosing process; they kept the button pushed but found that their patient did not become well, and weren't sure why. Visitors also found the TB slider distracting (and noisy) when they were watching the nearby HIV video. About 1/2 of our phone interview visitors also had problems with the sliders, and wanted clearer directions on how to use them.

I found the TB exhibit confusing. Well, I couldn't quite tell when I was pushing the button if I was causing the pregnant African woman to stop treatment or if it was due to other factors or the situation of living in Africa. I pushed the button down and treatment was not continuous. I was confused if it was me or the situation, I think they were trying to get across the point that in Africa it is difficult to provide continuous treatment; I couldn't tell. (Exit interview)

F1: TB: I didn't understand the scroll across [slider], whether to hold down button or not, eventually I got it.

F2: Another comment on that one, the symptoms gone away, most people would stop treatment if they felt better, and not stop [if they were feeling bad] . . . I wanted more explanation about each person and the options for treating them.

(Exit interview)

Several visitors were also confused as to how to interpret the public health graph located near the Global View component.

I don't understand how to read this graph . . . if you look here at 1970 when I was born, the expected age I would live to was in the late 60s. That doesn't seem accurate. I know things have changed since I was born, but I can't believe the life expectancy back then was that low; I think there is something wrong.

(Interactive observation)

In addition, visitors often didn't realize that the Bacteria, Viruses and Fungi slider actually moved, until shown by a docent or the evaluator. Visitors suggested adding written directions and/or arrows to the component.

VISITOR LEARNING

From what I learned, I think they [scientists and medical personnel] are dealing with the reemergence of diseases, resistance to antibiotics and the overuse of drugs. (Exit interview)

GENERAL LEARNING

PERG evaluators asked what, if anything, our exit interview and phone interview respondents had learned in *Infectious Diseases*. About 90% of our visitors, including many who worked in scientific and/or public health fields, discovered something new during their visit.

Visitor responses fell into the following categories:

Visitor Learning in <i>Infectious Diseases</i> (N=58)	
Topic	Number of responses
HIV—treatment, spread, replication	16
Malaria	14
Bacteria, microbes, antibiotic resistance	8
TB	7
Other diseases	7
No new learning	6
Global health issues	5
Vaccinations and related issues	4
Other	3
Viruses	3
Cholera	2

Note: Many visitors' answers fell into multiple categories. Not all visitors answered this question.

Visitors frequently cited the two videos—one that discussed the replication of HIV, how it could be treated using protease inhibitors and other drugs, and the other, which focused primarily on Botswana's response to the AIDS crisis.

. . . the HIV caught my eye; it's a relatively new thing, and it's incredible how fast they've understood it and it's because of the DNA studies . . . (Exit interview)

Yes, the video on how medicine worked, and how it stopped or controlled HIV. (Exit interview)

Our respondents frequently discussed malaria and TB as areas of learning, as well as HIV/AIDS, as noted below.

Malaria—it was hopeful to see this exhibit and I learned that using multiple interventions is effective in preventing malaria, but it did take me a while to figure out that I had to push the buttons to see how each intervention worked. (Exit interview)

I wasn't 100% informed on how malaria was spread, so I did gain some information. For the malaria part there was a lot of detail. Good info on AIDS. Nice video presentation. It discussed the retroviruses in detail. I had never seen those details before. I'm an engineer by trade. I had never seen what it did inside the cells. (Phone interview)

TB treatment—treating the disease by continuous drug use. My major was medicine for a while. It was a pretty good demonstration to show why the TB treatment . . . you need to keep dosing. (Exit interview)

Visitors spent a considerable amount of time at the Global View station, comparing maps and coming to their own conclusions about the connections between clean water, population density, and other factors, and the prevalence of infectious disease.

I probably liked the most about the global view. I didn't realize that all these viruses were going on all over the world; I was shocked to learn about all that exist in just Africa. (Exit interview)

The different diseases . . . [Global View] I liked showing the differences in how diseases are treated in different countries and how that contributes to spread. (Exit interview)

Several visitors talked about the replication of viruses and the issue of antibiotic resistance, and the challenges faced by scientists in trying to stay ahead of these organisms.

