

Version

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PUBLIC HEALTH PREPAREDNESS (PHP)
TRAINING PROGRAM

Training Course Materials



The Ebola Training Series:
The Basics of Ebola Training Course

PUBLIC HEALTH PREPAREDNESS TRAINING COURSE MATERIALS

Handbook for the *Basics of Ebola Training Course*



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Welcome to the Online *'Basics of Ebola'* Training Course

This online accessible training course is intended to be done at the trainee's own pace. The intent of this course is to create a common foundation of knowledge to build off of during future trainings, exercises and real-world activations of the public health system.

In this ongoing grant climate of 'do more with less', we here at the Nevada Division of Public and Behavioral Health's (DPBH), Public Health Preparedness (PHP) training and exercise program, are working on ways to continue bringing you training opportunities, but with little to no travel expenses associated with those trainings.

One of the strategies we have come up with is to provide training opportunities through an online format using a internet-accessible system called **Prezi**. For those of you who have never heard of Prezi, it is basically a more dynamic version of the old standby: *Microsoft (MS) Power Point*. Rather than transitioning from slide-to-slide like we have in the past on MS Power Point; with Prezi you 'fly' through the transitions seamlessly. You'll see what I mean in a few moments.

Today's online training course should take about **sixty-five minutes** to complete.

System Requirements to Run Today's Training Course

Basic Computers Will Work Fine: The technical support team at Prezi has posted the following on their Prezi Basics web page:

The Prezi editor runs well on most contemporary computers, even netbooks. You can easily determine if your computer meets system requirements to watch prezis by:

1. *Checking out any prezis from www.Prezi.com/explore to see if it plays back smoothly on your computer.*

2. *Checking if you can play back YouTube videos while in full screen mode when in any prezi.*

High End Usage: If you would like to play a very large prezi (with many videos, animations, high resolution images, etc), Prezi uses Adobe Flash technology to render prezis in real time, therefore you can create very high resolution presentations, but your playback performance will rely on the hardware. Here are some hardware recommendations:

1. *Fast processors and lots of memory will help more than a strong graphics card.*
2. *It can help to play a prezi through once, it will play more smoothly the second time (do not restart the prezi).*

Website: The www.Prezi.com website supports all major modern browsers (Internet Explorer 9 and above, Mozilla Firefox 3 and above, Google Chrome, Safari) but for the best experience we recommend using the most standard compliant browsers available (Firefox 3.6+, Chrome 4+, Safari 4+). Flash version 11.1 is required.

Prezi for Windows /Mac: For users who would like to access Prezi through Microsoft Windows:

- *2.33GHz or faster x86-compatible processor, or Intel Atom™ 1.6GHz or faster processor for netbook class devices*
- *Microsoft® Windows® XP, Windows Server 2003, Windows Server 2008, Windows Vista® Home Premium, Business, Ultimate, or Enterprise (including 64 bit editions) with Service Pack 2, Windows 7, or Windows 8 Classic*
- *512MB of RAM (1GB recommended)*

For users who would like to access Prezi through a Mac Operating System (OS):

- *Intel® Core™ Duo 1.83GHz or faster processor*
- *Mac OS X v10.6, v10.7, or v10.8*
- *512 MB of RAM (1GB recommended)*

High-Speed Internet Connection: In order to access today's training course, you will need access to a computer with a high-speed internet connection. We realize that for many of you in our rural counties, such a connection may be an issue. So in an effort to ensure that you can at least read along with what the audio recordings for each transition, we have provided a complete transcript of what those audio recordings cover.

Software Requirements: In addition to this internet connection requirement, we ask that your computer also have *Windows Player* installed. This will allow your personal computer (PC) to run the audio portions of the Prezi presentation.

**HANDBOOK FOR THE BASICS OF EBOLA
TRAINING COURSE**

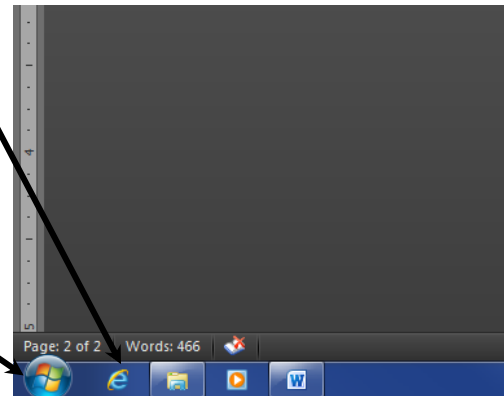
Sound Speaker(s): In order to listen to the presenter's recordings for each transition in today's course, please ensure that your PC has a speaker (or speakers) that are working and as basic as this sounds: make sure the volume is turned on and up. If your system does not have a speaker, then you can follow along in this course handbook and read through each recording's content.

How to Access, Open and Watch the Prezi Presentation: Open the internet browser for your PC by double clicking on that browser's icon in the bottom-left corner of your screen like this:

If your computer is setup with a shortcut to your browser, like this, then click here:

If your computer does not have that shortcut, then click here:

When that opens, look for the Internet browser and double click on that.



Once your internet browser opens, you will need to copy/paste this web address into your browser. Please ensure that each letter/digit/symbol is copied into your browser; otherwise the presentation will not open for you.

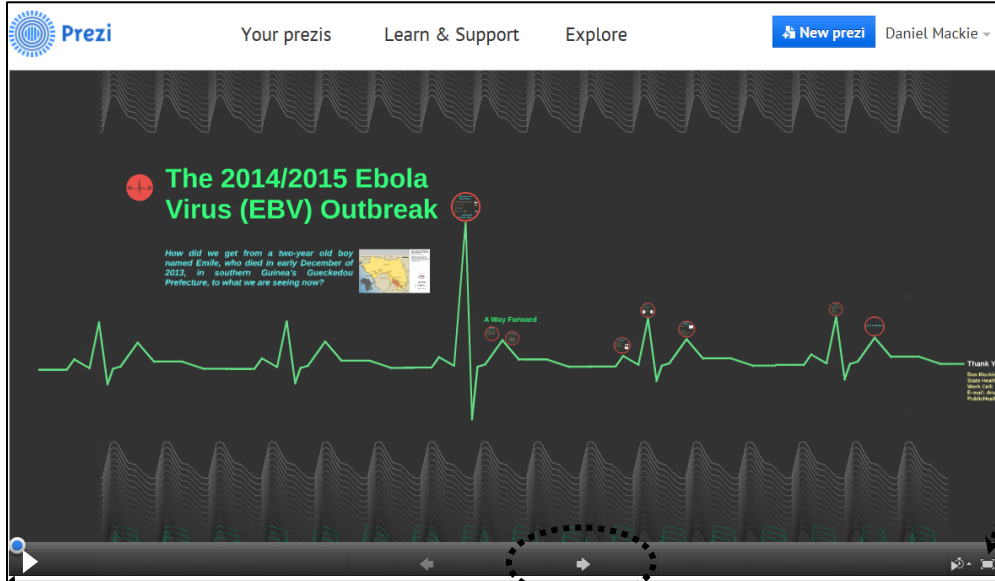
By clicking on this **hyperlinked** web address below, it should automatically open the *Prezi* presentation for you. If not, then please copy and paste this web address into your PC's internet browser.

http://prezi.com/-7zyjagszelp/?utm_campaign=share&utm_medium=copy&rc=ex0share

Depending on your computer and the strength of its internet connection, it may take up to a minute for the online presentation to fully load; so please be patient while the website loads the online course.

