

```

import torch
import torchvision.transforms as T
from torchvision.models.segmentation import deeplabv3_resnet50
import cv2
import numpy as np
import os
import matplotlib.pyplot as plt

# Load the pre-trained DeepLabV3 model
model = deeplabv3_resnet50(pretrained=True)
model.eval() # Set model to evaluation mode

# Define the transformation for input images
transform = T.Compose([
    T.ToPILImage(),
    T.Resize((512, 512)), # Resize image for the model
    T.ToTensor(),
    T.Normalize(mean=[0.485, 0.456, 0.406], std=[0.229, 0.224, 0.225])
])

# Path to the folder with lung cancer images
image_folder = os.path.expanduser("Test cases")

def segment_image(image):
    """Segment the given image using DeepLabV3."""
    input_tensor = transform(image).unsqueeze(0) # Add batch dimension
    with torch.no_grad():
        output = model(input_tensor)['out'][0] # Get model output
        output_predictions = output.argmax(0).numpy() # Convert to NumPy array
    return output_predictions

def calculate_percentages(segmented):
    """Calculate percentage of pixels for all unique classes."""
    total_pixels = segmented.size
    unique, counts = np.unique(segmented, return_counts=True)
    percentages = {int(cls): (count / total_pixels) * 100 for cls, count in zip(unique, counts)}
    return percentages

# Loop through all images in the folder
for filename in os.listdir(image_folder):
    if filename.endswith(".jpg") or filename.endswith(".png"):
        # Load the image
        image_path = os.path.join(image_folder, filename)
        image = cv2.imread(image_path)
        image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB) # Convert to RGB

```

```

# Perform segmentation
segmented = segment_image(image)

# Calculate percentages for all classes
percentages = calculate_percentages(segmented)

# Display results
print(f"\nImage: {filename}")
for cls, percentage in percentages.items():
    print(f"Class {cls}: {percentage:.2f}%")

# Optional: Display the segmented image
plt.figure(figsize=(10, 5))
plt.subplot(1, 2, 1)
plt.imshow(image)
plt.title("Original Image")
plt.subplot(1, 2, 2)
plt.imshow(segmented, cmap="jet")
plt.title("Segmented Image")
plt.show()

```

```

C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\
_utils.py:208: UserWarning: The parameter 'pretrained' is deprecated
since 0.13 and may be removed in the future, please use 'weights'
instead.
    warnings.warn(
C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\
_utils.py:223: UserWarning: Arguments other than a weight enum or
`None` for 'weights' are deprecated since 0.13 and may be removed in
the future. The current behavior is equivalent to passing
`weights=DeepLabV3_ResNet50_Weights.COCO_WITH_VOC_LABELS_V1`. You can
also use `weights=DeepLabV3_ResNet50_Weights.DEFAULT` to get the most
up-to-date weights.
    warnings.warn(msg)

```

```

Image: 000001_03_01_088.png
Class 0: 100.00%

```

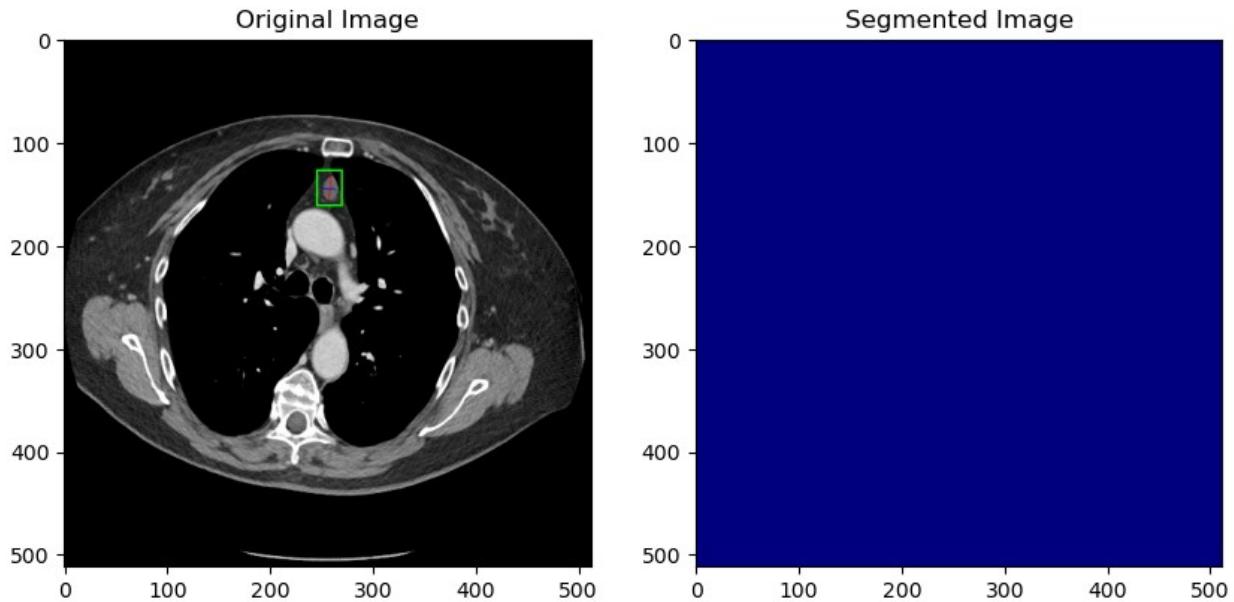


Image: 000017\_02\_01\_016.png  
Class 0: 99.95%  
Class 3: 0.05%

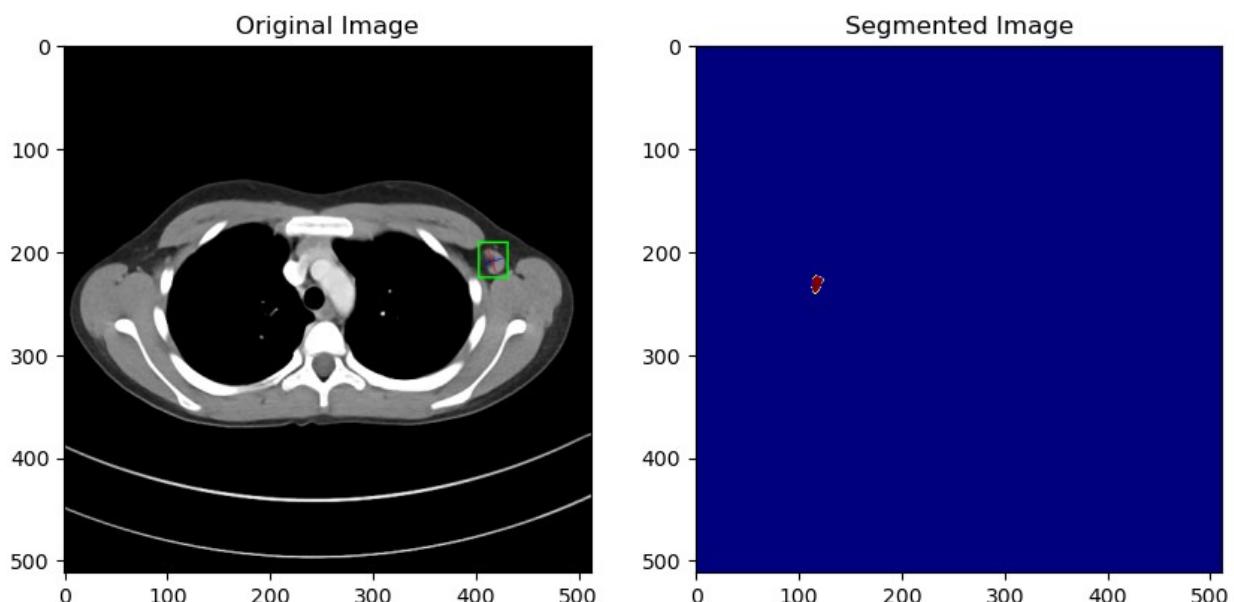


Image: 000019\_01\_01\_021.png  
Class 0: 86.76%  
Class 3: 13.24%

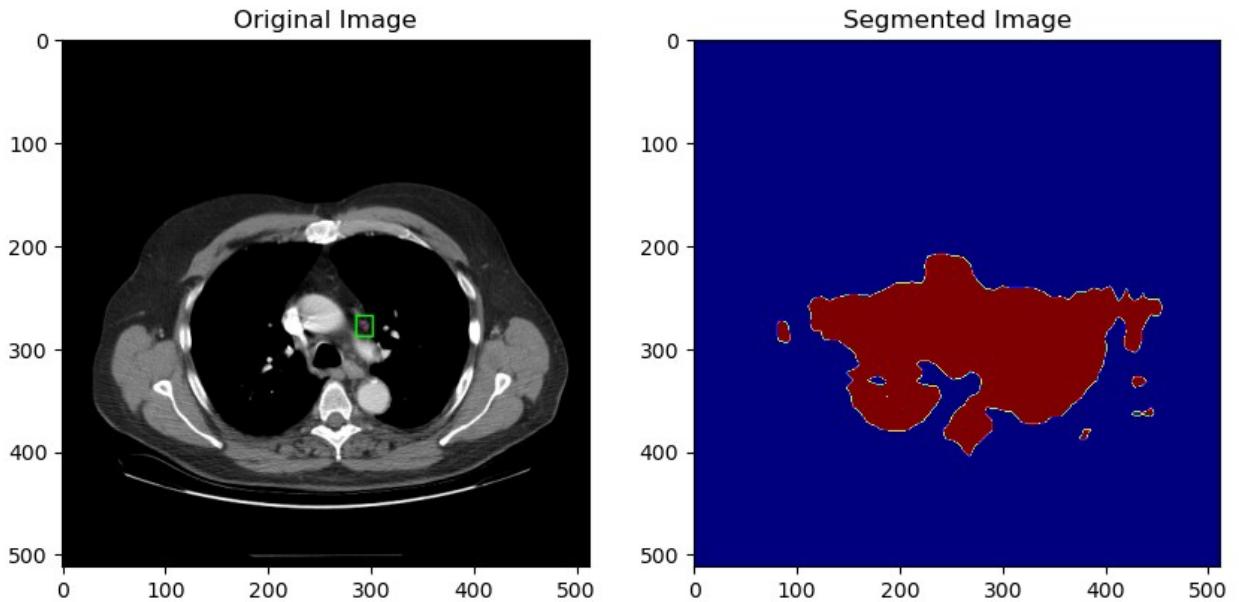


Image: 000019\_02\_01\_025.png  
Class 0: 100.00%

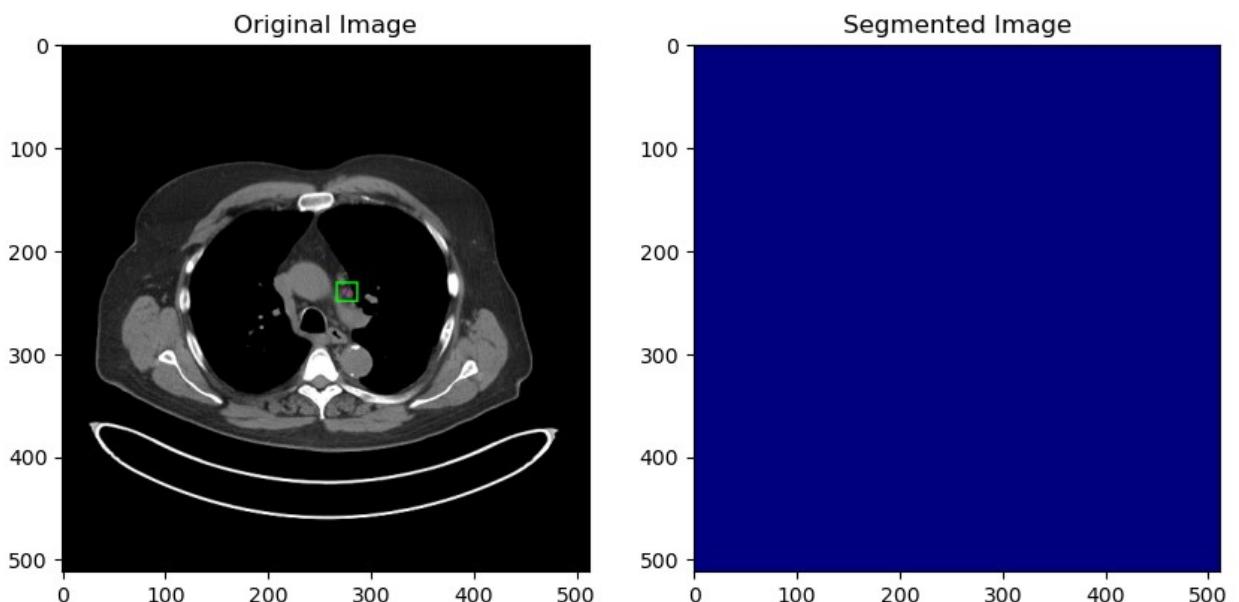


Image: 000019\_03\_01\_025.png  
Class 0: 100.00%

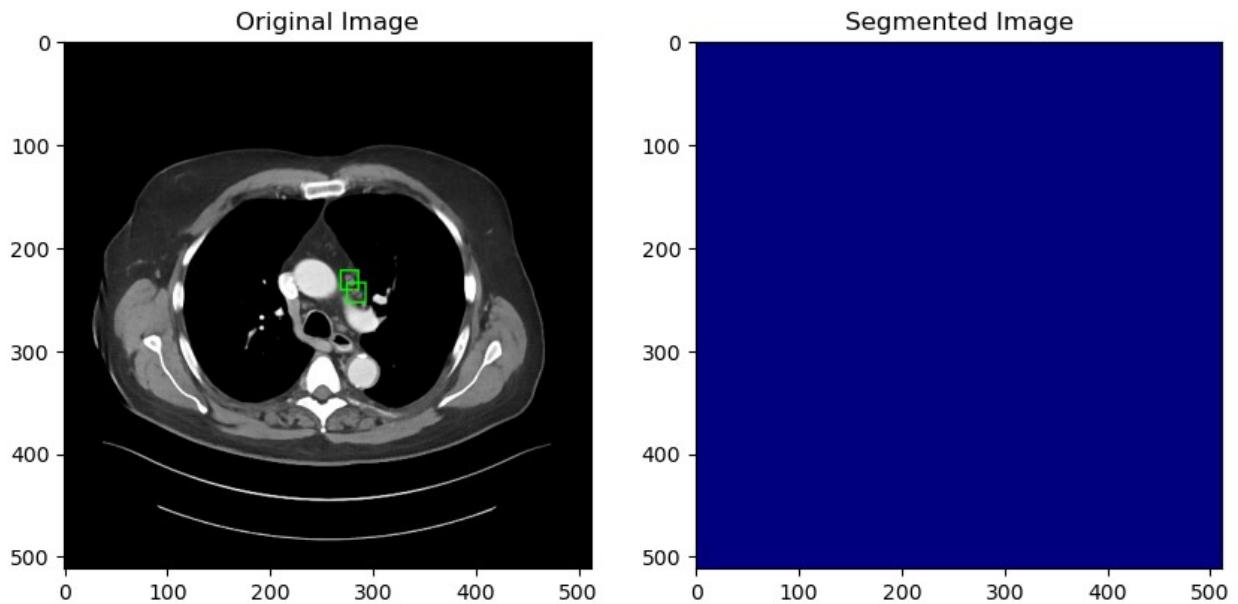


Image: 000020\_01\_01\_066.png  
Class 0: 100.00%

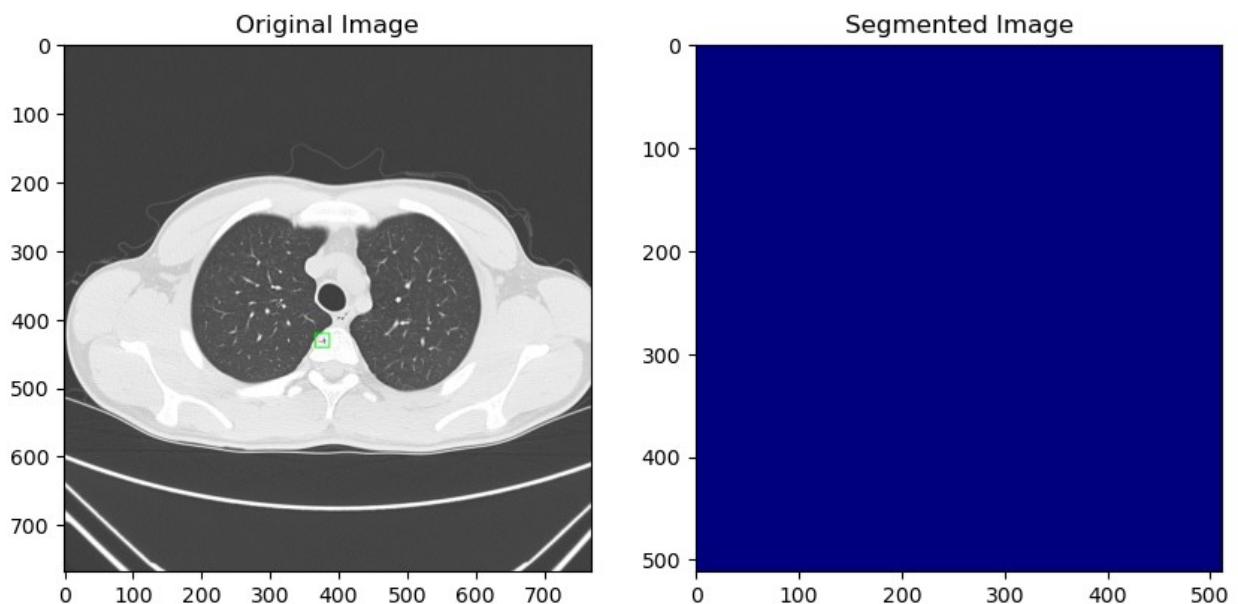


Image: 000020\_02\_01\_062.png  
Class 0: 98.18%  
Class 12: 1.82%

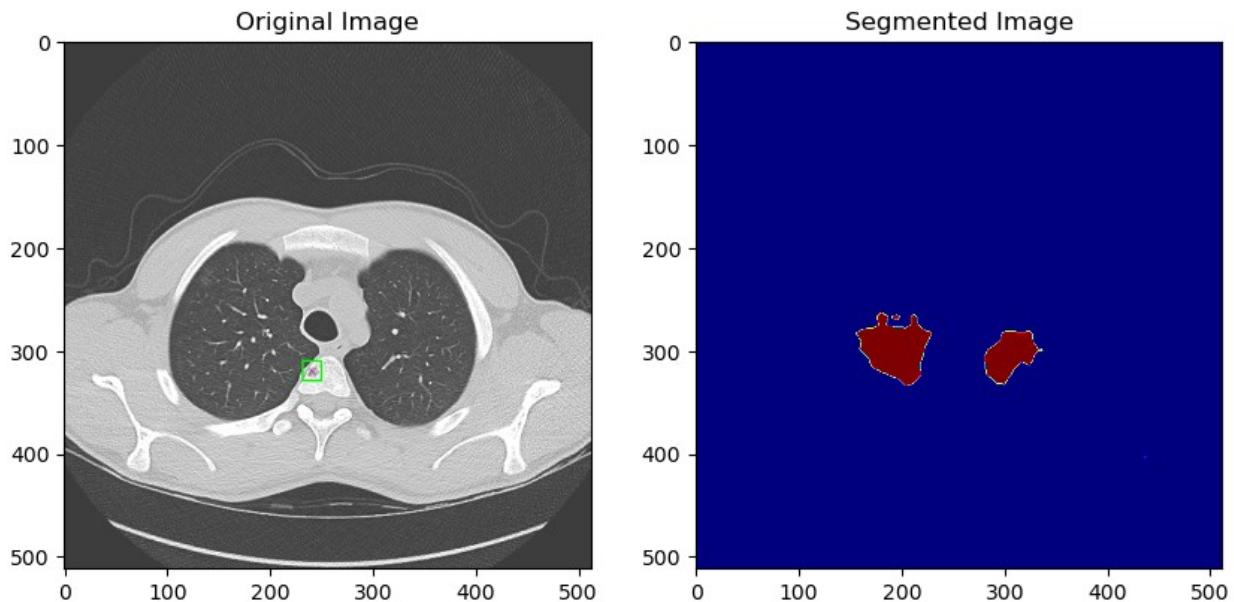


Image: 000020\_03\_01\_134.png  
Class 0: 100.00%  
Class 3: 0.00%

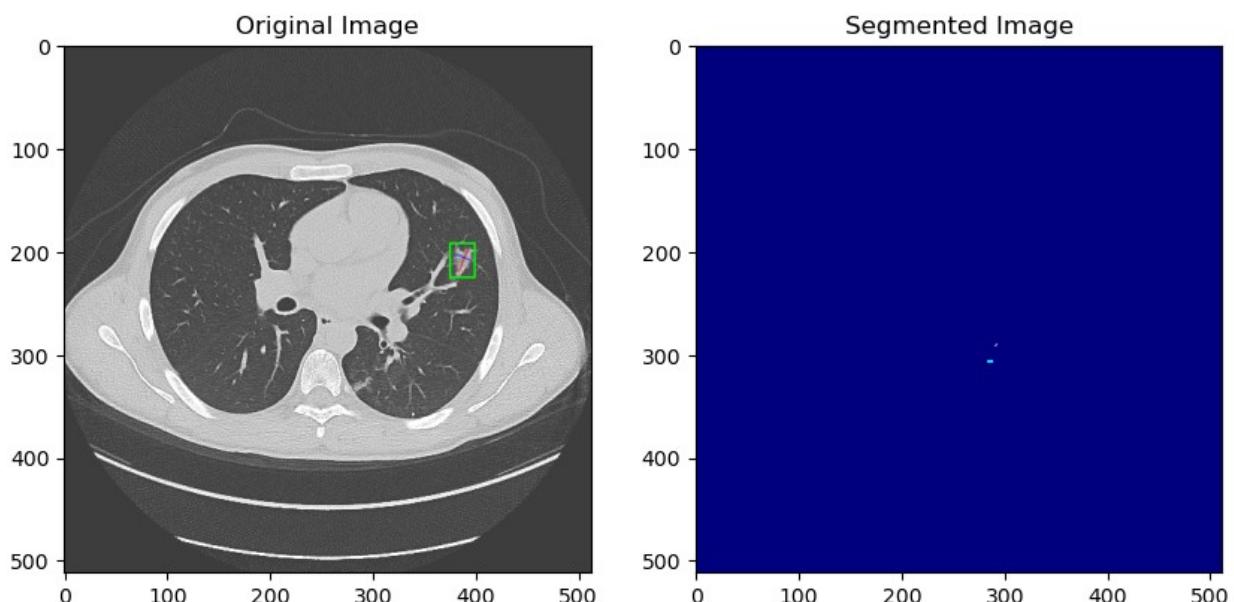


Image: 000020\_03\_01\_166.png  
Class 0: 82.03%  
Class 3: 17.97%

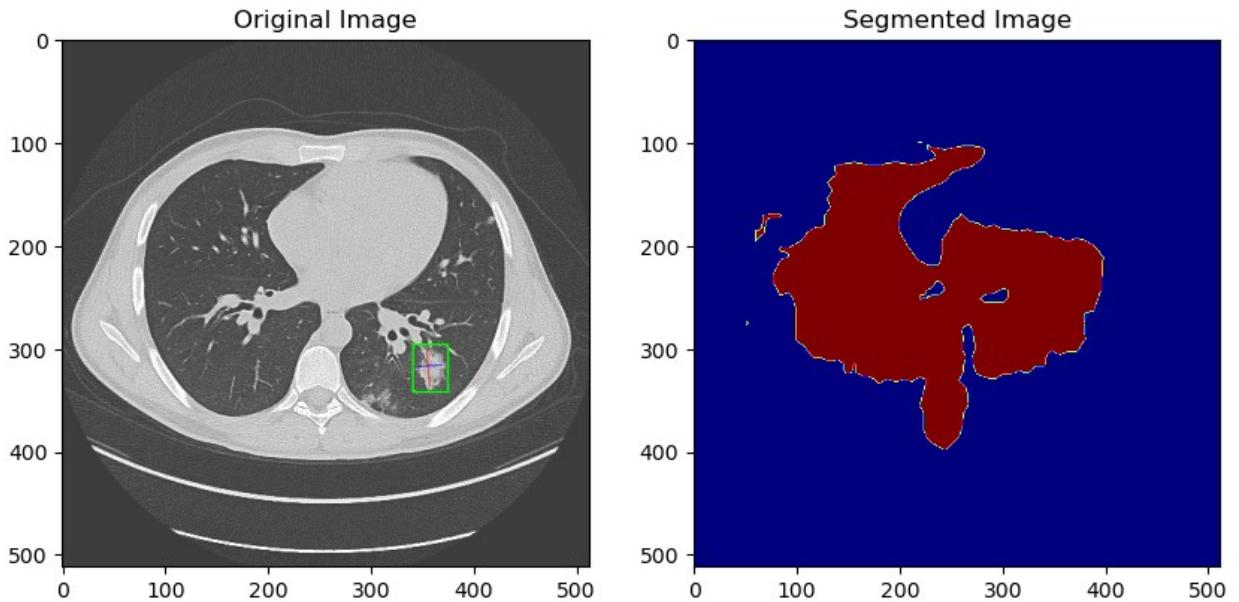


Image: 000020\_03\_01\_212.png  
Class 0: 96.25%  
Class 3: 3.15%  
Class 8: 0.60%

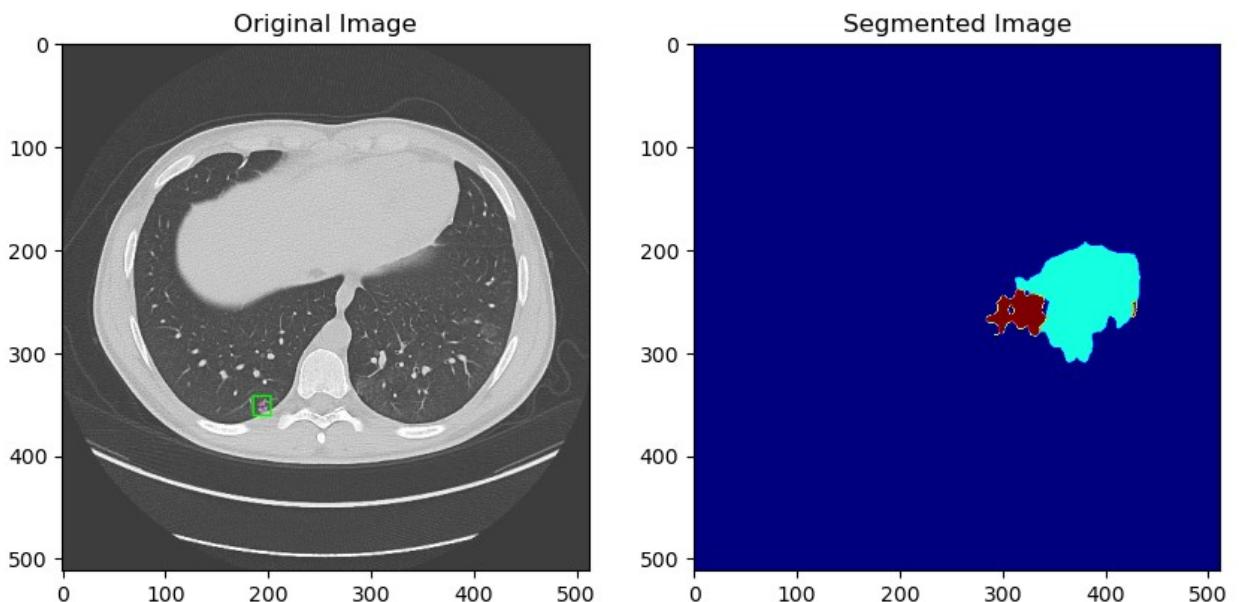


Image: 000020\_04\_01\_116.png  
Class 0: 99.47%  
Class 3: 0.53%

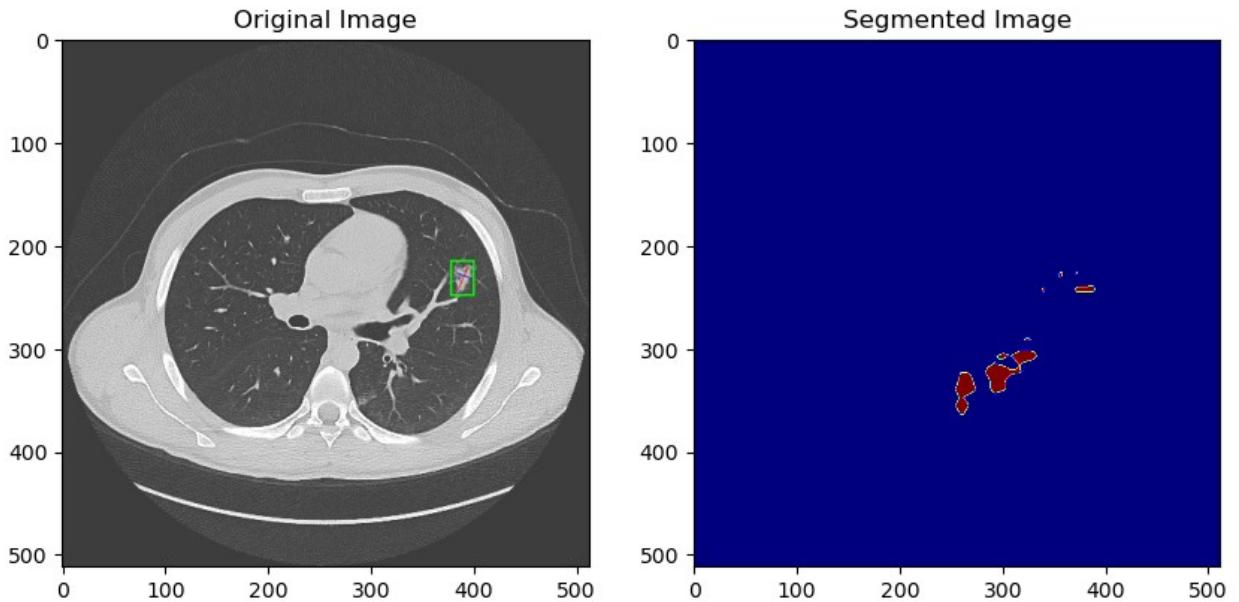


Image: 000020\_04\_01\_143.png  
Class 0: 92.15%  
Class 3: 7.84%  
Class 8: 0.01%

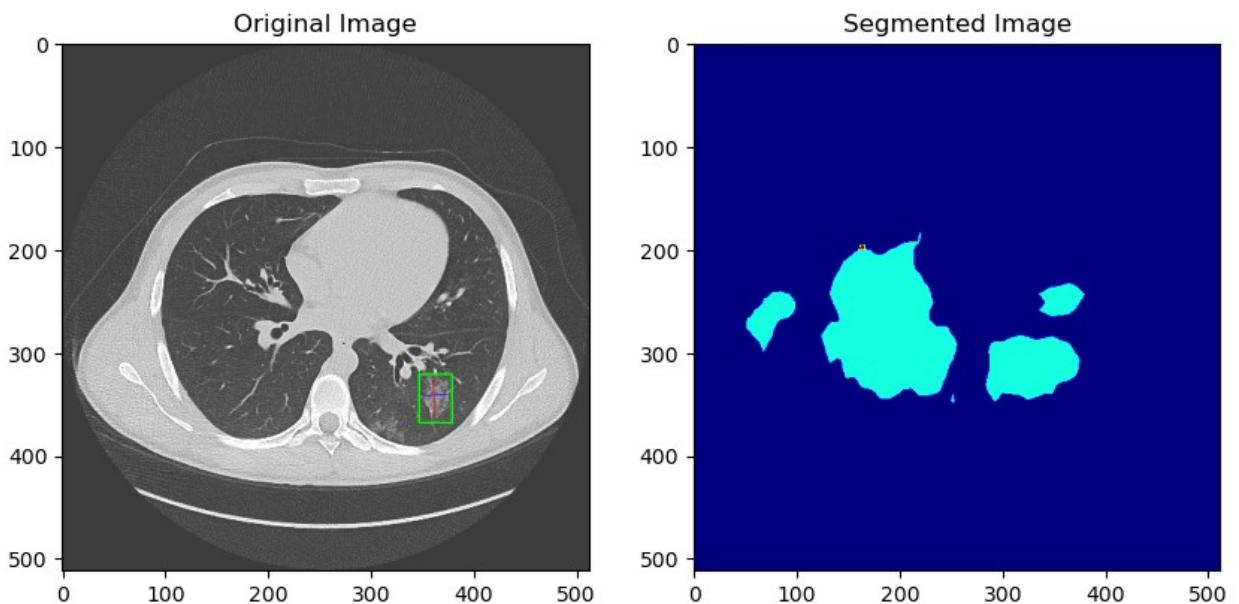


Image: 000020\_04\_01\_159.png  
Class 0: 91.68%  
Class 8: 8.32%

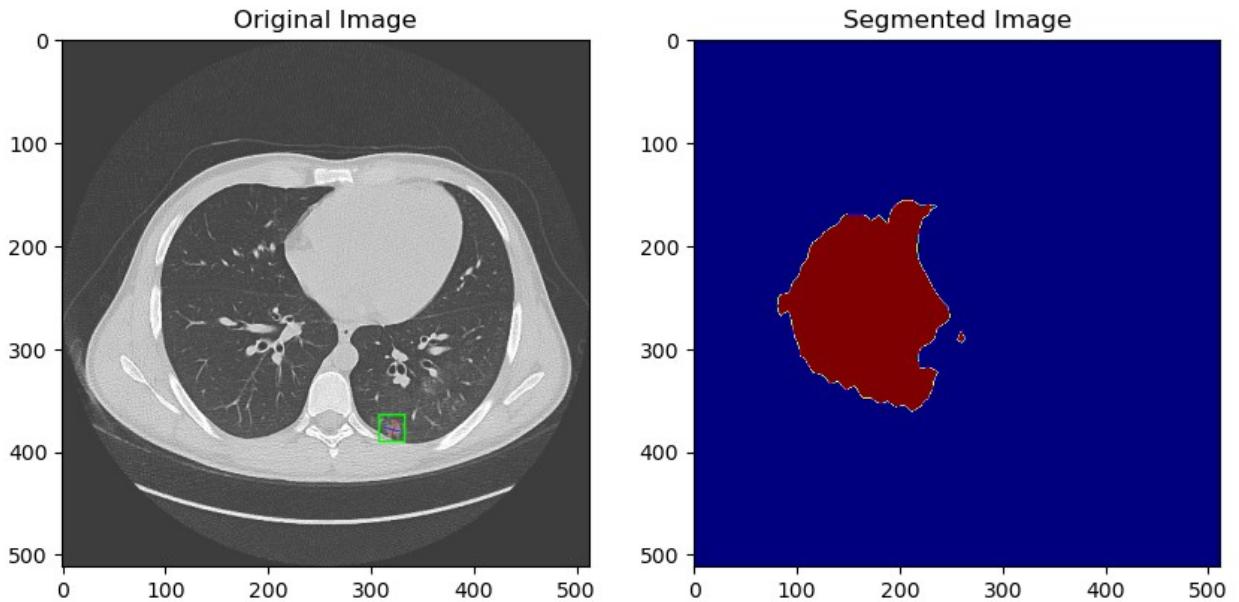


Image: 000021\_01\_01\_016.png  
Class 0: 89.28%  
Class 10: 10.72%

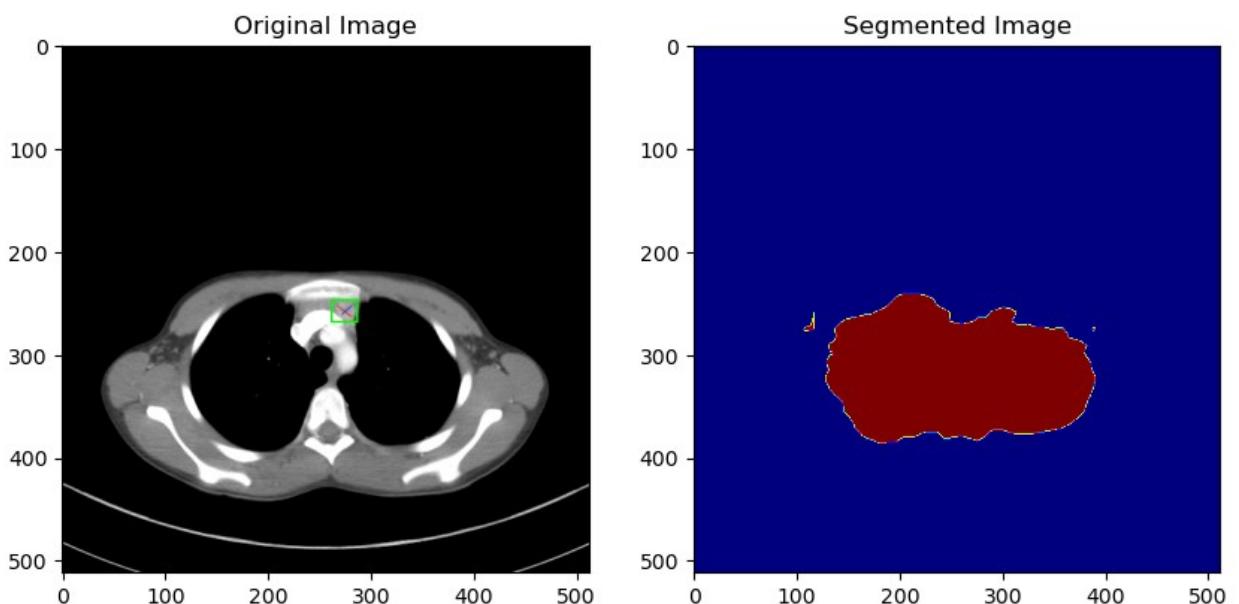


Image: 000021\_02\_01\_068.png  
Class 0: 97.45%  
Class 3: 2.55%

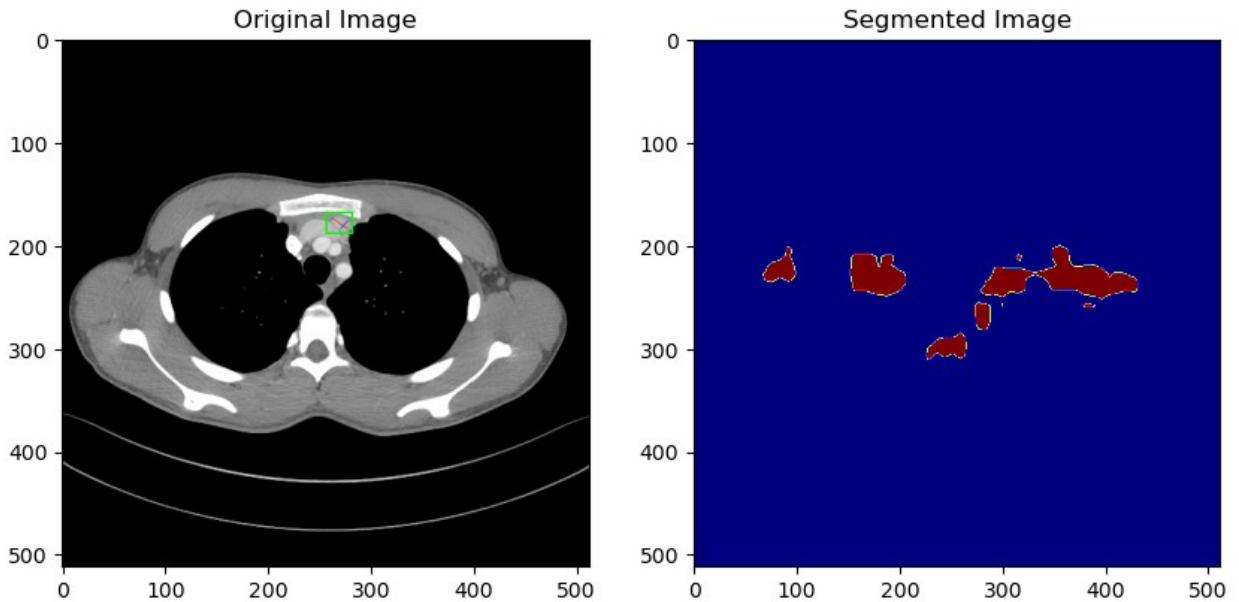


Image: 000021\_03\_01\_012.png  
Class 0: 97.22%  
Class 3: 1.09%  
Class 10: 1.69%

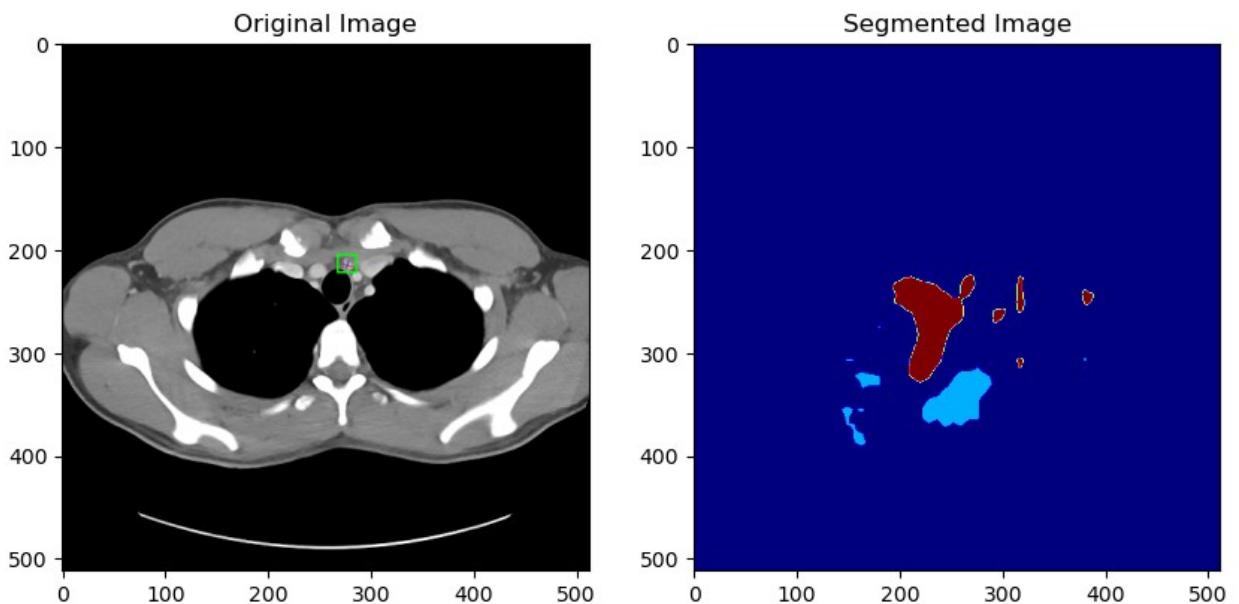


Image: 000021\_03\_01\_017.png  
Class 0: 86.99%  
Class 3: 10.09%  
Class 10: 2.92%