I liked random mutations—it shows how quickly bacteria can mutate. (Exit interview)

There was an airborne disease exhibit in the middle. It explained a little bit about how viruses travel and how they infect [people]. (Phone interview)

Finally, several visitors made discoveries on a number of other topics, including the eradication of smallpox, the spread (in several countries) of polio, and the presence of bacteria and viruses in everyday life, as they discuss below.

There was a picture of a fungus that gave me thought about my [brittle] nails. I learned how AIDS happens and propagates. [There was an] exhibit on how you get different flus. All of a sudden you get a pandemic. (Phone interview)

I was shocked that Iowa was a hot spot for salmonella outbreak. (Exit interview)

Before watching this video, I thought only the western countries were working hard to improve HIV. I didn't realize that African countries were also working hard to battle the disease. (Interactive observation)

During our interactive observations, visitors pointed out new information, and shared some of their discoveries with us.

Wow, I really learned new information I didn't know before, about Botswana and how HIV gets passed between the mother and child. I also didn't know that in Botswana that they were testing everybody when they came into the clinic; that is great. (Interactive observation)

[At Public Health graph]: That's new to me, that 1918 flu pandemic; that was a disaster. (Interactive observation)

[At Global View]: Look at malaria. Most likely to get malaria in places that are poor, with less healthcare, hot and wet. [She compares two maps.] (Interactive observation)

LEARNING ABOUT TB AND MALARIA

The TB and Malaria components were important features of the exhibition, and Koshland staff were interested in visitors' reactions to these stations. Therefore, we asked exit interview visitors if they had tried the two components, and what, if anything, they had learned there.

Approximately 30 of our exit interview respondents stopped at TB, Malaria or both components, and almost 90% of those visitors learned something new about these diseases, including several public health professionals and scientists.

Oh yes, especially on malaria . . . the global effect and different methods to control and using all 3 almost eradicates it. (Exit interview)

[For malaria] I was surprised the mosquito netting made such a big difference . . . We combined everything and that was most effective; my oldest daughter showed me that. (Exit interview)

He [patient in TB scenario] kept having a bunch of side effects, and when I didn't give him meds he got sick again . . . You have to make sacrifices to do something that's worse . . . take a little pain to avoid the big pain . . . (Exit interview)

I cured the man from the US. I learned that you have to know about general symptoms about illness; you need to be very alert and get help right away, to go to a doctor on time and see a doctor regularly. Because this illness [TB] can run fast and spread. (Exit interview)

During our interactive observations, visitors also frequently stopped at these components, and shared their learning.

F: Look, honey, I never would have guessed that using bed nets would work to control malaria as much as taking anti-malaria medicine; that's new to me.

(Interactive observation)

M: See what happens when you use all three [methods of controlling malaria]? Watch the numbers go down.

G15: Wow, you're right.

(Interactive observation)

CONNECTION TO VISITORS' LIVES OUTSIDE THE MUSEUM

More than 90% of our exit interview respondents made connections between the topic of infectious diseases and their lives outside the museum. In addition, about 1/2 (8 of 15) of our phone interview respondents said they had made connections/thought about *Infectious Diseases* since their museum visit.

Visitors often discussed diseases/illnesses they (or family members) had experienced, or talked about diseases they had heard about in the media.

Our children are from Ethiopia and [we've discussed] their experiences growing up with HIV around them; it is part of our lives, talking to them about HIV.

(Exit interview)

Visitors also talked about the importance of taking preventative measures, such as getting vaccinated, the importance of educating the public, the challenges we face from infectious diseases, and precautions they take in their daily lives.

It reminded me of how important it is to get a flu shot, which I got this year.

(Exit interview)

When I was going through, it made me think about my own vaccination. I started to check off in my head if I had that vaccination or not—polio etc. Check off my vaccination charts; help me to reflect on my life . . .

(Exit interview)

After going through exhibit, now I understand why drugs are so expensive at the pharmacy, the need to keep on doing more research, why viruses keep mutating, not once and done. It takes a lot of smart people to continue to keep up to date on the changes . . .