HANDBOOK FOR THE BASICS OF EBOLA TRAINING COURSE

Depending on your internet connection, this presentation may take a few seconds, to a few minutes, to load; so please be patient. Once the presentation does load, you can watch the course as it displays, on a portion of your PC's screen; or, you can expand it to fill your computer's entire screen by clicking on this symbol in the bottom-right corner of your screen:



Either way you choose to watch the Prezi presentation, in full screen mode or not, you will be advancing the presentation at your own pace, one transition at a time, by clicking the right-arrow at the bottom of the screen (circled above).

If you would rather watch and listen to this course like a movie, you can also click on this “Play” button in the bottom-left corner of the window, as indicated by this arrow.

Note: If you opt to watch the course in the full-screen mode, the software will pop-up a question about “*Allow full screen with keyboard controls?*” Just click on the **Allow** button.

From that point on, you will watch and listen at your own pace. If you need to go back and redo a previous slide (or as Prezi calls them: *Path*), then simply click that left-facing arrow at the bottom of your screen. Adjust your PC's volume and enjoy the course!

Full-Transcript to the Basics of Ebola Training Course

The U.S. Centers for Disease Control and Prevention (CDC) have created 10 essential public health services that public health systems throughout the country should be capable of. The eighth essential service is: “Assure a competent public and personal health workforce.”

—Taken from the CDC website <http://www.cdc.gov/nphpsp/essentialservices.html>

In this first installment to the ‘Ebola Training Series’, we will look at the basics of what the Ebola Zaire virus is, and we will look at this current threat to public health within the context of some previous threats. This course will also try to balance facts-versus-fiction with the current outbreak of Ebola virus.

If you are taking this course at your own pace from your computer, then please allocate at least **65** minutes to complete this presentation. Each of the courses within this series are designed to build upon the knowledge gained in previous courses, so please do not jump from course to course out-of-sequence.

As with each of the courses within this series, here is the transcript of what was recorded for this course.

Course Transcript

Path #1: Welcome to the course! Before we get going, I ask that you please adjust your computer’s volume control so you can hear the audio component of this training course. As with the previous courses, you can advance at your own pace by clicking that right-facing arrow at the bottom of your screen, or you can click that ‘Play’ button in the bottom-left corner of the screen. Hello, and welcome to the first in a set of courses called: “*The Ebola Training Series: The Basics of Ebola.*” My name is **Dan Mackie** and I am an epidemiologist with the Nevada Division of Public and Behavioral Health’s State Epidemiology Program. I was asked by Nevada’s Chief Medical Officer, Dr. Tracey Green, to create this first

online-accessible training course, in what will end up being an entire series of courses covering Ebola. As you may notice from the course title, I've taken the liberty of naming this current outbreak as the 2014/2015 Ebola Virus Outbreak. I have done this in an attempt to begin getting us all familiar with the estimated timeframes that this outbreak will last. The *Ebola Training Series* is intended for both public health and its partner agencies, so that we may all be speaking the same language when it comes to large-scale responses to Ebola virus (aka: EBV).

Path #2: So I begin with a simple question: How did we get from a single case of Ebola Zaire virus in a two-year old boy named Emile, who died back in early December of 2013 in his village in Guinea's *Guéckédou Prefecture*, to what we're seeing now? How is it possible that this first case has turned into all this tragedy since then?

Path #3: Here is map from a recently published article in the New England Journal of Medicine (NEJM) that helps give us a geographical representation of where young Emile's story ended, and the global story that we are all watching unfold before our eyes began. As this map shows, the *Guéckédou Prefecture* lies at the confluence of where the borders to three separate West African countries come together: Guinea, Sierra Leone, and Liberia. From this rural crossroads, which lies on the highway between Guinea's rural interior and its sprawling capital city of Conakry on the coastal plain, is where the story began in December of 2013.

Path #4: Although I could go into greater detail on how Emile, along with most of his family, lost their lives to Ebola; I would recommend that you read this JAMA article by *Baize et al.* The authors do a great job unraveling the story of Emile, and how this opportunistic virus called Ebola took full advantage of the conditions it found both within Guinea's rural interior, and within its population hubs.

Path #5: So let's begin by looking at this current threat to public health within the broader context of previous crises.

Path #6: As it says here: "*We have been here before....*" I went and clipped a bunch of newspaper headlines that may help us to see Ebola in its true context. As I go through each of these, try to remember where you saw or read any of these headlines for the current Ebola crisis facing us all.

Path #7: I begin with this headline: "*We Need Research, Not Hysteria!*" That phrase has come up a few times as the global community demands an effective vaccine to be pressed into service to protect us from Ebola. The same could be said of public demand for anti-viral combinations such as *Z-Mapp*, etc.

Path #8: This one has been getting a lot of press coverage lately, especially with mid-term elections coming in November, and the border security debate being such a 'hot-button' topic in this election cycle.

Path #9: I like this one, because it ties us right back to Mr. Duncan’s story, and how he and the Ebola virus his body housed, flew straight into the headlines of every major newspaper on our shared planet. This topic has been all over the evening news and has even been debated over by various political candidates as they present themselves to the electorate prior to November’s big day.

Path #10: And how about this one: “*Nurses to Go On Strike!*” We hear this one in both Spain, and here within the United States. As the tragic events surrounding the nurse in Spain, and the two nurses in Dallas, Texas, come to light; this quote leaps straight off of our televisions and computer screens on a daily basis. But are these headlines that I’ve found contemporary, or do they speak to a history that we as a nation have within our collective memory? Without you knowing it, I found these headlines in the archives.

Path #11: The first headline that I used in this demonstration came from a New York Time article from circa 1982/1983. As gay men began flooding into our nation’s healthcare system with strange cancers, symptoms, and absolutely non-responsive to every treatment regimen that our best doctors and nurses could throw at them, this clarion call of “we need research, not hysteria” was typed in bold face amongst many of our nation’s largest newspapers.