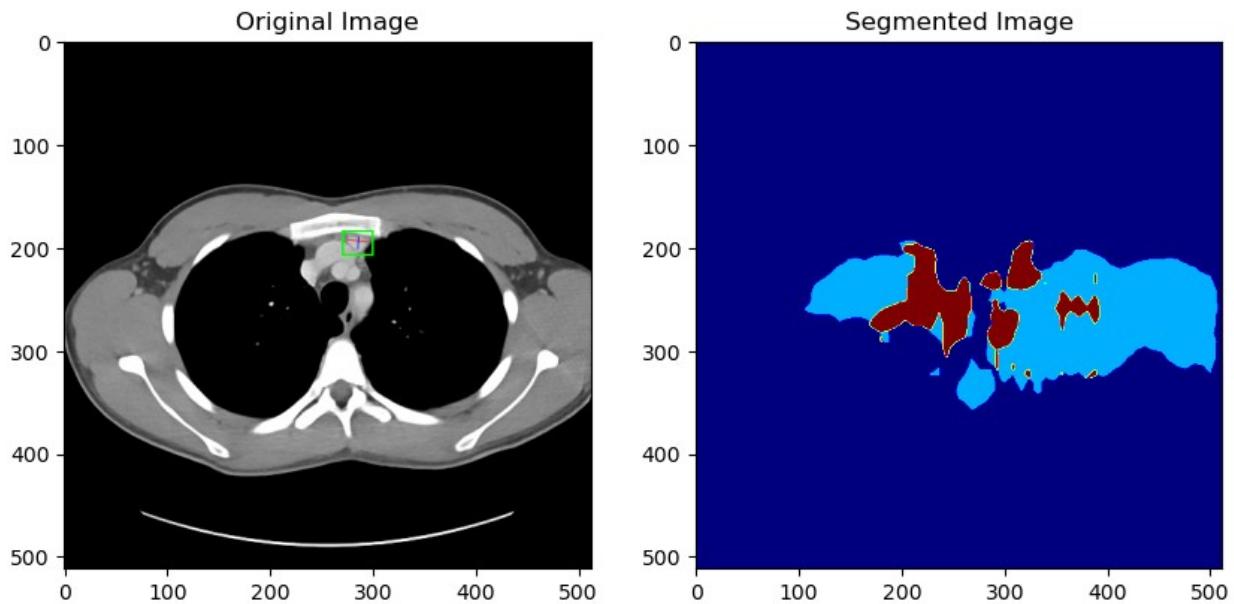


Image: 000021\_04\_01\_090.png

Class 0: 99.71%

Class 3: 0.29%

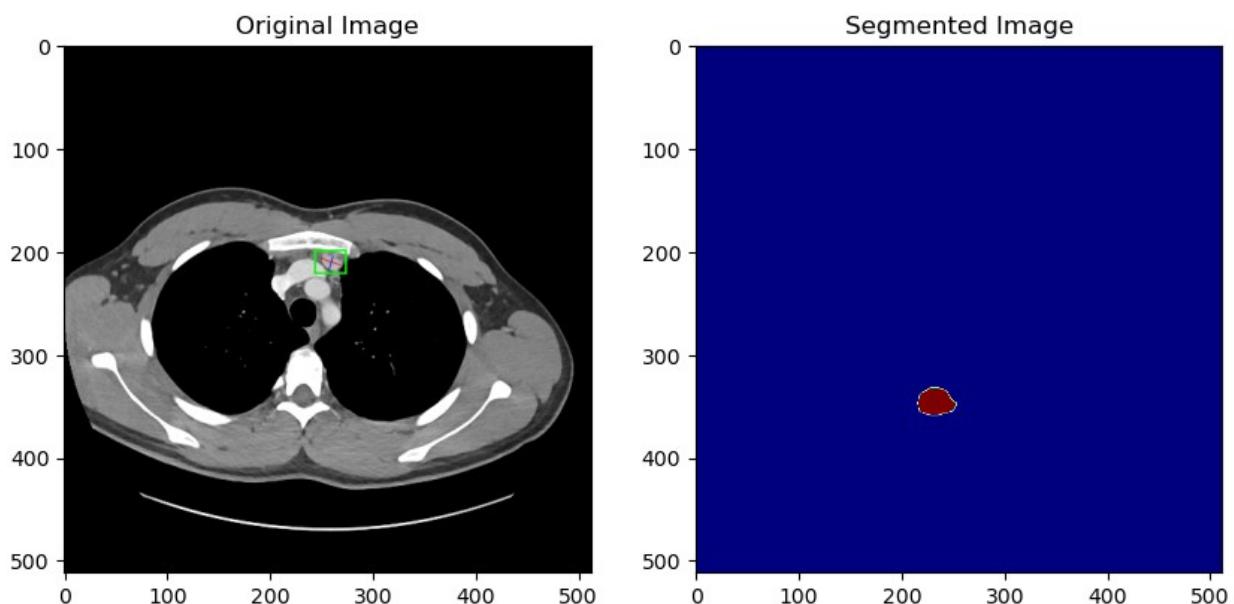


Image: 000027\_01\_01\_113.png

Class 0: 100.00%

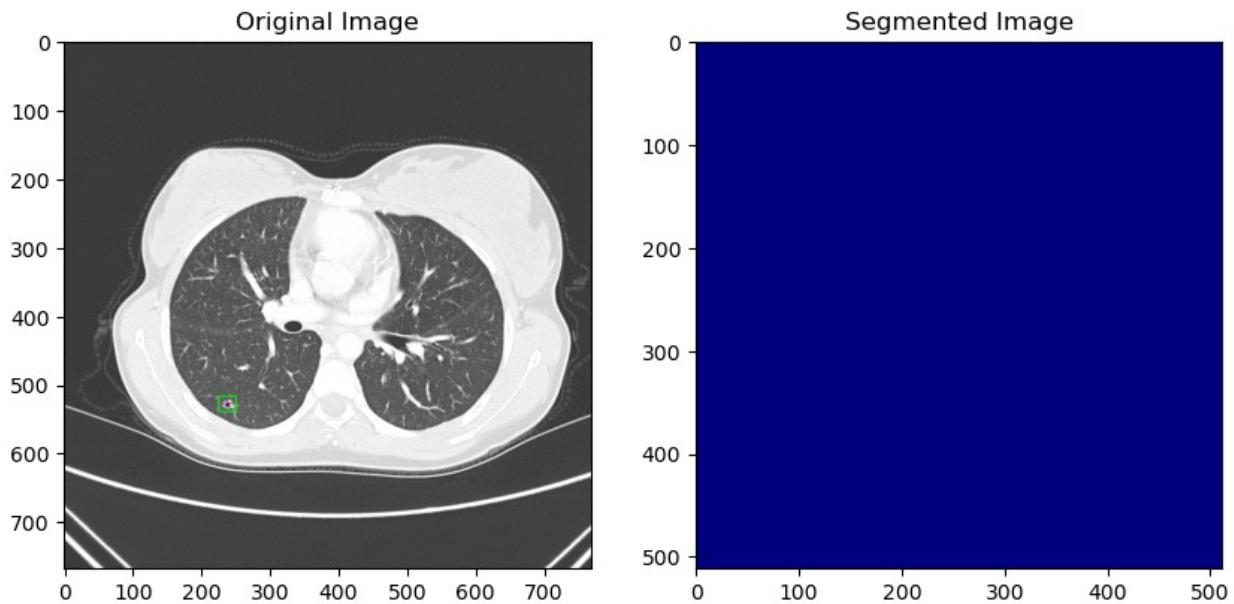


Image: 000027\_02\_01\_105.png  
Class 0: 100.00%

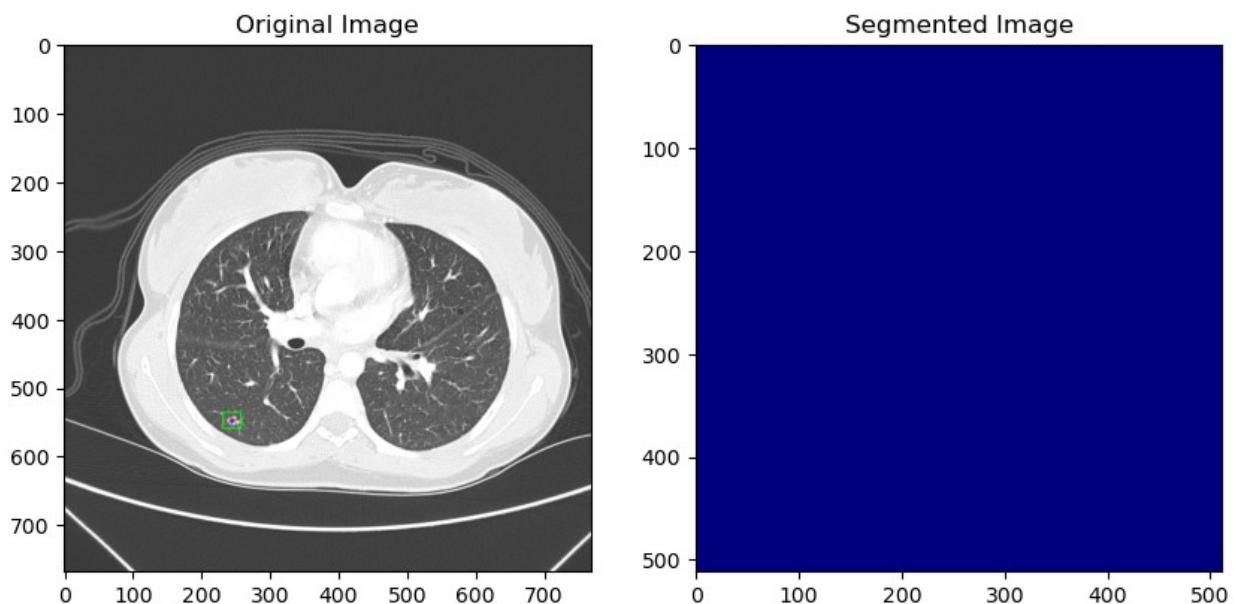


Image: 000027\_03\_01\_095.png  
Class 0: 100.00%

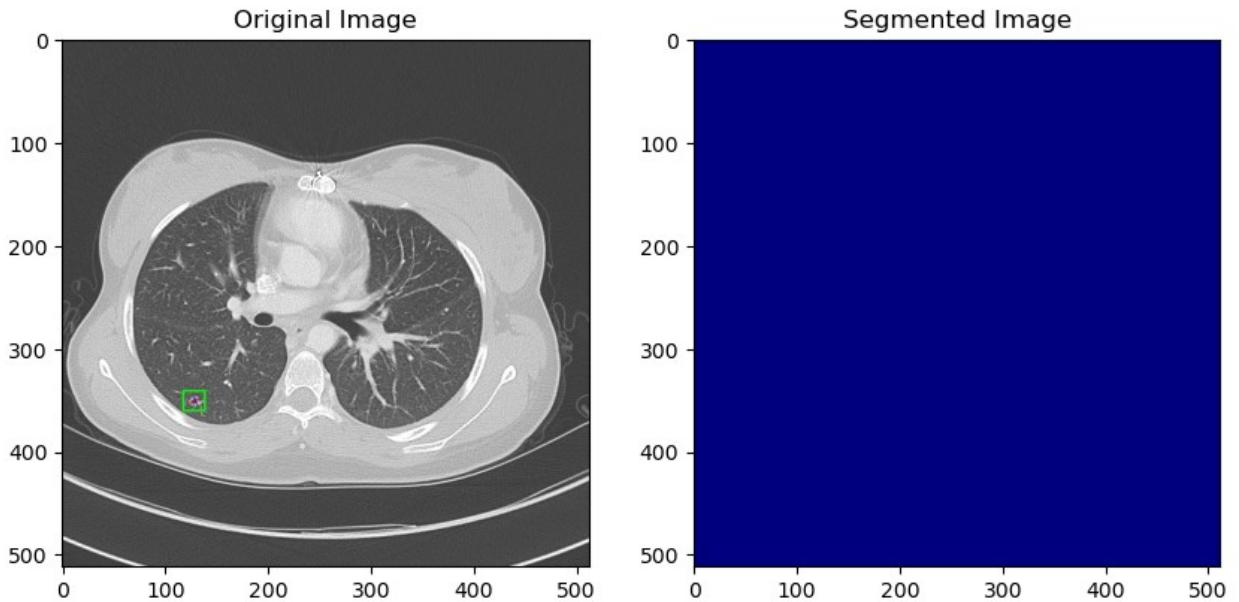


Image: 000027\_04\_01\_119.png  
Class 0: 100.00%

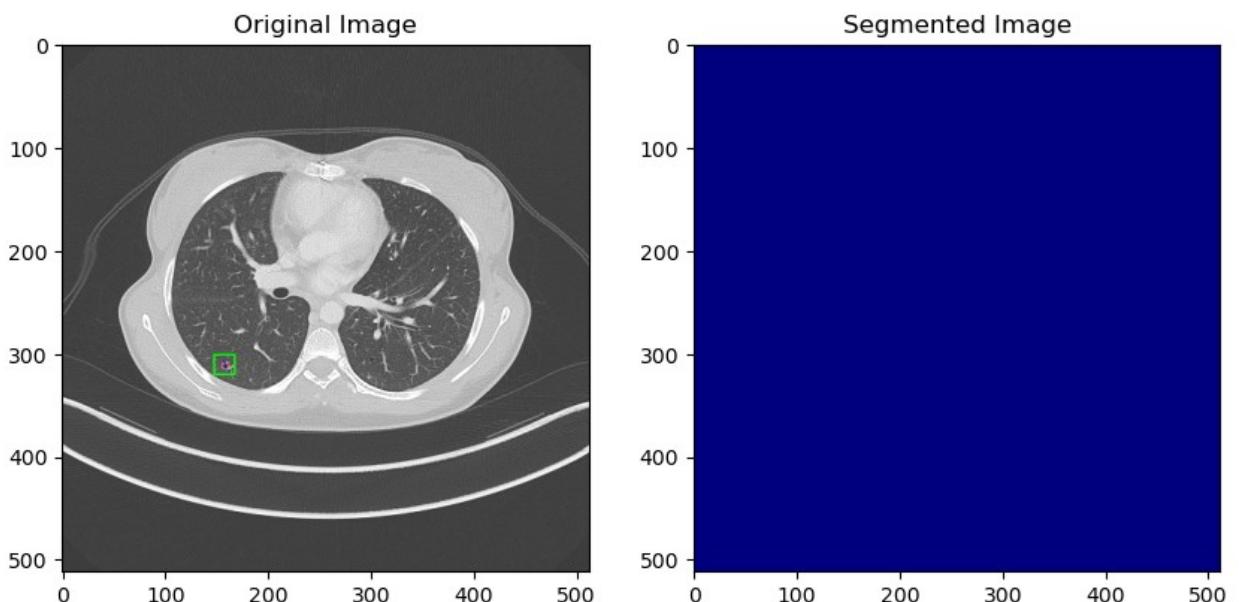


Image: 000027\_05\_01\_099.png  
Class 0: 90.83%  
Class 8: 0.57%  
Class 16: 8.60%

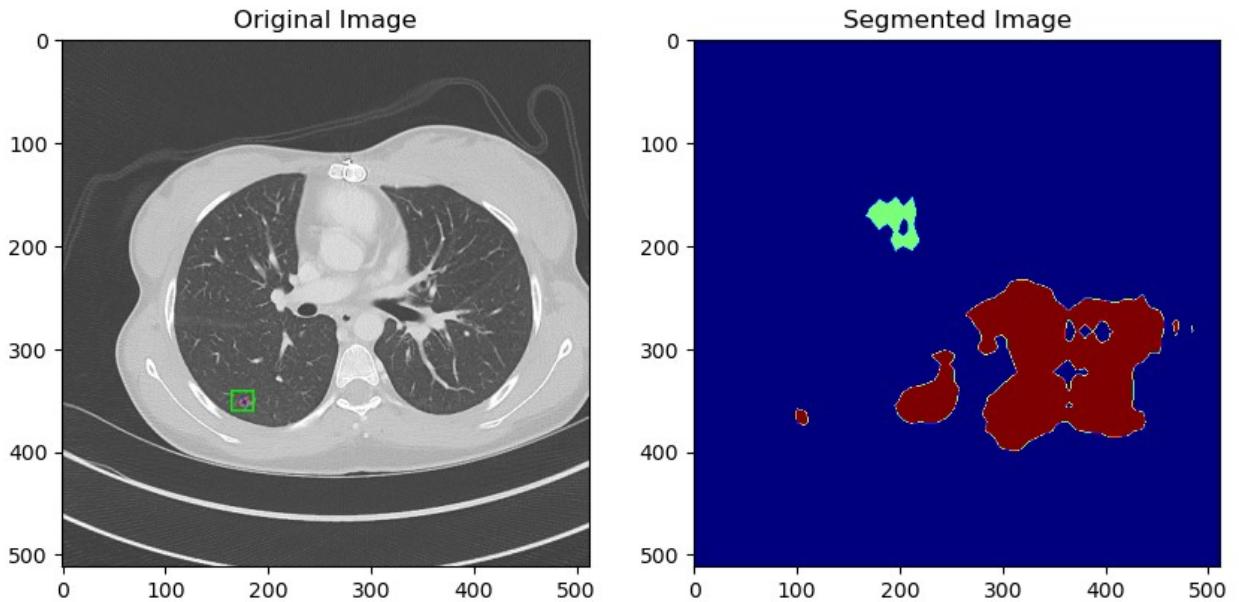


Image: 000027\_06\_01\_020.png

Class 0: 99.00%

Class 8: 1.00%

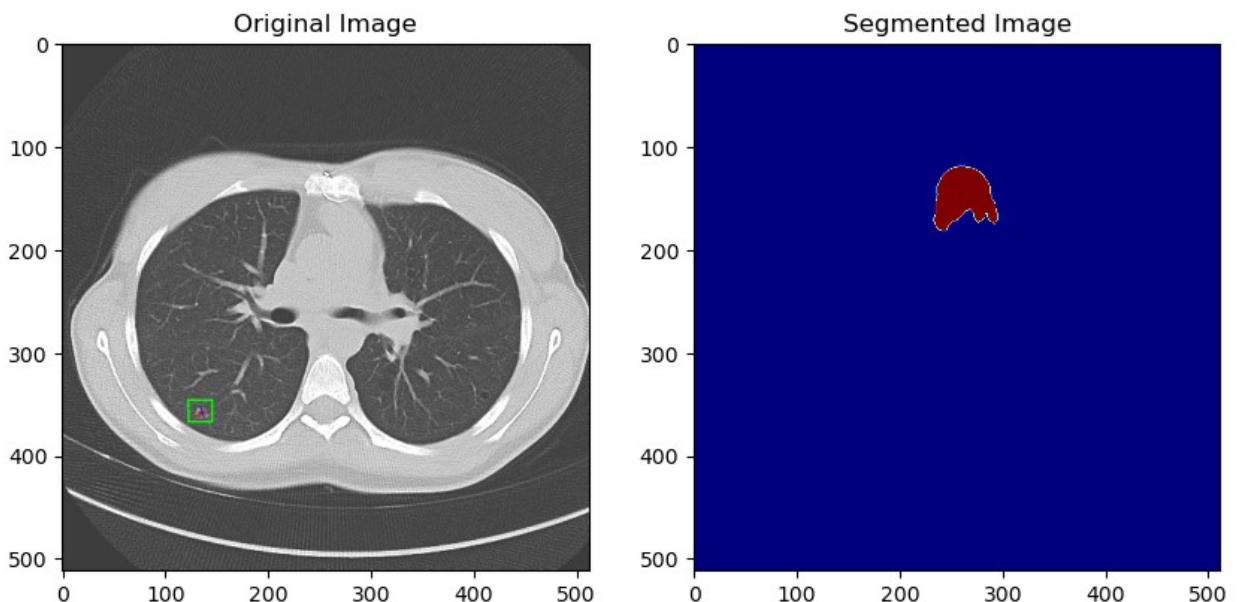


Image: 000054\_03\_01\_018.png

Class 0: 99.05%

Class 3: 0.40%

Class 15: 0.55%

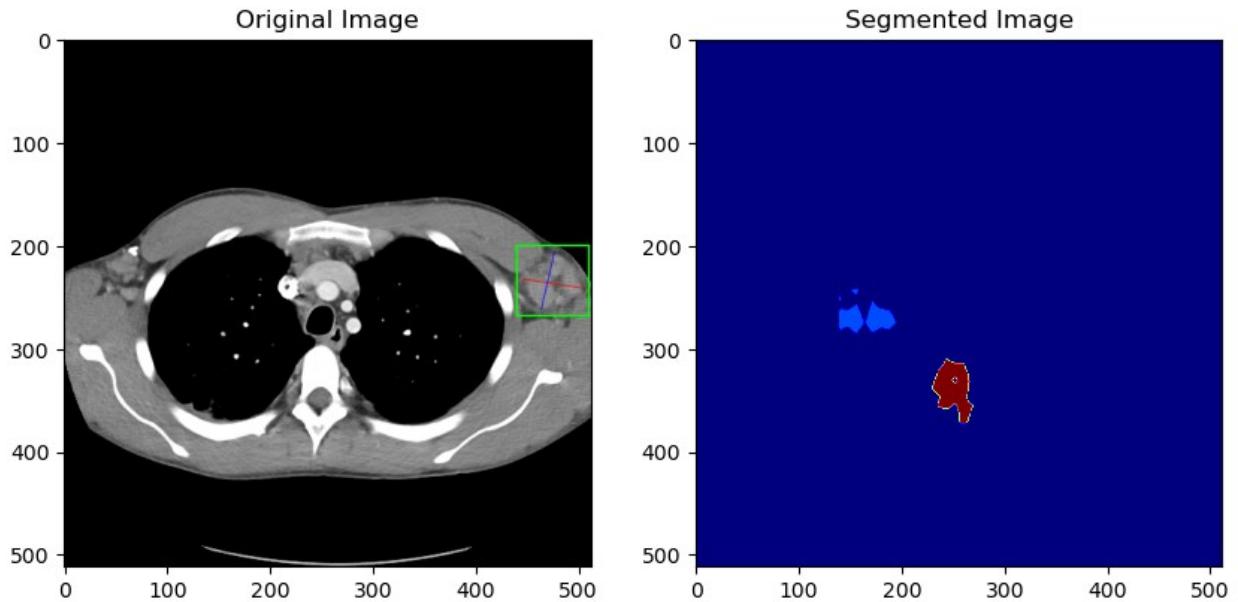


Image: 000054\_03\_01\_025.png

Class 0: 88.12%

Class 3: 11.88%

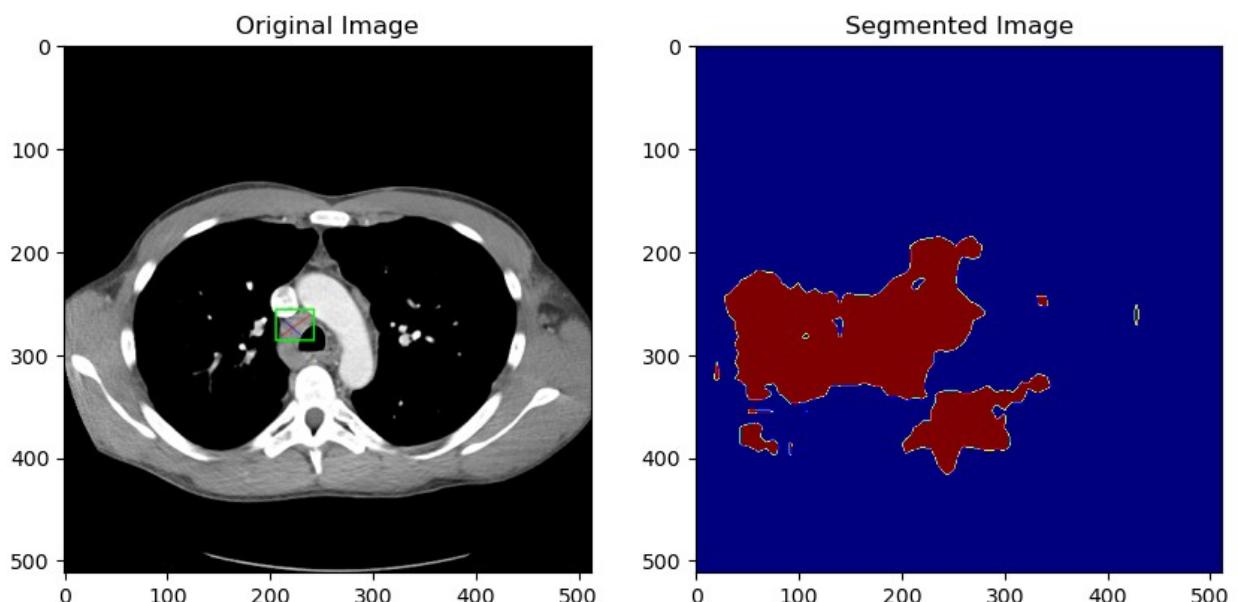


Image: 000054\_03\_01\_033.png

Class 0: 92.34%

Class 3: 7.65%

Class 12: 0.00%

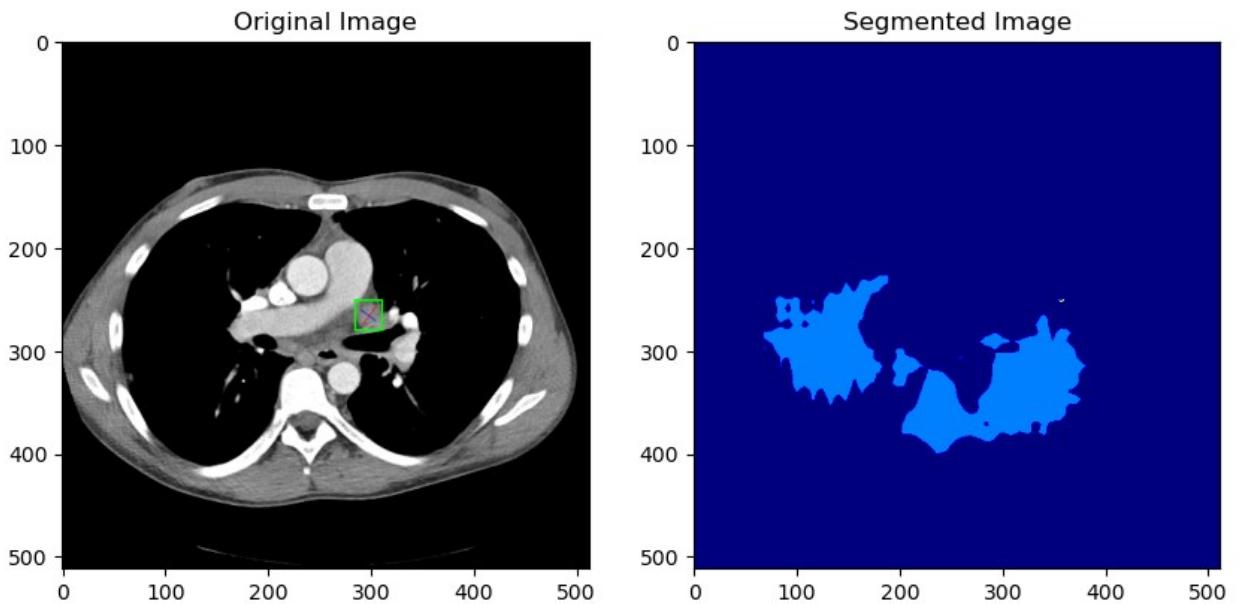


Image: 000058\_06\_02\_177.png  
Class 0: 100.00%

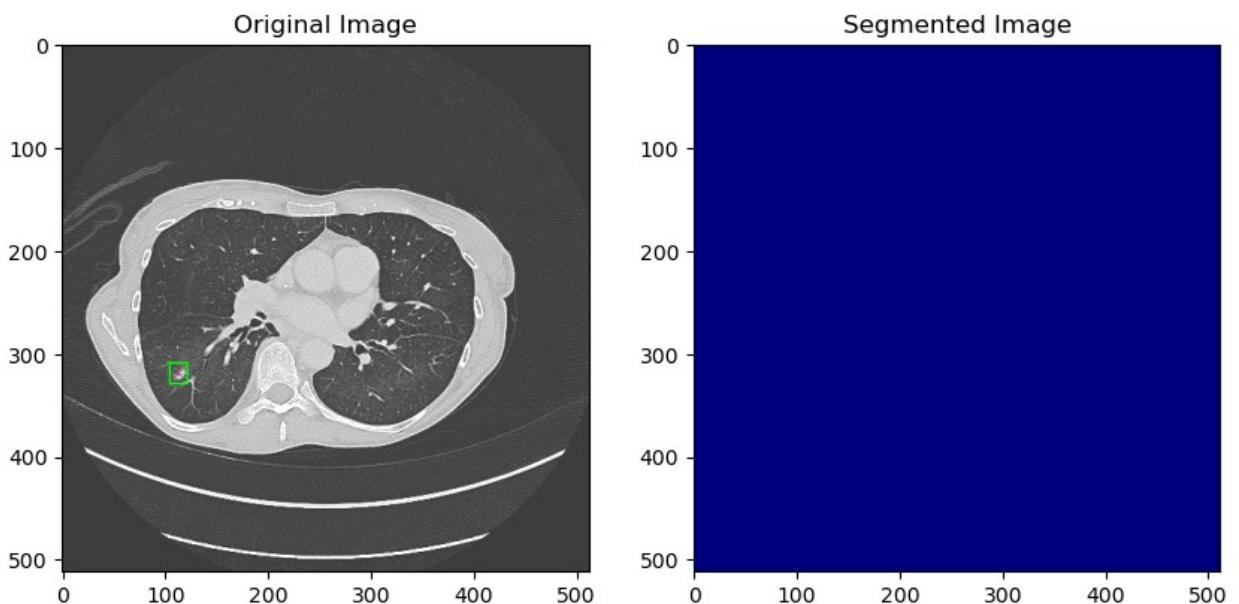


Image: 000058\_06\_02\_223.png  
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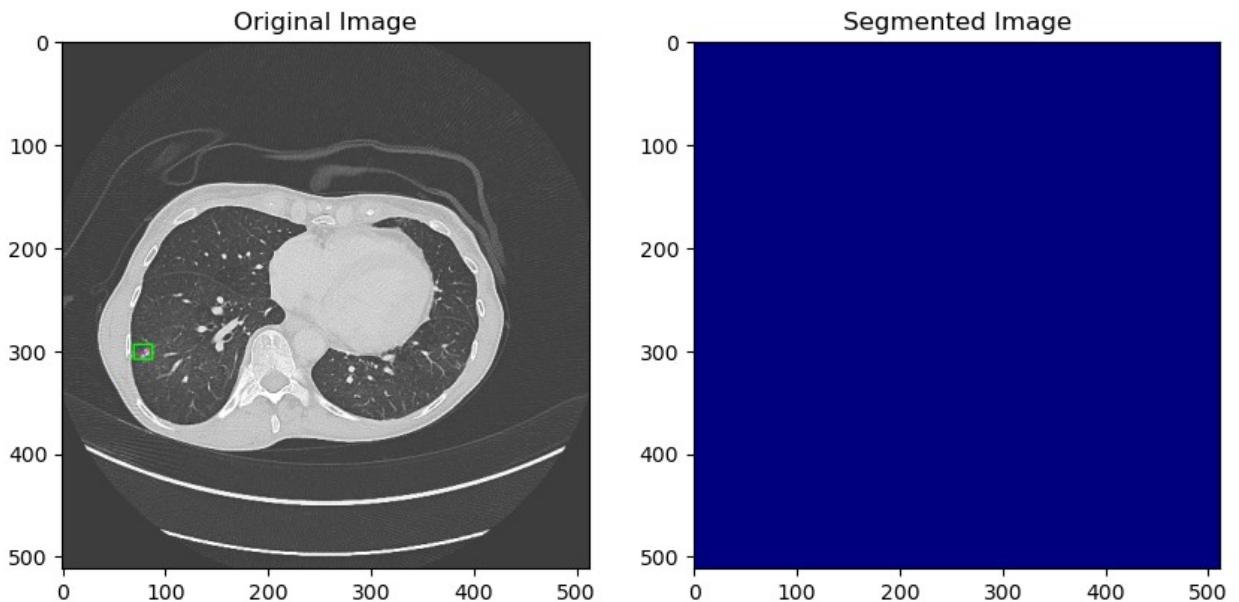