(Exit interview)

Oh, yeah, the bugs are fighting to survive and so are we, but they do it faster . . . Bugs can change a lot faster than we can . . . One generation of people takes 20–40 years; a bug can change several million times. The smaller you are, the faster you can change, like HIV—it works well at doing its job because you can't even detect it's there.

(Exit interview)

In our follow-up phone interviews, about half of visitors had not thought about the exhibition or made connections to their daily lives since their visit to *Infectious Diseases*. Those who had, likely worked in a related field or already had some interest in this topic.

I work for an ambulance company. We deal with this [risk] on a daily basis.
(Phone interview)

Maybe a little bit. That's part of the reason I went in; I saw the sign. It's personally something I'm fascinated with.
(Phone interview)

Yeah, because I do breast cancer research, I'm always interested in cancer and companies that do research in infectious diseases.
(Phone interview)

Visitors from developing countries made direct connections between their life experience and infectious diseases.

Malaria, because it is prevalent in Ghana, which is where I am from. I grew up with it; it is a disease you usually catch, it happens so often. Coming to read methods of control—bed net, anti malaria, insecticide—was new to me. I didn't know that you should use all three methods at the same time. When I was growing up my father did some spraying, but not all three methods, so the chain of infection was there.
(Exit interview)

The mosquito information about malaria wasn't new to me. We know a lot about this in Panama; we have malaria. Also that mosquitoes can carry dengue fever; we know how dangerous this is.
(Exit interview)

Our respondents also made connections to their work and fields of study.

In my case, I am in the process of becoming a high school science teacher, so I came today to learn more about what is involved in bringing a class here next year. I have a much better appreciation for the impact of diseases on people in Africa. I am more inclined to donate to charity related to Africa specifically, malaria, HIV. It seems to me these diseases are more serious in Africa.
(Exit interview)

[The exhibition] relates to work and everything I do; I give vaccines in my doctor's office—HPV, oral vaccine. I give all vaccinations, so there are lots of connections.
(Exit interview)

The connection to my teaching and how to think about bringing in some of what I saw today into my lectures; to connect certain laws and acts to public health issues.
(Exit interview)

Finally, virtually all of our IO visitors made connections to their lives outside the museum as they went through *Infectious Diseases*. They found reminders to get vaccinations, discussed people they knew who had become ill, and found outbreaks in places they had lived or visited.

At Polio:

F1: I was born in '48; we had a rash of polio.

F2: My uncle had polio.

B: What does eradicate mean, mom?

(Interactive observation)

At Tetanus:

F1: You know what this reminds me of . . . the hurricane of 1947; everybody had to get tetanus shots . . . there [were] problems with clean water, sewage was seeping into the drinking supply; it was bad. You had a card to show people the shots you got.

F2: I tell you . . . makes me want to go and get a flu vaccine right now, thinking of all of this.

(Interactive observation)

F: My father was a medical specialist in South Korea, so I grew up hearing a lot about infectious diseases.

(Interactive observation)

At Malaria:

F to daughter: Remember when your grandma went to South America she had to take anti-malaria drugs, just like what they are talking about here? They say here to best prevent malaria is to take medicine, use nets over your bed and spray inside the house.

(Interactive observation)

Others related information in the exhibition to their work activities.

At HIV:

M: The movie was well done. I read a lot of books and try to explain HIV with pictures and visuals, but to see the 3-D model they use here is impressive for people to see how HIV attacks the body and the difficulties in stopping the virus.

(Interactive observation)

I'll bring my students here. There's a lot about TB [she's hearing more about it]. Our kids [students] have to get a TB test before they can go visit childcare centers. One of the reasons I wanted to come was to see if they showed that these diseases are returning because people are refusing to do vaccinations.

(Interactive observation)

VISITOR QUESTIONS

What I know is, when I cut my finger on a rusty nail, I have to get a shot so I don't get tetanus, but I don't exactly understand what happens beyond that. What does it actually do inside your body?

(Interactive observation)

About 1/2 of our exit interview respondents said they were leaving *Infectious Diseases* with new questions. Their questions touched on a broad range of topics. Some visitors wanted to know more about specific diseases and their treatment, such as malaria and AIDS, while others were interested in public health issues, including the location of global "hot spots," the effects of disease on people in Africa and other parts of the developing world, and the impact of changes in the environment.