Path #12: That headline about “Closing the Border” comes to us from the early 1900s. I found this image in a New York news magazine from that era called ‘Puck.’ In this cartoon image, we see Death arriving on New York’s shores with the word “Cholera” written across his belt. Down below, we see the New York City Board of Health rowing out to meet him, with a large bottle of carbolic acid strapped to the bow of their (that is still used as a disinfectant against cholera). The fear then was over Yiddish Jews from western Russia who had been pushed out by the Czar, bringing cholera with them to our country as they immigrated. Although they first arrived from Russia into Western Europe, from there they were quickly loaded onto trans-Atlantic ships, and passed to our country’s eastern seaboard, most notably: New York City.

Path #13: I like this one about “Stop the Flights.” Although not as old as the previous example I used, many of us may recall the fear and hysteria we all watched in 2003 as the Severe Acute Respiratory Syndrome, or **SARS** for short, made its dramatic debut in China’s southeastern Guangdong Province. As that novel corona virus exploded out of China’s open-air animal markets, this headline was plastered across our airwaves, and on our new papers.

Path #14: And finally I have this headline about how “The Nurses Will Go On Strike.” As the proud son of an ICU nurse, I watched as my mother and her colleagues wrestled with the fear and doubt of taking on AIDS patients back in the early 1980s. At that time, my family was living near New York City, out on Long Island. As you may recall, the first cases of HIV/AIDS exploded upon the scene

in that part of the country, and in San Francisco here on the west coast. For a kid such as I, who had a mother working in direct patient care at that time, the national dialogue on HIV/AIDS was a daily conversation at our dinner table. It appears my family and I were not the only ones who were concerned: this photo is of British nurses who went on strike in 1983 because they felt they were NOT being given the correct PPE, training, and support. Sound familiar???

Path #15: So what does this latest threat to public health represent to those of us who are watching it unfold? From where I'm sitting, today's Ebola threat mirrors all of the attributes we've seen in previous situations; especially for those situations where fear and hysteria are high, and training and understanding are low. We are in a '*perfect storm*' of hysteria, that I will depict with this triangle. Above everything, I listed an "Unfamiliar Threat," and by that I mean; unfamiliar to those of us in this part of the world. Down in the left-corner I chose to put "Perceived Lack of Readiness", because as we've all seen in the news cycle: "The CDC and the WHO were caught unprepared for this outbreak, and they're lying to us to cover their tracks." And finally I have "Disproportionate Fear", because we in public health are playing catch-up to what Hollywood and fiction writers have been putting out for two decades. More to come on that, later in this presentation. If you are interested in learning more about these previous outbreaks, I would recommend a book by Howard Markel titled "*When Germs Travel: Six Major Epidemics that have Invaded America Since 1900 and the Fears They Have Unleashed.*"

Path #16: So if this most recent challenge to public health is the latest in a long line of similar crises, then what will we do to overcome this challenge, much like we did with those examples of historical challenges that I just dug up out of the archives? That's what this course will begin to do, to begin a new dialogue on what we will do. OK folks, we have been here before, and we will be here again sometime in our future. Hopefully way down the line after I am long retired from government service and public health!

Path #17: So what's the way forward from this high hysteria, low training and low understanding reality that we are seeing now? Well right out of the gate, I would recommend that we begin with two simple concepts: let's **demystify public health**, and let's get back to one of public health's core functions: **assurance**.

Path #18: I will begin with this recommendation first.

Path #19: Although the phrase 'Public Health' is well recognized throughout our world, it is often misunderstood by the same public, and partner agencies, that we seek to protect. Although we get a lot of recognition for our work in vaccines; many of the other attributes to public health have been lost within the public's understanding.

Path #20: So our state's Chief Medical Officer, Dr. Tracey Green, has set out to help assist both the public, and our partner agencies, to become better informed

consumers of the public health message. The hope is that whenever you see or hear a public health official speaking about “lowering the burden of disease amongst our XYZ population”, that you will better understand what that person is talking about. Back in a previous life when I was a young lieutenant in the U.S. Army, I learned to “*never state a problem without offering at least one proposed solution.*” So here are some examples of solutions that Dr. Green and I have been working on to help demystify public health.

Path #21: In this first example, I would like to point you to a set of online accessible training courses (much like the one you are watching and listening to now) that Dr. Green came up with called “*The Foundations of Public Health Series.*” As the title to this series implies, these courses cover some of the basics that we in public health are responsible for. Unlike the course you are taking now, these “foundational” courses are general in nature. The idea is that if you take each of these 10 to 15 minute courses, that you will have a basic understanding of what public health does, and what it could ‘*bring to the fight*’ if we were all working together in a large-scale response. As the old preparedness mantra goes: “We shouldn’t be exchanging business cards on our way to a response”, so too does it go with understanding what public health can do in a response: “Public Health shouldn’t be explaining what it does on our way to a response.”

Path #22: The first course covers something called “**The Chain-of-Infection.**” For any large-scale response to a biological agent, this course helps to explain many of the key concepts on how an agent must transmit to a new host. Off to the right is a screen shot of what the main page to the Prezi presentation looks like, so you know what to look for when you open it.

Path #23: Next we have something that my colleagues and I in the state Public Health Preparedness (PHP) program came up with in the aftermath of the 2009/2010 response to H1N1; something called the “**Public Health ‘Toolbox.’**” This 15 minute course goes through the seven interventions that public health would look to in a response to a biological threat: Vaccinations, Medications, Antivirals, Isolation, Quarantine, Hygiene (to include decontamination and personal protective equipment/PPE), and Social Distancing.

Path #24: The third training course in Dr. Green’s series covers **PPE**. This course is general in nature, and explains six levels of precautions that our healthcare providers and responders would employ in responses involving a biological threat. Please note that in the days and weeks to come, Dr. Green will be publishing an Ebola-specific PPE training course, so please keep your eyes out for that training opportunity.

Path #25: This fourth course is near and dear to my heart: the **Epidemiology and Disease Surveillance** course. Some of the concepts covered in that course

will also be used in this course that you are taking now. I will go into more detail on that later.

Path #26: And finally we have this fifth course that covers the differences between something called RNA viruses and DNA viruses. For those of you who may have questions about why some types of viruses mutate more than others, this course is perfect for you.

Path #27: OK, that's it for the current set of foundational training courses offered by Dr. Green. As I've listed here, we ask that you check in from time-to-time, to see what other courses have been added to the series.

Path #28: In addition to the examples I just went through, the state health division also has a website where those courses, as well as other useful materials, can be found.

Path #29: Here's the Main Page to that website, and.....

Path #30:here's the web address you will need to use in order to access that website. <http://www.health.nv.gov>

Path #31: Once you arrive on the site's Main Page, then this menu option may be of some help to you and your organization as we all prepare for a possible Ebola response: The **Nevada Ebola Virus Toolkit**. If you click on that option, then this is what opens next.....