Image: 000058\_07\_01\_170.png  
Class 0: 100.00%

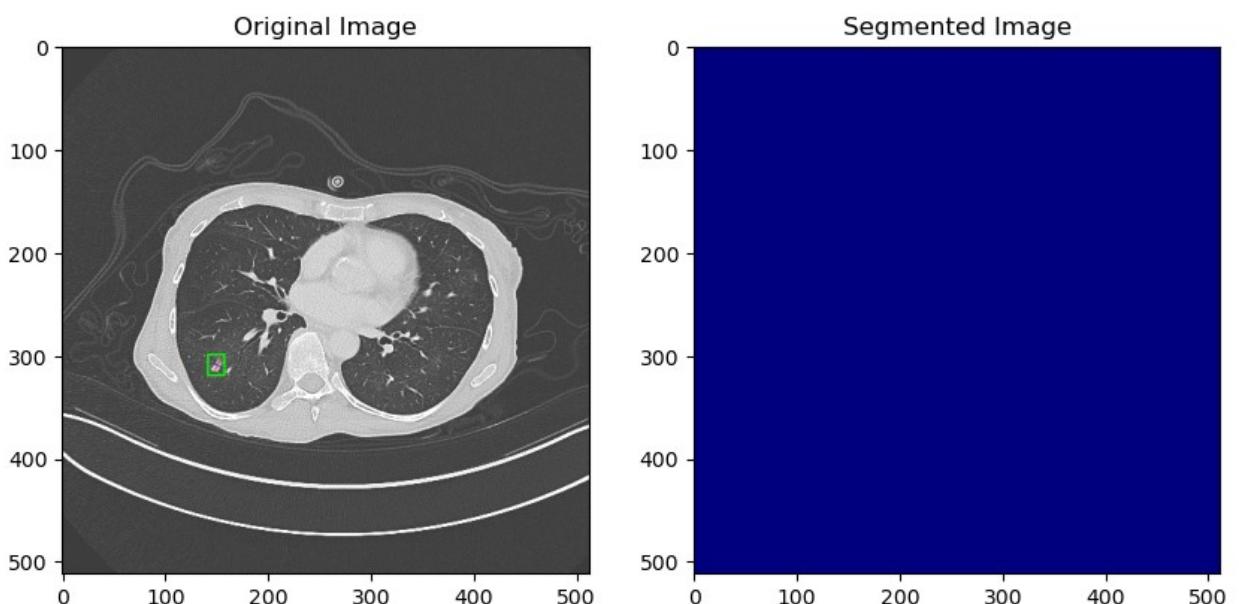


Image: 000058\_07\_01\_195.png  
Class 0: 98.55%  
Class 3: 1.45%

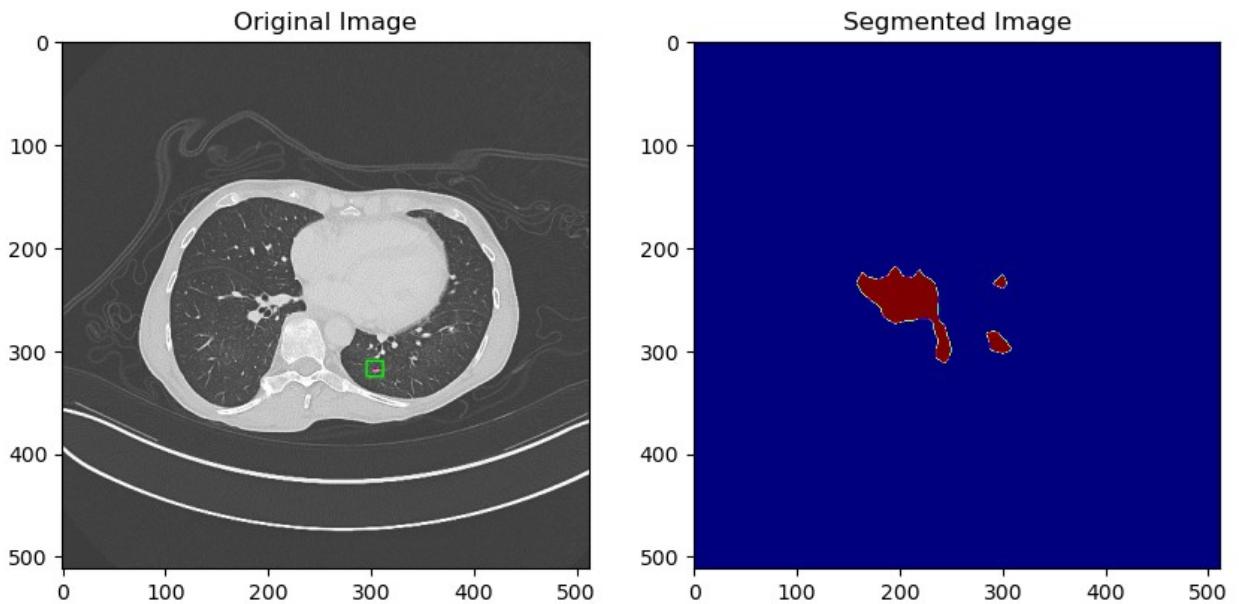


Image: 000058\_07\_01\_218.png  
Class 0: 100.00%

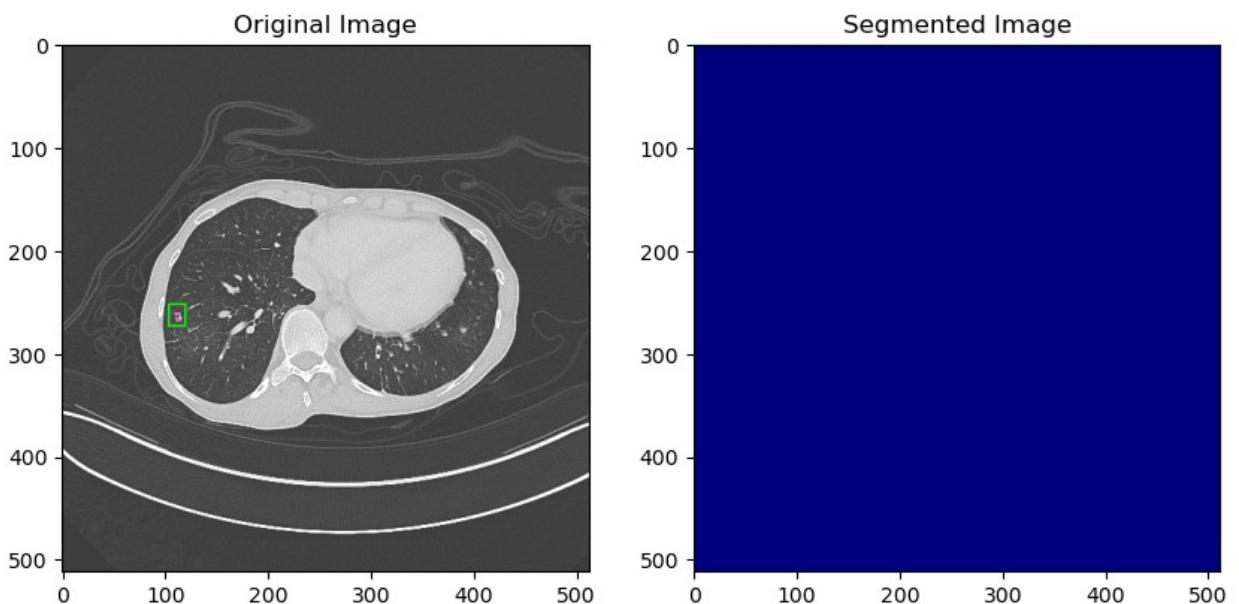


Image: 000058\_08\_01\_035.png  
Class 0: 99.83%  
Class 3: 0.17%

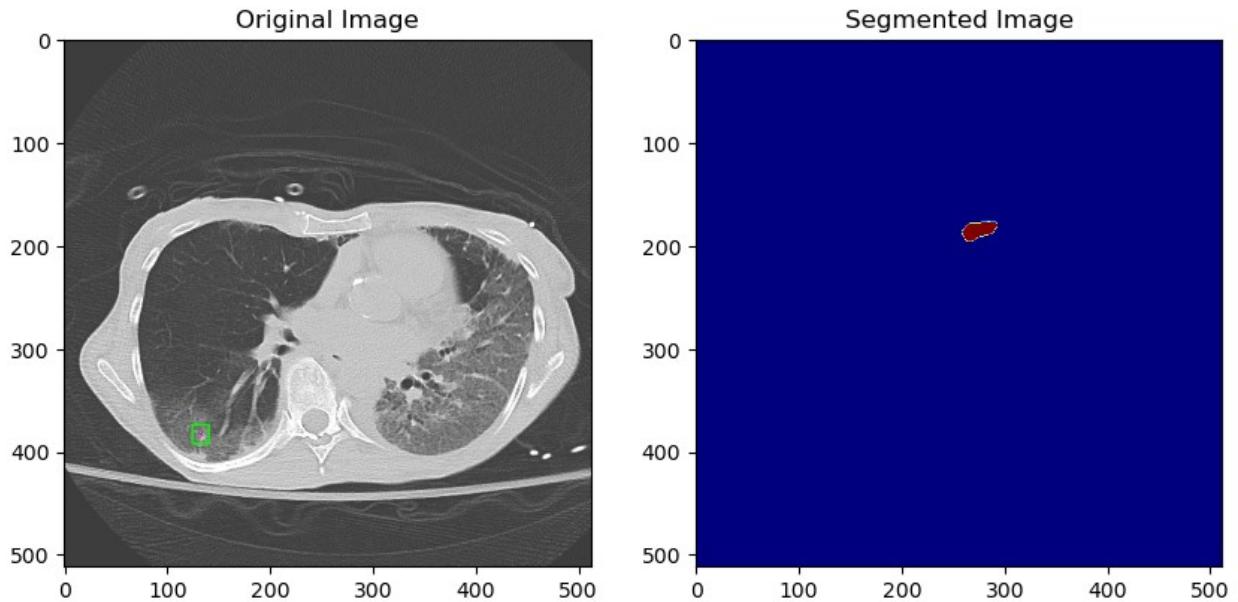


Image: 000063\_01\_01\_155.png  
Class 0: 99.54%  
Class 11: 0.46%

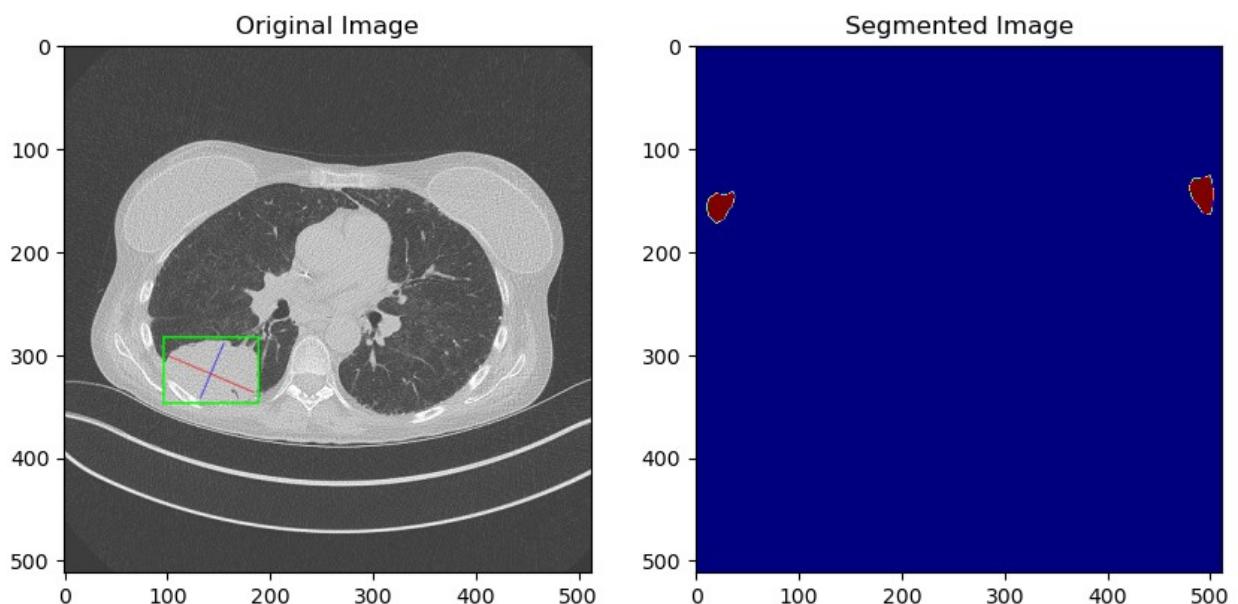


Image: 000063\_02\_01\_035.png  
Class 0: 100.00%

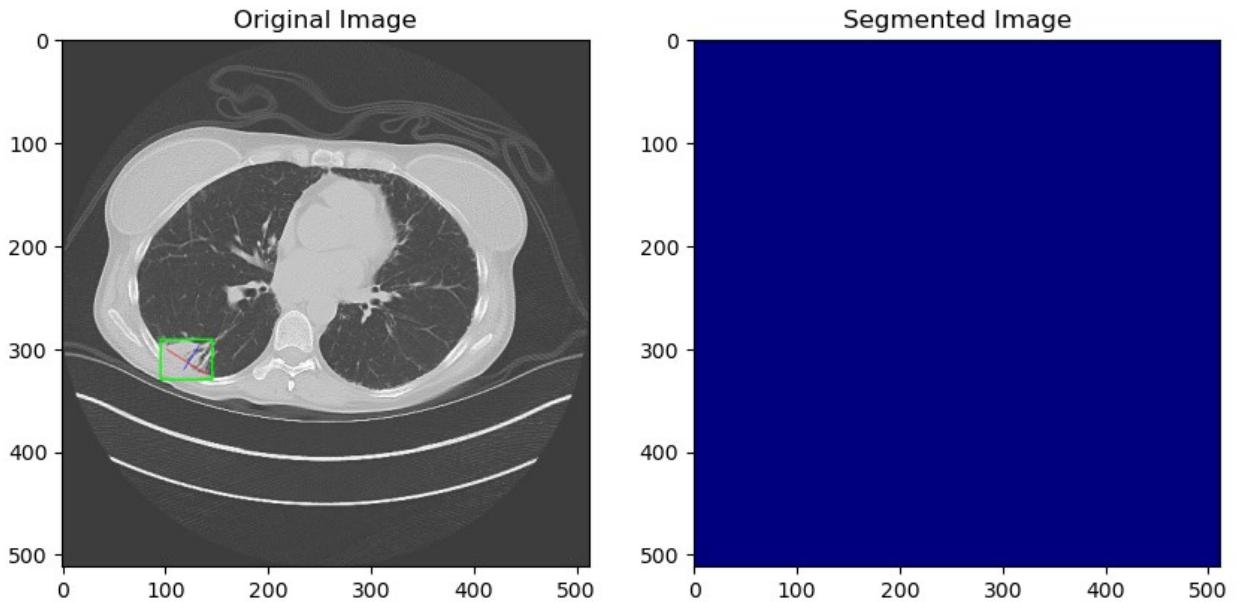


Image: 000063\_03\_01\_144.png  
Class 0: 100.00%

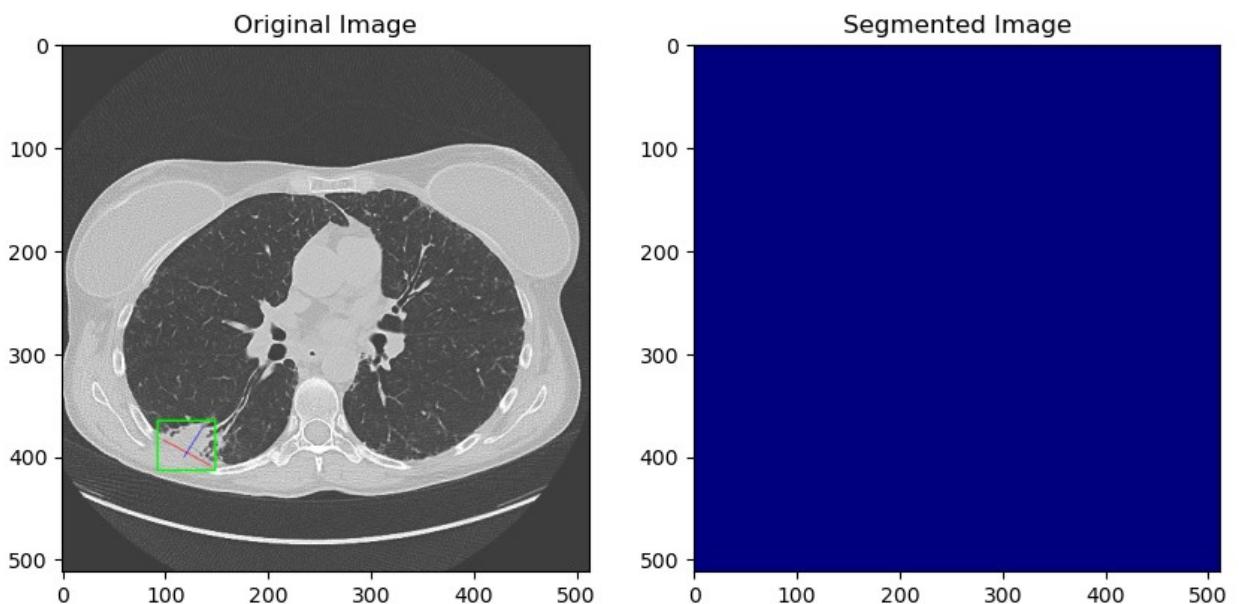


Image: 000063\_04\_01\_160.png  
Class 0: 100.00%

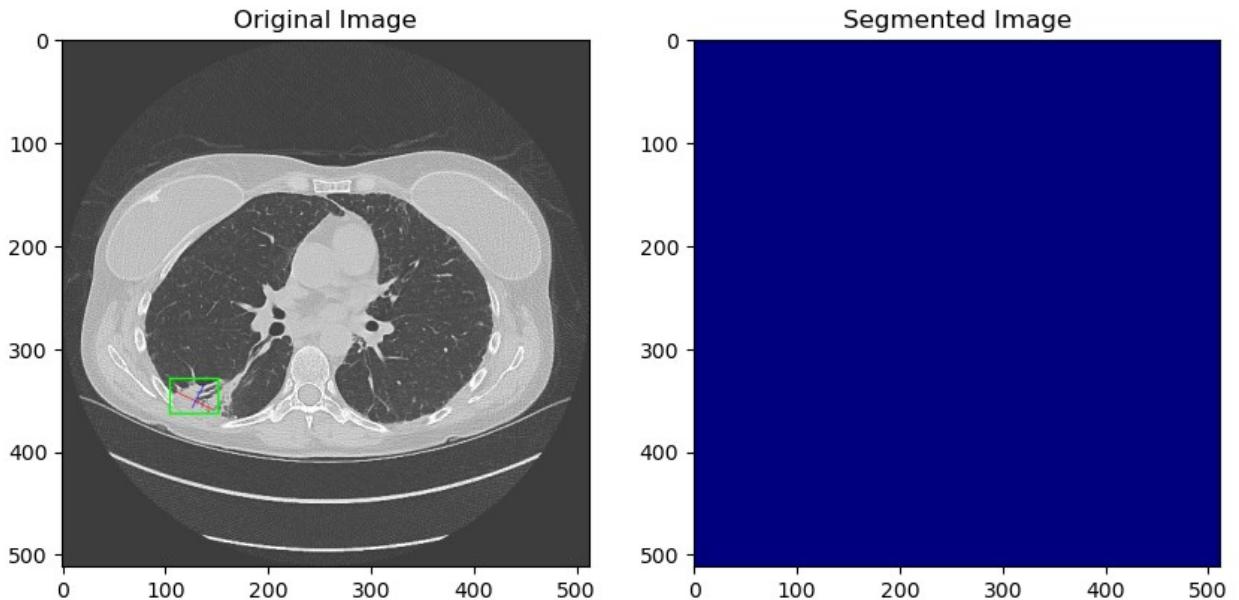


Image: 000065\_06\_01\_030.png  
Class 0: 99.98%  
Class 3: 0.02%

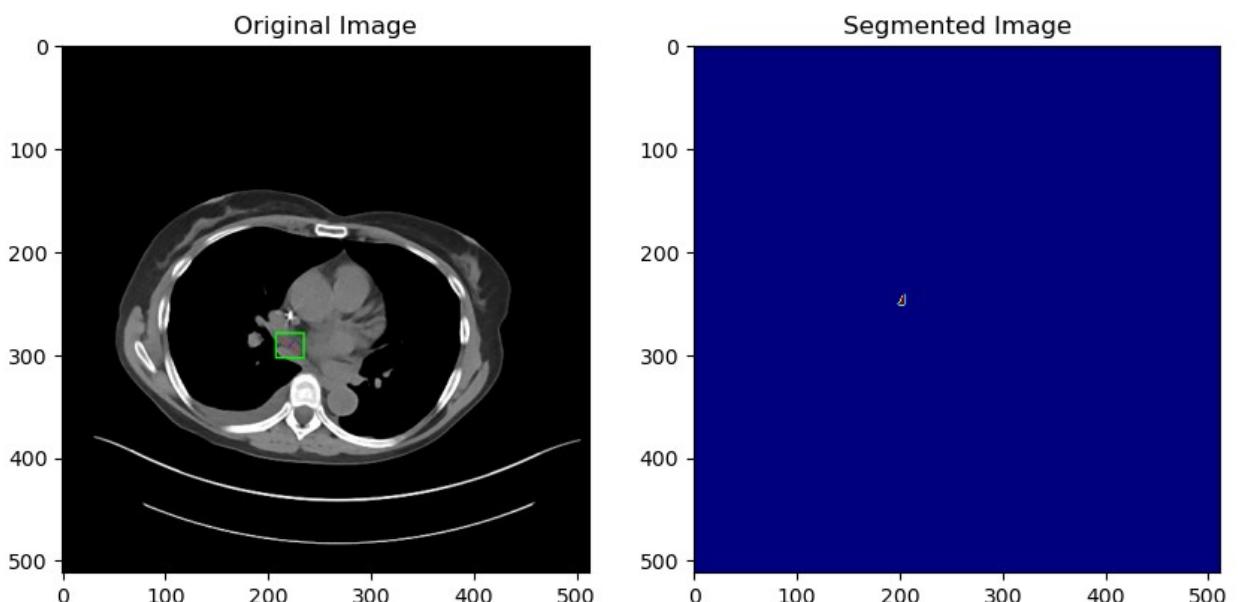


Image: 000103\_01\_01\_104.png  
Class 0: 100.00%

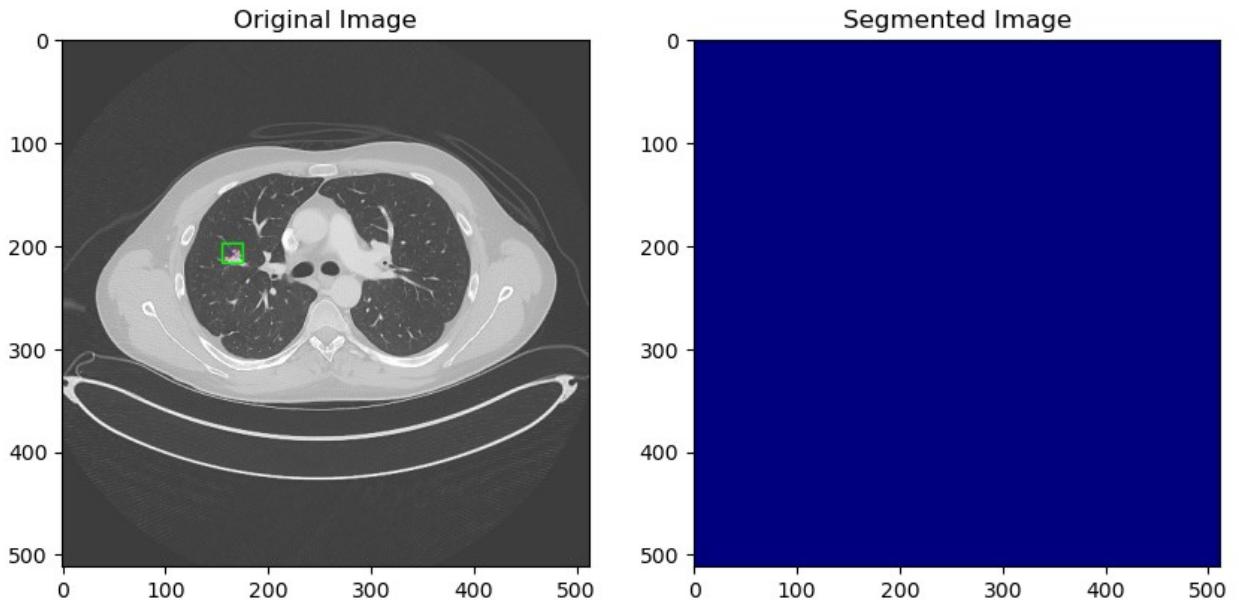


Image: 000103\_01\_01\_173.png  
Class 0: 99.96%  
Class 11: 0.04%

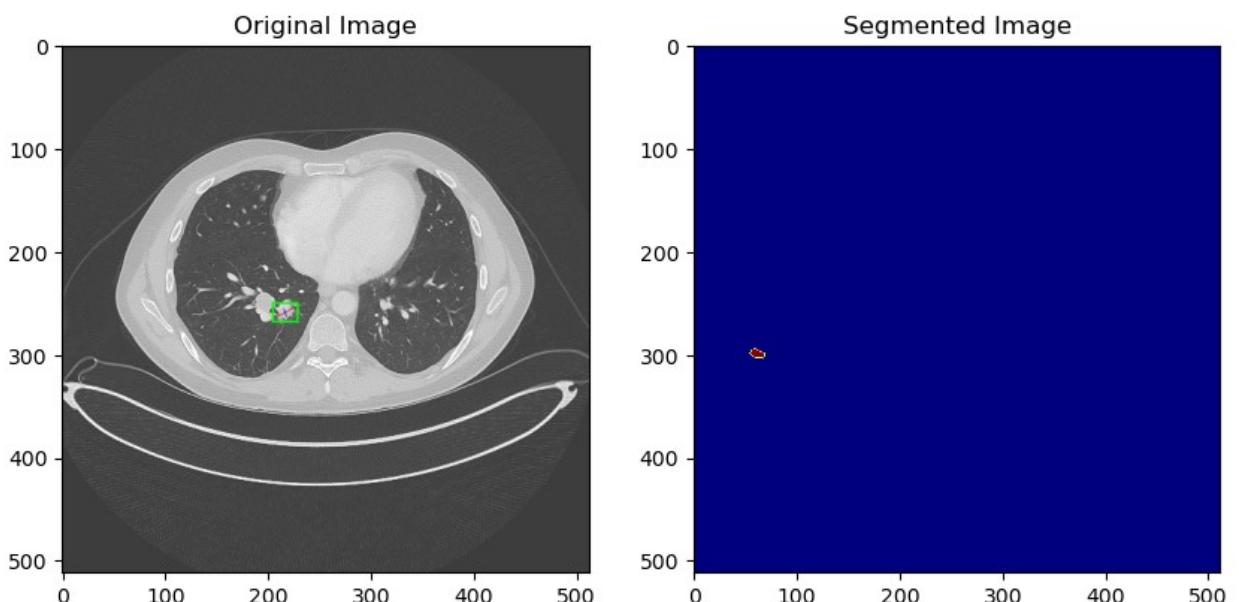


Image: 000103\_02\_01\_060.png  
Class 0: 98.47%  
Class 12: 1.53%

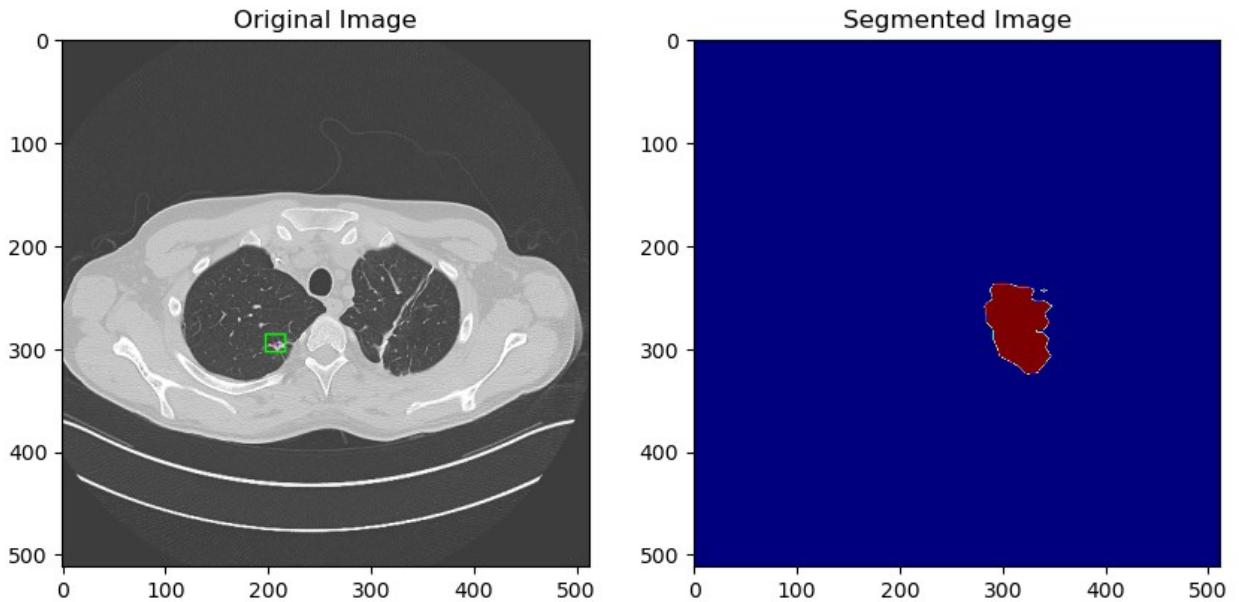


Image: 000103\_02\_01\_107.png

Class 0: 94.32%

Class 15: 5.68%

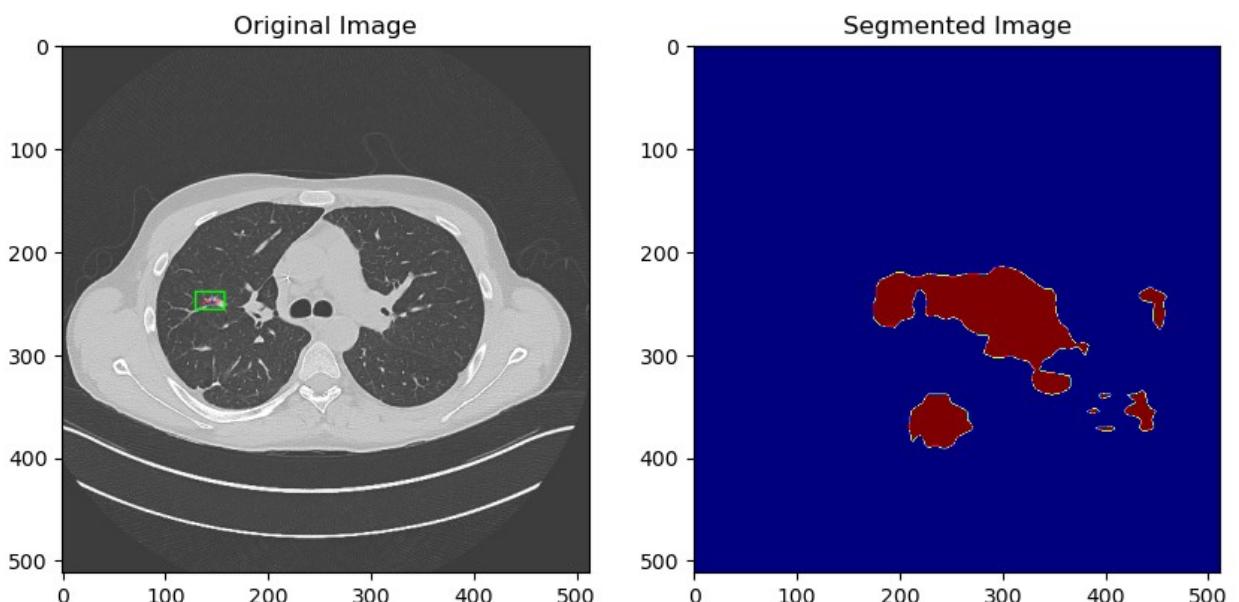


Image: 000103\_02\_01\_168.png

Class 0: 95.30%

Class 3: 3.69%

Class 8: 0.34%

Class 15: 0.67%

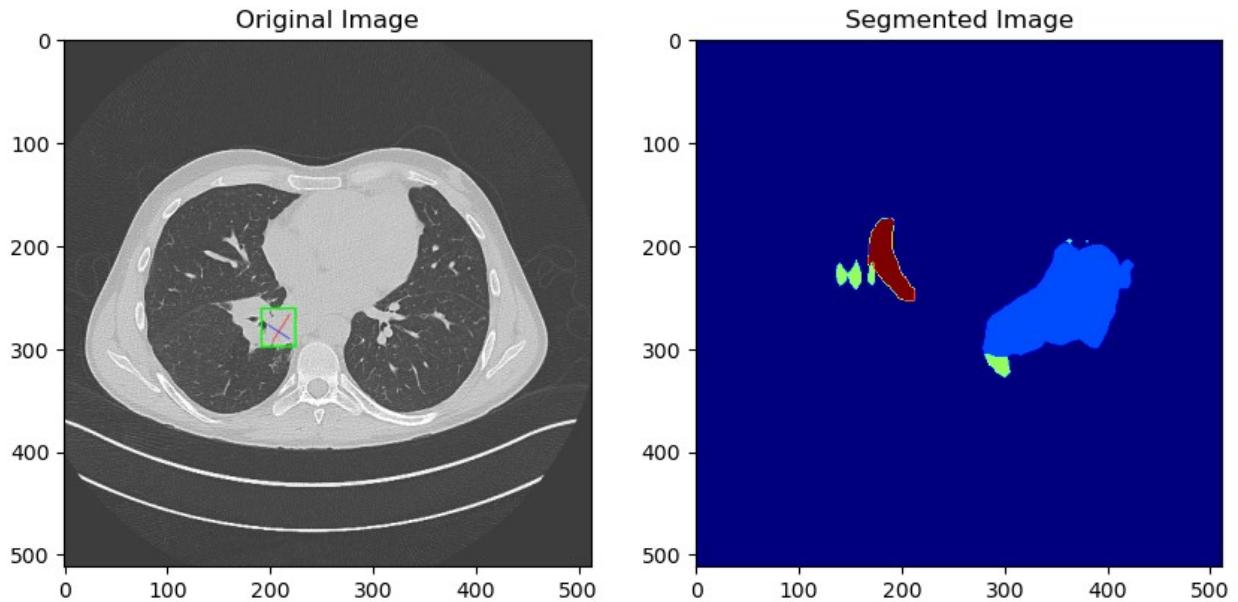


Image: 000103\_03\_01\_082.png

Class 0: 99.44%

Class 15: 0.56%

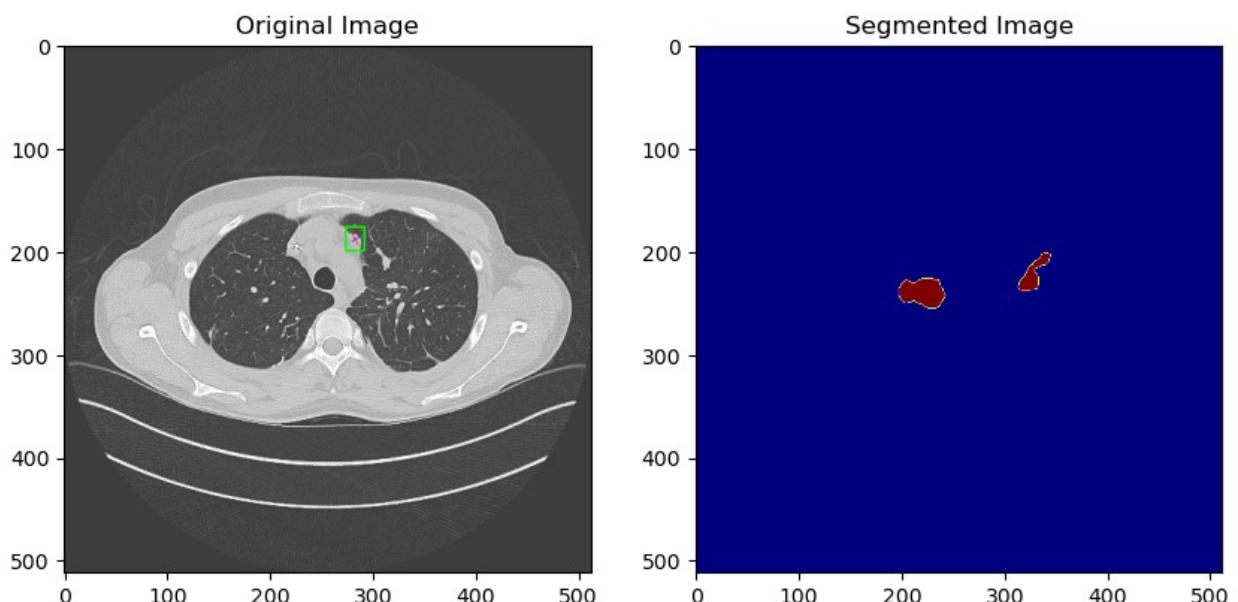


Image: 000103\_03\_01\_166.png

Class 0: 79.38%

Class 3: 20.62%

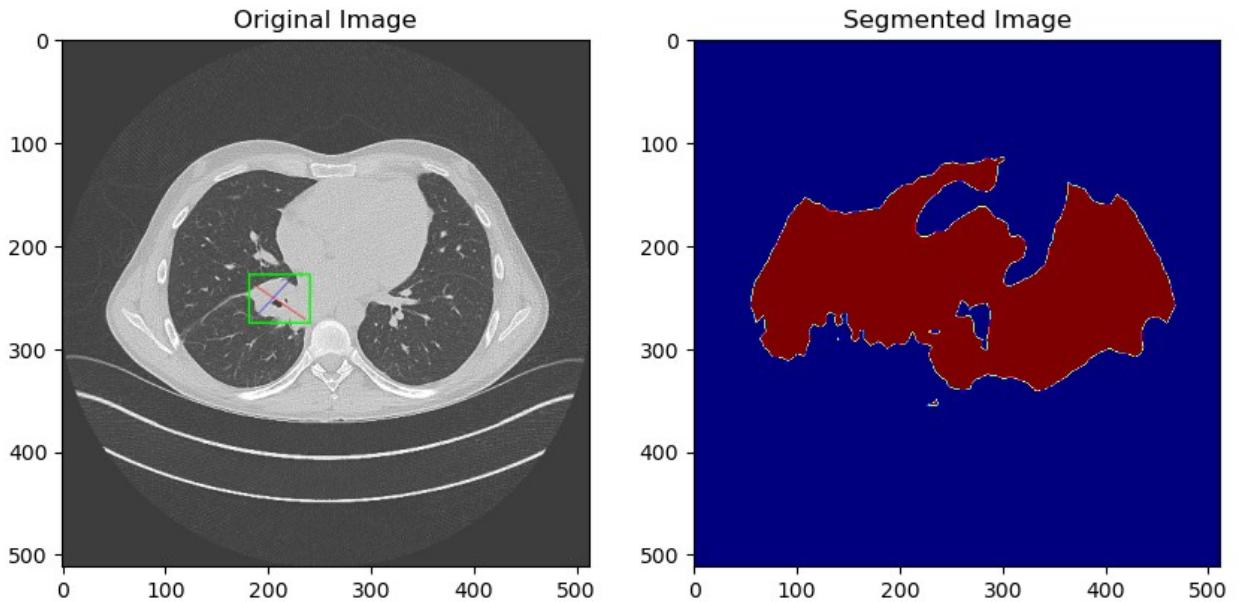


Image: 000103\_04\_02\_090.png

Class 0: 99.63%

Class 15: 0.37%

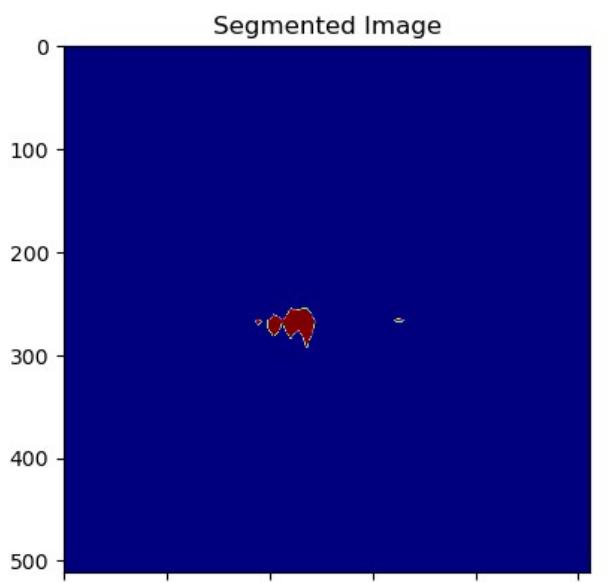
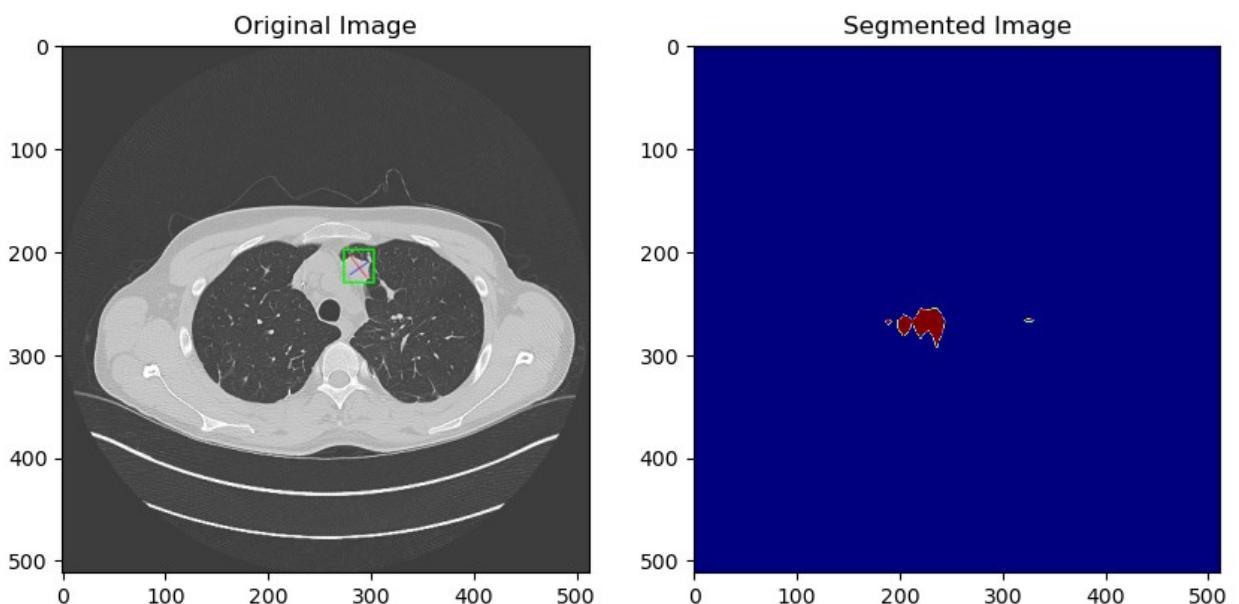


Image: 000103\_04\_02\_175.png

Class 0: 99.52%

Class 3: 0.45%

Class 15: 0.03%

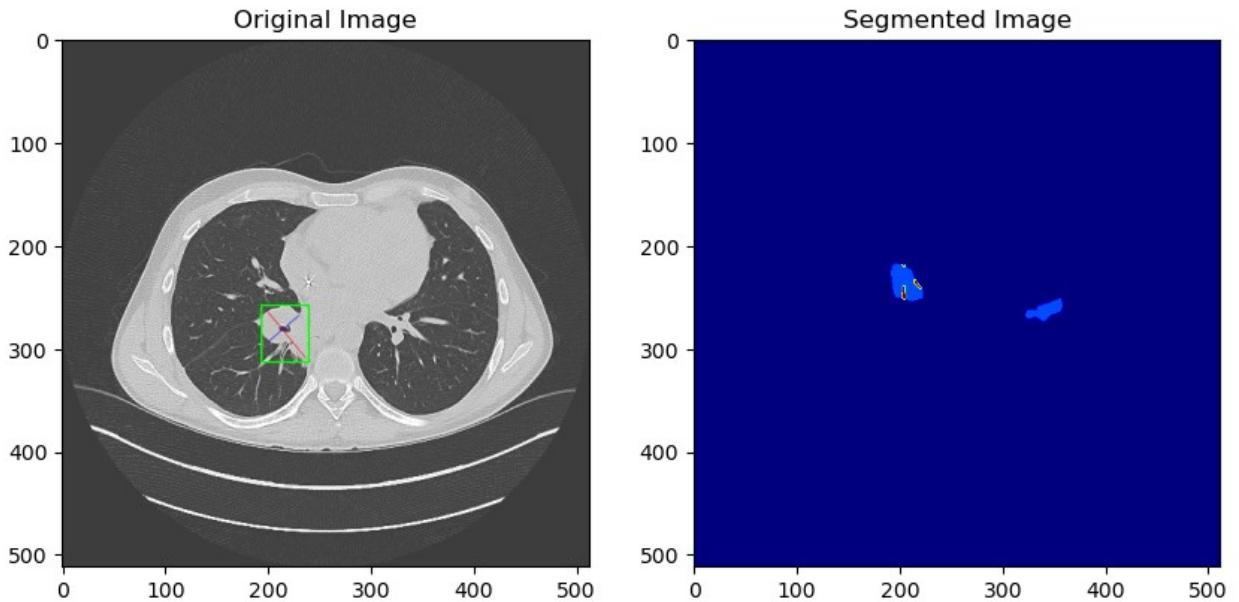


Image: 000103\_05\_01\_133.png  
Class 0: 75.54%  
Class 3: 0.13%  
Class 15: 24.33%

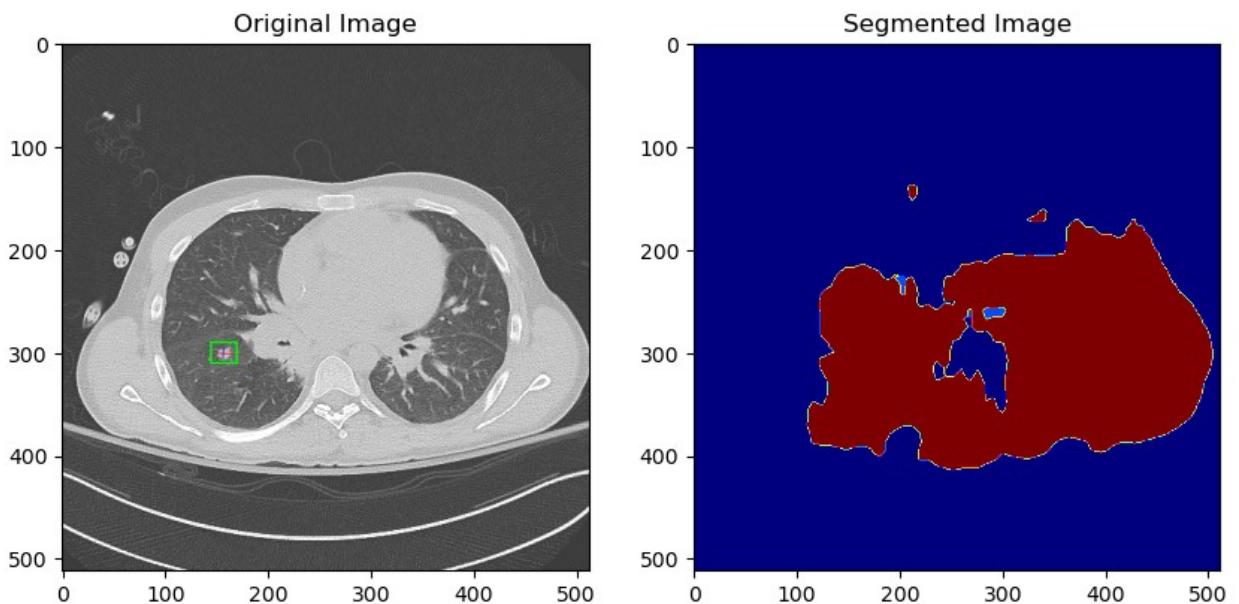


Image: 000103\_05\_01\_136.png  
Class 0: 88.28%  
Class 3: 3.58%  
Class 15: 8.14%