I guess the question is how to find out more information about malaria and cholera, where to look for more information on the website. How can I tell my friends back in Ghana to find out more information? If they are not able to come to exhibit, can they access this same information on the Koshland website?

(Exit interview)

I do have a better understanding of anti-retroviral drugs; I had a general understanding before. It makes me wonder about other research that could be done in terms of interrupting the life cycle of the disease and all the different places you could interrupt that. It increased my interest.

(Exit interview)

Yeah, this makes me think more about the role of global environmental changes on diseases and trends . . . I want to look into this more.

(Exit interview)

Several other visitors had questions relating to the costs of managing infectious disease.

The relationship between the costs of prevention vs. treatment, and the relationship of taking public health actions and improved public health action, impact on treatment.

(Exit interview)

I would like to know more about what this country is doing to find solutions to diseases. How much money is put into research in the medical field? How does the US go about educating your public?

(Exit interview)

Other visitors said they had learned new information, and sometimes had their questions answered, in *Infectious Diseases*, but they weren't leaving with any questions.

During our interactive observations, visitors frequently asked questions as they explored the exhibition. Some shared personal experiences and knowledge with each other while going through *Infectious Diseases* in pairs or family groups, while solo visitors shared questions with the evaluators.

At Public Health graph:

F: Look, Peter. If you look at this graph, you can see that your mother will live longer because of vaccinations . . . things have improved.

(Interactive observation)

At Malaria:

F: There are no problems with malaria here [in US], so I don't know much about it. Where do you find it in the world?

[Visitor touches the interactive display to find out.]

F: Do they have insecticide in those places? If so, they should use them to stop malaria.

(Interactive observation)

At Hep-B panel:

G15: Wow, I didn't know you could get cancer.

M: Yes, that's why people need to get vaccinated . . .

G15: I didn't know that.

(Interactive observation)

At Global View:

F: Look, there is a TB prevalence and HIV in Africa. It is just terrible—no sanitation, the water supply even in Mexico, look, is bad too. Now you know why they say don't drink the water.

(Interactive observation)

At end of IO:

F: Why don't people help people in Africa? They don't need to send money, they need to send actual people to help improve their lives.

(Interactive observation)

CHALLENGES

The evaluators asked our respondents, in both exit and follow-up phone interviews, to discuss the challenges scientists and medical personnel face in trying to control/eradicate infectious diseases. Visitors gave a variety of answers, which appeared to reflect their prior knowledge as well information presented in the exhibition.

Our respondents most frequently cited the overuse of antibiotics and antibiotic resistance, the need to develop new drugs and the difficulty of keeping up with new diseases, as well as the need to educate the public.

From what I learned, I think they are dealing with the reemergence of diseases, resistance to antibiotics and the overuse of the drugs. (Exit interview)

Cooperation of populations and governments to find something that blocks the disease from spreading . . . antibiotics, not to over use or bugs develop immunizations on own, but that takes time to happen on its own. (Exit interview)

Human behavior issues, population growth, poverty and mutation and change of the problem, like adaptation and evolution of bacteria or disease . . . it's brought out well. (Exit interview)

They also cited the cost of drugs and developing new medicines, and the challenge of distributing drugs to the people who most need them. Several visitors mentioned HIV, and talked about the difficulty of finding a cure, along with the stigma and ignorance that make treatment and control difficult.

The high cost of doing research to find a cure, timeline to work faster than the microbes who are constantly evolving. Also, human behavior, social issues; they were saying in the video that there was such a stigma associated with HIV in Botswana and that half the battle was educating the people about the virus and how it is passed. (Exit interview)

Public education and changing human behavior is challenging . . . Educating people to use condoms and risks for pregnant women, behaviors and ideas in their culture could go against public health . . . (Exit interview)

I know that stopping HIV would be really hard in poorer countries because of lack of information, money and education; not enough money to buy antibiotics.
(Exit interview)

Mostly ignorance. Right now, Africa's biggest problem with HIV is denial; it's ignorance and denial . . .
(Exit interview)

In our follow-up phone interviews, visitors discussed similar topics as those above. Several also talked about globalization, and the ease of travel, which serves to spread disease, as well as man-made environmental changes.