Path #32: ...the Ebola toolkit. The course you are now taking will be available down there at bottom, along with all those other courses I discussed previously.

Path #33: Well that's it for the basics on how we intend to help demystify public health. If you have any questions, hold them until the end of this presentation where I will list all my contact information.

Path #34: The second recommendation that I submit is this idea of going back to one of public health's core functions.

Path #35: Years ago, key public health partners at the national level, such as the U.S. Centers for Disease Control and Prevention (CDC), collaborated with the academic community to develop a standardized list of something called "The Core Public Health Functions." Through those efforts, this group came up with the three core functions.

Path #36: The first two are listed here. Although I could go into more detail on each of them, I'd recommend we move on to the third core public health function instead.

Path #37: Assurance is a key to the three core functions, and incorporate three of the ten “Essential Public Health Services” that were devised to help make those core functions a reality. I’ve listed Essential Service number seven in that sub-bullet: *‘assure a competent public health and personal health care workforce.’* The next bullet covers essential service number nine: *‘Inform, educate, and empower people about health issues.’* And that last bullet covers essential service number ten: *‘Mobilize community partnerships to identify and solve health problems.’* This presentation and those courses by Dr. Green that I discussed a few moments ago are examples of our efforts to *‘assure a competent workforce’*, and of *‘informing, educating, empowering’* you all, our partners; and so on.

Path #38: As you can probably tell, I am a student of history. For all the fear and frustration we currently see with this Ebola response, we have succeeded at things like this before, and we will again; especially with Ebola. In the early years of the 1980s, we struggled to come to grips with a terrifying new illness called HIV/AIDS. But over time we learned to understand the threat, and to come up with sensible solutions to mitigate it. I found this image from one of my old HIV/AIDS course that I took as a new Peace Corps Volunteer in Gabon back in 1998. These simple ideas that *ignorance equals death*, and that *silence equals death* are just as applicable to Ebola now, as they were to HIV/AIDS back in the early 1980s.

Path #39: That covers it for assurance. The takeaway to the section about “Demystifying Public Health” and the section about “Assurance” is that those of us within the field of public health need to do a much better job at telling our story, and at helping you all to better understand what we can and cannot do in a response.

Path #40: So now that we’ve got the general topics out of the way, let’s bore in on the nitty-gritty to what I know you’re all here to learn about: *‘What the heck are we going to do about all this Ebola stuff we are seeing and bearing so much about in the media.’*

Path #41: In order to do that we need to begin by addressing the facts of Ebola versus the myths and fiction of Ebola. From this point on in my presentation, I will address only one sub-species of the Filovirus family of viruses: something called **Zaire Ebolavirus** species.

Path #42: Well, we certainly have our work cut out for us. Since this particular species of Ebola virus was first identified in 1976, the writers of fiction have shaped both the national understanding of this biological agent, and the national dialogue on this threat.

Path #43: We begin with this novel by Richard Preston called “*The Hot Zone*” that was first published back in 1995. This story walks us through a real-world outbreak of Ebola virus right here on U.S. soil, just outside our nation’s capital, in beautiful Reston, Virginia. Mr. Preston explores this event in great detail, and

explains to us how imported non-human primates that were quarantined in a holding facility in Reston, began to develop symptoms that were consistent with a viral hemorrhagic fever of VHF. The monkeys nearly all died from a species of Ebola virus that is 99% identical to the species of virus that can infect humans. Fortunately, the species of virus that decimated those research monkeys did not make humans sick; so we dodged a bullet on that one back in 1989.

Path #44: Next we have a book by New York Times reporter Laurie Garret. In her 1996 book titled “The Coming Plague”, the author recounts her experiences and observations during the 1995 Ebola outbreak in Kikwit, in what was then known as Zaire (now known as the Democratic Republic of the Congo or DRC for short). While reporting on the outbreak, Ms. Garrett observed a burial for one of the outbreak’s many victims. Within two weeks of that funeral, all of the woman who attended to the body of the deceased, had also died from Ebola. This connection between traditional funeral practices and the creation of new Ebola cases led to Ms. Garrett winning a Pulitzer Prize in 1996 for her work.

Path #45: Things really got crazy when Dustin Hoffman and Rene Russo jumped into the fray with their over-the-top depiction of an Ebola-like disease in the hit movie “Outbreak.” What I’ve always found interesting about this film, is how the studio convinced Nelson Mandela to join the cast. Ha -- gotcha! Just kidding, that’s none other than actor Morgan Freeman.

Path #46: So with so much being written about Ebola in fictional novels, and the good folks over in Hollywood doing their thing; it’s no wonder that public health began this national dialogue on Ebola virus with a huge gap in knowledge to fill. So early in the outbreak (e.g. last Spring), I was happy to see that CNN’s Medical Correspondent, Dr. Sanjay Gupta, did a short piece about the “Myths of Ebola.” In the six months since he posted this piece, his information is just as valid now as it was then, before the whole world was watching and worrying. Myth #1: Ebola can wipe out the entire human race just like the Great Plague did. Well first off, if that were true, none of us would be here. In fact the Great Plague that wrecked havoc across Europe and the Asian sub-continent from 1346 to 1453 killed somewhere between one quarter and one half of Europe’s inhabitants. Ebola is nowhere like that great calamity. Next we have Myth #2 about how Ebola is highly contagious. Although the words ‘contagious’ and ‘infectious’ are often used synonymously, they actually mean different things. Contagious means can it go from Person A to Person B; and infectious means “How much of ‘it’ does Person B need to be exposed to for them to become ill.” Ebola is not very contagious, meaning it’s not easily passed from person-to-person; but it’s highly infectious, meaning it doesn’t take a lot for someone to be exposed to before they become infected too. Myth #3 about Ebola being passed through the air is flat out false. Although a sick person can cough and sneeze small globules of schmutz that have the Ebola virus within them, those globules are too heavy to float on the air. So within three to six feet from where they are coughed or sneezed out of the body,

gravity pulls them down to the ground. This is called droplet transmission. Myth #4 about Ebola liquefying your organs comes straight out of those novels and movie that I just discussed. Yes the virus can cause internal bleeding, but you don't turn into a big puddle of goo or anything. Finally we have that fifth myth about Ebola: that this virus is the most dangerous disease known to humans. As a trained epidemiologist, my counterparts and I like to geek-out and debate what pathogen is the most dangerous; and you would most likely be surprised when we come up with lists that have diseases you're probably very familiar with: influenza, measles, diphtheria, etc. As exotic as Ebola may sound, in truth, it has generally impacted small communities in a short amount of time. Later in this presentation I'll go through the numbers to this current outbreak, so you will see what I mean.