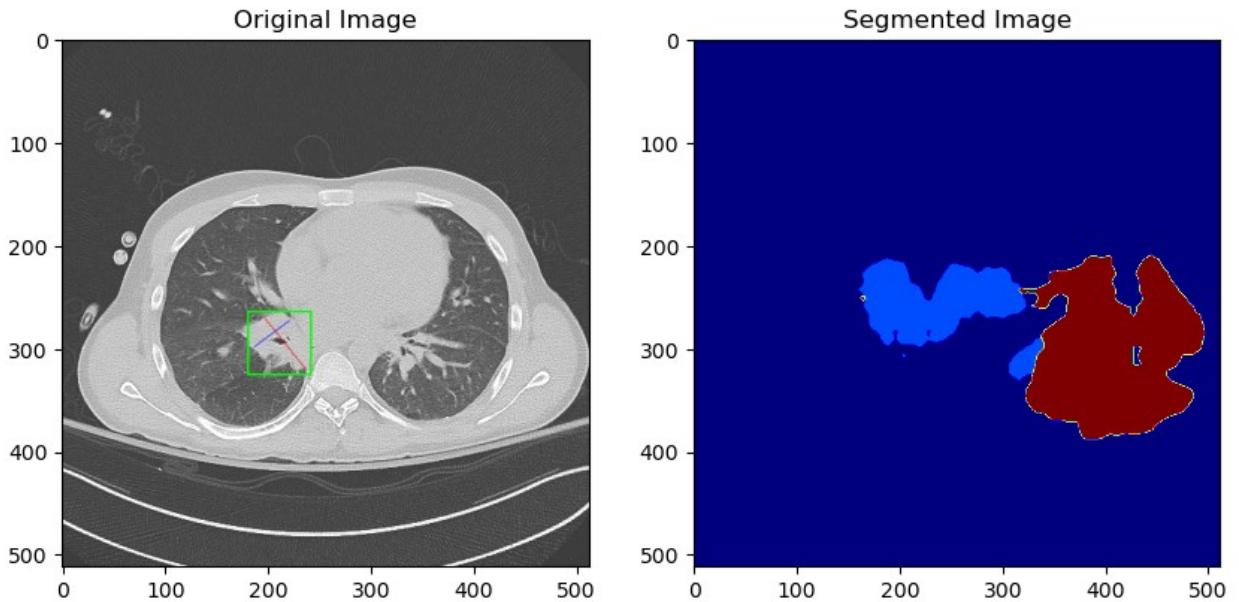


Image: 000103\_06\_01\_131.png

Class 0: 93.24%

Class 15: 6.76%

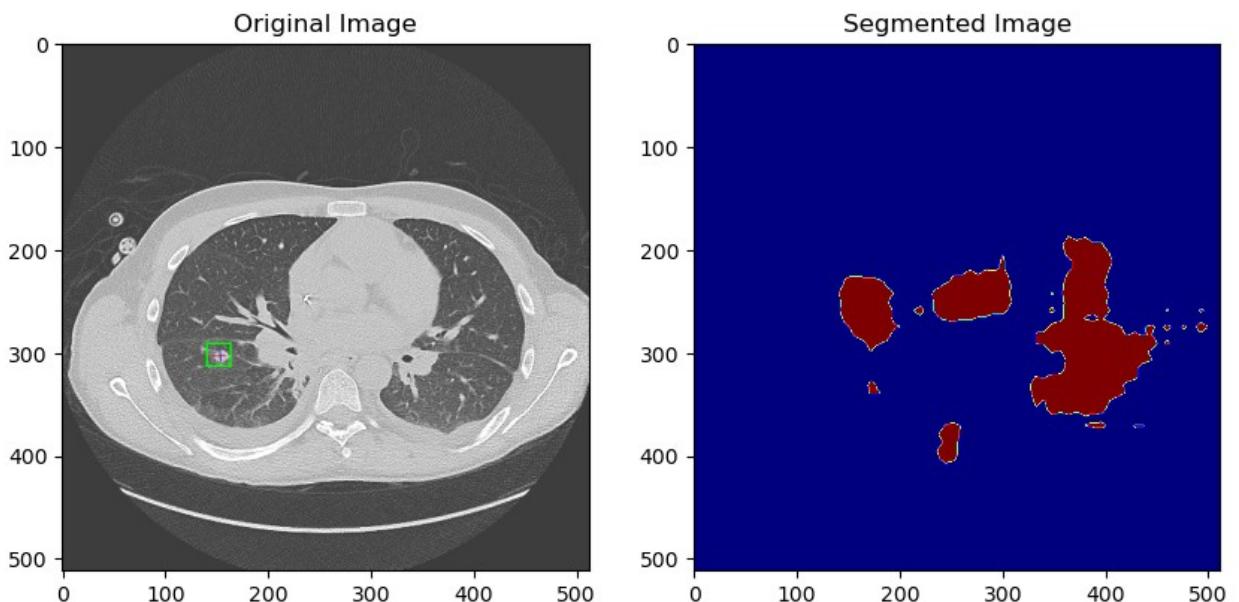


Image: 000103\_07\_01\_022.png

Class 0: 86.85%

Class 3: 0.74%

Class 10: 12.41%

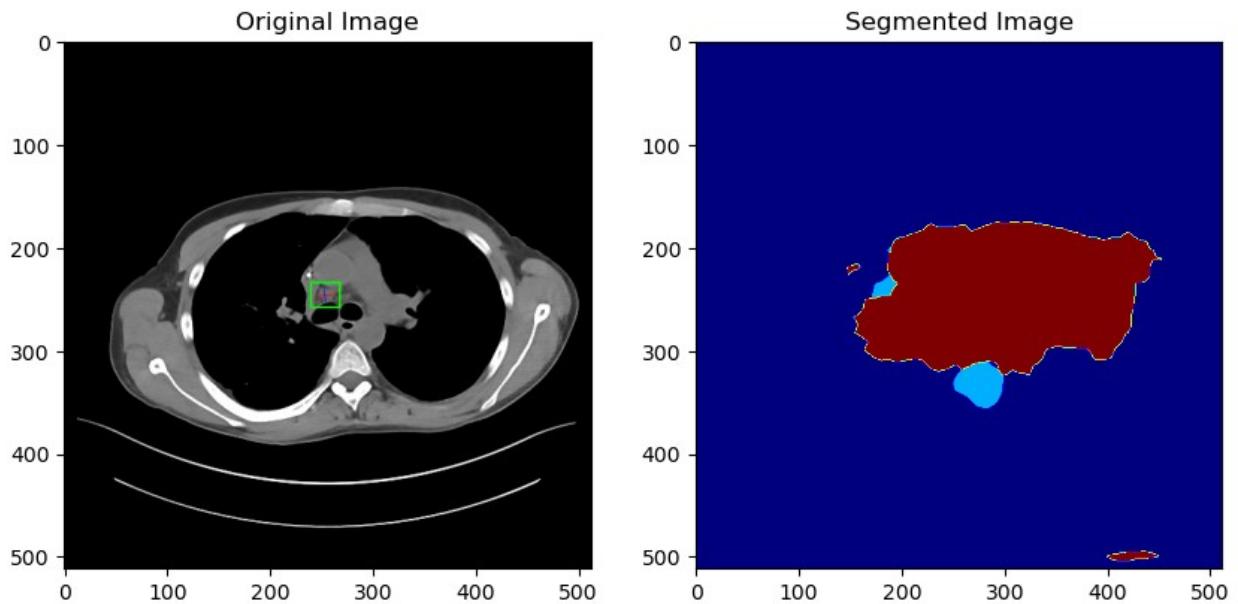


Image: 000103\_07\_02\_082.png  
Class 0: 100.00%

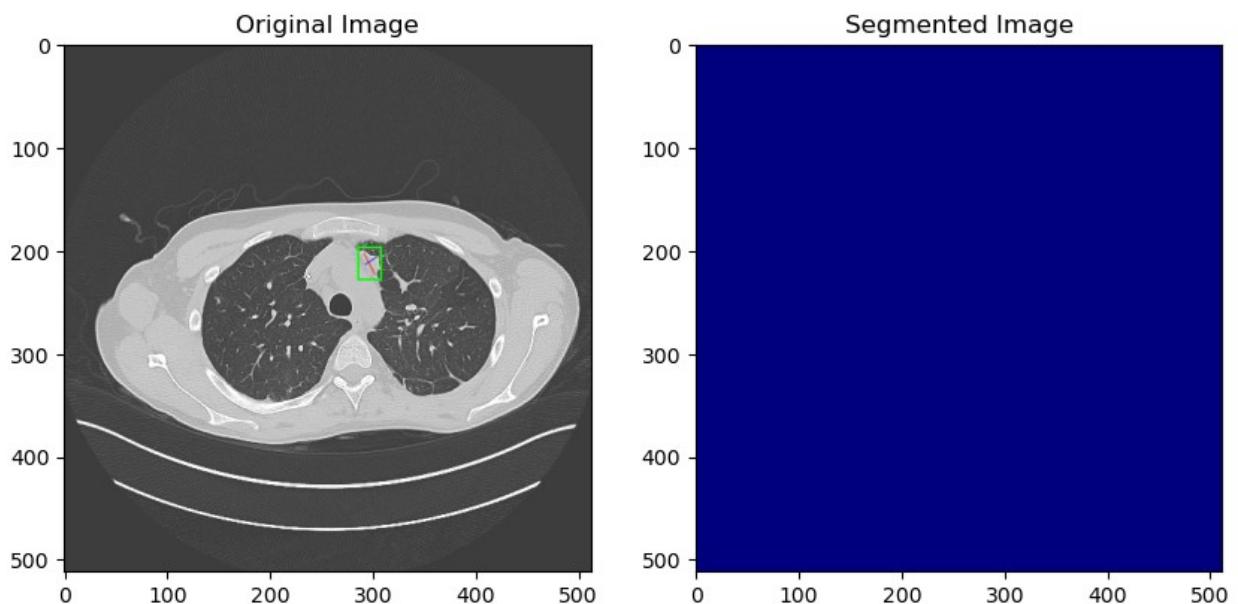


Image: 000103\_07\_02\_160.png  
Class 0: 73.07%  
Class 3: 26.93%

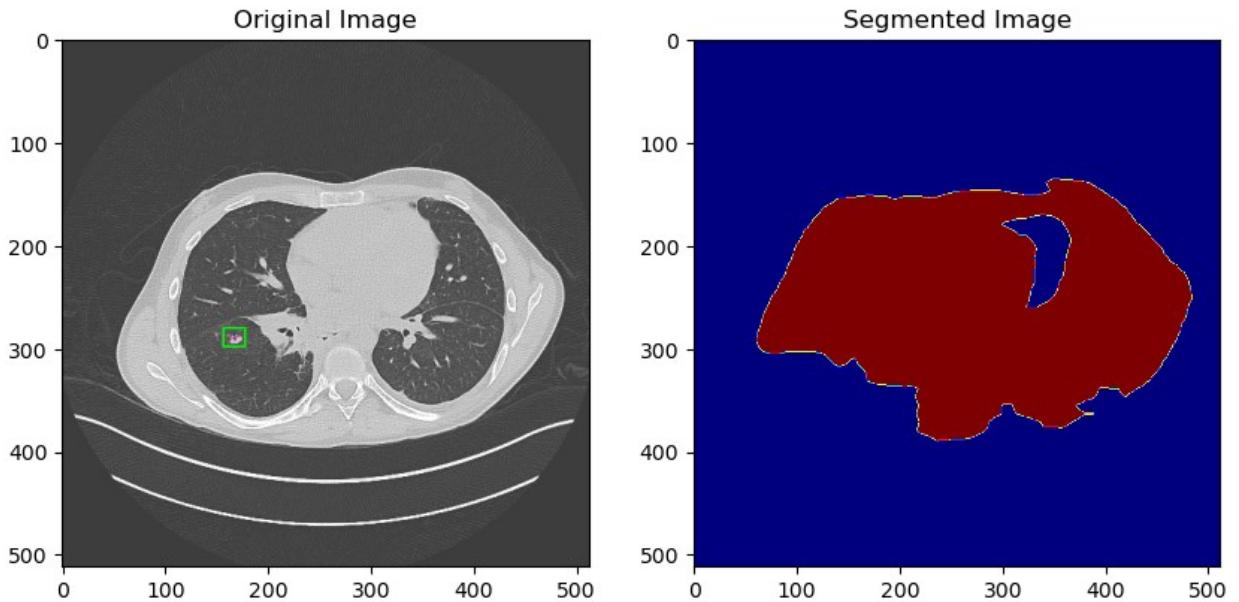


Image: 000103\_08\_01\_016.png  
Class 0: 100.00%

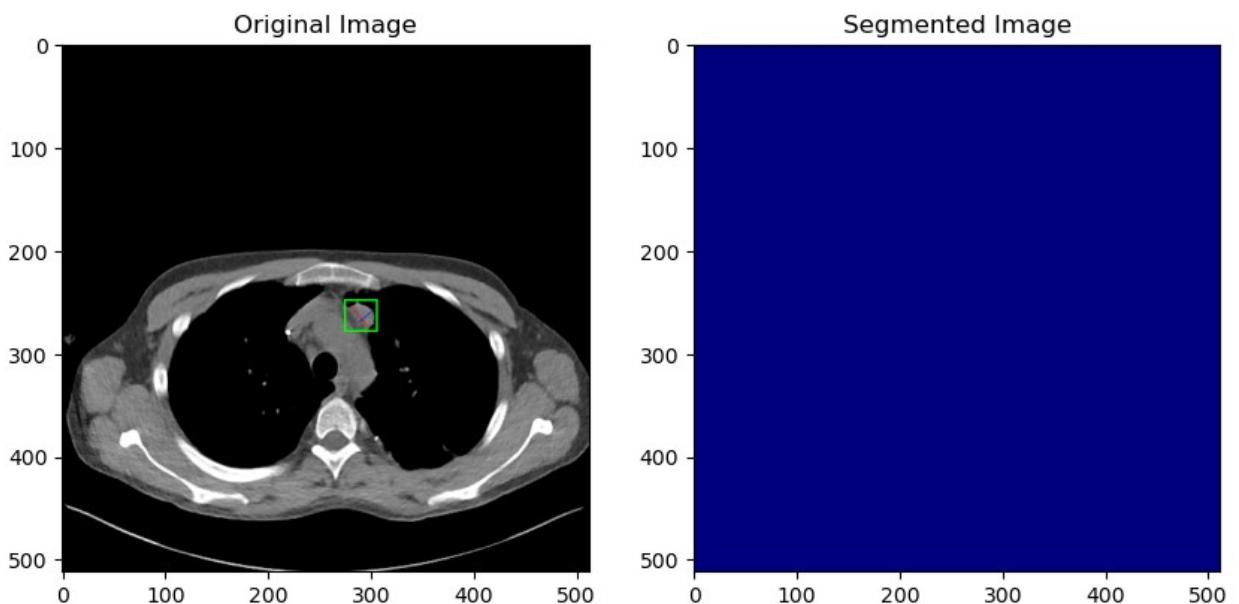


Image: 000103\_08\_01\_021.png  
Class 0: 84.21%  
Class 3: 1.01%  
Class 10: 14.78%

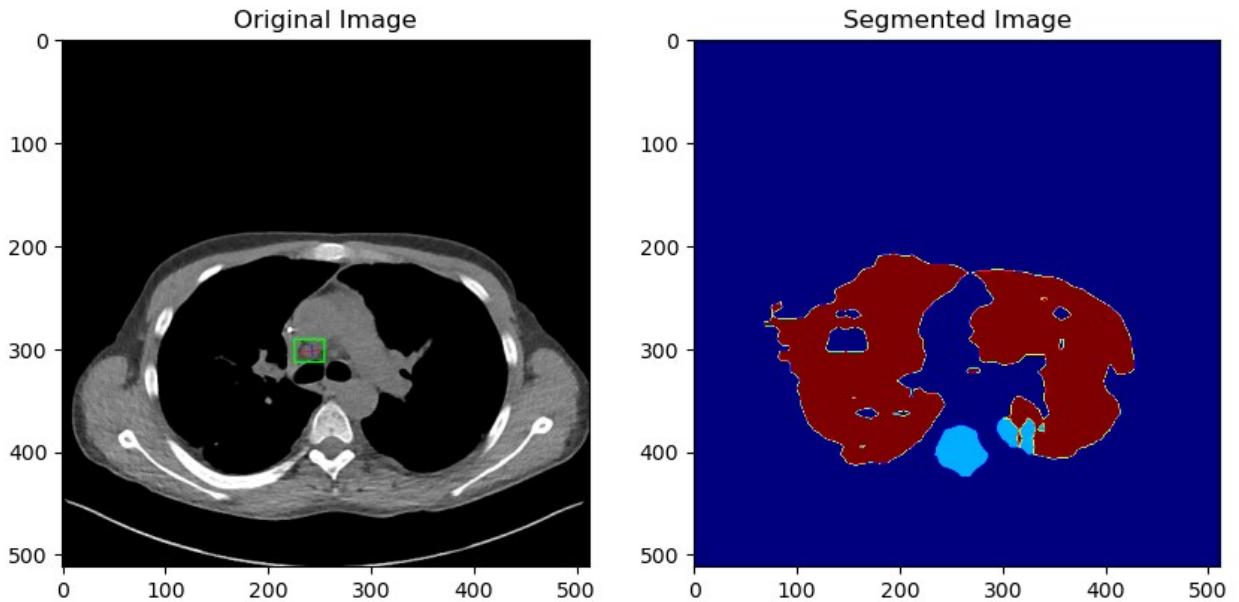


Image: 000103\_08\_02\_153.png  
Class 0: 66.39%  
Class 3: 33.49%  
Class 12: 0.12%

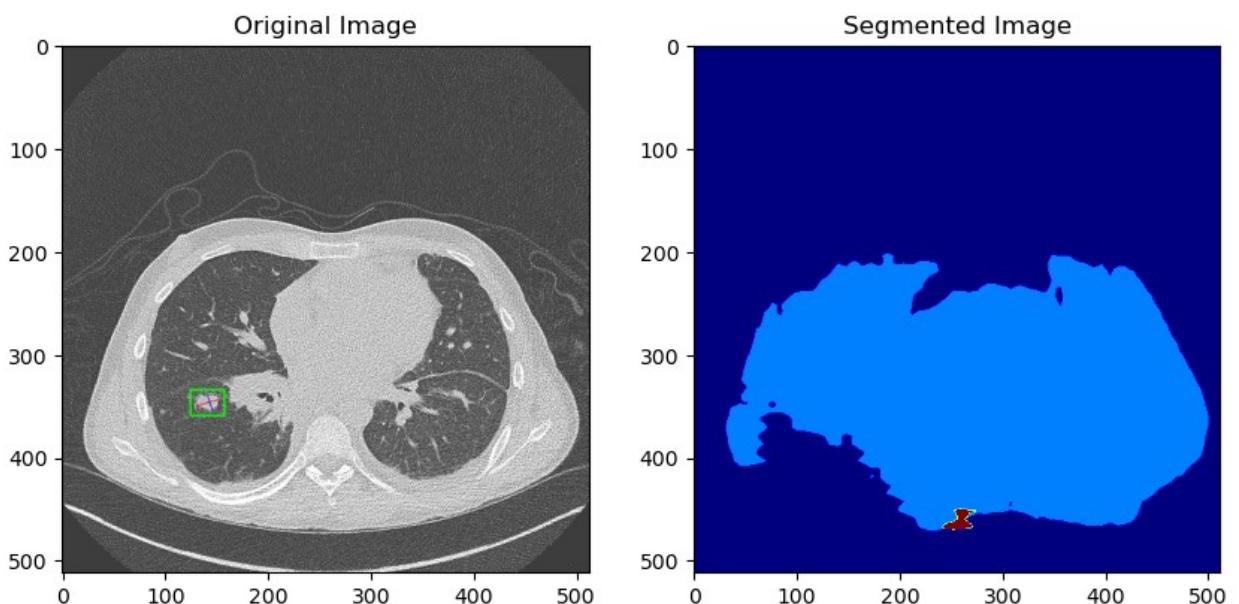


Image: 000103\_09\_01\_019.png  
Class 0: 87.10%  
Class 3: 12.90%

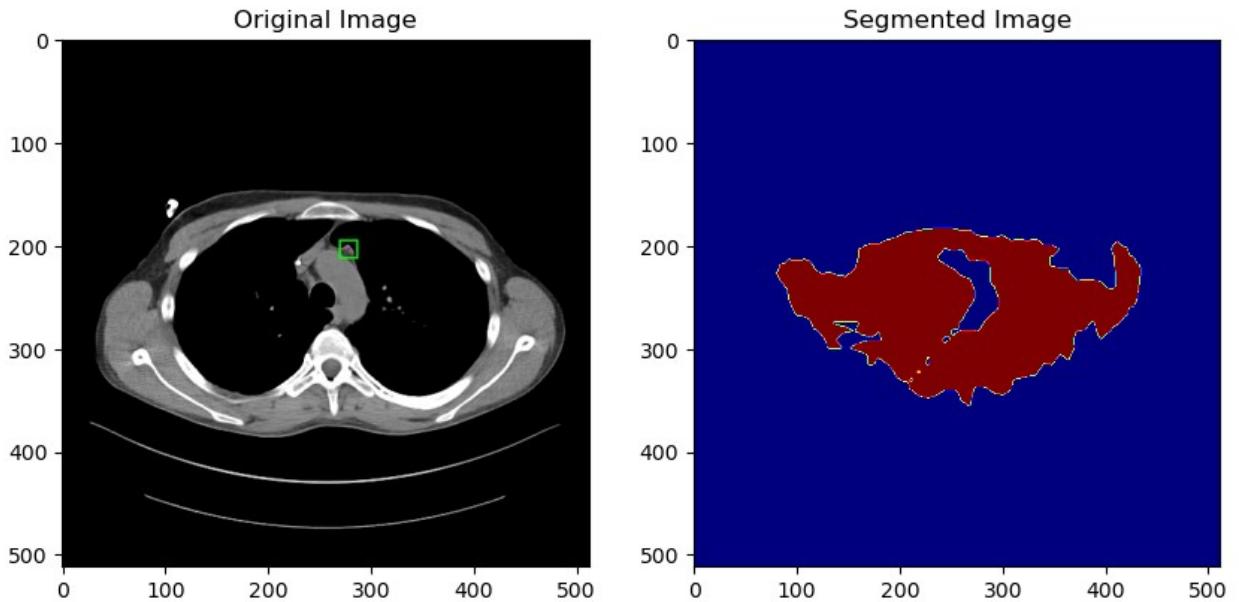


Image: 000103\_09\_01\_023.png  
Class 0: 86.14%  
Class 3: 6.76%  
Class 10: 7.10%

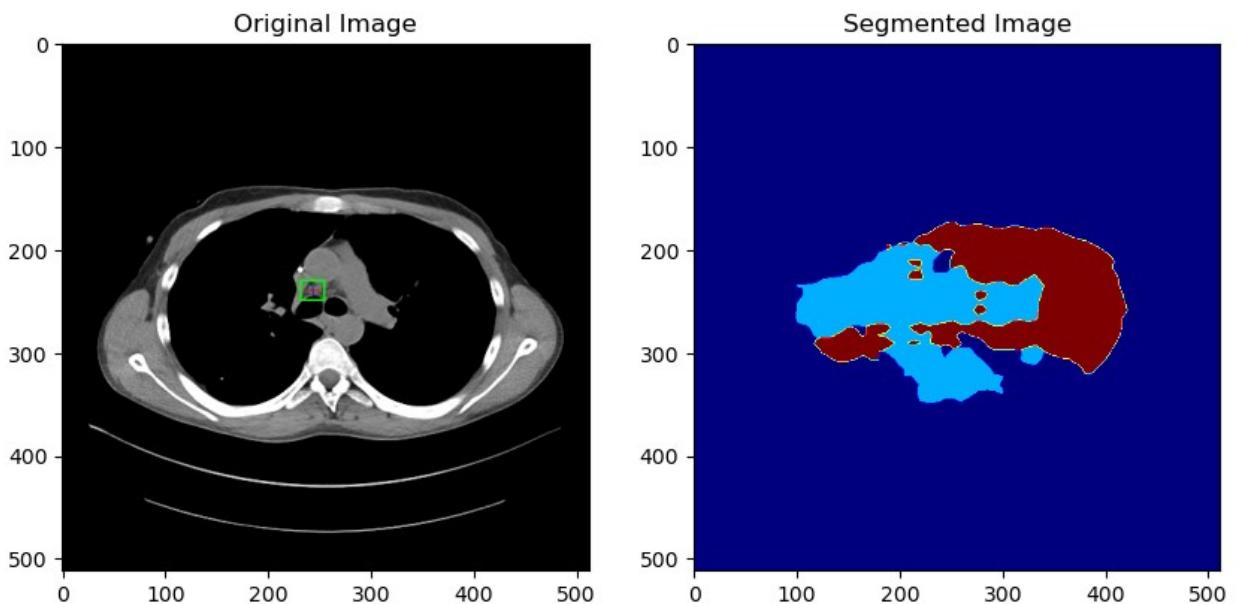


Image: 000103\_09\_02\_169.png  
Class 0: 96.44%  
Class 3: 3.56%

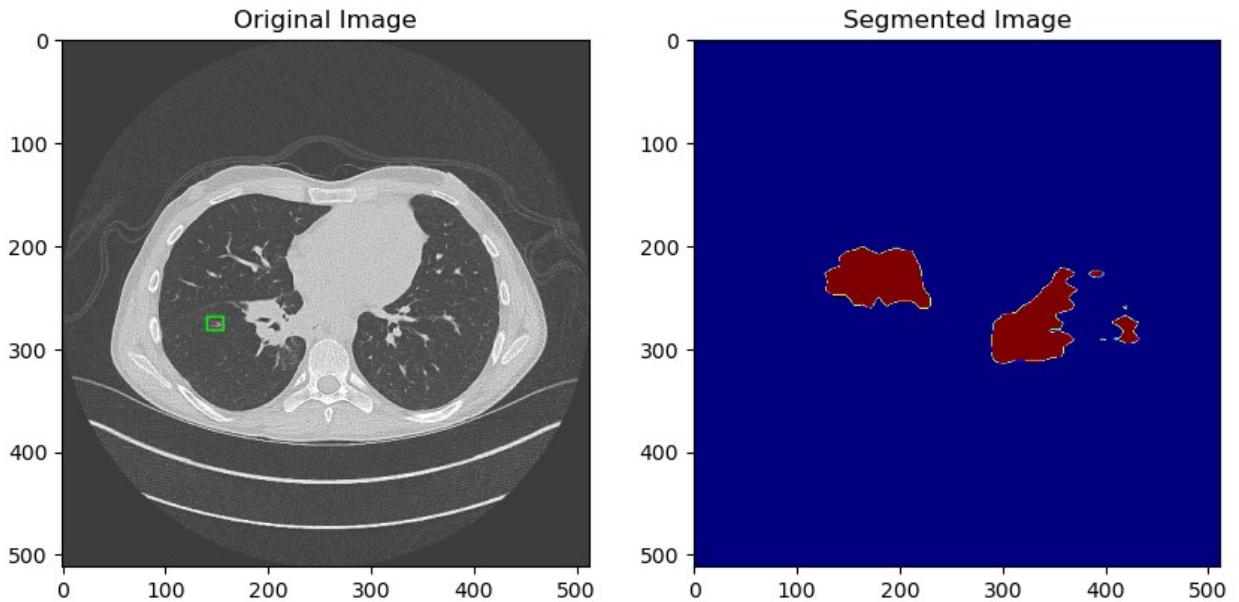


Image: 000103\_10\_01\_166.png

Class 0: 84.50%

Class 3: 15.50%

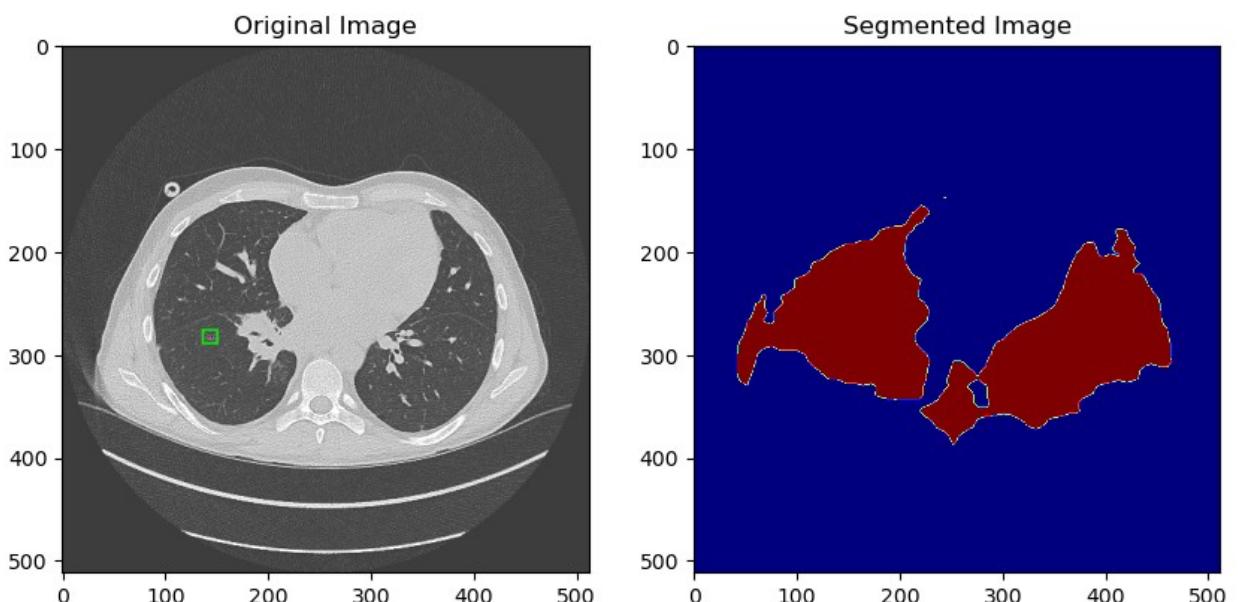


Image: 000103\_11\_01\_177.png

Class 0: 84.93%

Class 3: 15.07%

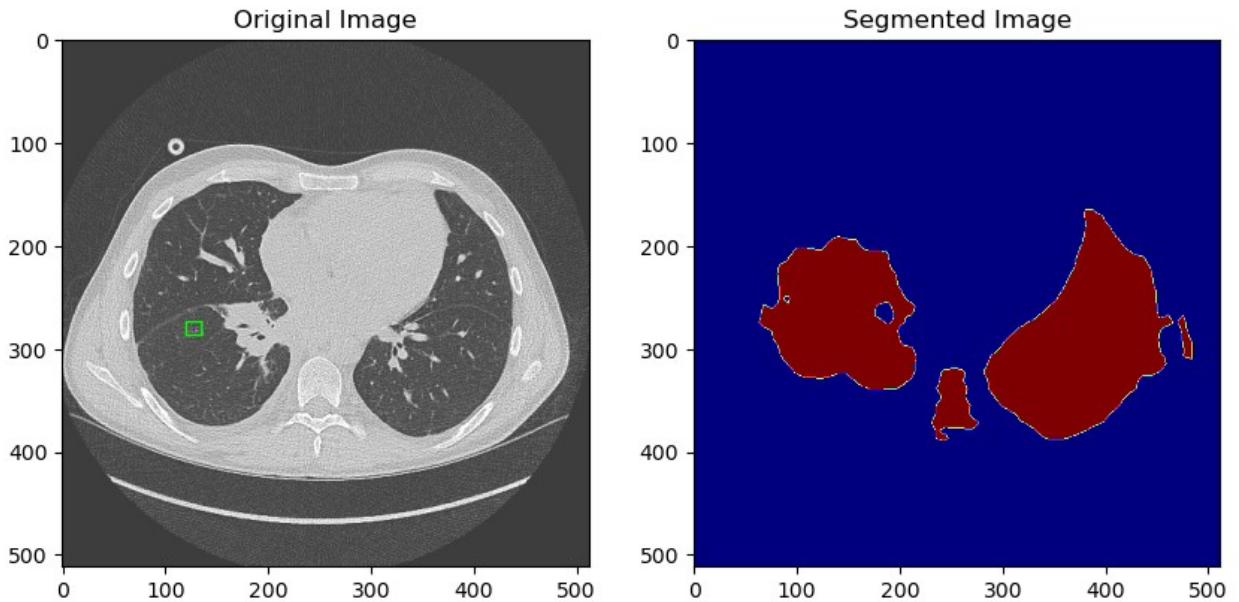


Image: 000103\_12\_01\_075.png  
Class 0: 99.49%  
Class 3: 0.47%  
Class 15: 0.04%

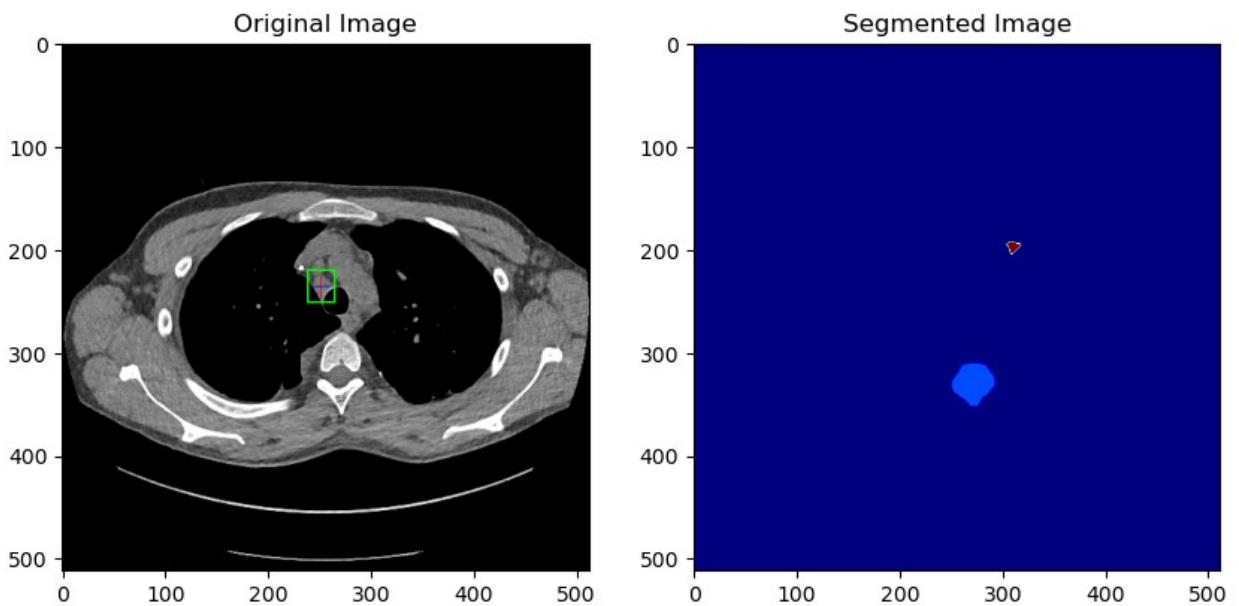


Image: 000103\_12\_01\_105.png  
Class 0: 79.19%  
Class 3: 0.44%  
Class 10: 20.37%