One of the greatest challenges: How do you work in concert with man's continuing need to industrialize and modernize our environment? We fail to keep up with all of the risks that process produces . . . How do we modernize without further jeopardizing humanity and not make it [modernization] counter productive?
(Phone interview)

Antibiotics—they're having trouble because people don't follow instructions. Don't stop the dosage just because you feel better. Now there is a stronger strain of bacteria, like with tuberculosis. Medicine is battling to keep up with the different types of bacteria. It keeps coming back with stronger strains.
(Phone interview)

It's probably the mobility of people . . . it's so much easier for people to travel now. People can fly. They used to not be able to afford it. Knowledge, or the lack thereof, on the public's part.
(Phone interview)

Informing the public on what they can do to help. We're all spreading disease if we don't wash our hands, get on an airplane . . . If you start when they're young, then they'll have a better understanding of the impact of the spread of disease.
(Phone interview)

One respondent, a scientific researcher, emphasized the need for more funding, and the public's need to know more about public health.

Education is #1; people don't realize what's available. Things [exhibits] like this are really important to let people know. Need to tell people what is being done and what we know; we have to be able to explain things without doing it in a degrading way. Getting the point across, getting the word out, is one of the hardest things. Funding is poor. People don't complain loud enough; we need to make more noise—not enough [money] for research.
(Phone interview)

THE PUBLIC'S RESPONSIBILITY

We also asked our exit interview visitors if we ('the public') contribute to the problems of infectious diseases. Virtually all visitors felt that the public bears some responsibility for the problems/challenges of infectious disease, as discussed below.

They cited similar issues to those outlined in the Challenges section of this report, including the overuse and misuse of antibiotics, lack of education, and the need to maintain personal hygiene and take responsibility for one's health.

They also spoke of the difficulty of changing people's behavior and lifestyles, related to HIV, TB and other illnesses.

By being in public when sick, going to work when sick, this could be a big issue if pandemic flu . . . also people not washing cups, basic sanitation, cleanliness.
(Exit interview)

We take the pills and we don't call our doctor if we're getting better or worse; we must have regular checkups, follow-ups . . .
(Exit interview)

Yeah, because a lot of people are scared to get tested for HIV because of social [stigma], so they don't get tested and they spread it more.
(Exit interview)

Yeah, because a lot of times people think it's not a problem in America, so they think it's not a problem . . . It's difficult for Americans to have a global view or feel responsible if you don't know anyone.
(Exit interview)

FEARS AND CONCERNS

While visitors were generally interested in the topic of *Infectious Diseases*, they were not overly fearful about these issues. Some visitors did want to know more about a possible pandemic, and the risks we face in the United States.

[I'd like] more information about the possibility of pandemic flu . . . I work for a county on pandemic [preparedness]. I'm an analyst; I'm trying to develop an emergency plan.
(Exit interview)

The staph infections—I'm worried about that, and bacterial resistance.
(Exit interview)

A few visitors did indicate that the exhibition had stimulated their fears/concerns.

[At Bacteria, Viruses and Fungi]: This makes me think about where is my antibacterial sanitizer right now? I forgot it in the car. (Interactive observation)

WHAT ONE CAN DO: TAKING PRECAUTIONS

Almost all visitors said there were things they could do to protect themselves and those around them. Again, they emphasized personal hygiene, taking medicine as instructed by their doctors, staying home when sick, exercising, and getting vaccinations.

Not ignore symptoms of disease, get a rapid diagnosis; I think to cooperate with public health programs, get HPV vaccine, encourage others to also get that vaccination.
(Exit interview)

Tell them to take less antibiotics, use drugs correctly; use antibacterial soap, but not all the cleaners on surfaces, other than that. When sick, avoid people; be aware of HIV and how it is transmitted; educate others about diseases.

(Exit interview)

Hand washing. I am kind of a germo-phobe so I am always aware of germs in public spaces; covering cough and sneezes.

(Exit interview)

Several mentioned the importance of practicing safe sex, and staying up to date on health-related issues.

Certainly take advantage of the vaccinations; public health policy demands that. Safe sex practices should be promoted . . .