Path #47: Here's a screen shot of that short "Ebola Myths" piece done by Dr. Gupta. I have also listed the web address along the bottom of this image. For those of you who are following along in the course handbook, there's a hyperlink to this short video.

<http://www.cnn.com/video/data/2.0/video/health/2014/04/17/orig-jag-ebola-myths-gupta.cnn.html>

Path #48: So what is this Ebola virus, and where does it come from? To answer that, I need to borrow a slide from another online training course I built last Spring called the "*Biological Threats to Homeland Security*."

Path #49: In that course I made heavy use of journal articles from the Journal of the American Medical Association or JAMA. In one such article I took a table used by the original authors, and recreated it to highlight some key points I was trying to make. In this example, I highlighted in red any family of Viral Hemorrhagic Fevers (VHFs) that had species which have been identified as being a threat to Homeland Security. Of the four families of VHFs (as seen from top to bottom along the left column) we have *filoviruses*, *arenaviruses*, *bunyaviruses*, and *flaviviruses*. If we look at filoviruses, we see that it has two sub-species: Ebola and Marburg. I highlighted that annotation next to where it says "Ebola" along the top row to point you down to the references. When this JAMA article was published in the early 2000s, there were four sub-types of Ebola virus species: Zaire, Sudan, Ivory Coast (aka: Tai Forest), and Reston (that one made famous by Richard Preston's book "Hotzone"). Since this article's publication, a fifth subtype has been identified: *Bundibugyo*. I have also taken the liberty of identifying "Fruit Bats" as the most likely vector in nature for this genus of VHFs. That assertion is based off of research that has been published since this JAMA article came out. So the reason I've included this table, is to help demonstrate that when we look at VHFs as a class of viruses; we are looking at the most serious family (Filovirus), and of that family, we are looking at the most serious type (Ebola), and of that type, we are looking at the most serious sub-type (Zaire strain).

Path #50: So how does this current outbreak of Ebola compare with those that have come before it? Well to answer that, I would like to point you to a useful

resource on the CDC's website. The good folks back in Atlanta have listed all of the Ebola virus outbreaks since the virus was first identified back in 1976. The current outbreak represents the 34th in a long list of such outbreaks.

Path #51: Here's a screen shot of that CDC website, and its list of outbreaks in reverse chronological order. Now a word of caution; for those of you who choose to open this website and take a look at this table, I need to point out one very important fact. You may notice that the country of Gabon is listed as having an Ebola outbreak in 1997, a few months before I moved there to serve as a Peace Corps Volunteer in a rural village pre-natal and vaccination clinic. You may also notice that Gabon experienced its next Ebola outbreak in 2001, a few months after I returned to the U.S. after my two and a half year service commitment. SO based off of these observations, we can deduce that my presence provides some sort of protective factor against Ebola outbreaks. But therein lies the problem: I am applying to both Johns Hopkins University and the Uniformed Services University for Health Sciences (USUHS) for their doctoral programs in epidemiology; should I be accepted into either program, I would need to move back home to the east coast. If that occurs, then I can no longer guarantee that an Ebola outbreak will NOT happen here in Nevada. Sorry folks, I just needed to make a full disclosure of that. OK, now back to the presentation.

Path #52: The CDC website also provides this map to help explain where most of the 34 Ebola outbreaks have taken place. I've spent nearly four years of my life in the equatorial belt of Africa, so Ebola was considered par-for-the-course in our neck of the woods. That table to right does a good job of listing how many cases each outbreak generated, as well as how many of those cases died from their illness. Later in this course I will explain how we divide the number of deaths into the number cases to calculate something called a Case Fatality Rate or CFR for short.

Path #53: That's it for the Facts versus Fiction of Zaire Ebolavirus species. If you have any questions, hold them to the end, and then reach out to me through my contact information that is listed.

Path #54: Next we will be moving on to something that I get *a lot* of questions about.

Path #55: It seems that no matter how many times I've given this presentation, the discussion of Ebola being a 'moving target' always comes up. Well, let's go at that topic head on, and look at what some of the science is saying about this issue.

Path #56: The big question I always receive is: "Will this strain of Ebola virus mutate and become airborne?" Good question, and by the amount of media attention paid to this topic, a question that the whole country seems interesting in hearing about. Back in April, when I last spoke with some of my former Congolese counterparts who were on their way out to help serve in French-

speaking Guinea; I began compiling my own literature review of Ebola and this current outbreak. For any of you who have seen me speak in public on Ebola, I carry my lit review with me in a big blue binder.

Path #57: One of the tabs within that blue binder organizes a series of journal articles on this issue; and to help make things simple, I have divided those articles into two camps: the **Pro**-mutation camp, and the **Con**-mutation camp.

Path #58: For the articles that are Pro-mutation, I picked this article that was published online by Science journal on August 28, 2014, by **Gire et al** (I added that green arrow so you can see the lead author's name in case you wanted to download your own copy). The authors to this example did an exhaustive study of the genomic characteristics of the strain of Ebola virus we are seeing in West Africa. Rather than have you read through the entire article yourself, I have taken the liberty of highlighting the crux of their argument for mutation.

Path #59: And here it is. If you turn to page 1372 of the Gire et al article, the authors state that “*The rate of non-synonymous mutations suggests that continued progression of this epidemic could afford an opportunity for viral adaptation, underscoring the need for rapid containment.*” So in brief, they're saying: The longer this outbreak goes on, the more times we roll the dice that somewhere along the line this thing will mutate. Nowhere in the article to the authors say anything about the virus mutating and becoming airborne; only that it may mutate.

Path #60: On the flip side of that coin, we have the Con-camp that do not believe this virus will mutate very much. From the articles in my lit review, I chose the **Carroll et al** article as the best representative of this camp. This group of authors took representative samples of Ebola viruses from many of the Ebola outbreaks that have occurred between 1976 and 2012. They mapped the genetic sequences to those samples, and then compared the results to each other.

Path #61: So in an effort to get you to the good stuff, here's the crux of their findings: “*The overall genetic diversity within the Zaire ebolavirus species is low, with a maximum 2.7% nucleotide difference between sequences.*” So what these authors are saying is basically: when we compare the genetic makeup of Ebola virus samples going all the way back to the 1976 outbreak, the virus has barely changed in 38 years.