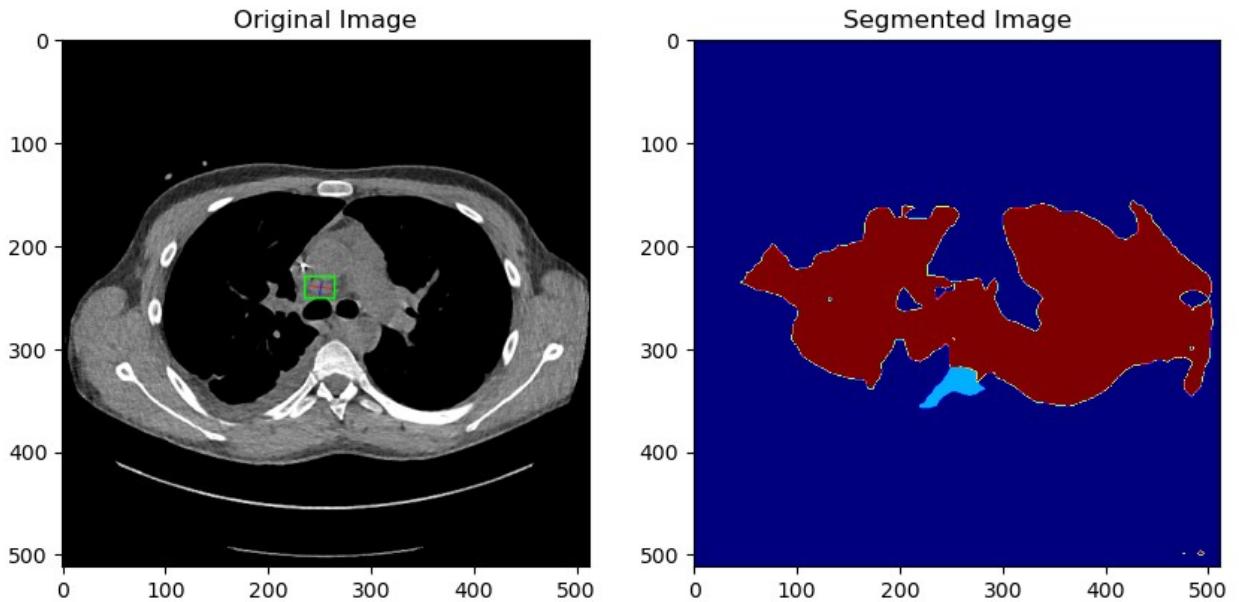


Image: 000103\_12\_02\_161.png

Class 0: 52.48%

Class 3: 47.52%

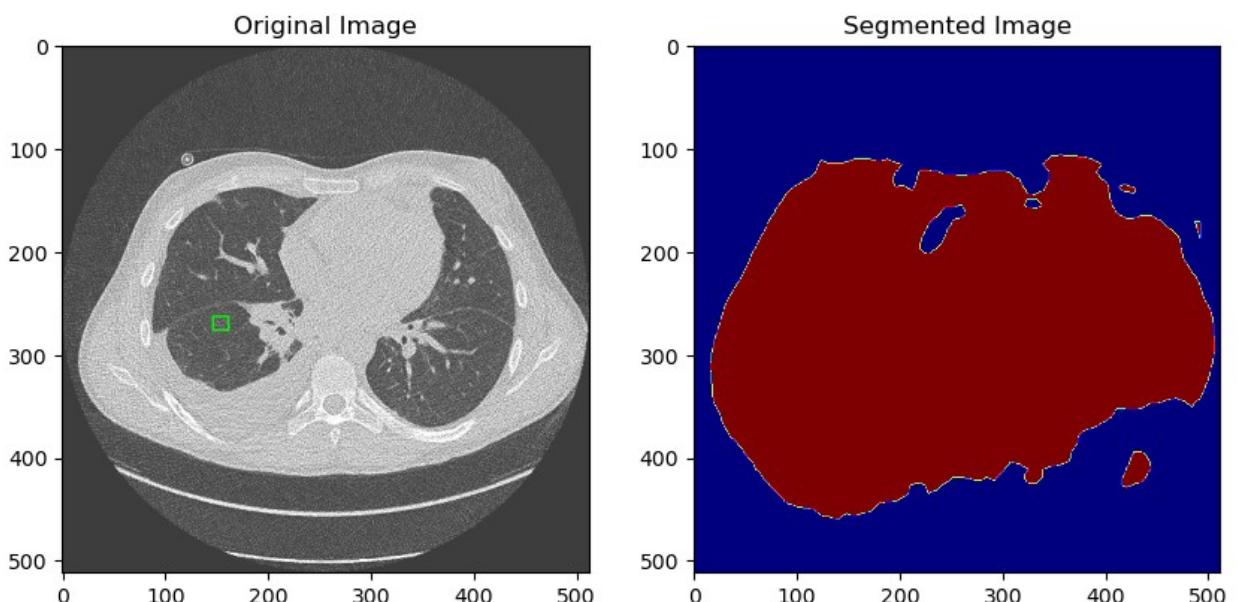


Image: 000103\_13\_01\_019.png

Class 0: 83.61%

Class 3: 0.06%

Class 10: 16.33%

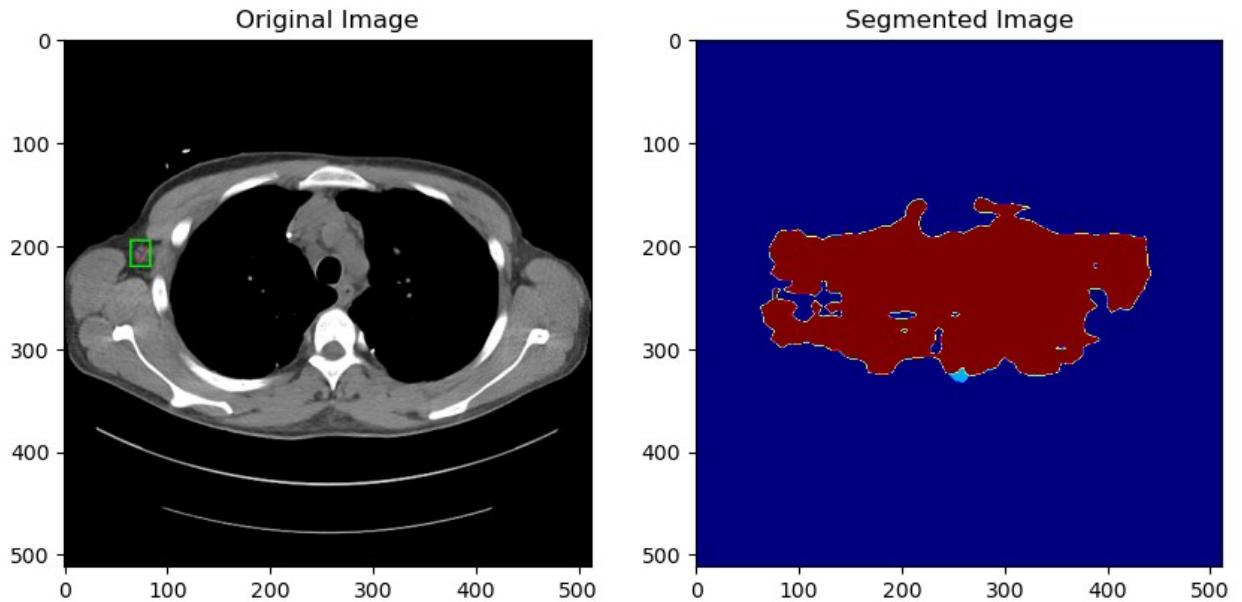


Image: 000103\_13\_02\_092.png

Class 0: 97.46%

Class 3: 2.54%

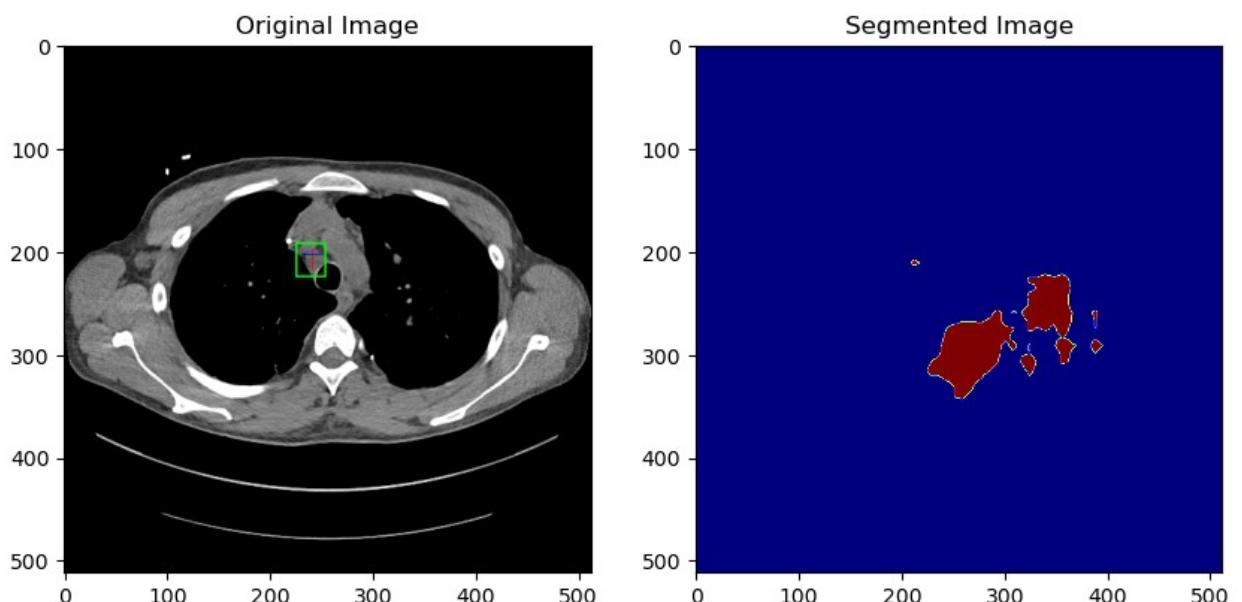


Image: 000103\_13\_02\_122.png

Class 0: 98.27%

Class 3: 1.73%

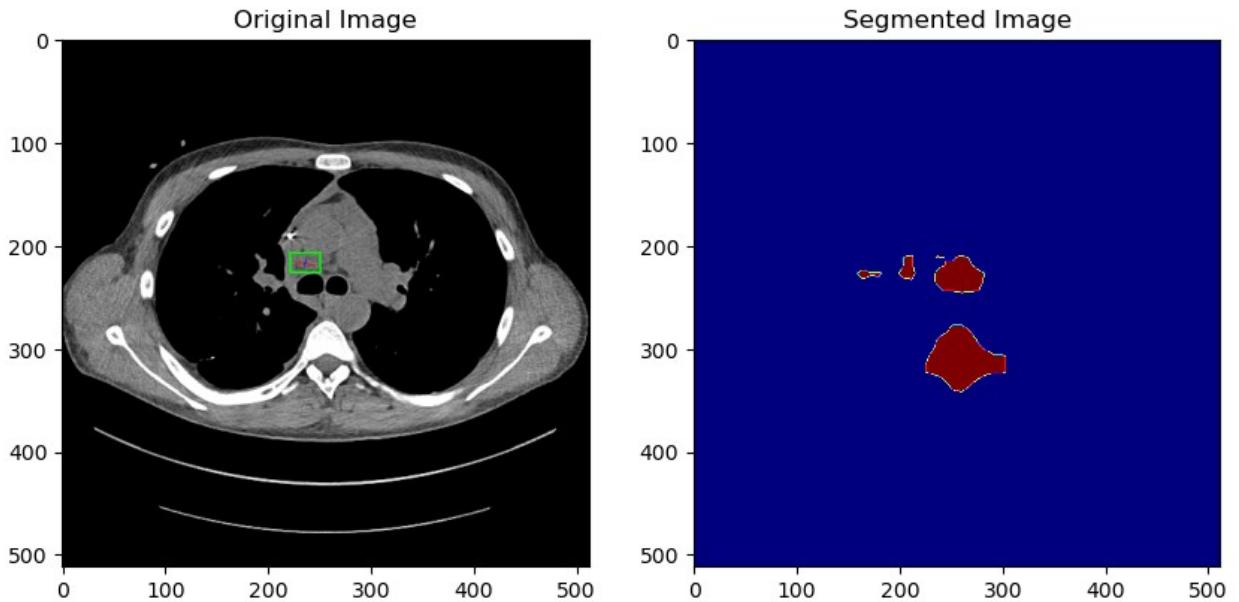


Image: 000105\_02\_01\_149.png  
Class 0: 89.13%  
Class 11: 10.87%

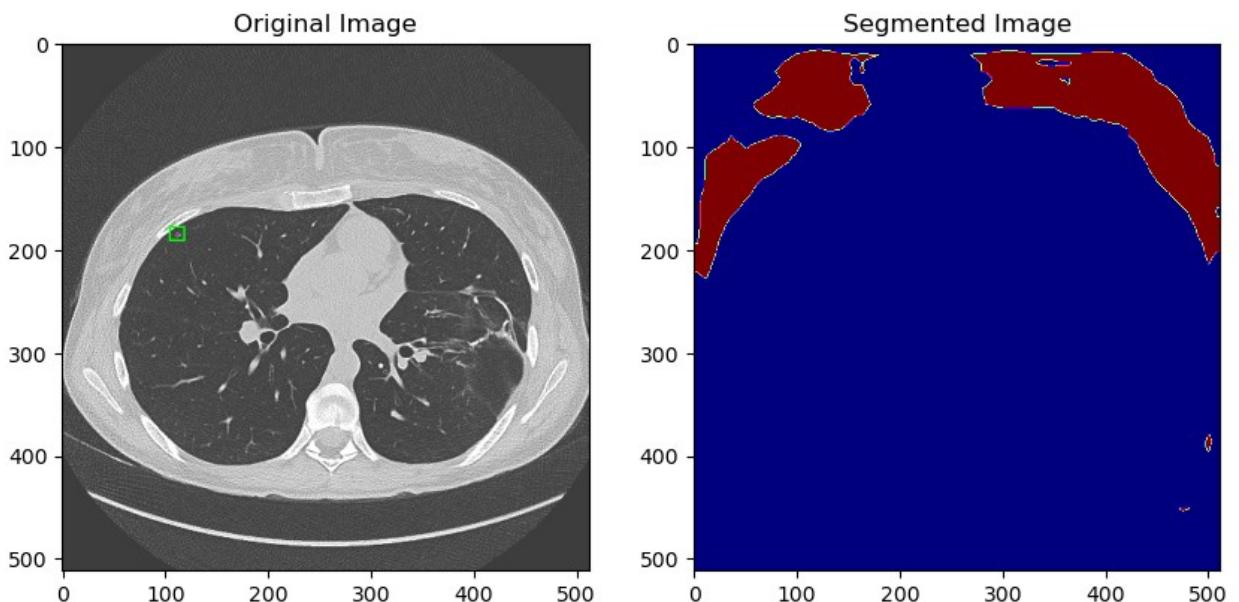


Image: 000105\_03\_01\_162.png  
Class 0: 100.00%

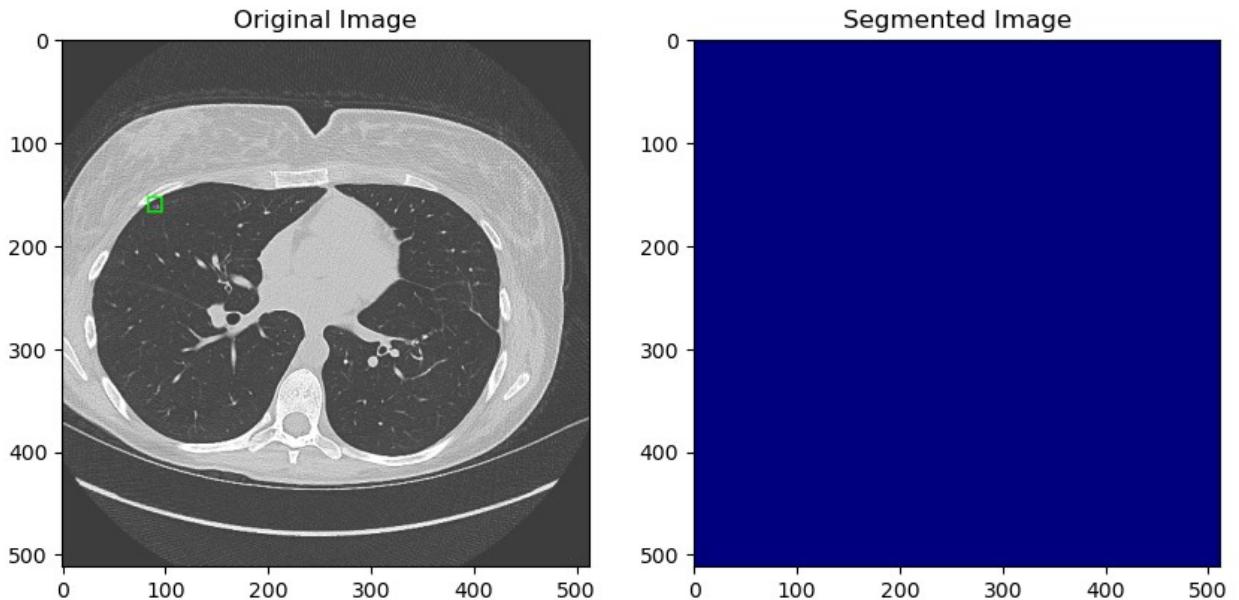


Image: 000105\_04\_01\_144.png  
Class 0: 99.94%  
Class 11: 0.06%

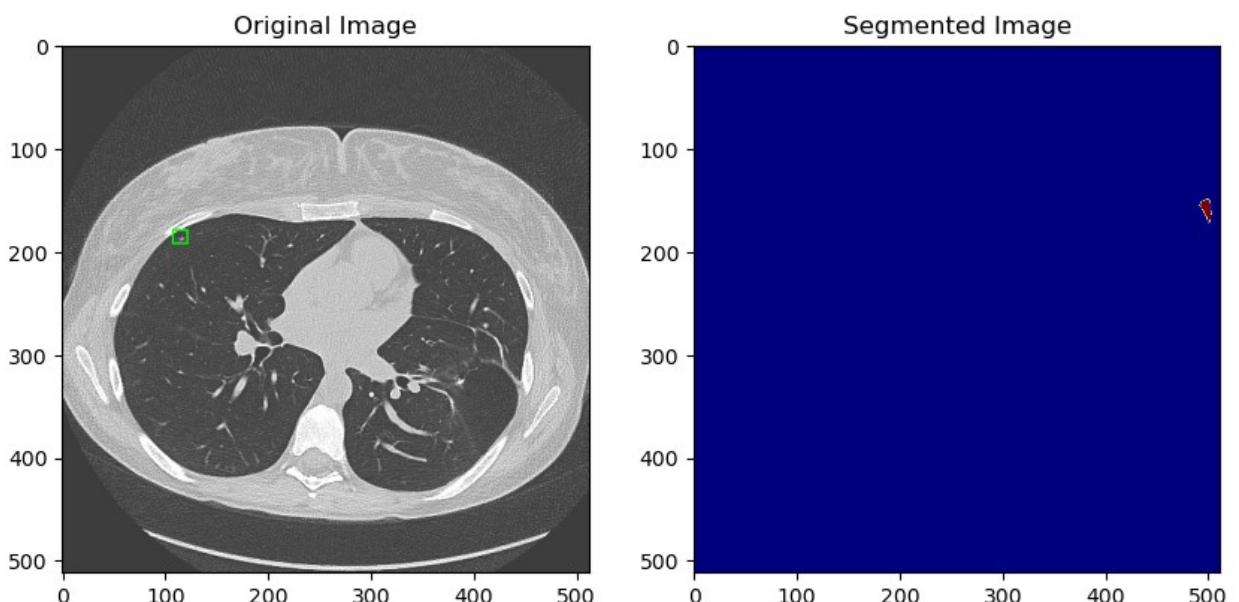


Image: 000133\_03\_02\_145.png  
Class 0: 99.96%  
Class 14: 0.04%

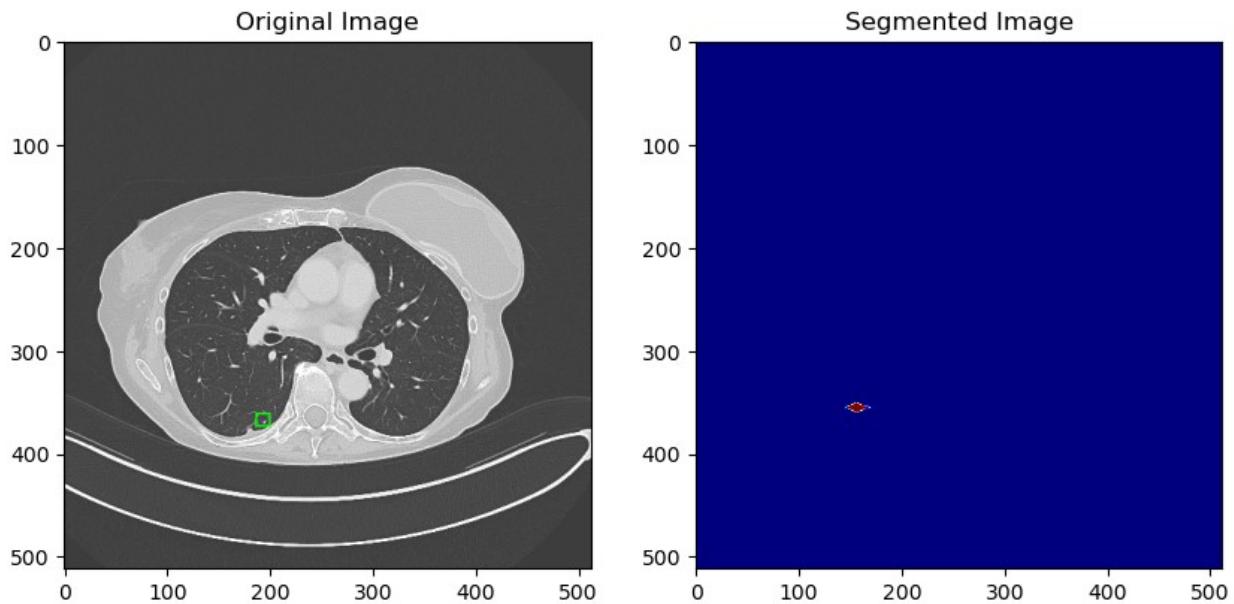


Image: 000133\_03\_02\_192.png  
Class 0: 98.50%  
Class 8: 1.50%

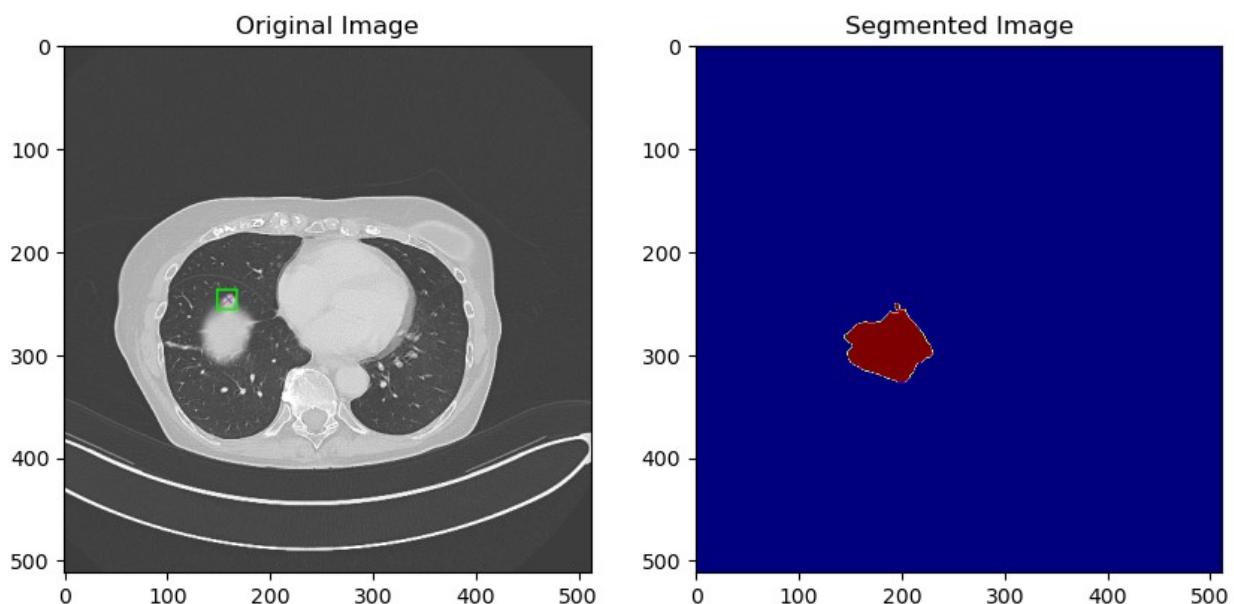


Image: 000135\_02\_03\_127.png  
Class 0: 100.00%

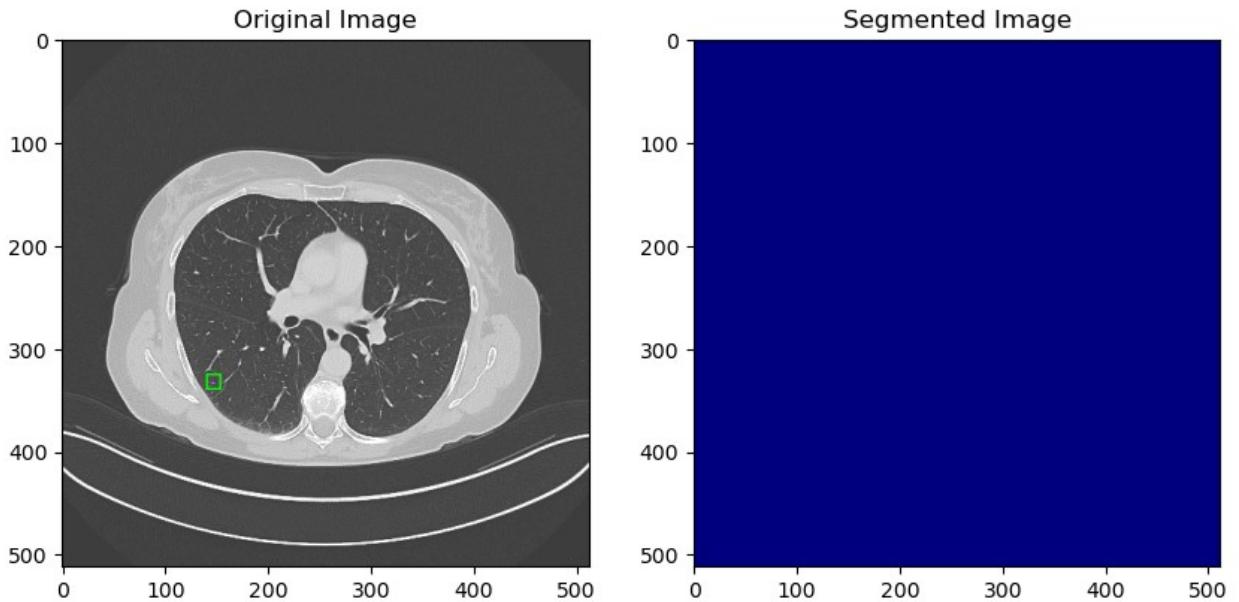


Image: 000135\_02\_03\_161.png  
Class 0: 99.21%  
Class 8: 0.00%  
Class 11: 0.79%

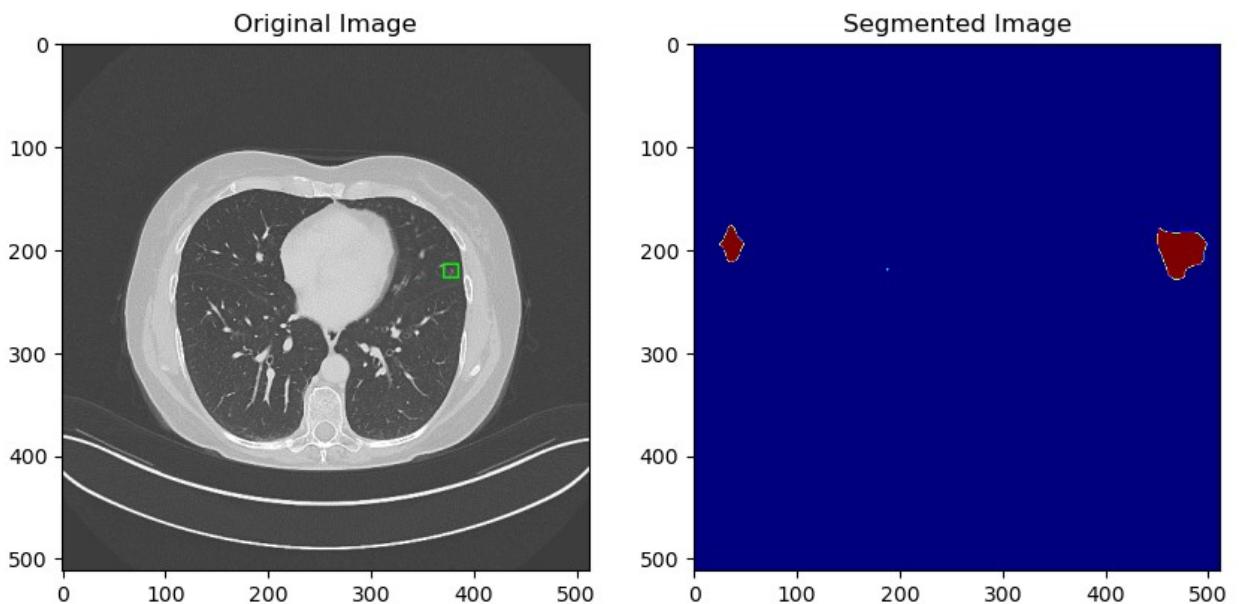


Image: 000135\_02\_03\_178.png  
Class 0: 89.57%  
Class 11: 10.43%

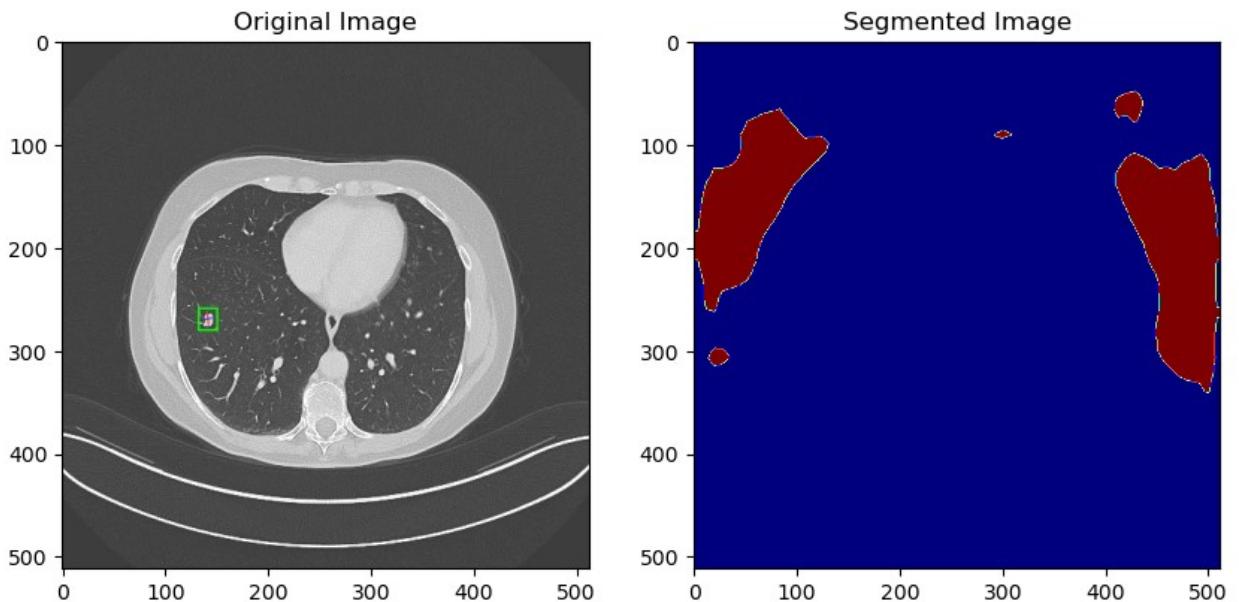


Image: 000138\_01\_01\_114.png  
Class 0: 98.06%  
Class 8: 1.94%

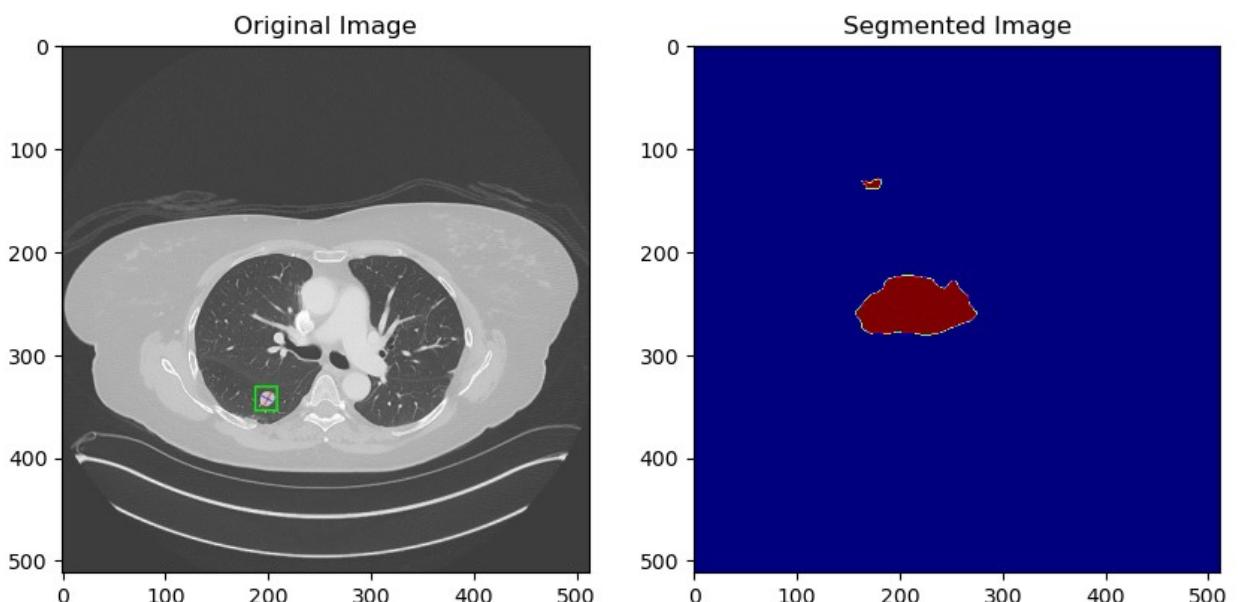


Image: 000138\_01\_01\_148.png  
Class 0: 97.41%  
Class 8: 2.59%

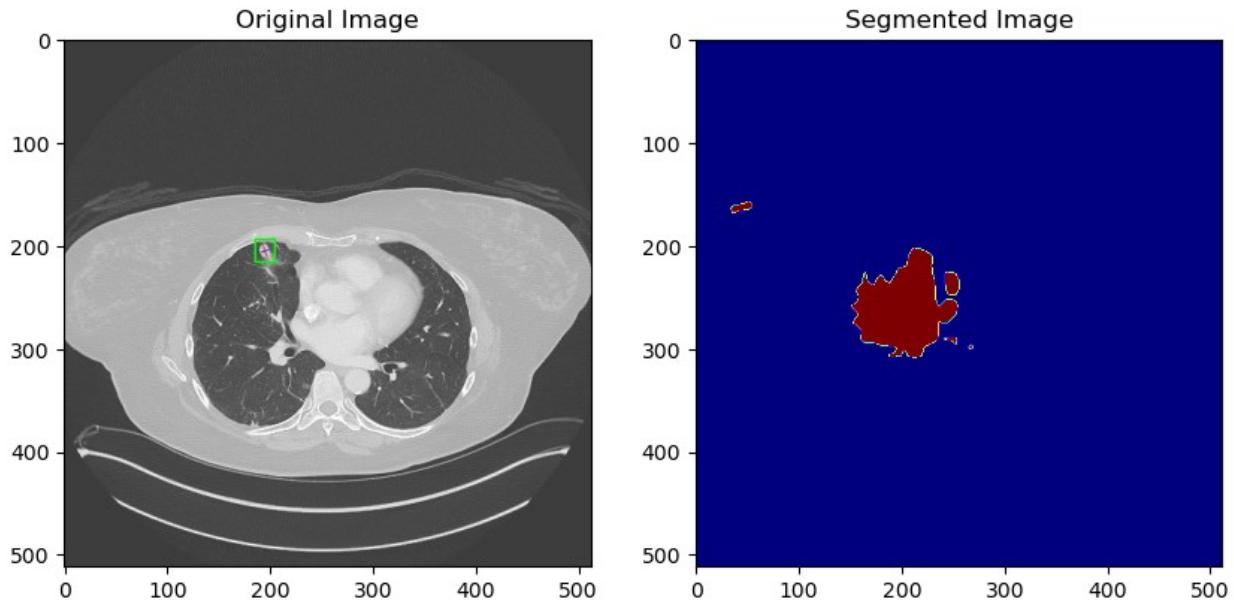


Image: 000138\_02\_01\_101.png  
Class 0: 98.57%  
Class 8: 1.43%

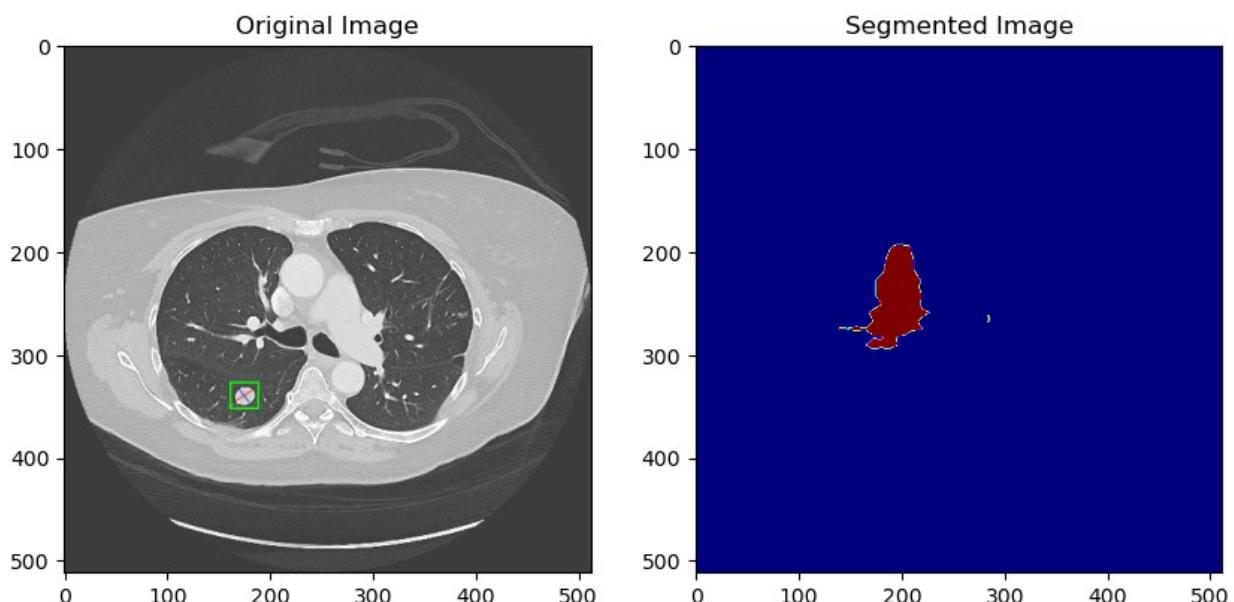


Image: 000143\_04\_02\_083.png  
Class 0: 100.00%

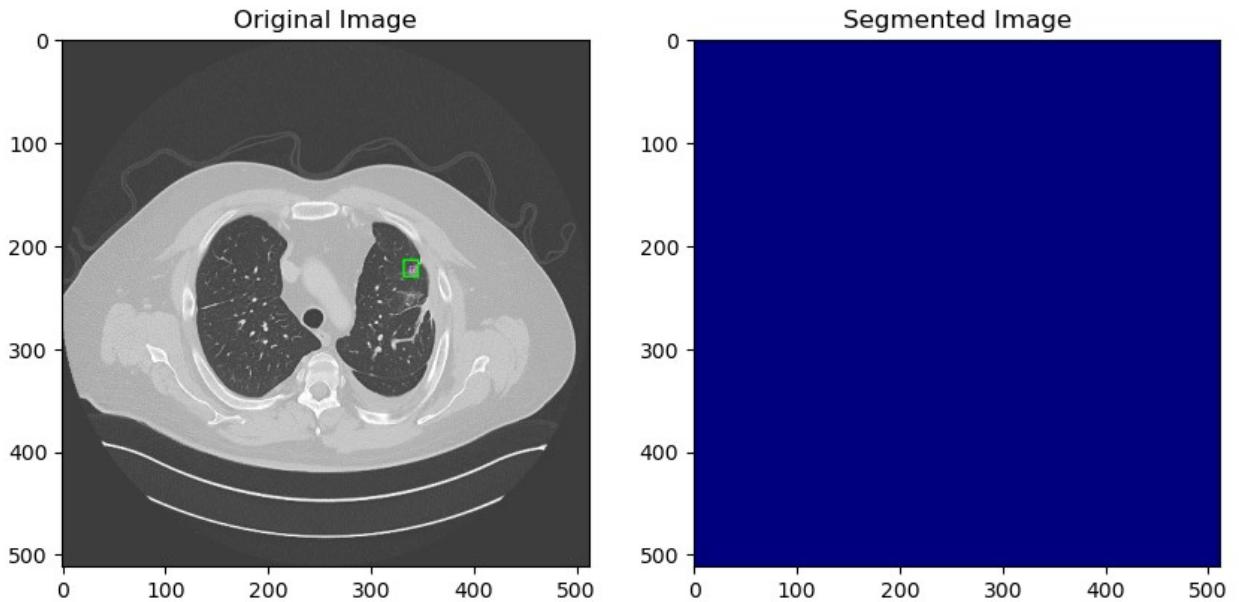


Image: 000143\_04\_02\_126.png  
Class 0: 93.92%  
Class 11: 6.08%

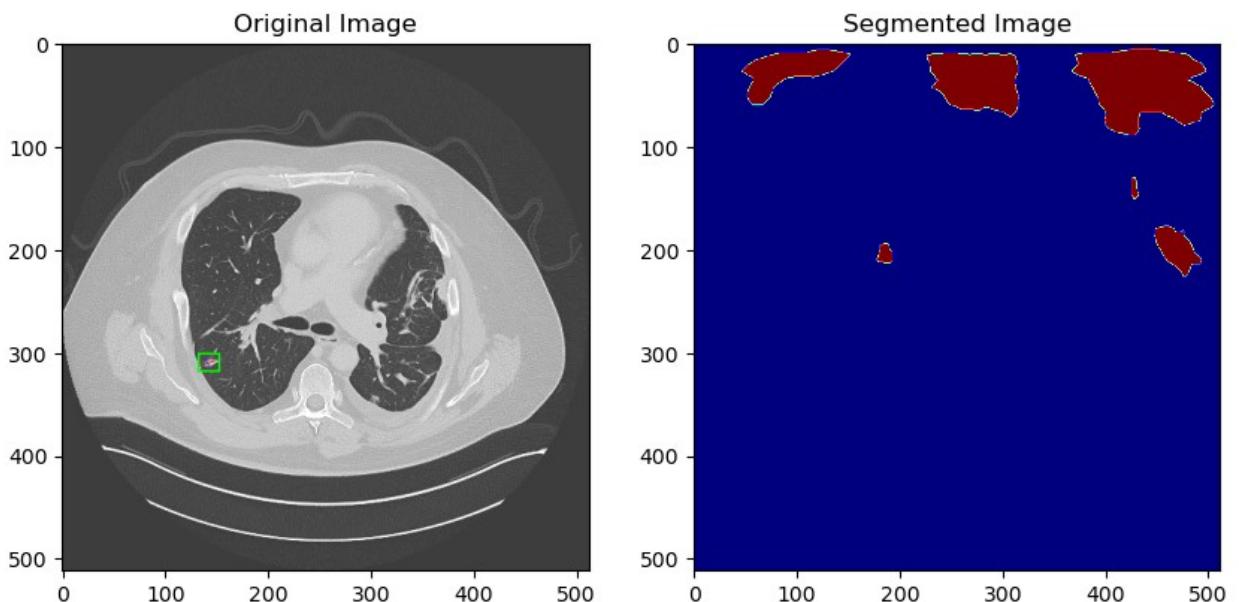


Image: 000143\_04\_02\_153.png  
Class 0: 82.19%  
Class 15: 17.81%

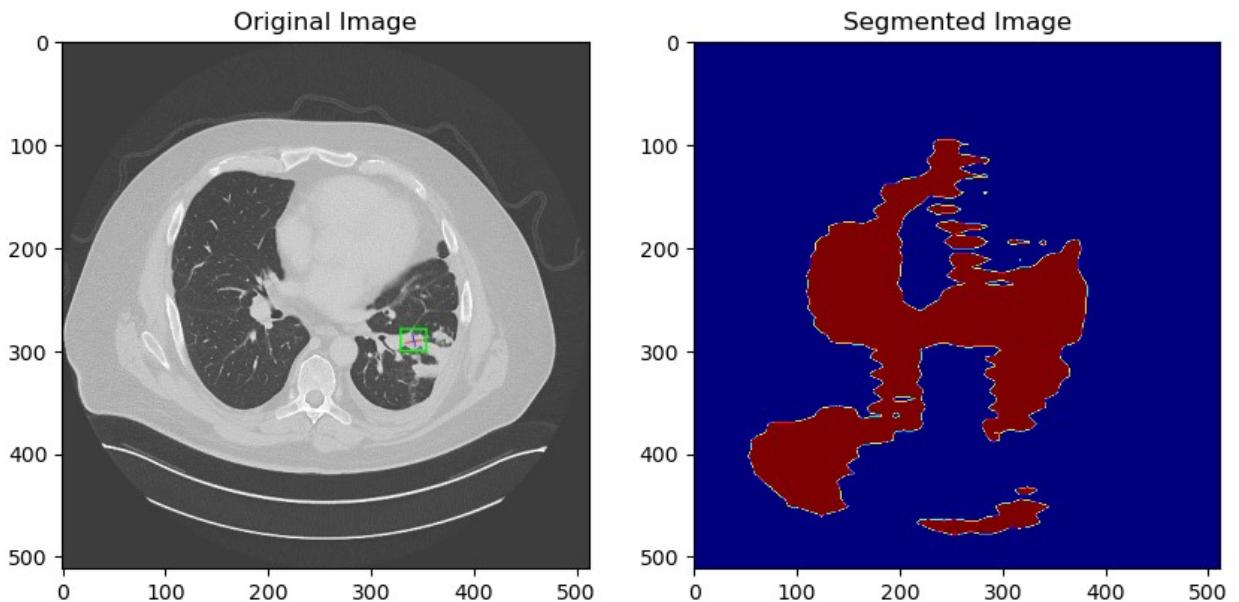


Image: 000143\_05\_01\_116.png  
Class 0: 100.00%

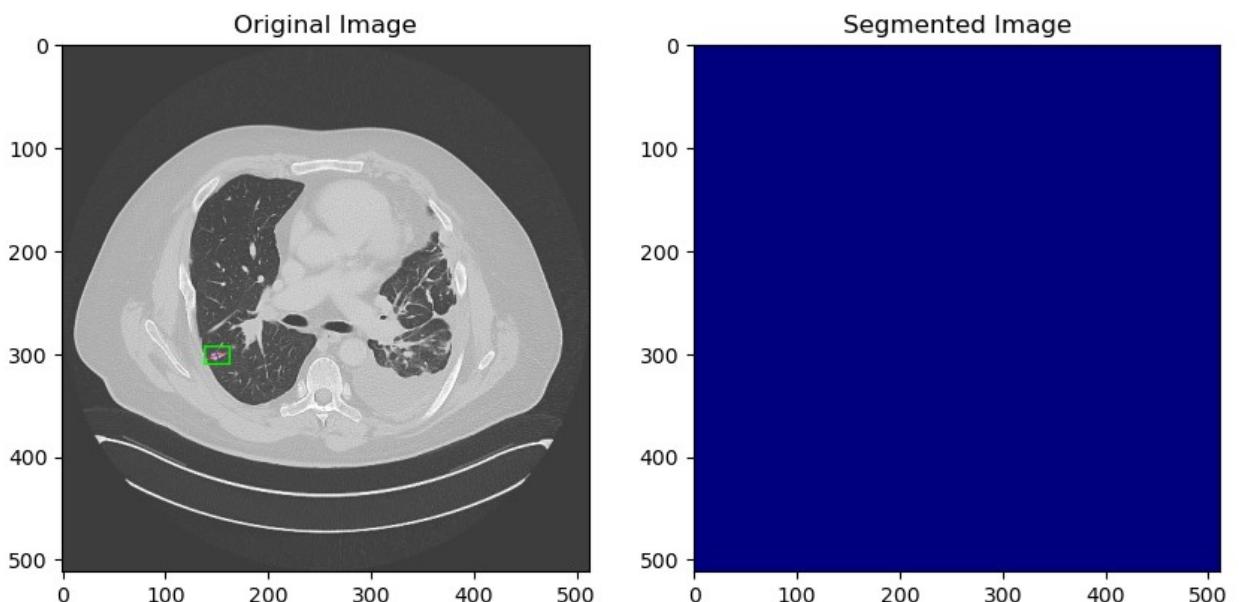


Image: 000143\_05\_01\_120.png  
Class 0: 97.09%  
Class 15: 2.91%

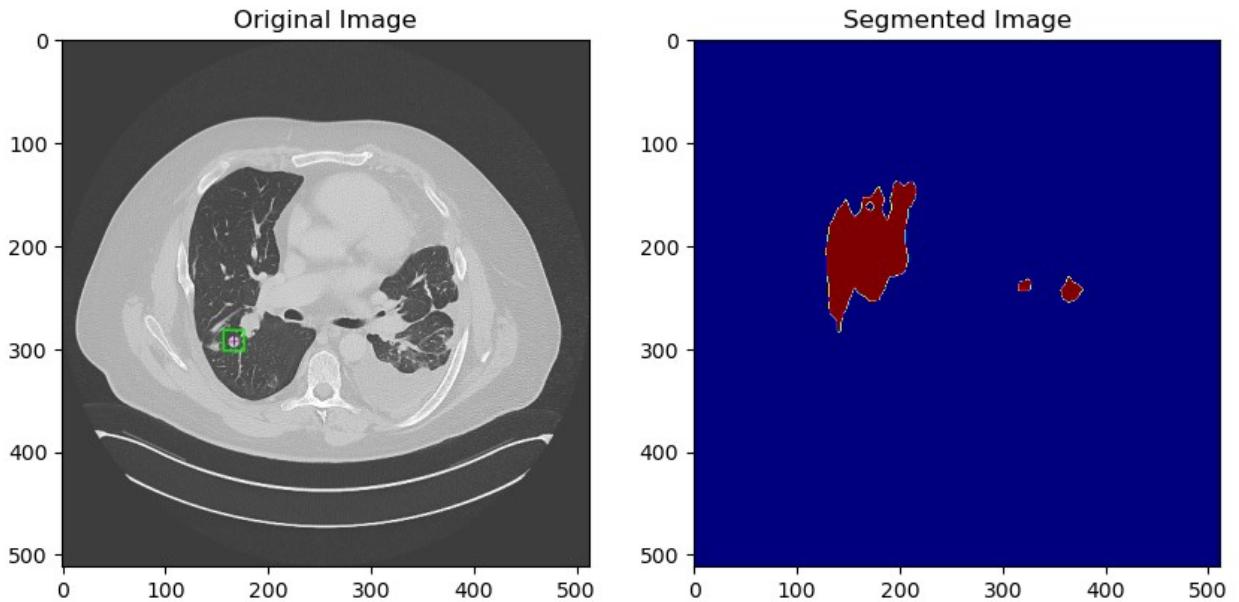


Image: 000143\_05\_01\_136.png

Class 0: 99.73%

Class 11: 0.27%

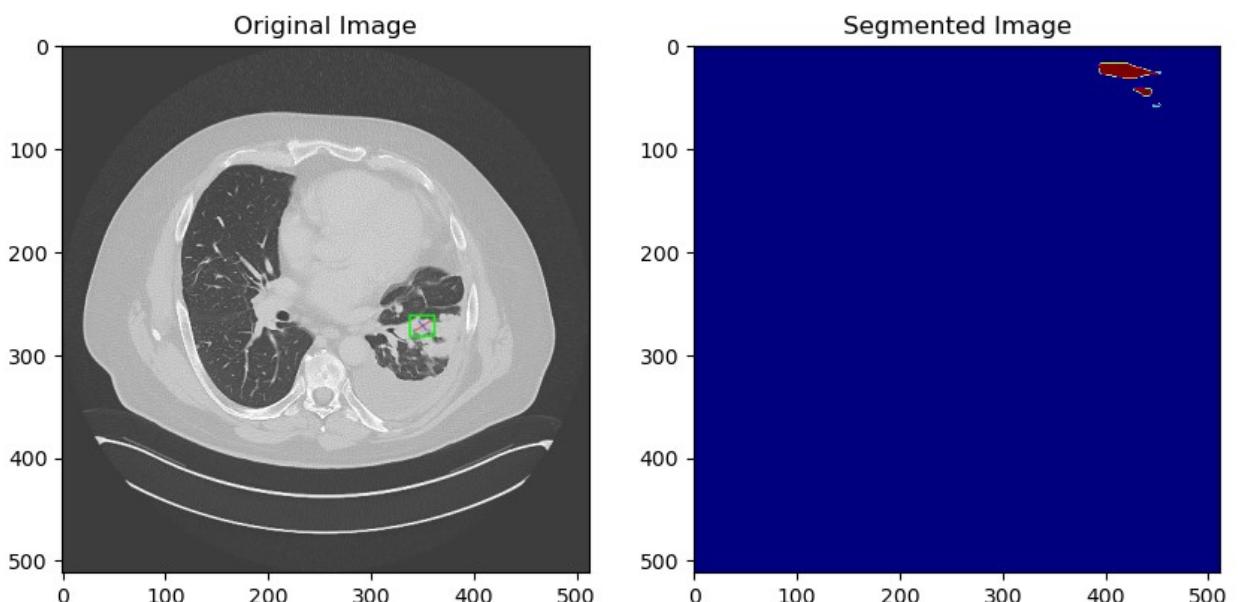


Image: 000185\_02\_04\_174.png

Class 0: 98.44%

Class 11: 1.56%

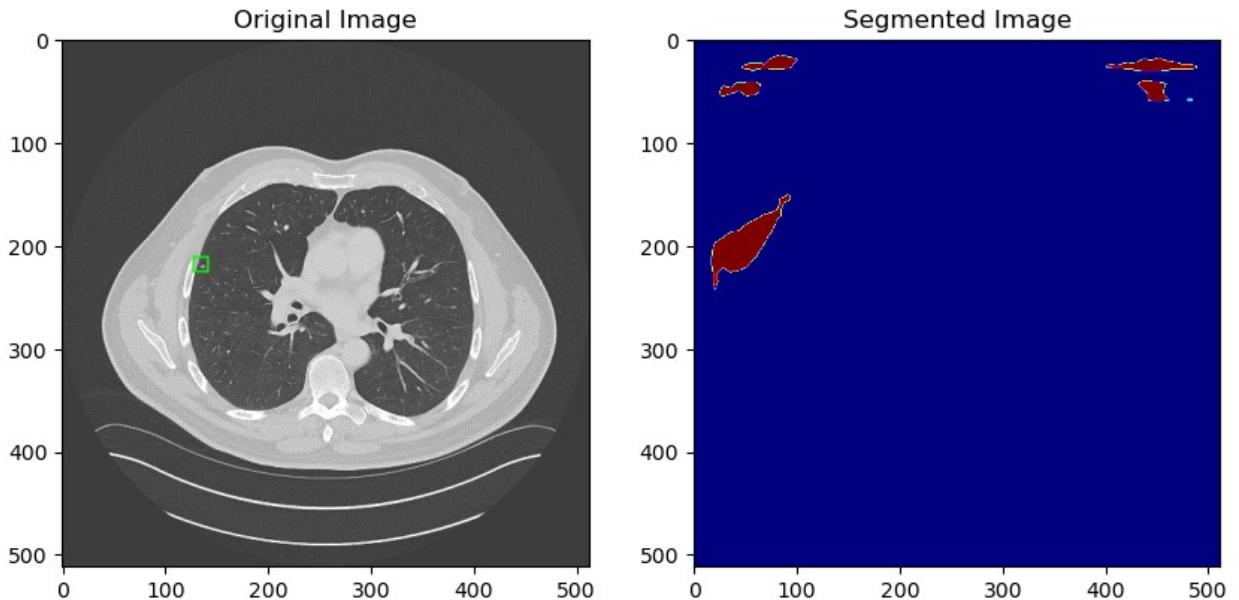


Image: 000188\_02\_01\_157.png  
Class 0: 100.00%

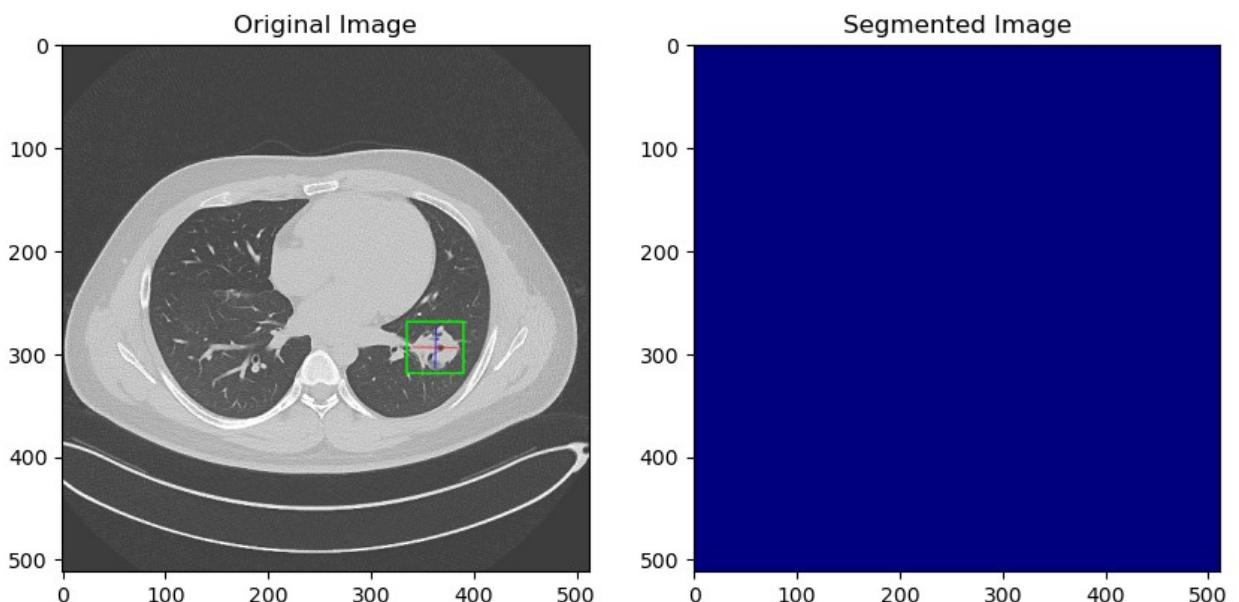


Image: 000188\_03\_01\_146.png  
Class 0: 99.99%  
Class 8: 0.01%  
Class 15: 0.00%