(Exit interview)

Try to keep myself educated and keep up to date with what the latest reliable sources are saying about these diseases vs. rumor emails that often send the general public into a frenzy of worry.

(Exit interview)

Giving them advice if they permit it. I will share this information that I learned at the exhibit with my family and friends; specifically I will teach them about how they can die from TB in 12 months if it goes untreated.

(Exit interview)

VISITOR SUGGESTIONS

IMPROVEMENTS TO THE EXHIBITION

In addition to suggesting topics for future Koshland Museum programs (see below), visitors provided a number of suggestions to improve *Infectious Diseases*. Many respondents, especially in the interactive observations, wanted clearer directions on how to use the interactive components, including arrows for the sliders at the TB and Bacteria, Viruses, and Fungi stations.

Visitors were sometimes confused by the text, especially at the Measles/Influenza component, as noted earlier in the report. They wanted more explanation about the infection rates for measles and influenza.

A few visitors found the font difficult to read, and suggested enlarging it or changing the font or background colors. They found the font on the Random Mutations video particularly difficult to read.

One visitor suggested having a hand sanitizer available.

I have a suggestion: a lot of these exhibits require you to touch the screen; well I think it would be a good idea to have that hand sanitizer on hand—you know, practice what you preach.

(Exit interview)

One visitor suggested adding cell phones and shared computer keyboards to the Bacteria, Viruses and Fungi station to show the prevalence of bacteria and viruses in public places. Another wanted to see films with people who had infectious diseases.

I think what would help me and others understand the impact and reality of these diseases is to see actual short films or visuals about what really happens if you get the disease, with real people. (Interactive observation)

Another visitor wanted the exhibit to have a clear introduction/entrance and a more obvious flow, so that the components were linked together.

It's [overall exhibit] good, but not clear [that] one thing follows to the next . . . making connections clearer for people like me [non-scientists]. (Interactive observation)

PROGRAM TOPICS

Visitors suggested a number of topics for follow-up programs. Many were interested in hearing about diseases that were present in the United States or which posed a potential threat to North America, including avian flu, SARS, and other viruses.

Situations about flus and diseases here in the US; I want to know more about how environment affects the spread of diseases. (Exit interview)

I want to know more about HIV, more about how bacteria affects us right here, everyday life, salmonella, and other things about how to prevent getting sick, and learn how others survive better and avoid diseases. (Exit interview)

SARS, HIV, super-flu . . . less sensational information and more information about how it's transferred. (Exit interview)

Other suggestions included more information about HIV/AIDS, drug-resistant TB, the evolution of diseases, and the impact of global warming on infectious diseases.

I want to know more about how global warming impacts the spread of infectious diseases. I think it would be great if they could link these two exhibits. (Exit interview)

You never go wrong with more education regarding HIV, TB, personal hygiene. That bacteria, fungi and virus are out there and [you] need to give people everyday steps to protect themselves; you don't have to be a scientist to protect yourself . . . (Exit interview)

In addition, visitors wanted to know more about contagious illnesses like the common cold, hepatitis, flus, and illnesses spread by insects.

I want to know more about diseases spread by insects, antivirus; learn more about that . . . (Exit interview)

Finally, several visitors were interested in learning about new drugs, public health measures to control disease, and how bacteria make us sick.

I would like to understand the progress we're making towards stopping these diseases, so if they had some program talking about what is currently taking place and the progress we are making and thoughts for the future, I would come.
(Exit interview)

I want to know more about the process of developing new drugs: What is the strategy for creating new drugs, antibiotics or HIV [medication]? Where does the public funding or private funding come from?
(Exit interview)

I would like to learn more about the HPV vaccination because I deal with it often; I want to be better educated about it.
(Exit interview)

I'd be interested in how diseases are changing, and what are some of the circumstances contributing to new diseases and their propagation with travel. Are we seeing new diseases emerging and old diseases coming back like TB? I'd like to see something clear, like malaria shows cause and effect between what we can do and what we are doing in dealing with public health threats; it shows there are a lot of things we can do, but it's not all together . . . I'm interested in possible actions . . .
(Exit interview)

DISCUSSION AND RECOMMENDATIONS

Our data show that visitors engaged with and learned from their experiences in *Infectious Diseases*. Even those visitors who worked in scientific or medical fields (about 1/3 of our exit and IO visitors) learned something new or refreshed their prior knowledge. Visitors took the time to read the panels; try the interactive components; and frequently, to share their discoveries with friends and family members at the museum.