Path #62: Hmmm. That's interesting information from each camp, but how do we use the science to help us better understand this mutation issue? For that, we will need to go back into one of Dr. Green's “*Foundations of Public Health Series*”, specifically the one on RNA Viruses versus DNA Viruses. For those of you who may not have taken that 15 minute online course yet; here are the Cliff Notes. Ebola uses RNA to carry its genetic coding. Ok, we got that. Next we see that RNA viruses are more simple and less stable than DNA viruses. Ok, we got that too. Then we see that RNA viruses lack any sort of proof reading mechanism whatsoever. So that means, when an RNA virus gets into a host cell and hijacks

that host cell's reproduction machinery to make thousands of copies of itself; it can't check to see if some of those copies are duds, or if some are crazy mutations of the original, etc. A year ago I was writing my master's thesis at Naval Postgraduate School on my research involving pandemic strain viruses such as type-A influenza, and human coronaviruses. In my research for that thesis I used John Barry's book called "*The Great Influenza*." I like this quote from page 105 of his book to help explain the rate of mutation observed in RNA viruses versus that observed in DNA viruses: "*viruses that use RNA to carry their genetic information mutate much faster – from 10,000 to 1 million times faster – than any DNA virus.*"

Path #63: Alright, so based on what we learned in Dr. Green's RNA/DNA course, the **Gire et al** article (that was the one that was pro-mutation) is basically saying that we should expect the Ebola virus in West Africa to mutate. OK...uh...newsflash, that's like saying "Northern Nevada should expect to see beaucoup wild fires next summer" or "we should expect San Francisco to be hit with a major earthquakesometime in the future." OK.

Path #64: But for those of us in the intelligence business, or the response business, or the prevention business, we need more to go on. We need details like when, where and how big?

Path #65: So based off of the science that I'm presenting from the two camps-of-thought; how did we get from Gire et al's mutation assertion, to specifically forecasting that the mutation would result in Ebola changing itself to become *airborne*? For me, that's like trying to predict when the 'Big One' will hit the Bay Area.

Path #66: I hope this part of today's presentation helped, and that the science we looked at will help you make your own informed decision on this discussion about Ebola mutating.

Path #67: Next we will be moving on to another Ebola issue that I receive lots of questions about.

Path #68: In this segment to my presentation, we'll be looking at Ebola by the Numbers. For those of you who do not consider yourselves to be 'Numbers People'; trust me, you will find this section rather interesting.

Path #69: For those of you who may have already taken Dr. Green's online training course for *Epidemiology and Disease Surveillance*, some of this will be old hat. For those of you have not yet had an opportunity to watch that course, I have the Cliff Notes version here too. Whenever we talk about an outbreak becoming really big, you will hear public health people discussing something called an Attack Rate. As it says here: an Attack Rate is the percent of an exposed population that becomes ill with an agent. So in order to make these calculations, we will first

need to know how many people have become ill with the agent that is causing the outbreak.

Path #70: The good folks over at the World Health Organization (aka: the W.H.O.) do a great job of tracking data just like that. Those data are published generally on a weekly basis in reports called “Situation Updates.” This example comes from the Situation Update for October 17, 2014. The first thing that you may notice is that Sénégal and Nigeria are NOT on this list. That is due to the fact that the Ministries of Health for those two countries, along with the WHO, have declared those outbreaks of Ebola to be over. By definition, an outbreak cannot be declared over until two full incubation periods have passed without any new cases. In the case of Ebola with a maximum incubation period of 21 days; this means that Sénégal and Nigeria have each gone through 42 days without a single new Ebola case being reported in either country. If you look at each country listed here (Guinea, Liberia, Sierra Leone) we see that the WHO folks have tabulated the number of confirmed cases, the number of probable cases and the number of suspected cases; they also give us a total for each country that is affected by this Ebola outbreak. Keep an eye on those total for the number of “Cases”, we’ll be using those again in a moment (e.g. 1,519 for Guinea, 4,262 for Liberia, etc.).

Path #71: To calculate attack rate, I’m supposed to know how many people were exposed, but that’s impossible to discern from the data we have. So in following with the WHO’s description for each of these three countries as having “widespread” Ebola distribution, I decided to use national population data as a surrogate (so we can get an idea). To find national population data, I went onto the Central Intelligence Agency’s (CIA’s) website and queried the national population for each of these countries. Those CIA data are good, and here is what they report for Guinea’s population as of July 2014: 11,474,383.

Path #72: Next, if I go back into that WHO Situation Update from October 17, 2014, we see that this country has had 1,519 cases since the outbreak began.

Path #73: So if I divide the number of cases into the total population, we get an estimated attack rate of about 0.013%. So in plain English this means: the Ebola outbreak within Guinea has infected less than one-tenth of one percent of that country’s population

Path #74: When we run the same sort of calculations for Liberia, we come up with these estimates; about a tenth of a percent of Liberians have been infected thus far.

Path #75: And down here, we see the estimates for Sierra Leone; also about a tenth of a percent.

Path #76: So when we go back into that WHO Situation Report from October 17, 2014, we see the following data altogether: 9,216 cases and 4,555 deaths attributed to this Ebola outbreak. To calculate something called the Case Fatality Rate or CFR, we divide the number of deaths into the total number of cases; and that gives us a **CFR of 49.4%**. In plain English that means: this virus kills half of the people it infects.

Path #77: In response to these types of attack rate estimates, and to these case fatality rate calculations; the W.H.O. came up with this strategy in early October, something it calls the “70 / 70 /60 Plan.” The idea is simple, and fits within the realities that the Ministries of Health, the WHO, and its growing roster of partners agencies, are all seeing and experiencing on the ground: ‘70% of the people who die from this virus must be buried safely; 70% of those who are ill with this virus must be cared for in a healthcare setting; and all of this must happen within the next 60 days.’ Those are achievable goals within the context of the West African healthcare system and the international support that continues to flow into the region. As the WHO says: these goals will not see the outbreak end within the next 60 days, but they will help close the performance gap between the virus and our response. Up to now, the virus has outpaced every intervention that humanity has managed to throw before it.

Path #78: The next key number to look for in outbreaks such as these is something called the ‘**Reproduction Number**’ or as it is more commonly referred to: **R-zero**. I have included the definition of R-zero in this frame for you. As you can see, it is the number of secondary cases generated by an index case in the absence of any control measures, or in the presence of control measure (e.g. isolation, quarantine, hygiene, etc.). So if I fall ill with something and infect one other person, then the R-zero would be one, and so on. In the Spring and early Summer of 2014, before Guinea, Liberia, and Sierra Leone had mobilized their response efforts, we were seeing R-zero calculations above 3.0 for each country.