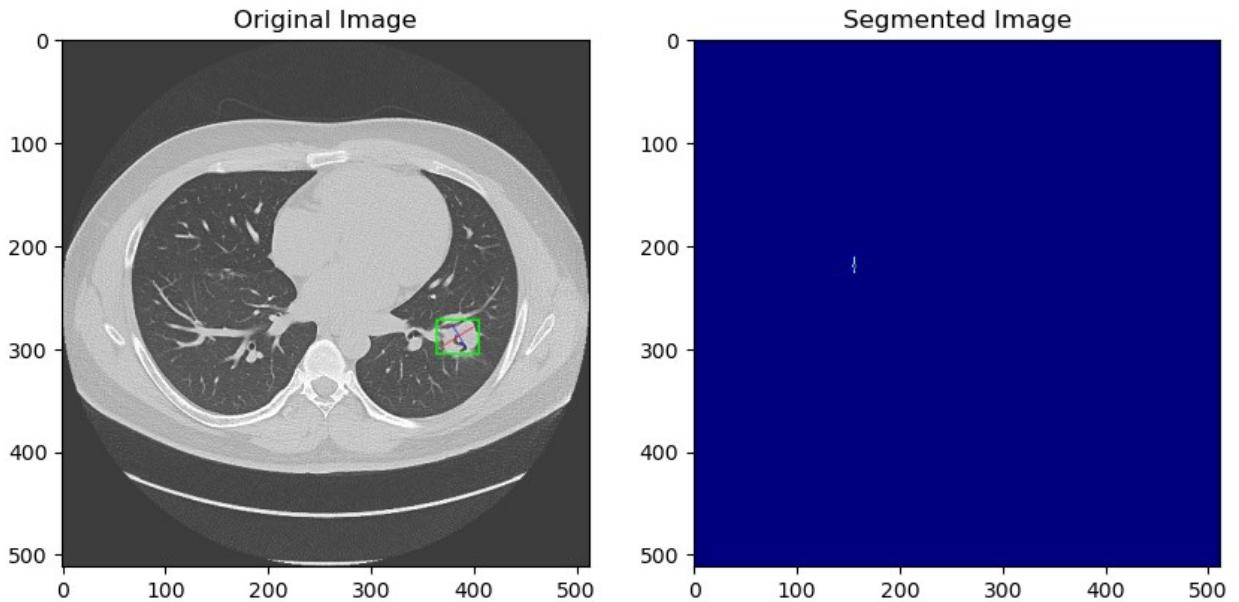


Image: 000196\_03\_02\_132.png  
Class 0: 100.00%

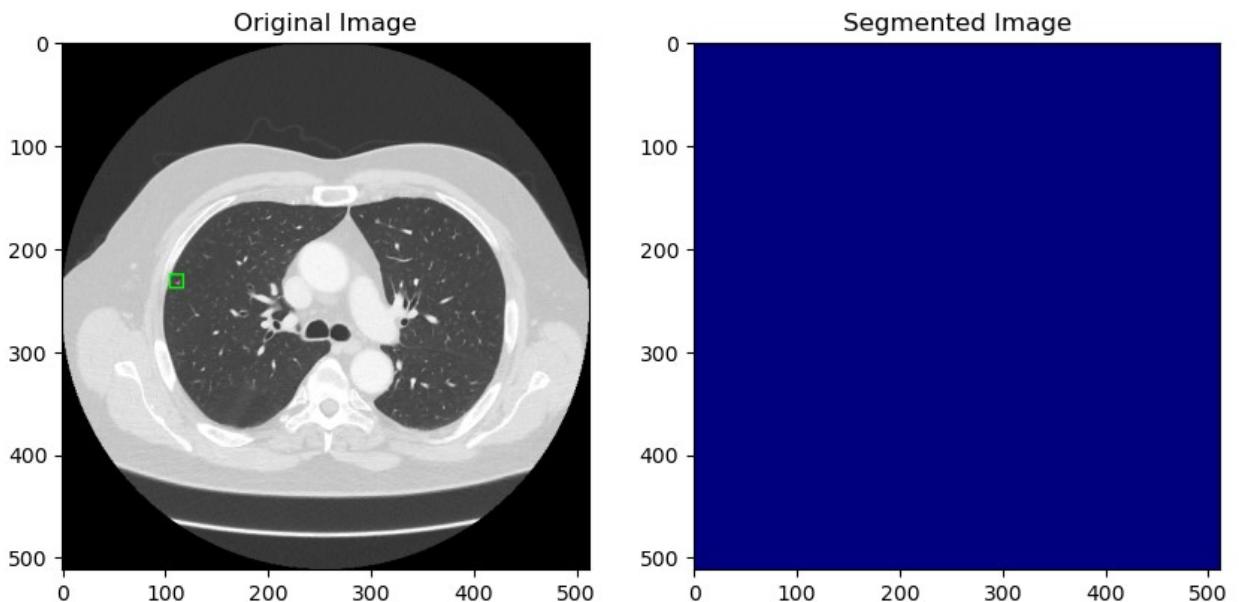


Image: 000196\_03\_02\_173.png  
Class 0: 100.00%

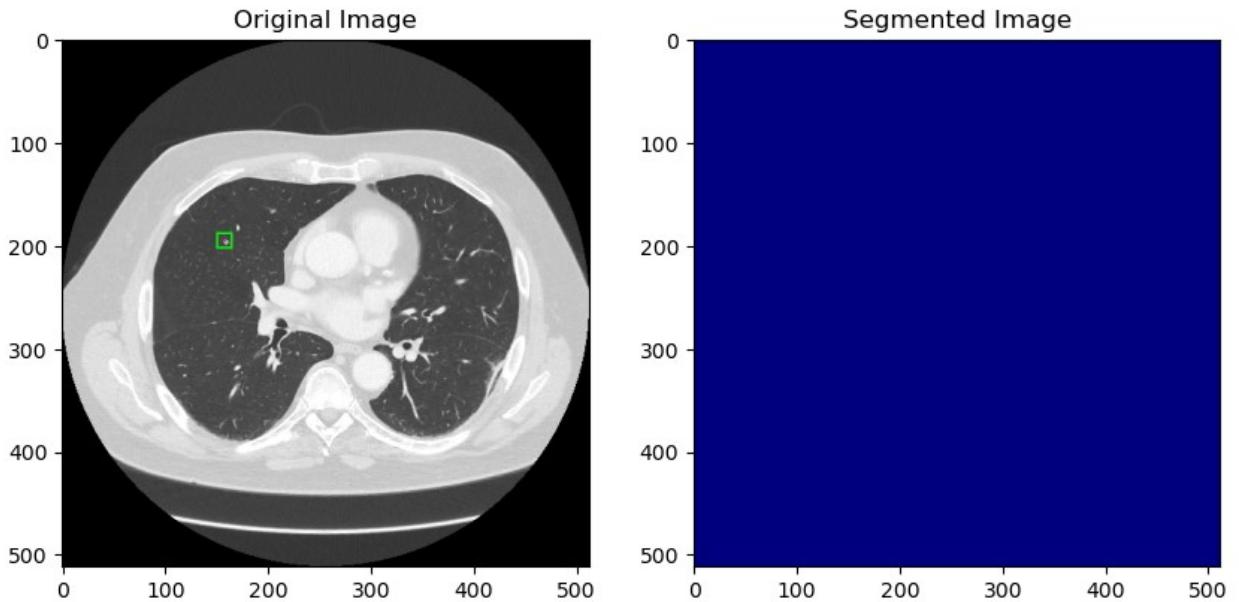


Image: 000198\_05\_01\_112.png  
Class 0: 100.00%

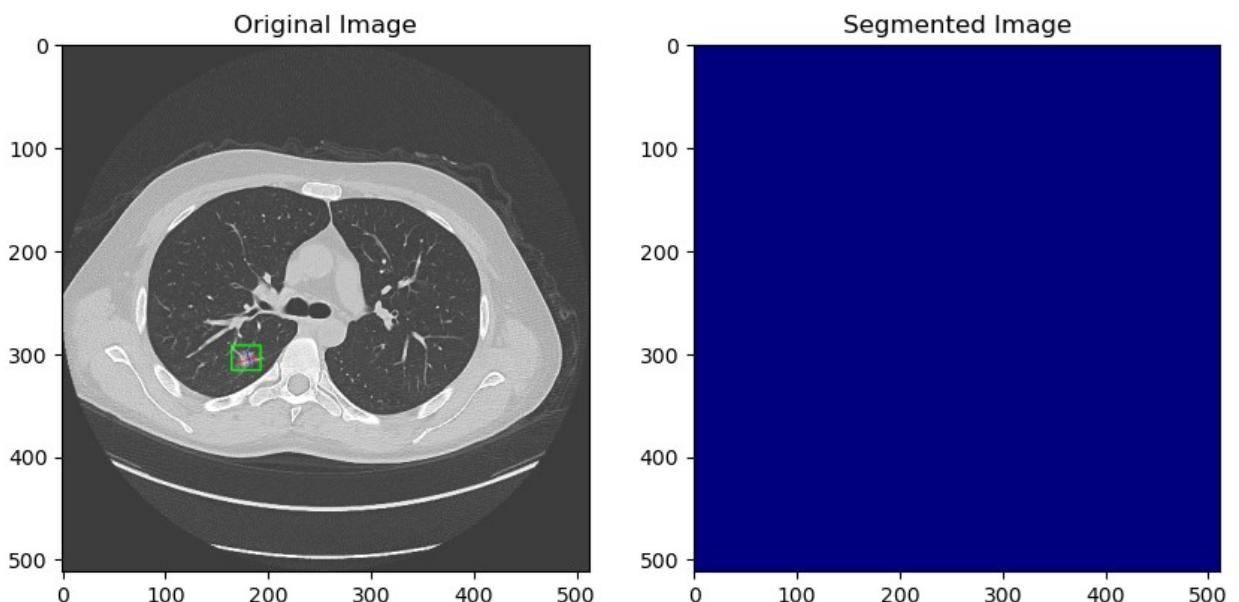


Image: 000198\_05\_01\_124.png  
Class 0: 100.00%

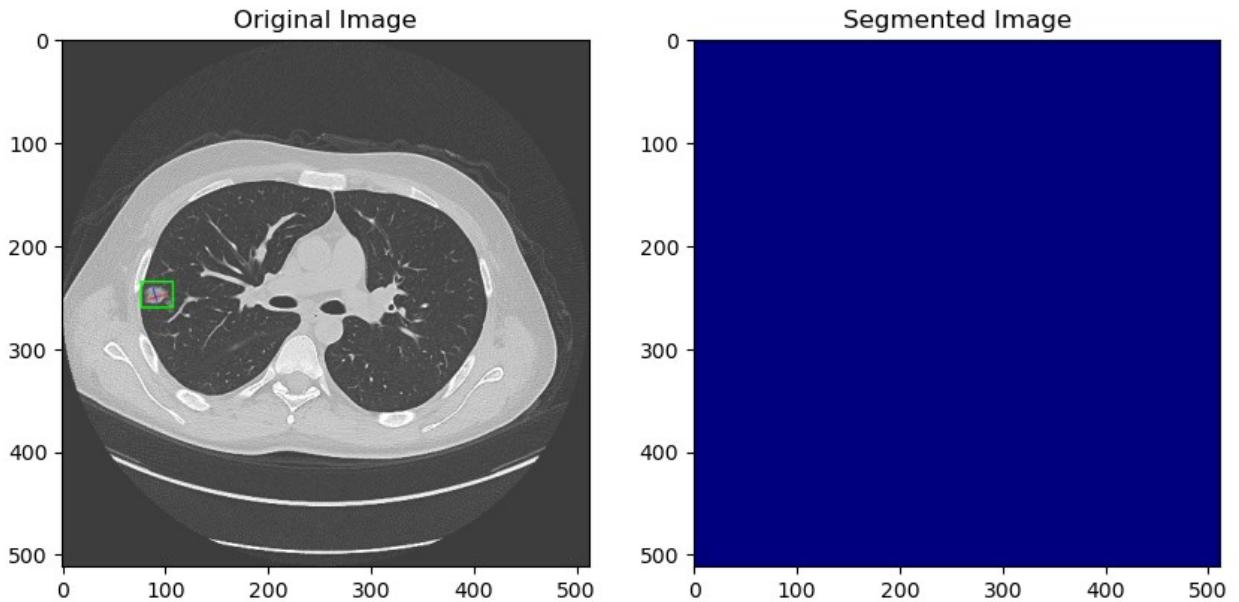


Image: 000199\_01\_02\_207.png  
Class 0: 100.00%

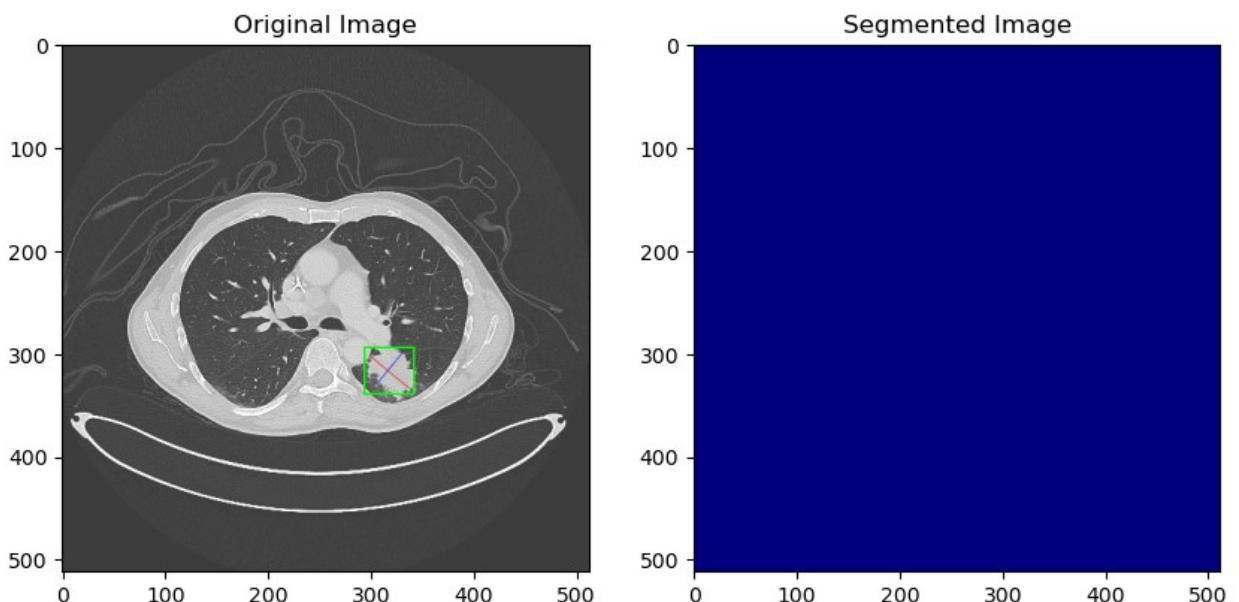


Image: 000207\_03\_01\_075.png  
Class 0: 99.68%  
Class 8: 0.32%

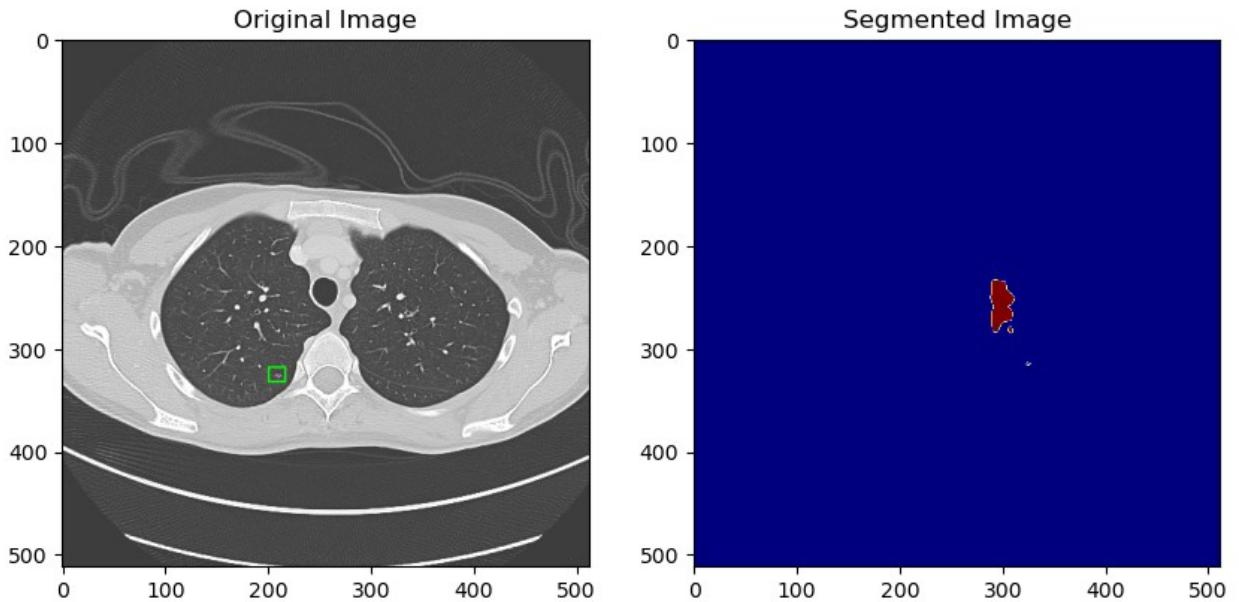


Image: 000207\_03\_01\_085.png  
Class 0: 100.00%

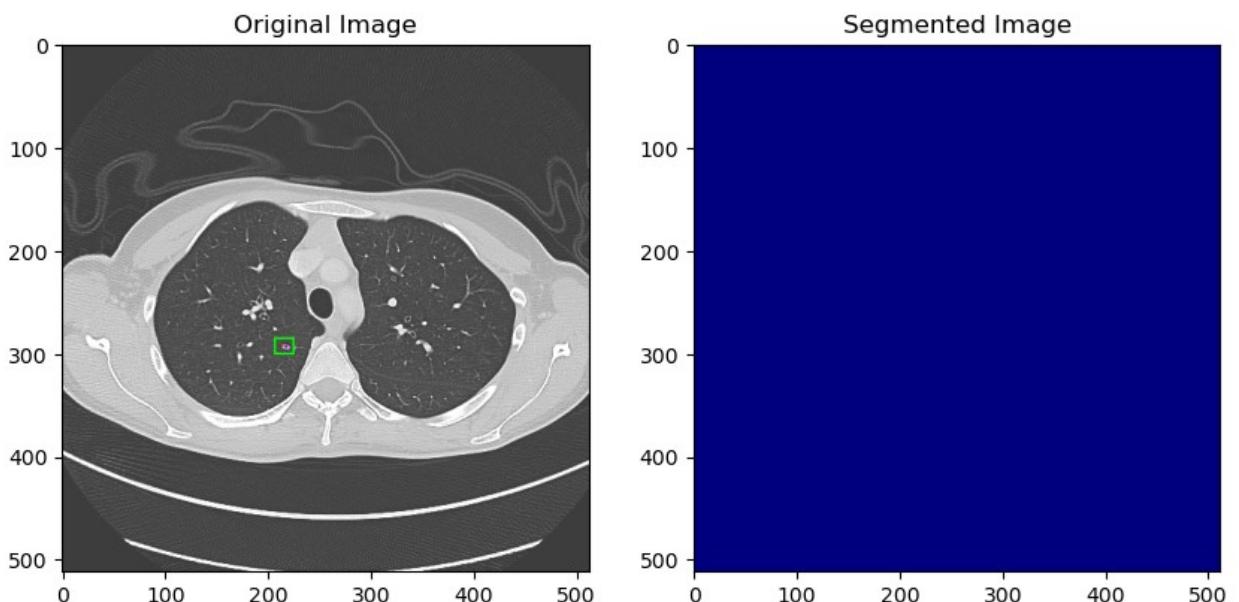


Image: 000207\_04\_01\_059.png  
Class 0: 100.00%

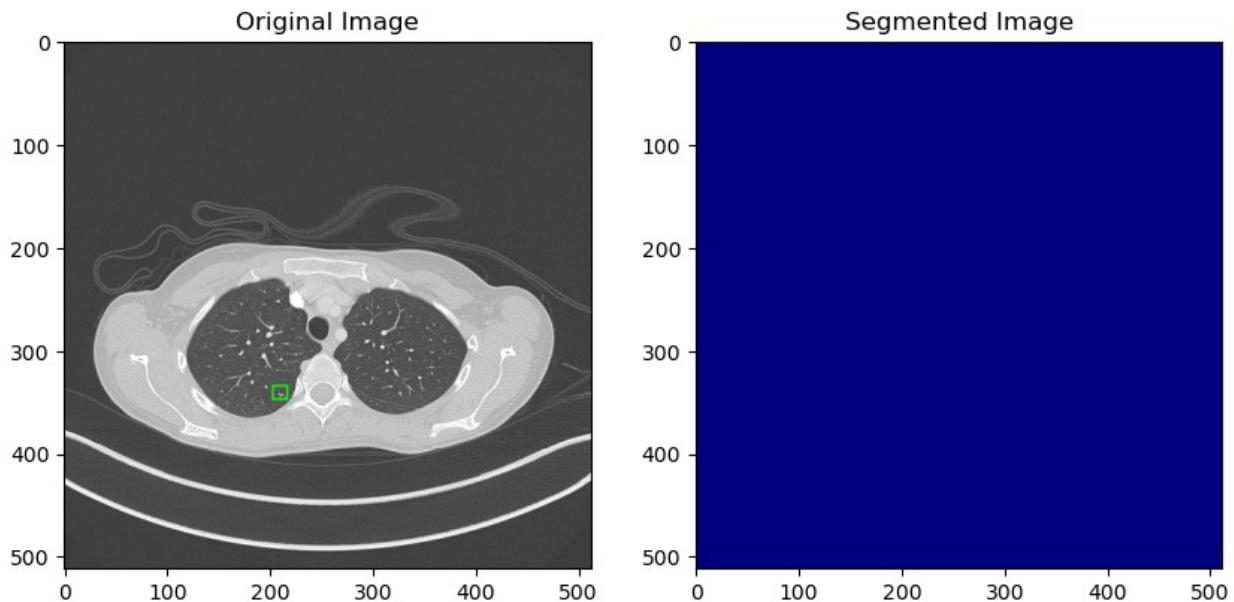


Image: 000207\_04\_01\_068.png  
Class 0: 98.35%  
Class 11: 1.65%

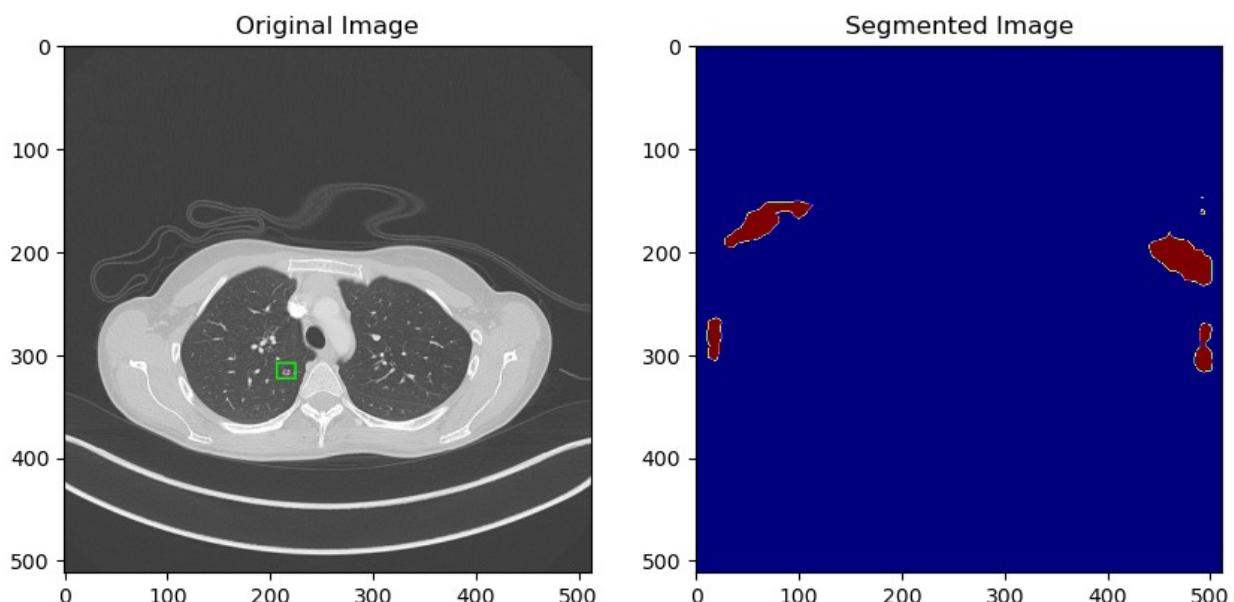


Image: 000207\_04\_01\_191.png  
Class 0: 99.47%  
Class 11: 0.01%  
Class 15: 0.52%