The discovery-learning aspect of visitors' experiences in *Infectious Diseases* was evident during our IOs, when respondents remarked, "This was new to me" and made similar comments. As noted earlier in this report, visitors made connections to their lives outside the museum. Those from developing countries found immediate links to their own life experiences and the challenges faced by their friends and families. Visitors who worked in health and scientific fields often made connections to their occupations and public health issues.

Visitors spent considerable time at certain components, and had ample opportunities to make discoveries within *Infectious Diseases*. This process of discovery learning was particularly evident at the Global View component, where visitors compared maps and came to their own conclusions about the links between various factors that contribute to the spread of disease.

In addition, visitors learned more about the wide variety of these diseases, and the challenges scientists/medical personnel face, such as antibiotic resistance and the prevention and treatment of HIV. Based on the information presented in the exhibition, and their previous knowledge, most visitors were able to cite steps they could take to protect their own health. Visitors also suggested a variety of topics for future Koshland Museum programming, related to infectious disease. They were particularly interested in hearing about issues affecting the United States (or may in the future), including a possible pandemic, SARS, the HPV vaccine, and HIV/AIDS.

While the exhibition was successful in engaging many visitors, some adjustments could be made to *Infectious Diseases*, which would support visitors' learning. Visitors were confused by the text at some components, particularly TB, Measles/Influenza, and (to a lesser extent) Malaria. In addition, some respondents found the sliders—especially TB—difficult to maneuver. Finally, visitors tended to flow in a clockwise direction around the periphery of the exhibition, and often missed the components and the video focusing on the mutation and replication of bacteria.

Based on evaluation data and visitors' suggestions, the evaluators offer the following suggestions:

- Consider adding clarifying text to some of the components, to help visitors understand the key messages embedded in the exhibition.
- Add visual directions, such as arrows, so that visitors know how to move the sliders.
- Consider adjusting the slider at TB, or moving the video kiosk, so that visitors can concentrate on the videos.
- Add additional signage to direct visitors to the video on bacterial mutation in the center of *Infectious Diseases*
- Several visitors found the information a bit “dense.” Consider adjusting the font and background to make it easier to read, and providing more visuals.
- About half of our exit interview visitors were leaving with questions. Provide a handout with information about the Koshland website and/or other websites that visitors can explore to find answers to their questions.
- Several visitors were interested in the economic and social costs of infectious disease. More information could be provided in the exhibition about these issues and about what individuals can do to help address these larger problems.
- Since visitors naturally have questions as they tour *Infectious Diseases*, consider having docents or museum staff available to make presentations or discuss topics related to the exhibition.

Infectious Diseases is an engaging and generally successful exhibition that has met its primary goals. While visitors generally enjoyed their experiences in the exhibition, there are additional opportunities for Koshland staff to refine *Infectious Diseases* and further support visitor learning.

APPENDICES

Appendix A: Preliminary Exit Interview Protocol

Appendix B: Short-Term Phone Interview Protocol

APPENDIX B
SHORT-TERM PHONE INTERVIEW PROTOCOL
Infectious Diseases—Koshland Museum
April 2007

M/F: **Location:** **Date of interview:** **Date of visit:**

- 1) What was your overall reaction to the *Infectious Diseases* exhibit?
Probe: What stood out, what did you like best?

- 2) Did you learn or discover anything new in the exhibit? Please give one or two specific examples.

- 3) Was there anything you didn't understand or found confusing in the exhibit? Were any of the exhibits unclear or difficult to use? If so, please tell us about it.

- 4) What challenges do medical personnel and scientists face in trying to control or eliminate infectious diseases?

- 5) Since you visited the exhibit, have you thought about infectious disease, or made any connections to your daily life outside the museum?

- 6) Is there anything you can do to protect your health and the health of your family?
Please give some examples.