Path #79: Based off of the most recently published R-zero calculations by **Christian L. Althaus** from the University of Bern in Switzerland; here are his updated R-zero calculations (as of September 2, 2014): *Guinea was at 1.51; Liberia was at 1.59; and, Sierra Leone was at 2.53*. Which means: for every case within these countries, one and a half to two and a half new cases are generated. I took the liberty of running my own calculations for Texas, using Mr. Duncan as the index case, and Nurse Pham and Nurse Vinson as secondary cases. The math is simple enough; in the case of Dallas, Texas, we see an R-zero of 2.0. When we compare that calculation to what we’re seeing in West Africa, the Dallas cluster performed just like the ones we are seeing oversea: one case generates somewhere between 1.5 to 2.5 secondary cases. I understand that our aspirations here in the U.S. are to see R-zero calculations of 0.0; but for our first time with seeing an un-announced Ebola patient arrive within the U.S. healthcare system, the virus performed here just like it has back in West Africa. If we dig a little further into

the literature, we find a March 2004 article by G. Chowell et al that calculates the R-zero for the 1995 Ebola outbreak in Kikwit, Zaire, as **1.83**; and the R-zero for the 2000 Ebola outbreak in Uganda as **1.34**. So how do all of these R-zero calculations for Ebola stack up with other diseases that we may be more familiar with? According to an article recently published in *Businessweek*, by Peter Coy on September 26, 2014, the R-zero for seasonal influenza is about 1.3, and the R-zero for measles is an incredible 17. Now you see why public health people get so twitchy when we hear of parents voluntarily opting out of their children's measles vaccine.

Path #80: So if less than one percent of the populations within these countries have been infected, then who are these people, and what did they do to become infected with Ebola virus? To answer that, I point you to a pattern the literature is telling us. Over the previous 33 outbreaks of Ebola virus, we have seen a general pattern whereby 1/3 of those who are infected are Healthcare Workers (aka: HCWs), and 2/3 are close contacts of cases (e.g. family members, close friends, and neighbors). If there's a silver lining to this whole Ebola business, it's the fact that the virus is not transmitted until the person is VERY sick. By the time a person with Ebola starts shedding enough virus to infect others, that person is usually in their home with family and friends around them. As those friends come to their loved one's aid, they in turn are exposed. Once that person is carried to a nearby health clinic, the nurses and doctors are then exposed. A sad truth about Ebola is that this has always been a disease that moves within families, and within healthcare workers. In the case of Texas, this rule-of-thumb was flipped around: Mr. Duncan represents 1/3 of the cases, and Nurse Pham and Nurse Vinson represent 2/3.

Path #81: That covers us for Ebola by the numbers. Please keep the idea of Attack Rate, Case Fatality Rate (CFR), and Reproduction Number (R-zero) in the back of your mind as you watch and listen to media reports. These calculations may help to give you a more realistic idea of how the outbreak is expanding or contracting, rather than all the hysteria.

Path #82: Now that we have an idea of the context in which the current Ebola outbreak exists, the Facts versus Fiction of Ebola, an understanding of Ebola as a moving target, and Ebola by the numbers; now we look at how Ebola will be defeated.

Path #83: I began today's presentation with a simple statement: We have been here before and we will be here again. In this next section we shall begin the dialogue on the tactics (and strategies) to beat back the Ebola virus.

Path #84: Although Ebola virus may be new and exotic to us over on this side of the Atlantic Ocean, for many of our counterparts over in central and western Africa, this virus is all too familiar to them. In the 38 years since Ebola made its

dramatic debut nearly simultaneously in Zaire, and in nearby Sudan, our counterparts in Africa have developed a successful set of tactics and strategies to defeat this enemy. Let's look at some examples of what I am talking about.

Path #85: This manual was published back in December of 1998 and has served as the standard of training to many Ebola outbreaks since then. The WHO, the U.S. Department of Health and Human Services, as well as the CDC came together to prepare this useful tool. Thus far Ebola outbreaks have occurred in countries that speak at least of the following three languages: English, French and Portuguese. So this manual can be found in each of those three languages.

Path #86: Since this manual was published, international aid agencies such as the Nobel Peace Prize winning group known as **Doctors Without Borders** (or as they are called in French, *Medecins Sans Frontieres*, or **MSF** for short) have come up with their own training aids and manuals. This is a screen shot from that agency's website. It shows the layout of an Ebola Care Center. If you place your cursor over those red circles, an interactive guide pops open explaining what goes on in that part of the care center, etc. I have an old photocopy of this agency's Field Operating Guide (FOG) written in French; and as a former career Army officer, and a two-time Returned Peace Corps Volunteer (RPCV); what always amazed me about these manuals by Doctors Without Borders is how sensible their planning, logistics and operations cycles are. They have thought through each of those aspects of a response, and have refined their system to a high degree of efficacy. A truly unique organization, with a unique skill set, and unique capabilities!

Path #87: I was fortunate to work under a true Subject Matter Expert (SME) for Ebola, Dr. Jean-Jacque Muyembe, Director of the DRC's National Biomedical Research Institute in Kinshasa. As a newly minted epidemiologist straight out of graduate school, I was hired on by UNC Chapel Hill's Epi Department to serve as their in-country program director for their Monkeypox Virus (MPV) project in the Congo. I was fortunate to work nearly seven months under Dr. Muyembe and learned a great deal from this extraordinary man.

Path #88: Here's a recent photo of him at a public health conference in Europe.

Path #89: What makes Dr. Muyembe such a subject matter expert is that his experience and understanding of Ebola literally goes back to when the virus was first identified in 1976 in a village called Yambuku, in what was formerly known as Zaire. In that outbreak, Dr. Muyembe worked with people who have gone on to become some of the biggest names in Ebola studies.

Path #90: One such person is Belgian-born doctor, Peter Piot. Dr. Piot's publications on Ebola virus are some of the first even written. He and his Congolese counterparts (as shown in this photo from that 1976 outbreak) conducted incredible science, under extraordinarily austere conditions, and for months at a time.

Path #91: This photo from Dr. Piot's notes, shows one of the Belgian nuns (who is also a nurse) in the midst of that first outbreak. Here we see the patient beds being cleaned and dried outside of the isolation ward for Ebola patients.

Path #92: Here is a more recent photo of Dr. Piot during an interview he did for CNN. Dr. Piot is a naturalized U.S. citizen who has worked within various national public health agencies here in the U.S. His book titled "*No Time to Lose: A Life in Pursuit of Deadly Viruses*" is a must-read for anyone interested in studying emerging infectious diseases, and Ebola virus in particular.

Path #93: Here are screen shots to some of the field notes that Dr. Piot wrote during that first Ebola outbreak in Yambuku, back in 1976. Below his field notes is a map that he and his Congolese counterparts prepared, to help track down the viruses spread. For those of you who may have taken Dr. Green's 15-minute online training course for Epidemiology and Disease Surveillance, I added that note down near the bottom about Dr. John Snow's map of the 1854 cholera outbreak in London, England. These classic tactics of mapping cases, in both space and time onto a map, go back to the very beginnings of epidemiology.