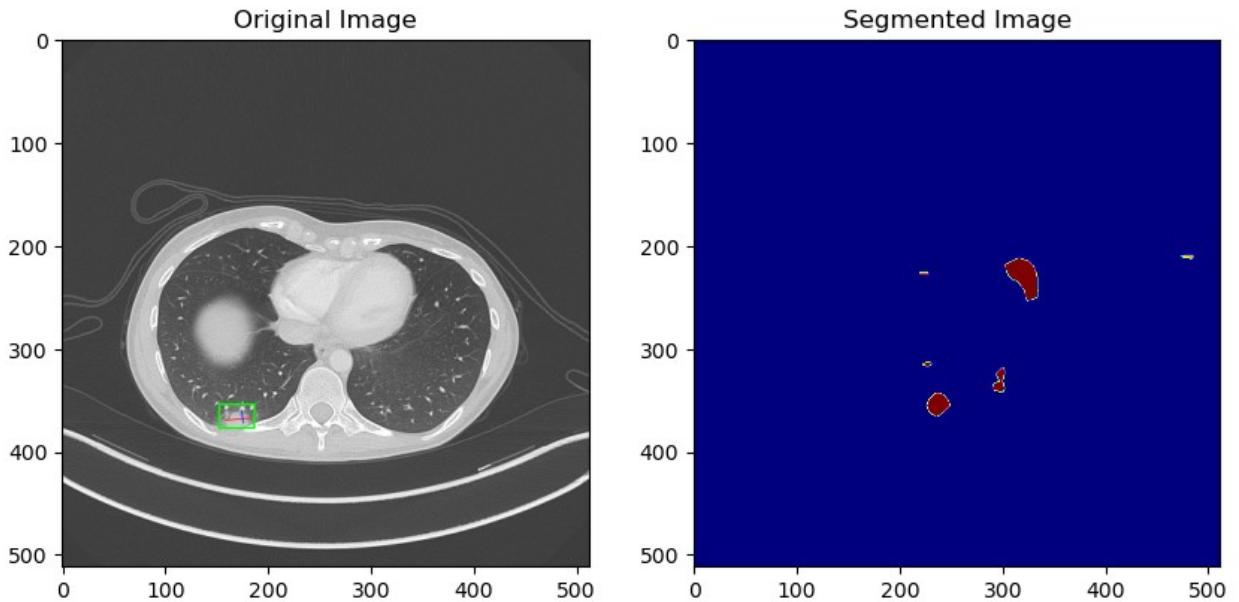


Image: 000223\_05\_03\_105.png  
Class 0: 99.97%  
Class 16: 0.03%

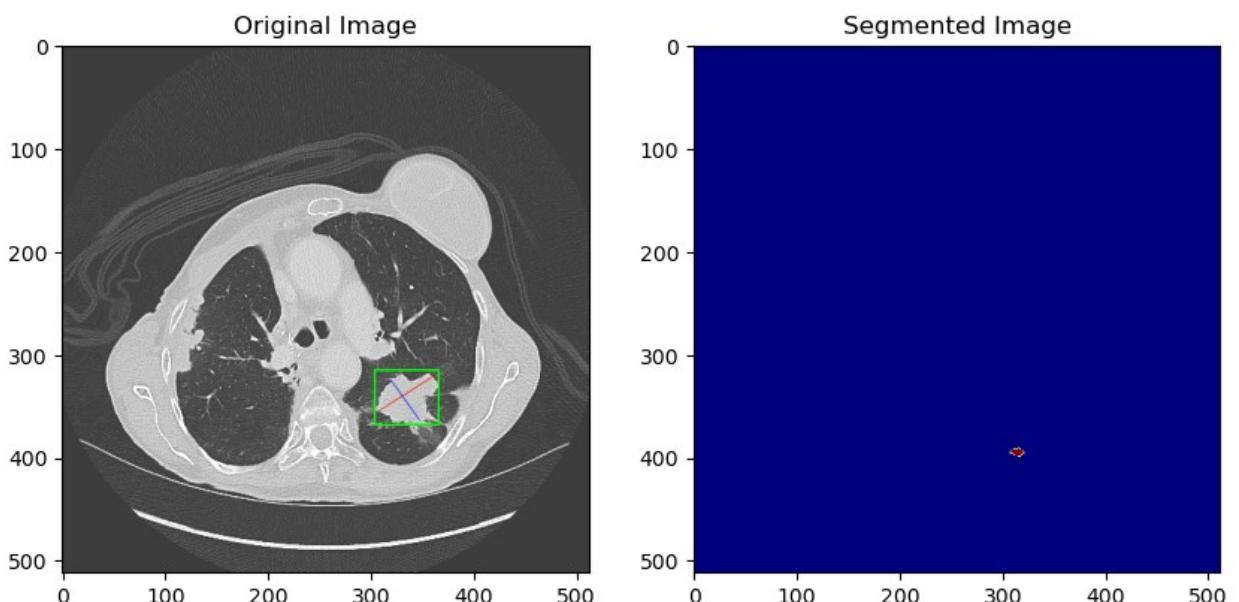


Image: 000223\_05\_03\_128.png  
Class 0: 100.00%

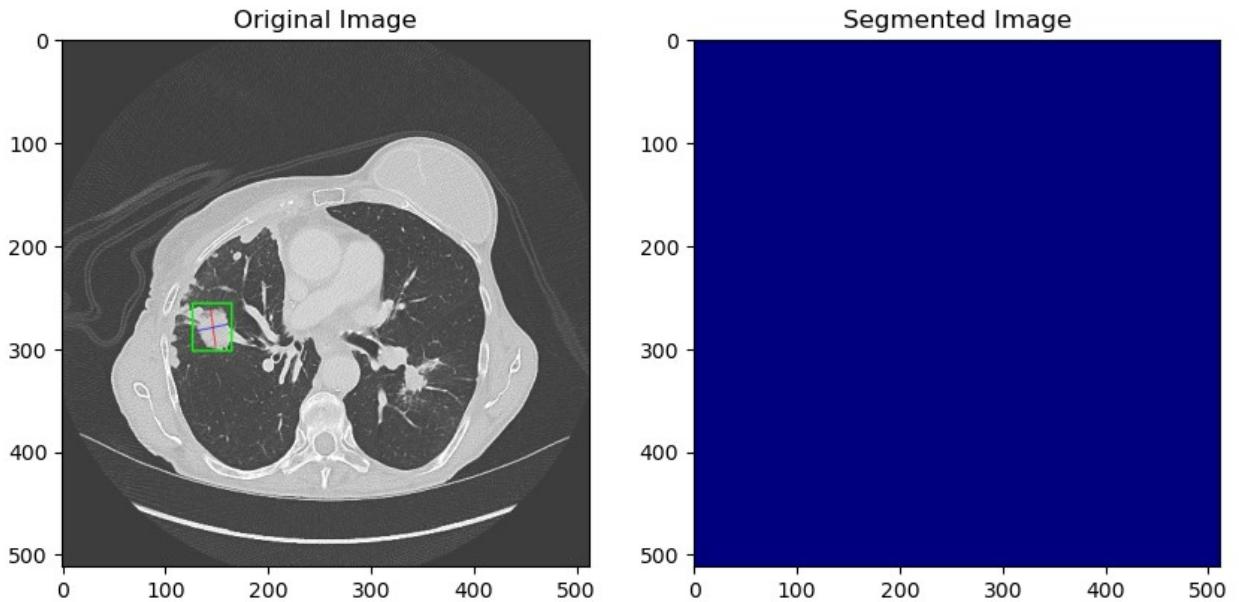


Image: 000223\_06\_03\_104.png  
Class 0: 100.00%

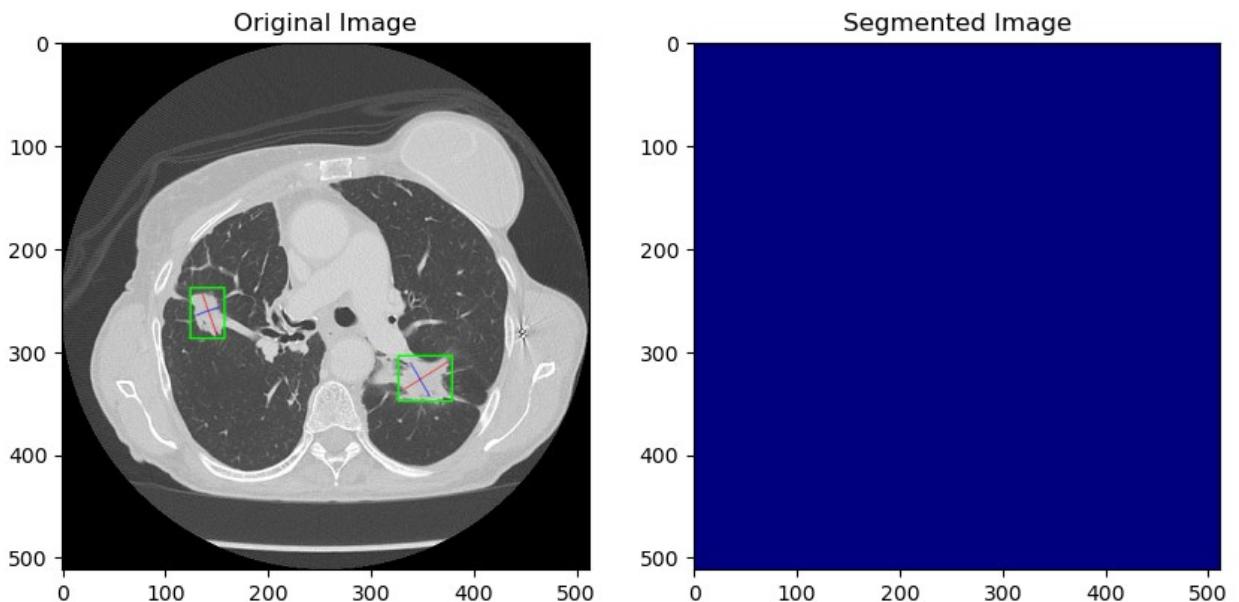


Image: 000223\_07\_01\_106.png  
Class 0: 96.65%  
Class 16: 3.35%

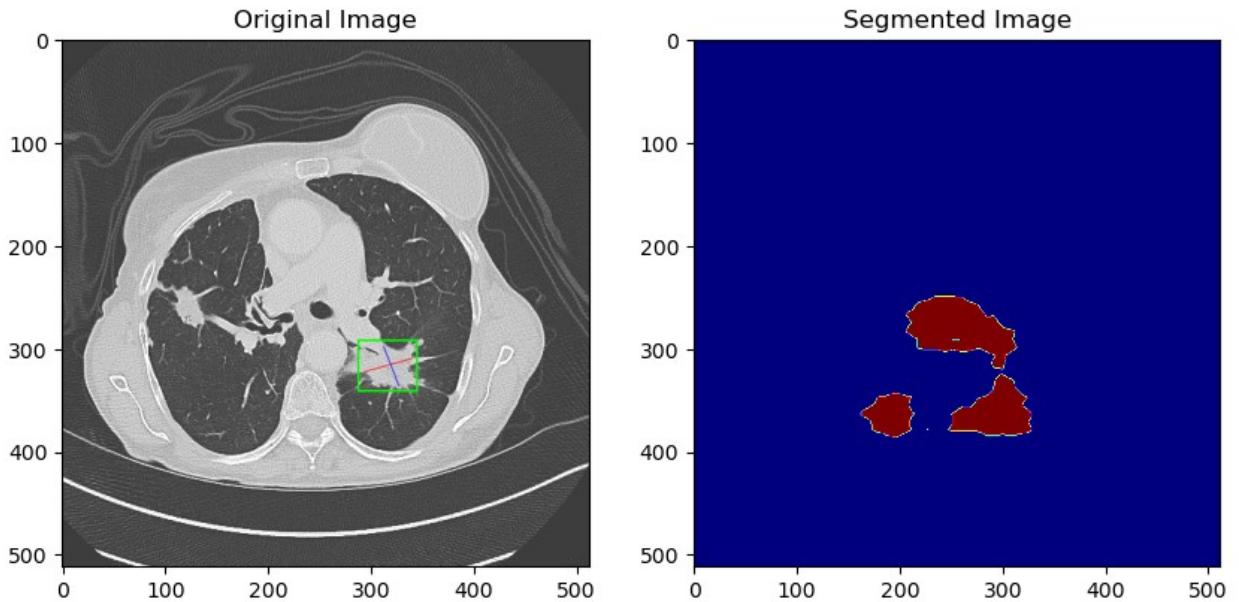


Image: 000223\_07\_01\_107.png

Class 0: 98.92%

Class 16: 1.08%

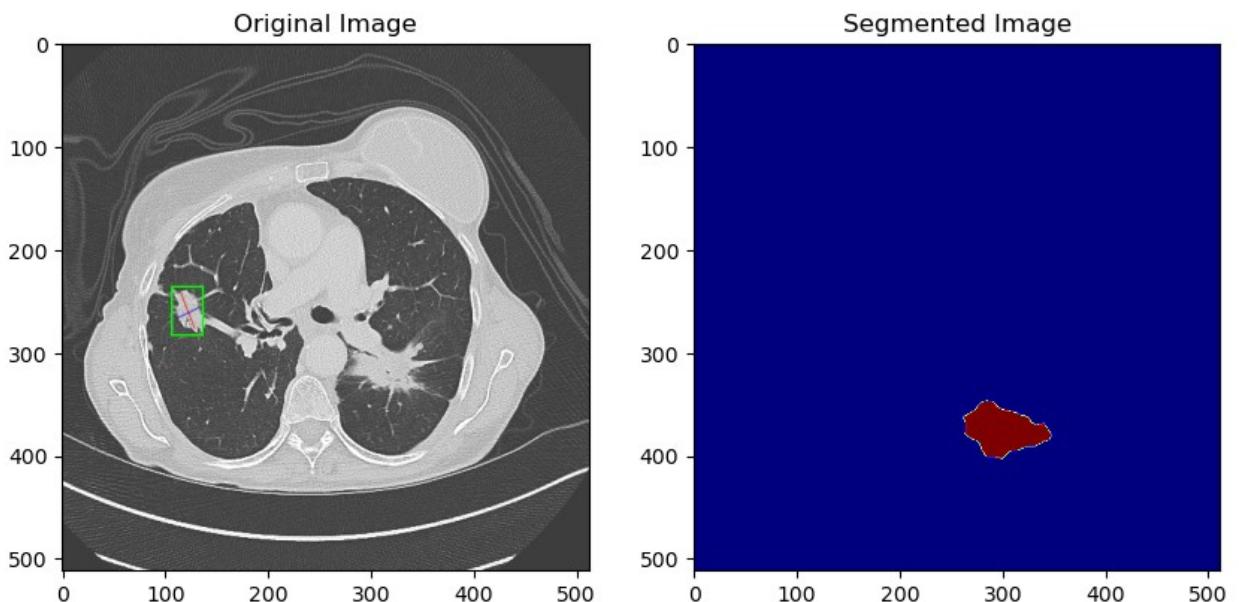


Image: 000223\_07\_01\_133.png

Class 0: 100.00%

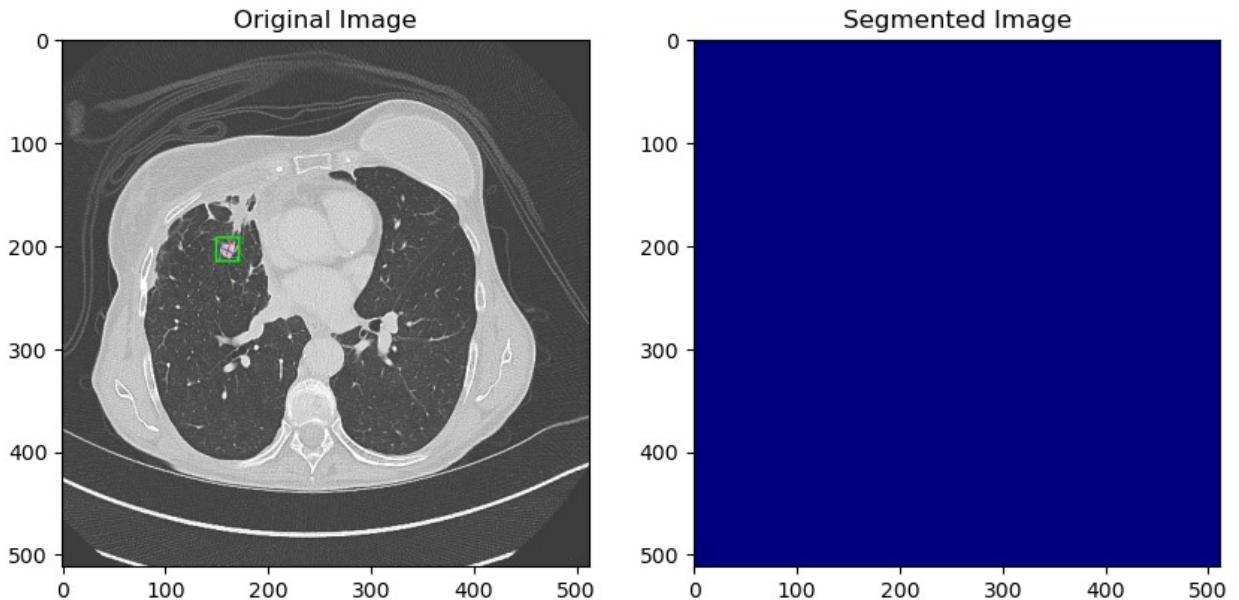


Image: 000223\_07\_01\_168.png  
Class 0: 95.20%  
Class 8: 4.80%

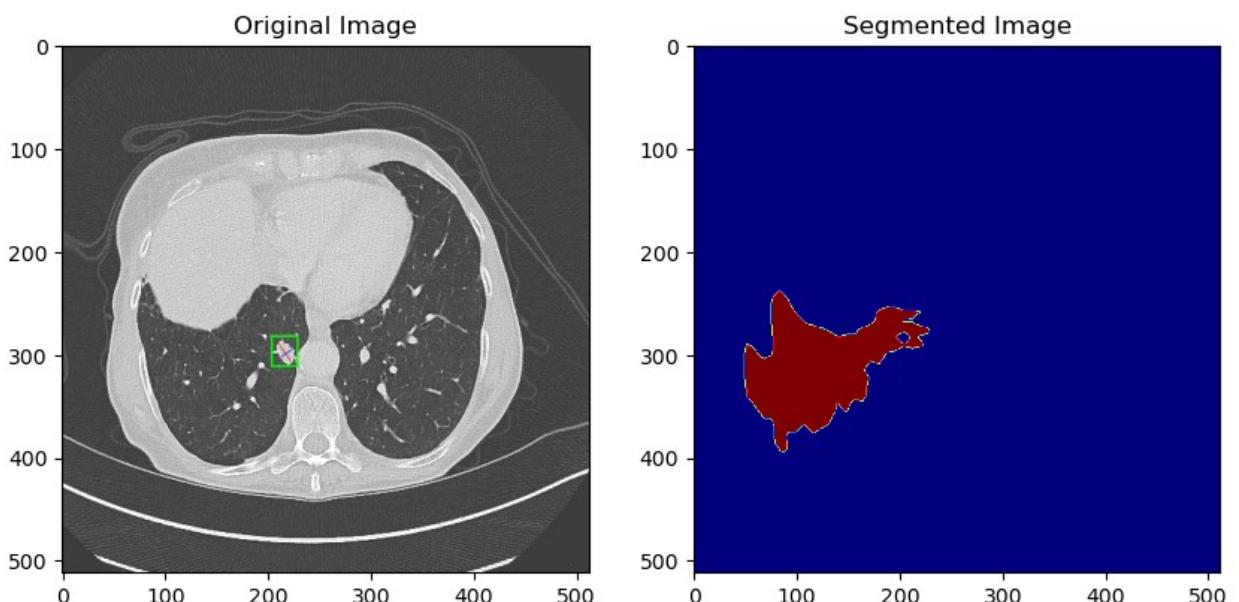


Image: 000223\_08\_01\_106.png  
Class 0: 99.82%  
Class 11: 0.18%

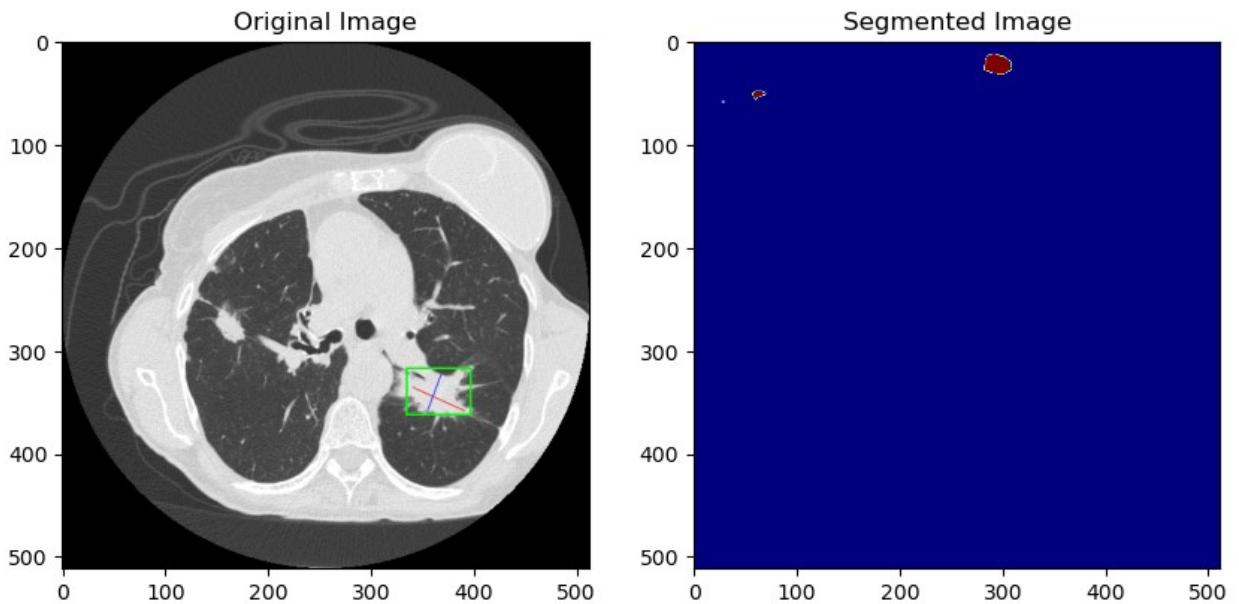


Image: 000223\_08\_01\_109.png

Class 0: 99.83%

Class 8: 0.17%

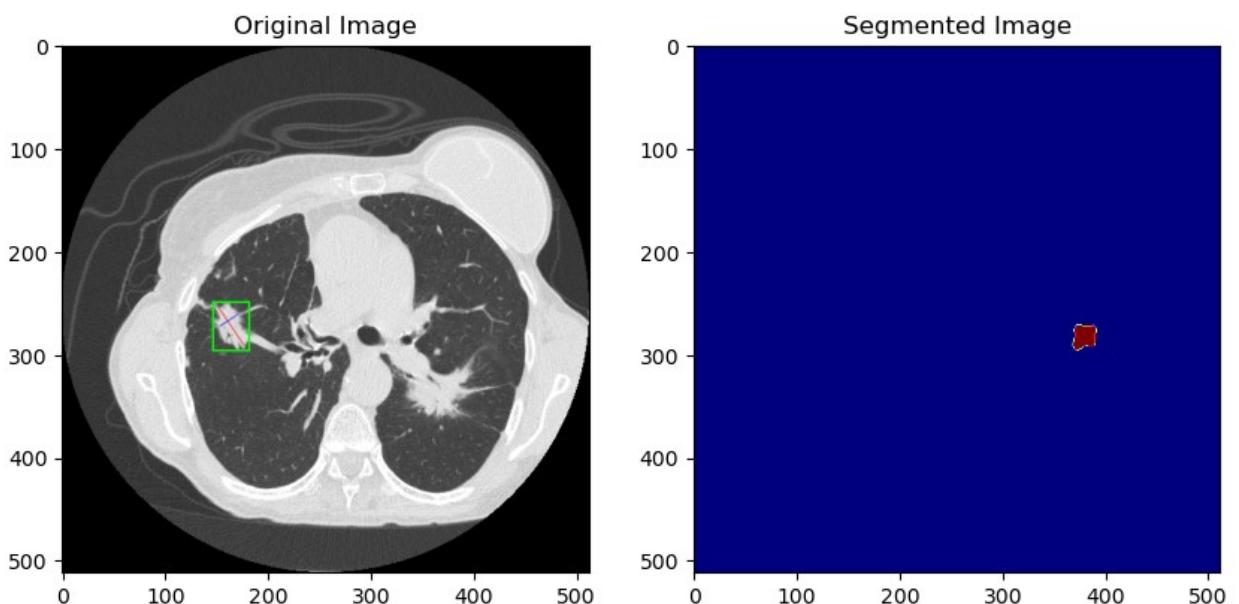


Image: 000223\_09\_02\_109.png

Class 0: 100.00%

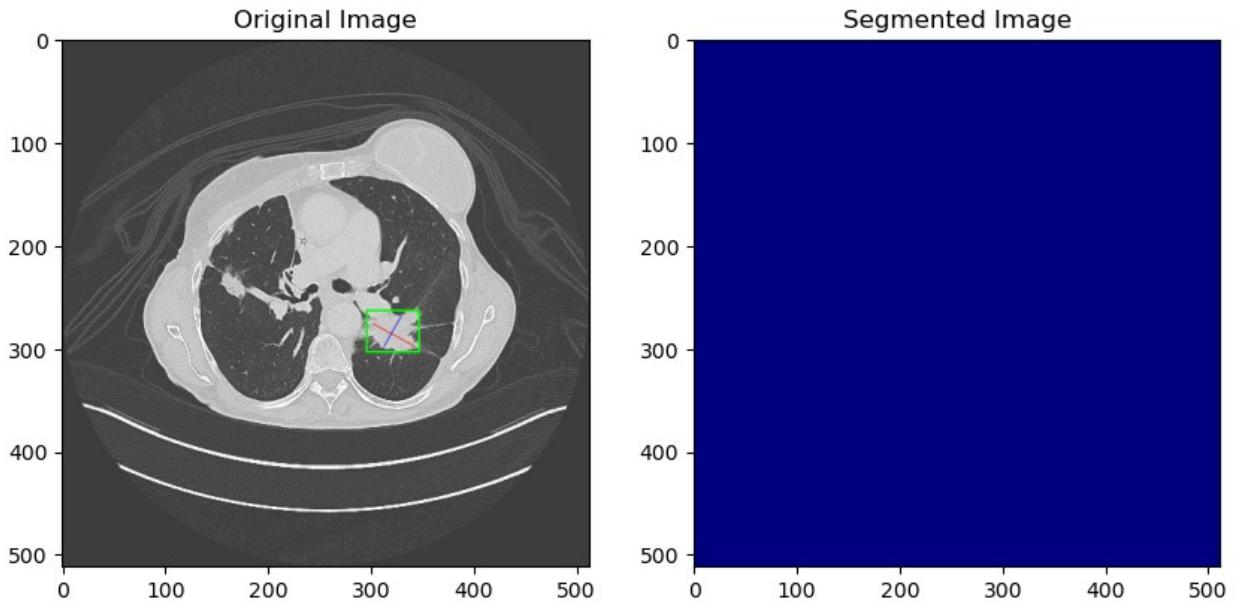


Image: 000223\_09\_02\_132.png  
Class 0: 100.00%

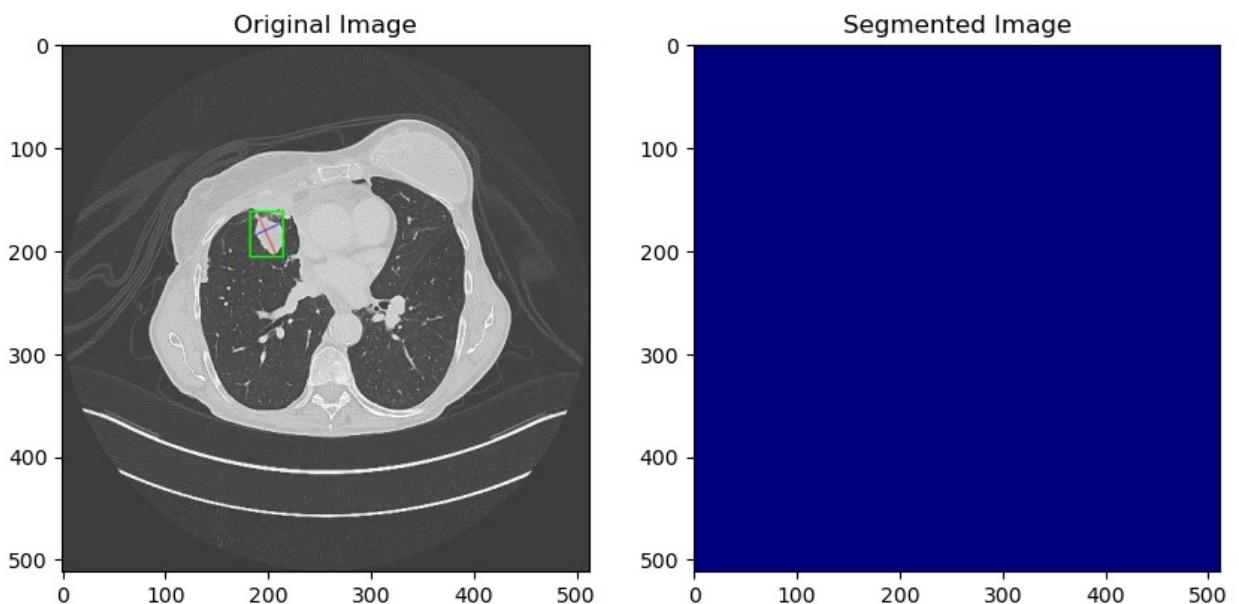


Image: 000223\_09\_02\_146.png  
Class 0: 100.00%

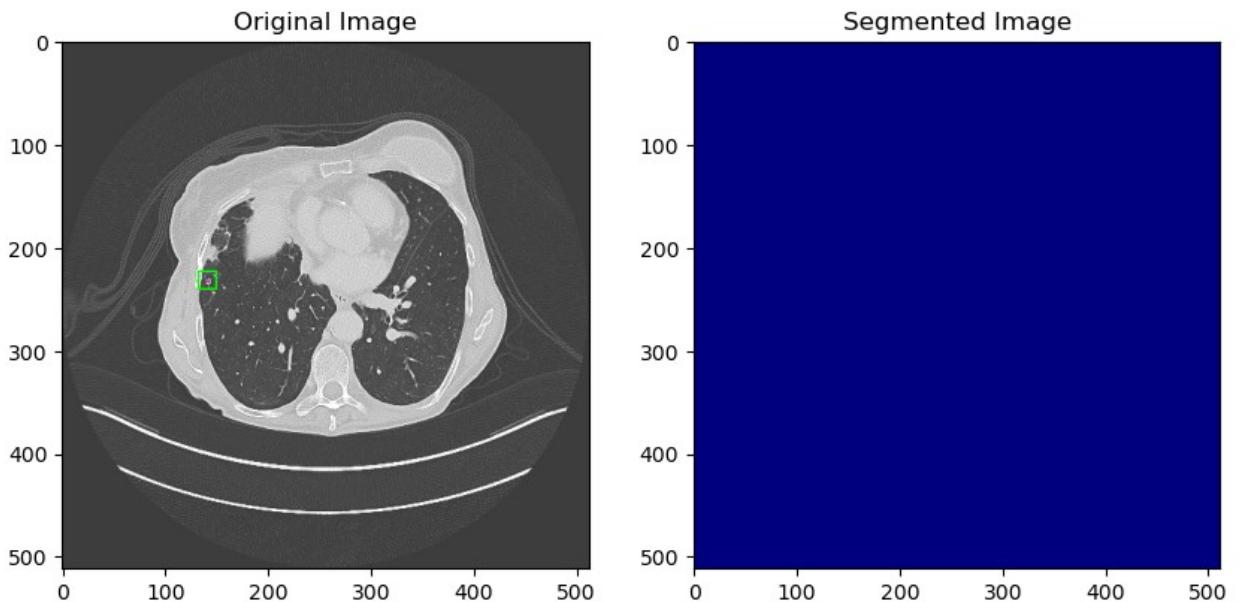


Image: 000226\_02\_01\_079.png  
Class 0: 99.34%  
Class 3: 0.10%  
Class 10: 0.29%  
Class 12: 0.26%

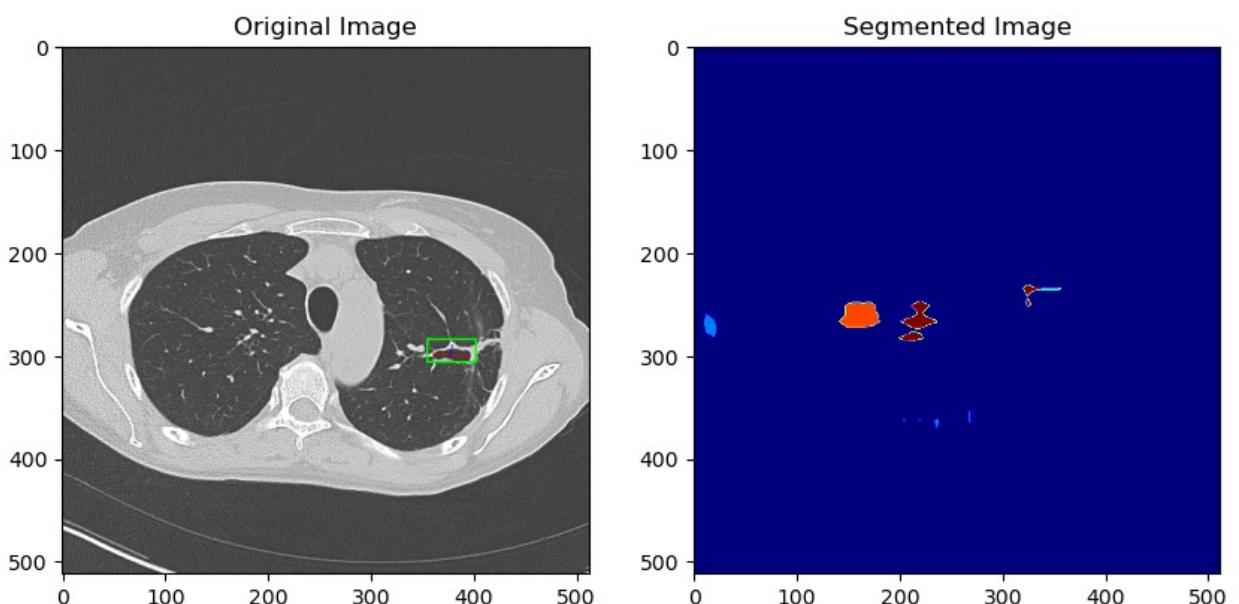


Image: 000228\_03\_03\_165.png  
Class 0: 90.53%  
Class 8: 9.47%

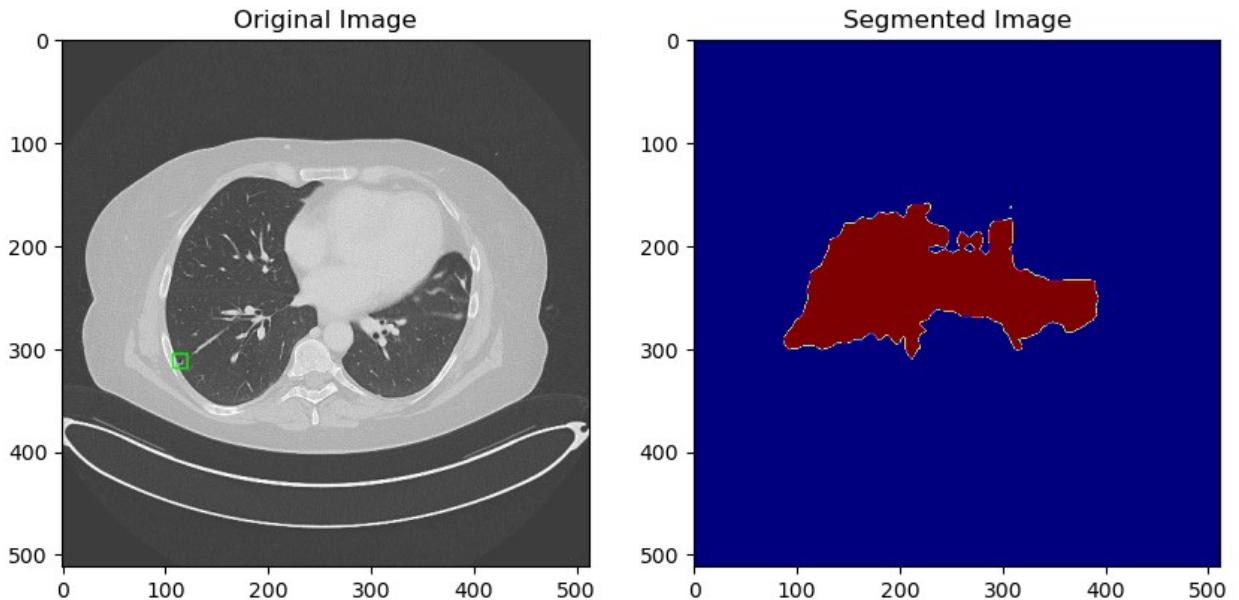


Image: 000229\_03\_04\_153.png  
Class 0: 97.83%  
Class 15: 2.17%

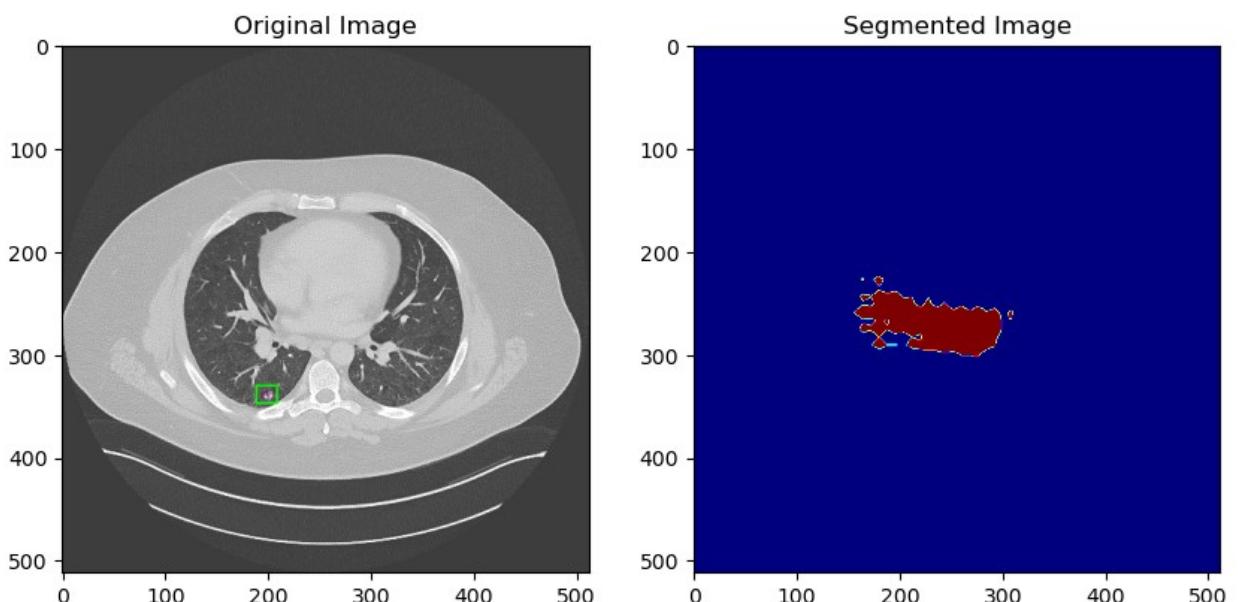


Image: 000229\_03\_04\_202.png  
Class 0: 99.98%  
Class 15: 0.02%

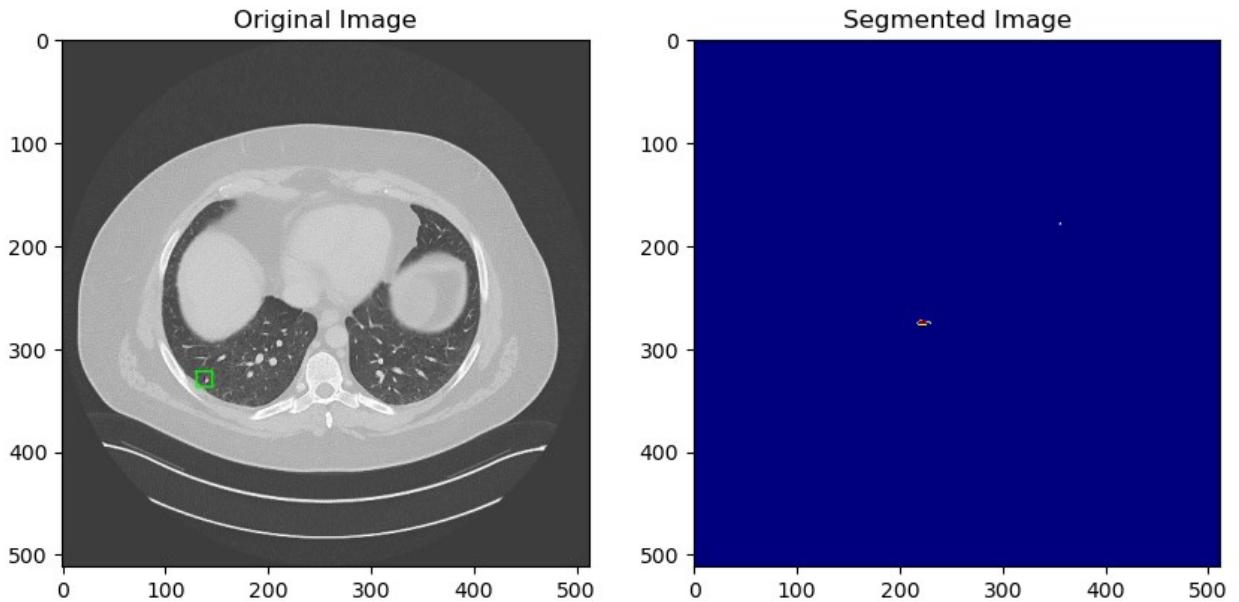


Image: 000230\_01\_01\_175.png  
Class 0: 93.79%  
Class 11: 0.07%  
Class 14: 6.14%

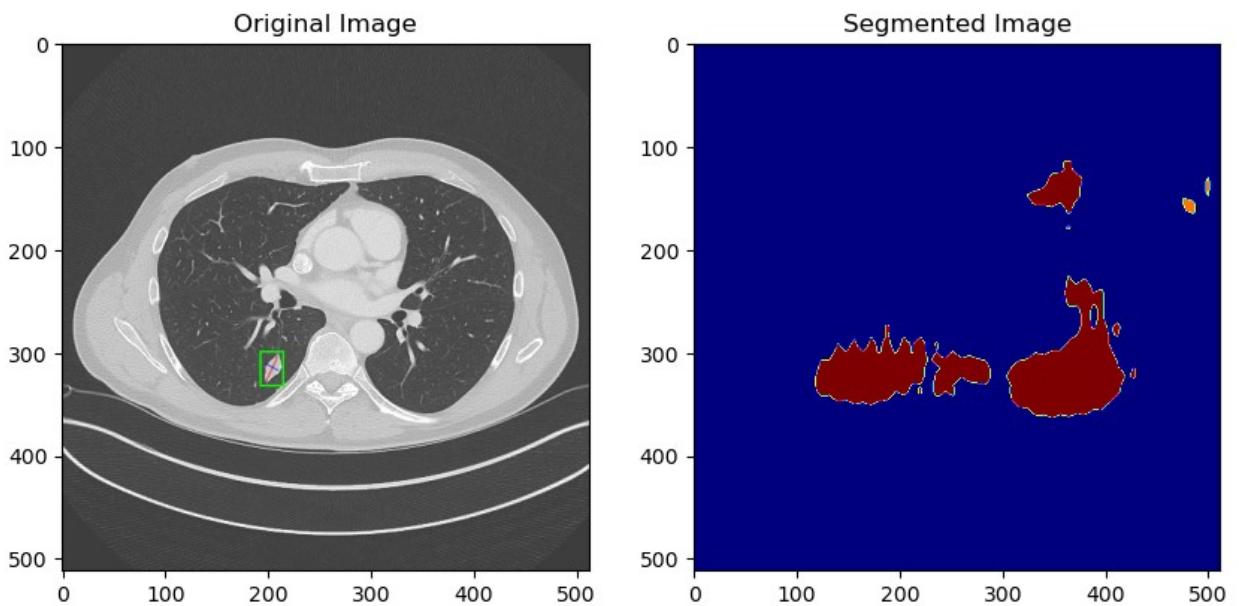


Image: 000230\_02\_01\_157.png  
Class 0: 100.00%

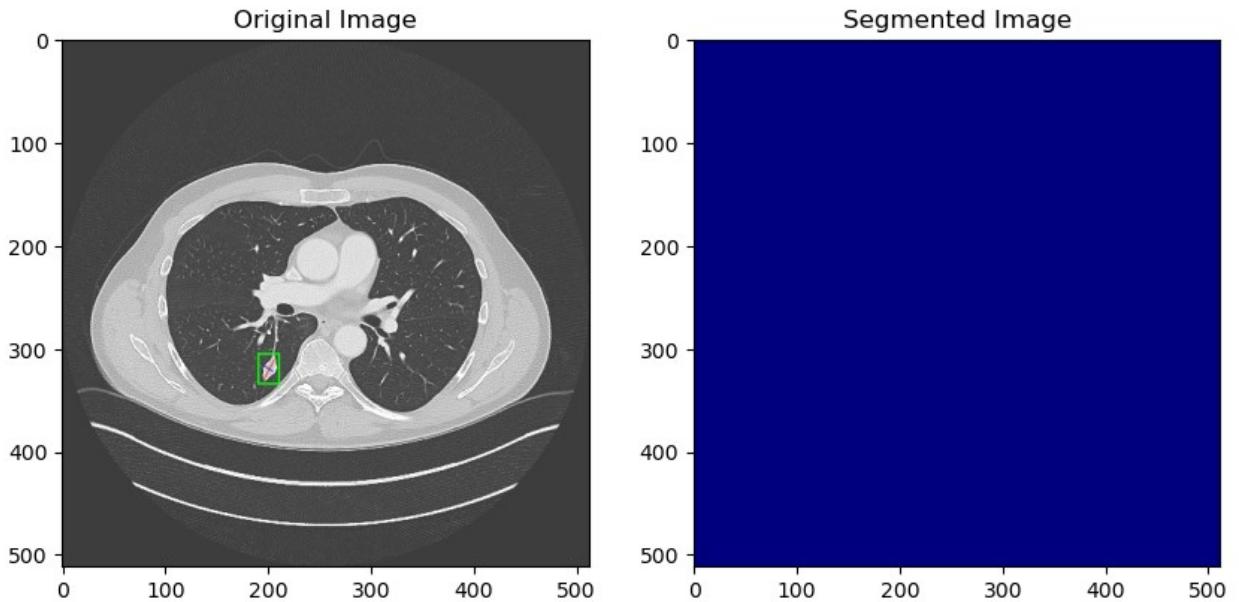


Image: 000230\_03\_02\_166.png  
Class 0: 100.00%

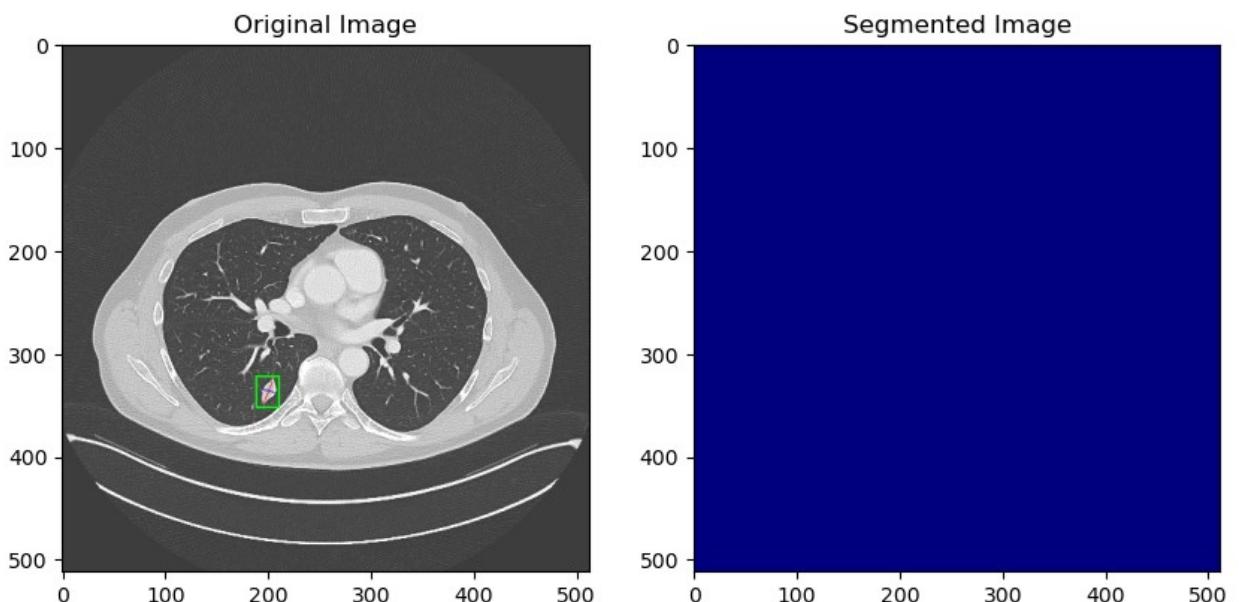


Image: 000230\_04\_01\_174.png  
Class 0: 100.00%

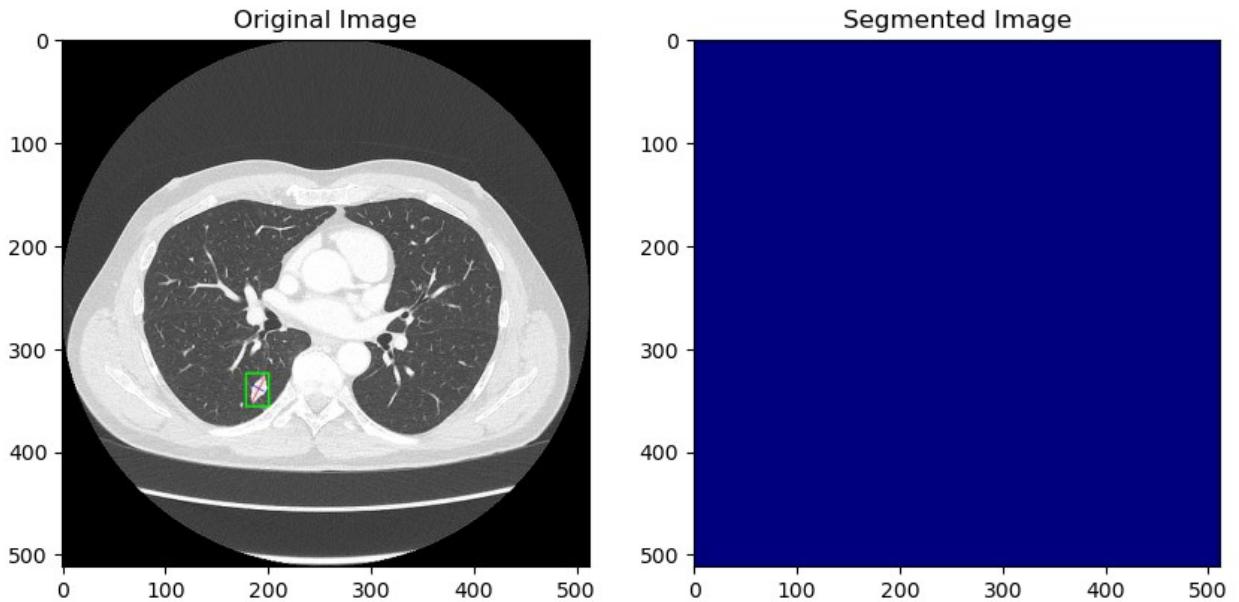


Image: 000230\_04\_01\_240.png  
Class 0: 100.00%

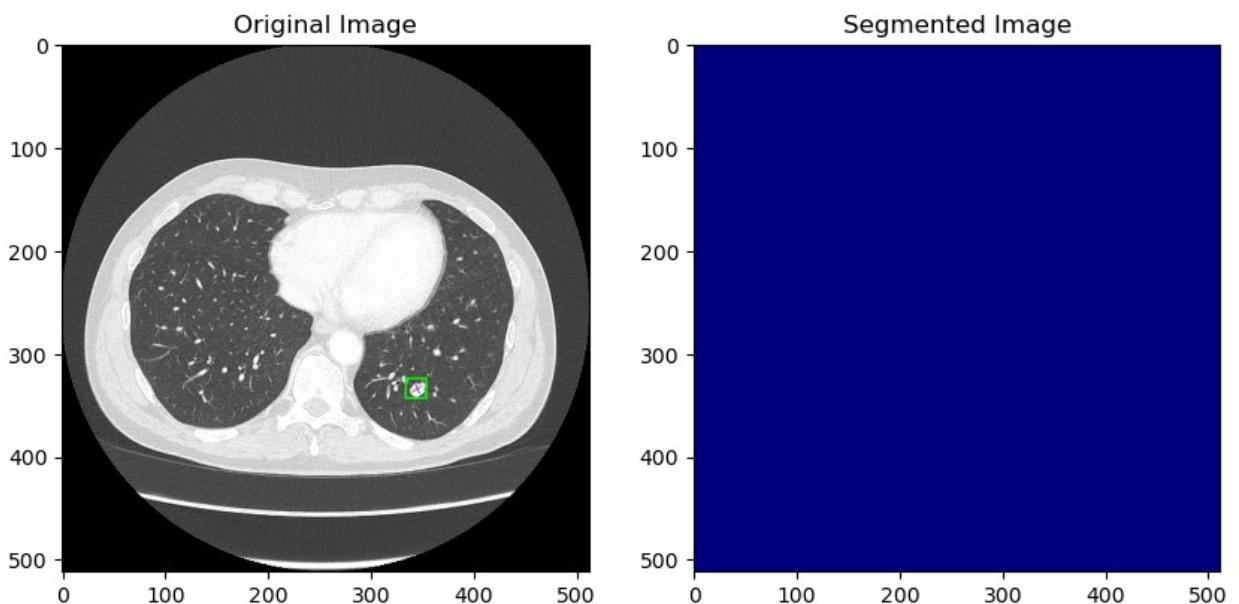


Image: 000230\_04\_01\_242.png  
Class 0: 100.00%

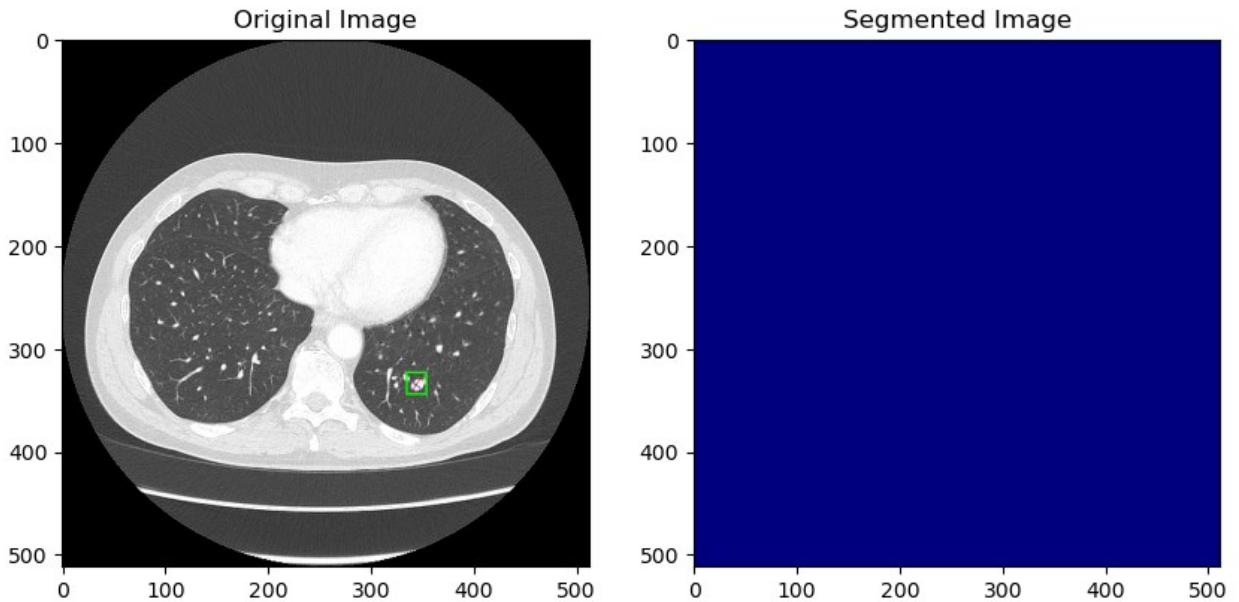


Image: 000230\_05\_01\_165.png  
Class 0: 52.87%  
Class 11: 46.88%  
Class 14: 0.25%

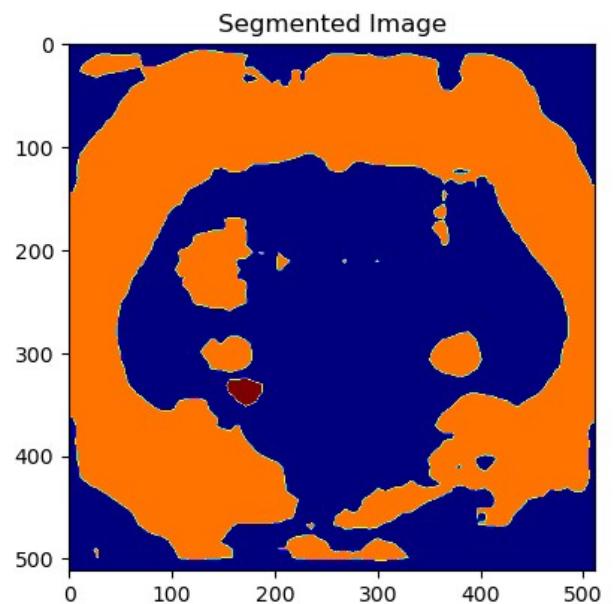
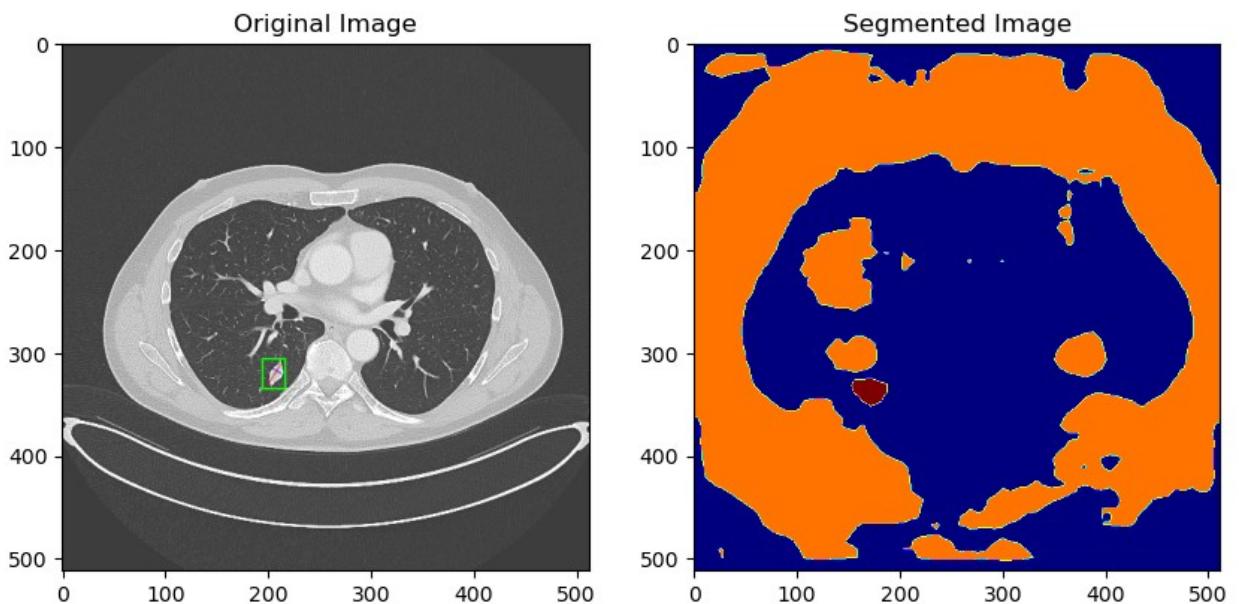


Image: 000230\_05\_01\_233.png  
Class 0: 82.28%  
Class 11: 17.72%

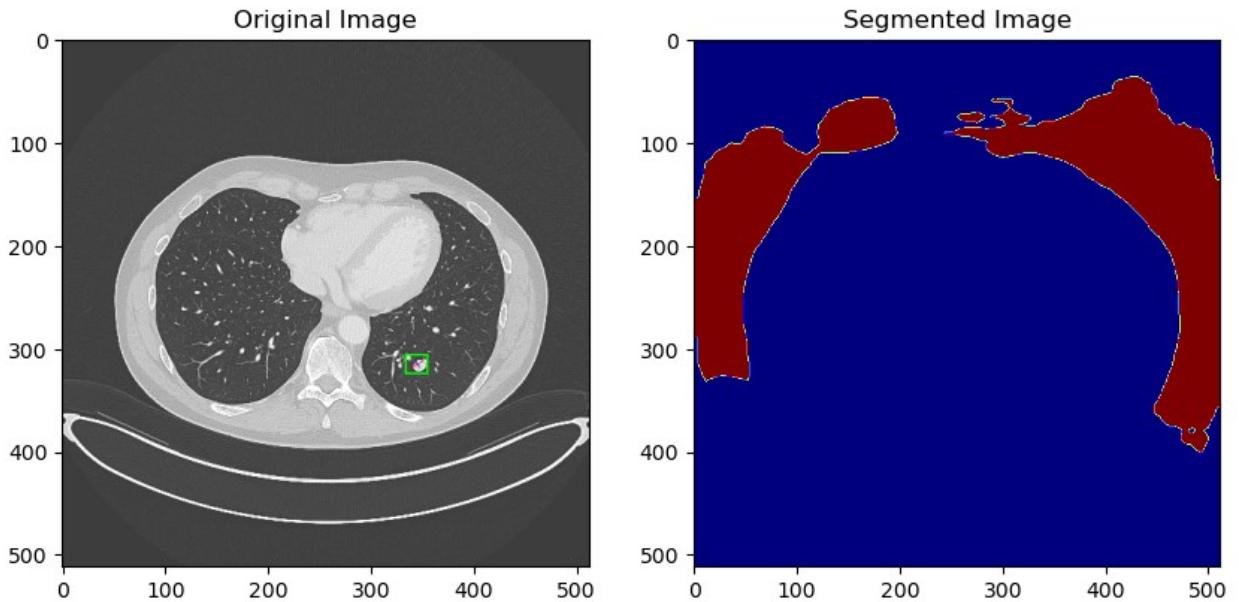


Image: 000231\_02\_01\_042.png  
Class 0: 96.01%  
Class 8: 0.06%  
Class 14: 3.93%