Path #94: Dr. Muyembe has published many articles on his decades of experience with Ebola. In one such article, he describes and 'Incident Command System' (aka: ICS) like structure that we may want to look at for use here in Nevada to a response involving an Ebola cluster and/or outbreak.

Path #95: For those of you who may be interested, here is a screen shot of that article by Dr. Muyembe, which you should be able to download from Google Scholar by searching for that title at the top of this image.

Path #96: If we turn to the end of this article, in his "Control Measures" section, we learn of this ICS-like structure, and get a sense of what each of those teams would be doing. From my experience with Incident Command, I see a Command Section, I see branches within the Operations Section, and I see units within the Logistics Section, and the Planning Section. For those of you who would like to see the initial drafts of organization charts for this ICS structure, please contact me at the information provided at the end of this presentation.

Path #97: What has always amazed me about people like Dr. Muyembe is that they can translate hard science into operational response plans. By operational, I mean plans that clearly explain the Who/What/Where/When/Why/How aspects of a response, throughout each phase of the response. That is a unique skill that is VERY difficult to find within the field of public health. In my sixteen years of public health service, I can count on one hand the number of people that I know within this field, who can do that sort of thing. If you find an operational plan writer, do whatever you can to keep them around, they're a rare breed indeed within public health!

Path #98: Dr. Muyembe was a contributor to that red book (remember the one I showed a few moments ago called “*Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting?*” If *imitation is the best form of flattery*, then this training manual for Monkeypox Virus that my Congolese counterparts and I came up with is just that. We took the best parts of the WHO/DHHS/CDC Ebola manual, and used those to create our own customized Monkeypox manual. Dr. Muyembe helped to coach us through the process, so we only incorporated information and images that would apply to Monkeypox. I learned an incredible amount of hands-on public health knowledge from Jean-Jacques and his team during this process.

Path #99: So if we have useful training tools such as the WHO/DHHS/CDC manual, the Doctors Without Borders materials, etc., then how do the current Personal Protective Equipment (PPE) standards here in the U.S. compare to what is being used in West Africa?

Path #100: I know that our instincts are to identify a ‘Bad Guy’ in that whole situation in Texas Presbyterian Hospital in Dallas, Texas. But in all honesty, I suspect that in the months and years to come when all the details come to light, that no one will be found culpable of any serious wrong doing. Meet this poor guy, who has the second worst job in all of America right: he’s the CEO to that hospital in Dallas. Side Note: Do you know who currently has the worst job in America? CDC Director Tom Frieden. That poor man can’t win for trying! In this screen shot of a recent ABC News interview between this man, and ABC News Medical Correspondent, Dr. Richard Besser, we see the leadership of Texas Presbyterian make a rather good argument that “hey, we were working with the best information we had.” That’s particularly important when the issue of PPE for nurses at the hospitals comes up.

Path #101: By the recommendations, anyone working with a suspected or confirmed Ebola case must wear something called “Full Barrier Precautions.” So what exactly does this level of precaution entail? So I went into the CDC website, and found long lists of PPE recommendation for full barrier precautions. Unfortunately those lists were so long, that when I took a screen shot, you would not be able to read anything on the list. So when in doubt, use Minnesota’s information (dang those Scandinavian descendants with their socialized medical system). So here’s a screen shot of that state’s website, describing what forms of PPE would comprise full barrier precautions.

Path #102: If we focus in down here, we see that full barrier precautions are a compilation of the other forms of precaution that came before it, with face/eye/head/foot covers thrown in for good measure. So to help give you an idea of what those additional PPE items would look like in a typical U.S. healthcare facility, I added these extra images and arrows. If we look at the definition for full-barrier precautions as they currently exist within the U.S., these examples that I have included within the extra images would meet that definition.

So as an outsider looking in on what transpired in Dallas; I suspect that those folks were meeting a ‘standard’, but that this standard was inadequate for the realities of an Ebola patient; and I will not even get into the whole training and logistics issue! So with these images in mind, let’s compare those to images of what our counterparts in West Africa are currently wearing as full barrier precautions.

Path #103: Wow! Right away, we see this mortuary team in gear that doesn’t even look close to what our standards are here in the U.S. If we work our way from head to foot we see the following differences. Goggles are worn to cover any exposed skin around the eyes, and I’ve included some examples of the types of goggles we are seeing used over there; everything from the high school wood shop safety goggles, to the more comfortable ski goggles. Next we have that one-piece hood that goes over the entire head, and works in conjunction with the goggles and mask to cover absolutely every square inch of exposed skin. Since this team is dealing with decedents, they wear on their top level set of gloves those heavy and re-usable rubber gloves that we here in the U.S. can purchase at any super market. Next we see that long water-proof apron. The length of these aprons is important because they help to reinforce the Tyvek suit work beneath, and they overlap the rubber boots. This overlap acts like shingles on our roof back at home. The top layer overlaps the bottom layer, so liquids can’t seep in. And finally we have those tall rubber boots that can also be reused after they’ve been cleaned, sterilized, and dried properly.

Path #104: Obviously this only begins the dialogue here in Nevada on what Dr. Green and I are calling “Enhanced Full Barrier Precautions.” As we await CDC recommendation and updates on what constitutes the Ebola-specific PPE recommendations, we will be publishing another online accessible training course on the ‘Enhance full barrier PPE’, and this course will go in step-by-step detail on both the *donning* (aka: putting on) and *doffing* (aka: taking off) of this level of PPE precaution.

Path #105: These training aids by Doctors Without Borders cover something called dual-flow hospitals. Just because a healthcare facility is taking Ebola patients, does not mean that all the other day-to-day illnesses stop coming too. This dual-flow model has been used with great success throughout West Africa.

Path #106: The idea of specialized patient care facilities has taken on its inertia back here in the states. Here is a recent article published in the Washington Post that details some of the unique challenges that healthcare facilities must plan and adapt for when handling Ebola patients.

Path #107: Normally when I present this course in person, we usually have at least a 30-minute Question and Answer session afterward. For those of you watching and listening to this course online, I will post my direct contact

**HANDBOOK FOR THE BASICS OF EBOLA
TRAINING COURSE**

information is a moment for you to contact me with, should you have any questions or concerns.

Path #108: Well, that covers the basics of Ebola. We realize how busy you all are, and how valuable your time is to you. As always, we appreciate that you have taken the time to watch and listen to this online training course. This course is intended to serve as only the beginning of the dialogue concerning Ebola virus, and not the end. If there are specific course you would like us to publish, please don't hesitate to send me those recommendations. If you have any questions or concerns on what I've covered thus far, please contact me at 775-443-7919, or at my e-mail address: dmackie@health.nv.gov . We thank you for your willingness to learn about this key component to the *basics of Ebola!*