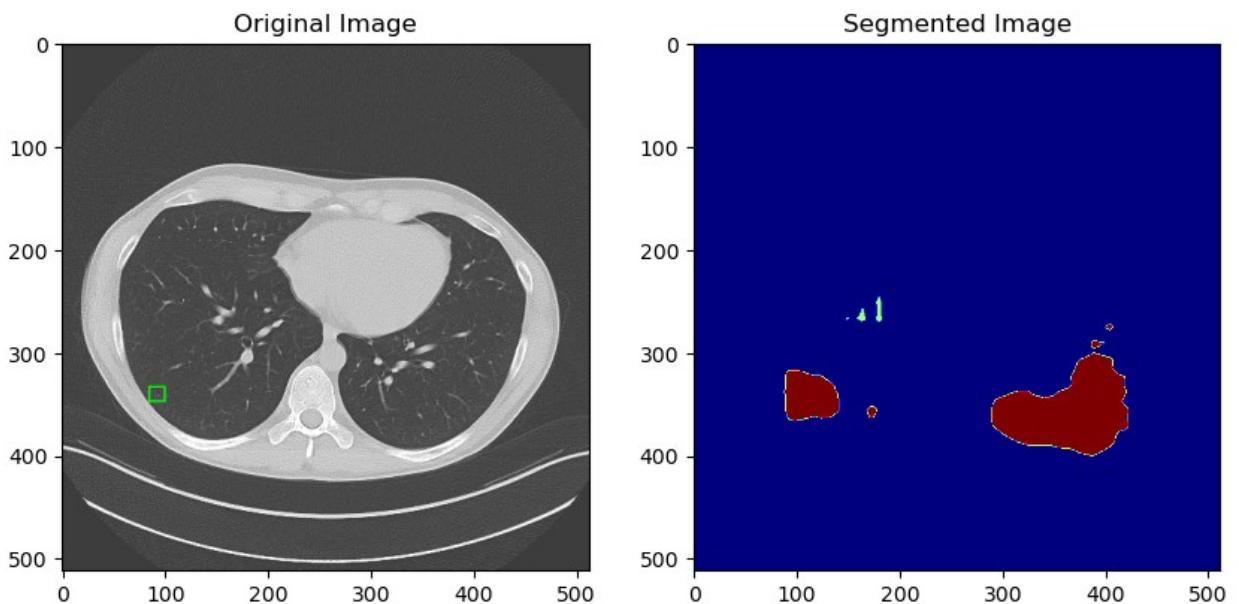


Image: 000238\_09\_03\_124.png  
Class 0: 100.00%

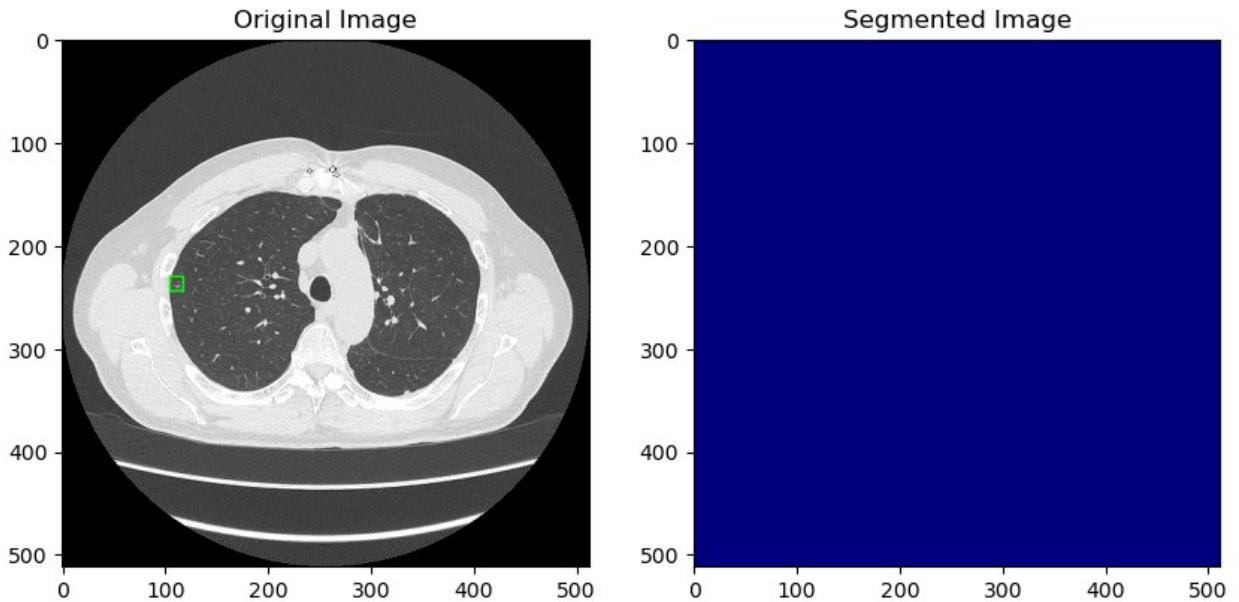


Image: 000238\_09\_03\_162.png

Class 0: 99.48%

Class 10: 0.52%

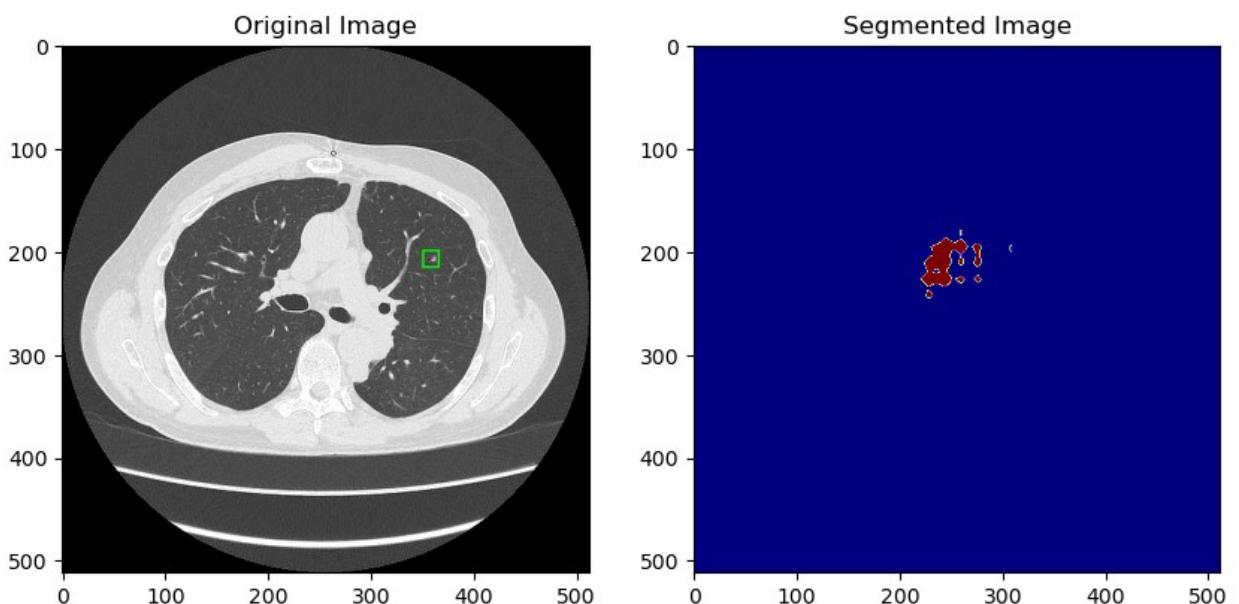


Image: 000238\_09\_03\_268.png

Class 0: 100.00%

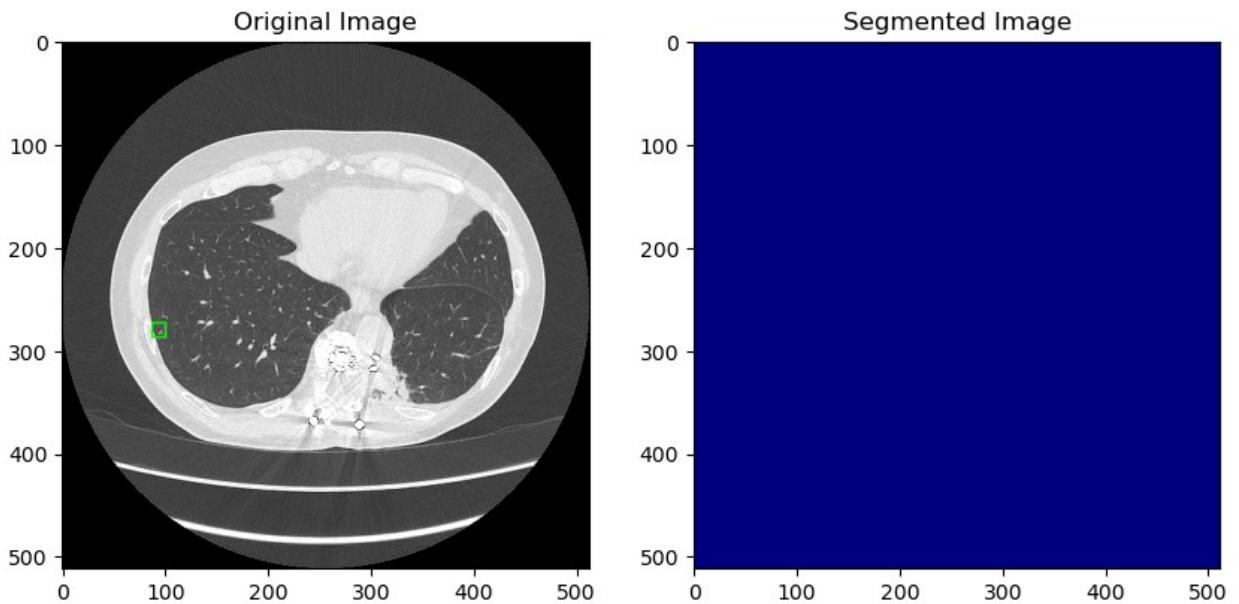


Image: 000238\_10\_02\_152.png  
Class 0: 100.00%

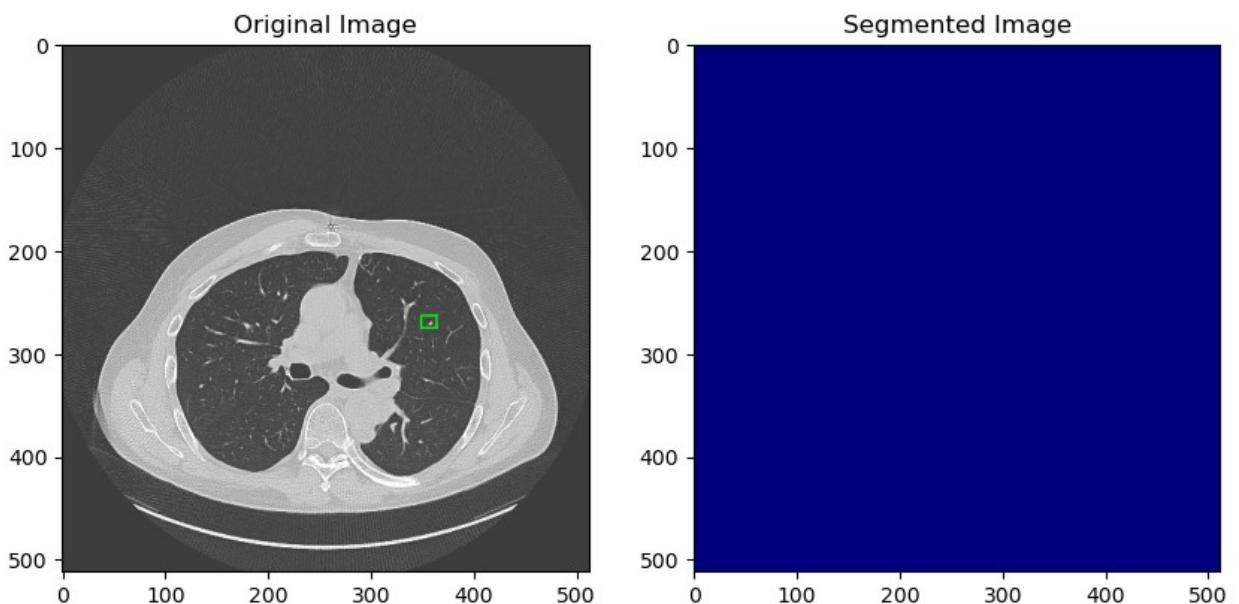


Image: 000245\_03\_02\_169.png  
Class 0: 100.00%

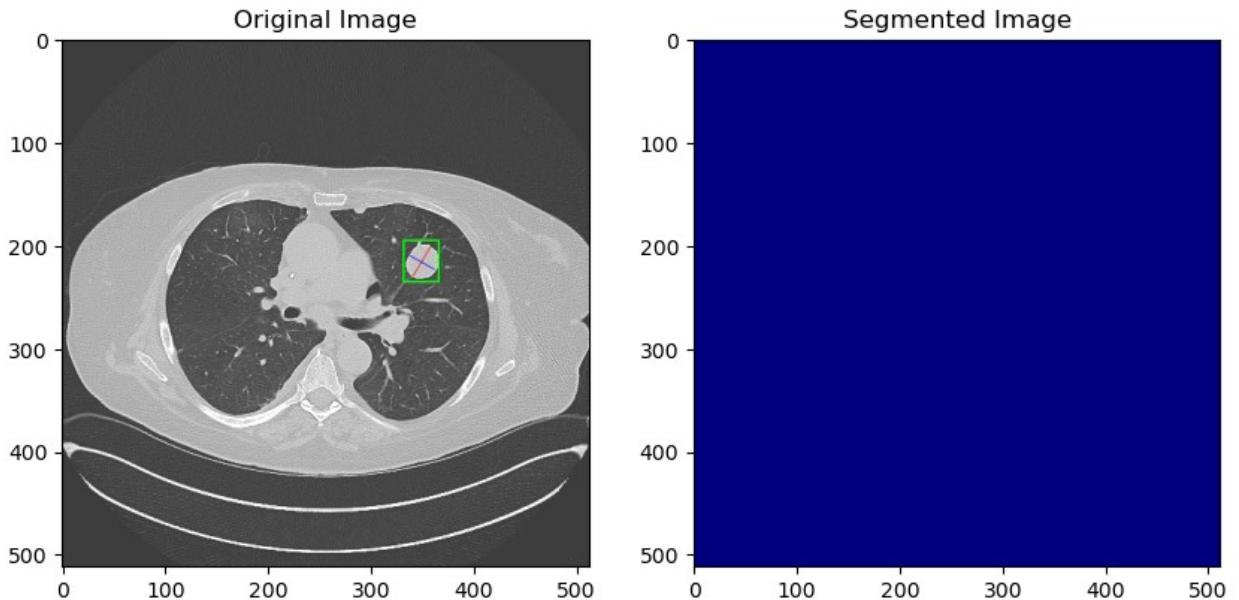


Image: 000245\_03\_02\_214.png  
Class 0: 99.76%  
Class 3: 0.24%

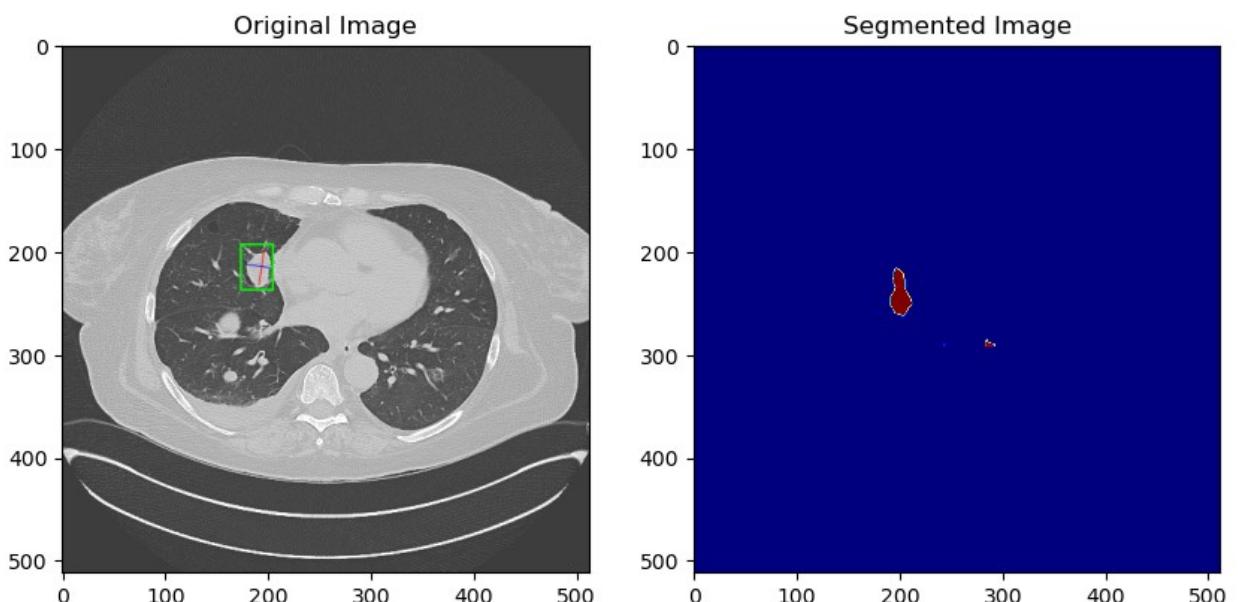


Image: 000247\_03\_01\_202.png  
Class 0: 99.73%  
Class 8: 0.27%

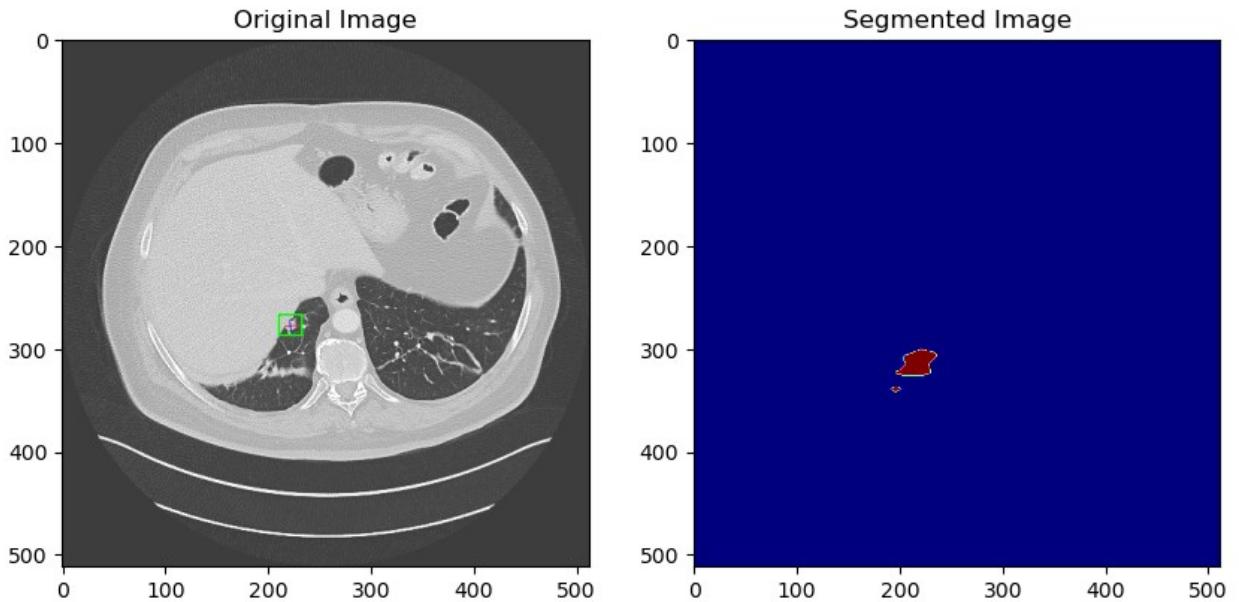


Image: 000247\_04\_01\_165.png  
Class 0: 99.72%  
Class 8: 0.28%

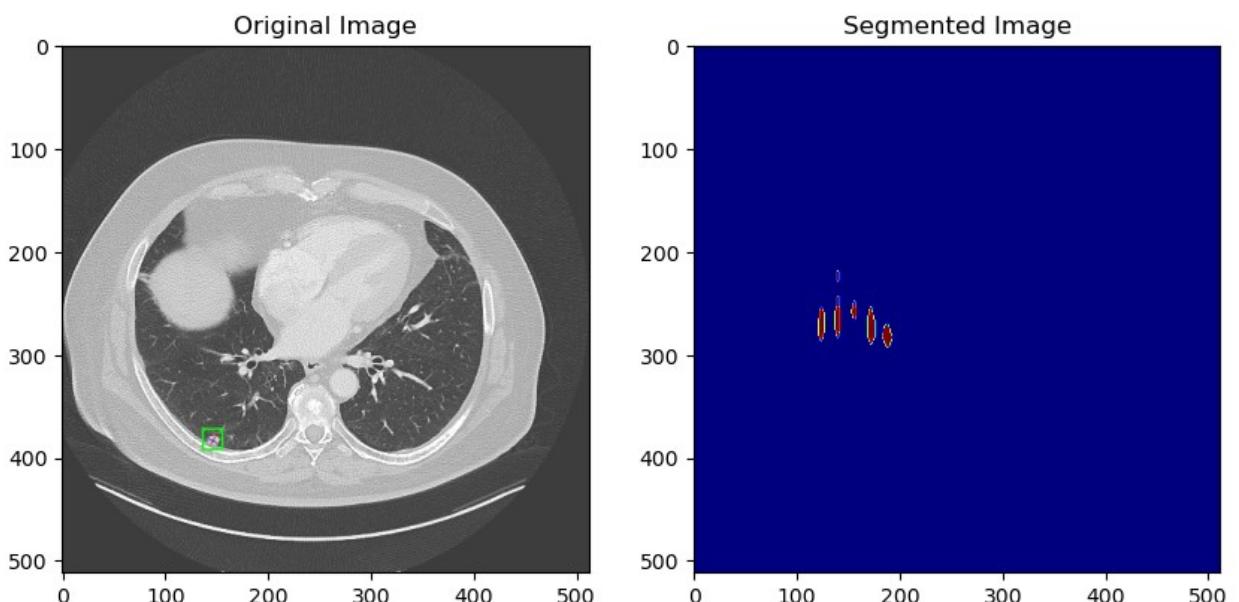


Image: 000247\_04\_01\_209.png  
Class 0: 90.15%  
Class 15: 9.85%

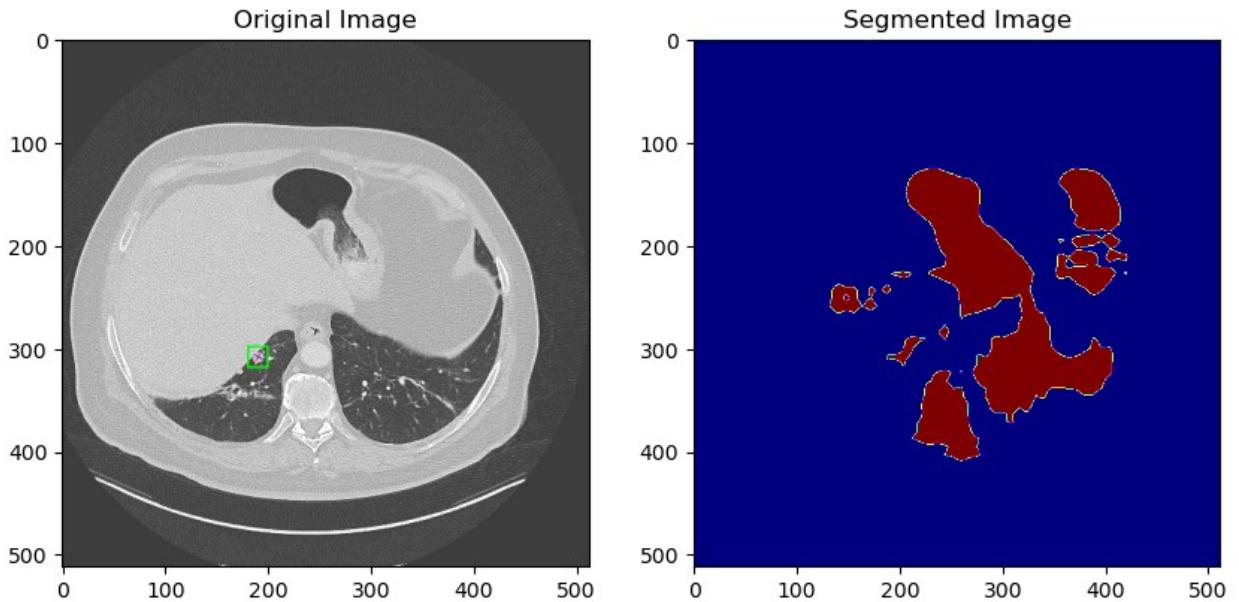


Image: 000247\_05\_01\_178.png  
Class 0: 98.21%  
Class 3: 1.32%  
Class 16: 0.47%

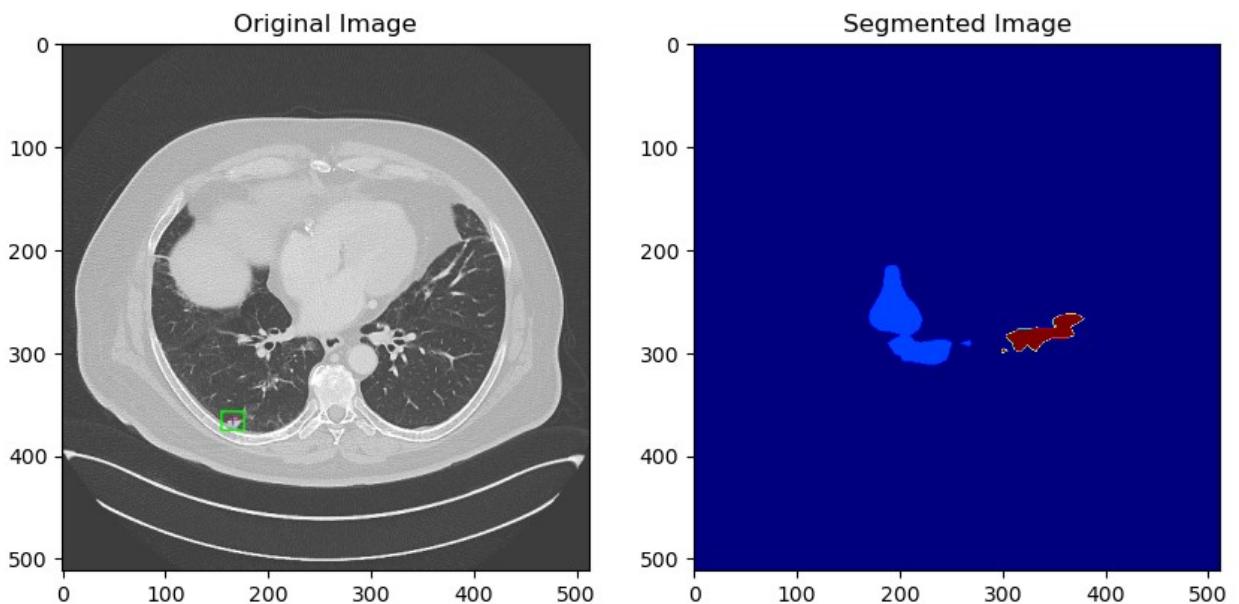


Image: 000247\_05\_01\_221.png  
Class 0: 99.72%  
Class 3: 0.28%

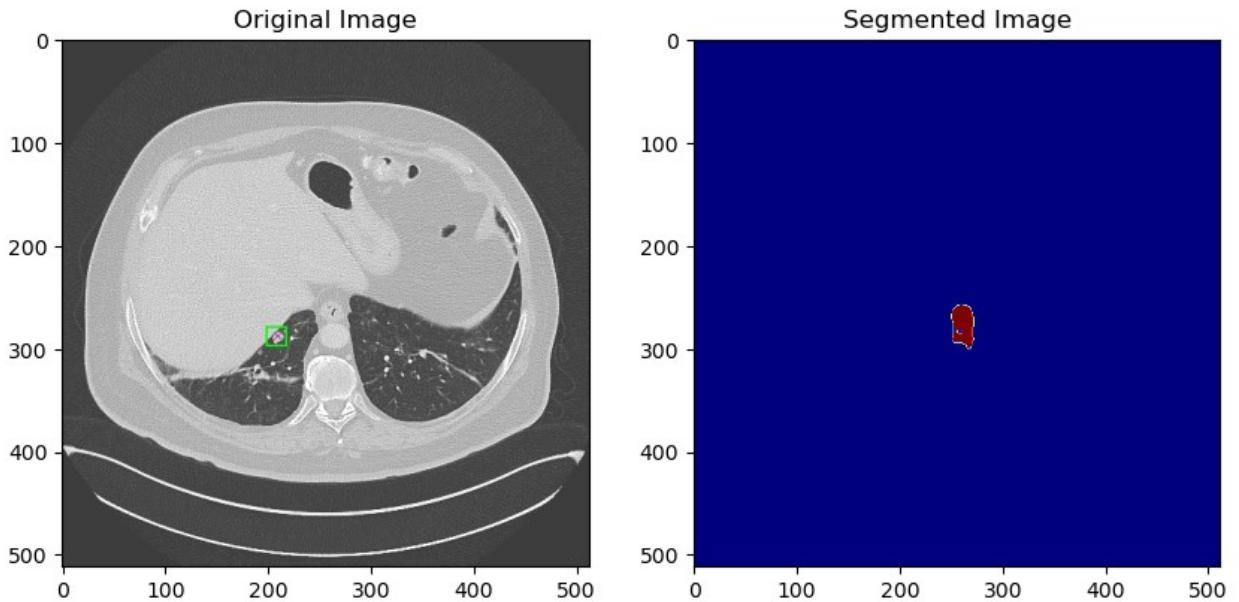


Image: 000247\_06\_02\_149.png  
Class 0: 100.00%

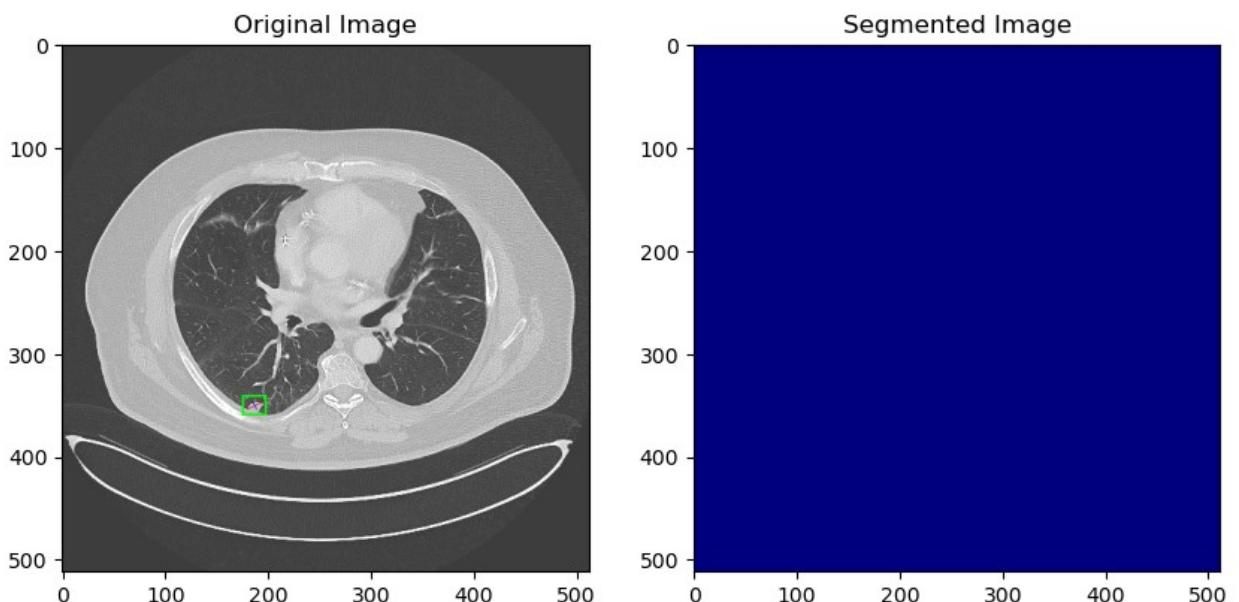


Image: 000247\_06\_02\_201.png  
Class 0: 100.00%

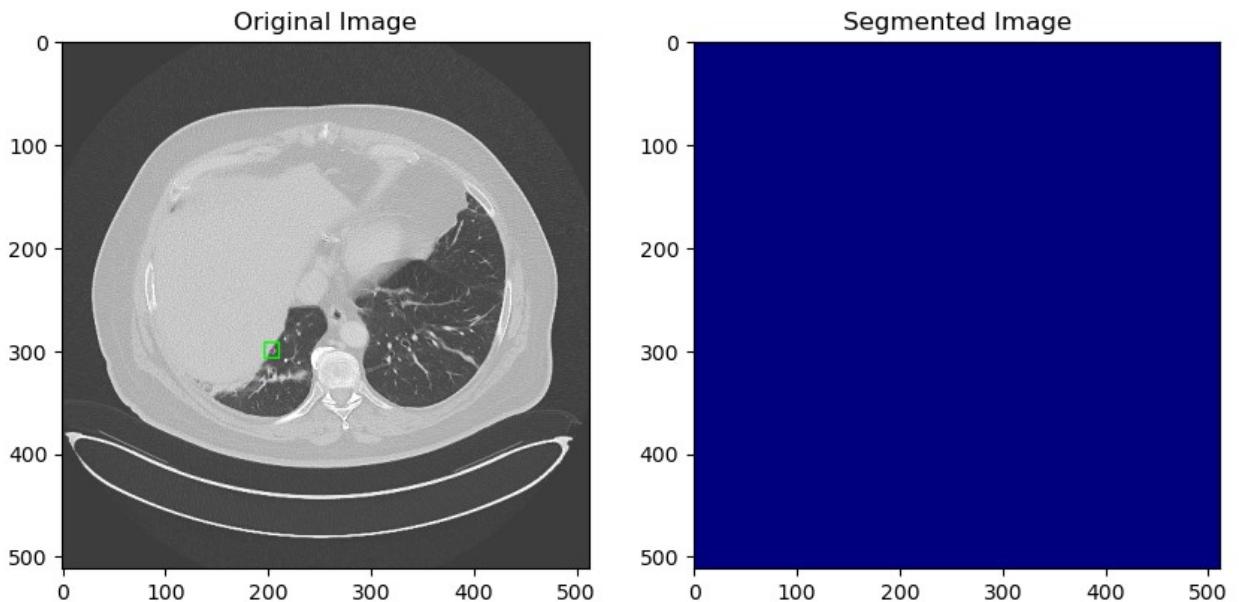


Image: 000251\_08\_02\_195.png  
Class 0: 100.00%

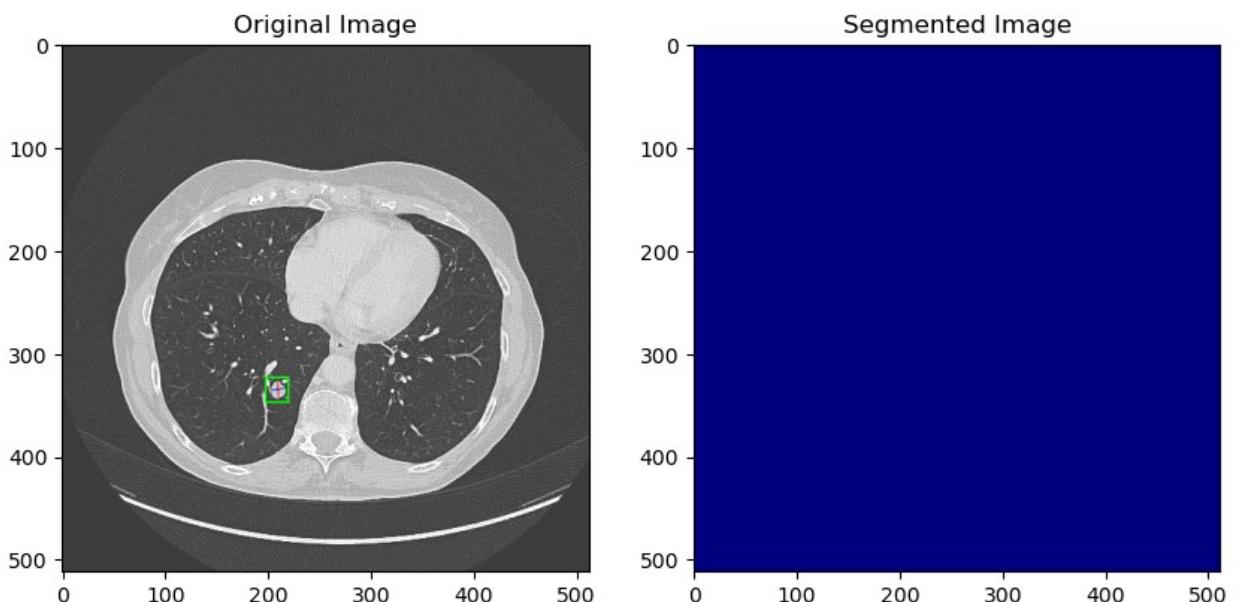


Image: 000265\_11\_02\_190.png  
Class 0: 100.00%

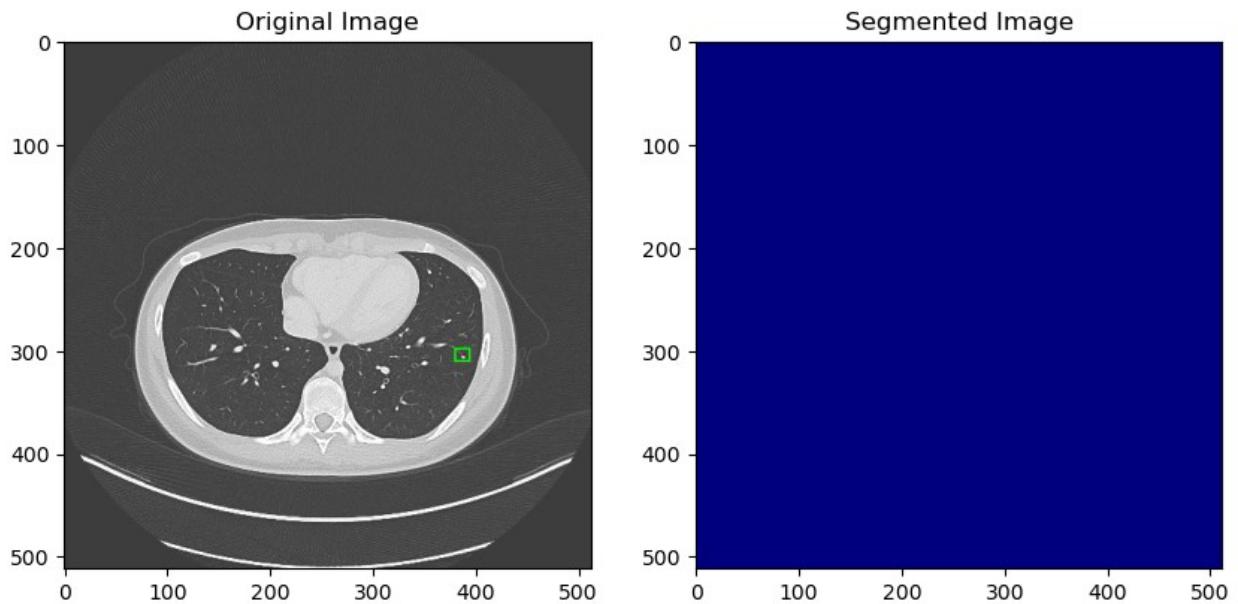


Image: 000266\_03\_02\_133.png  
Class 0: 100.00%

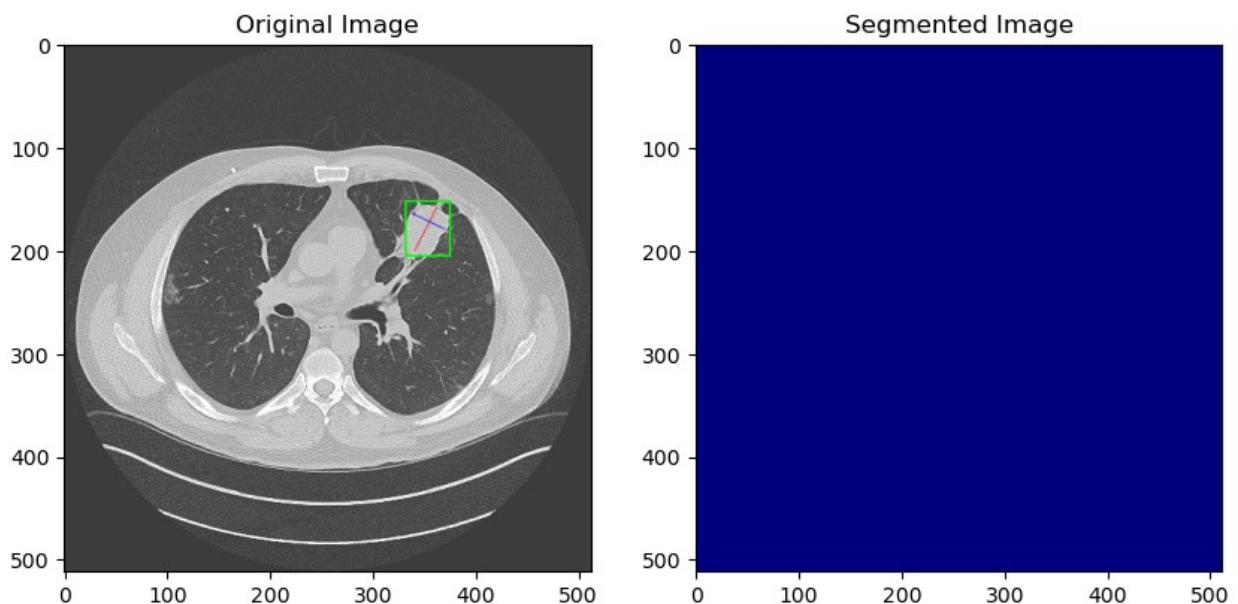


Image: 000266\_03\_02\_138.png  
Class 0: 100.00%

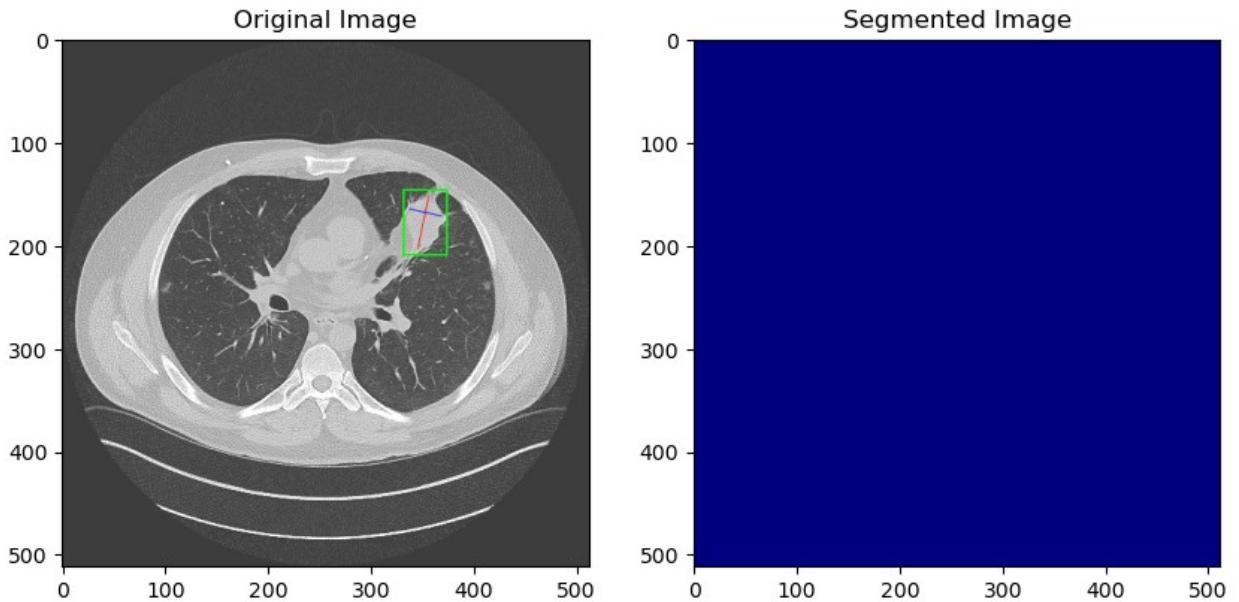


Image: 000266\_04\_01\_030.png  
Class 0: 99.81%  
Class 3: 0.19%

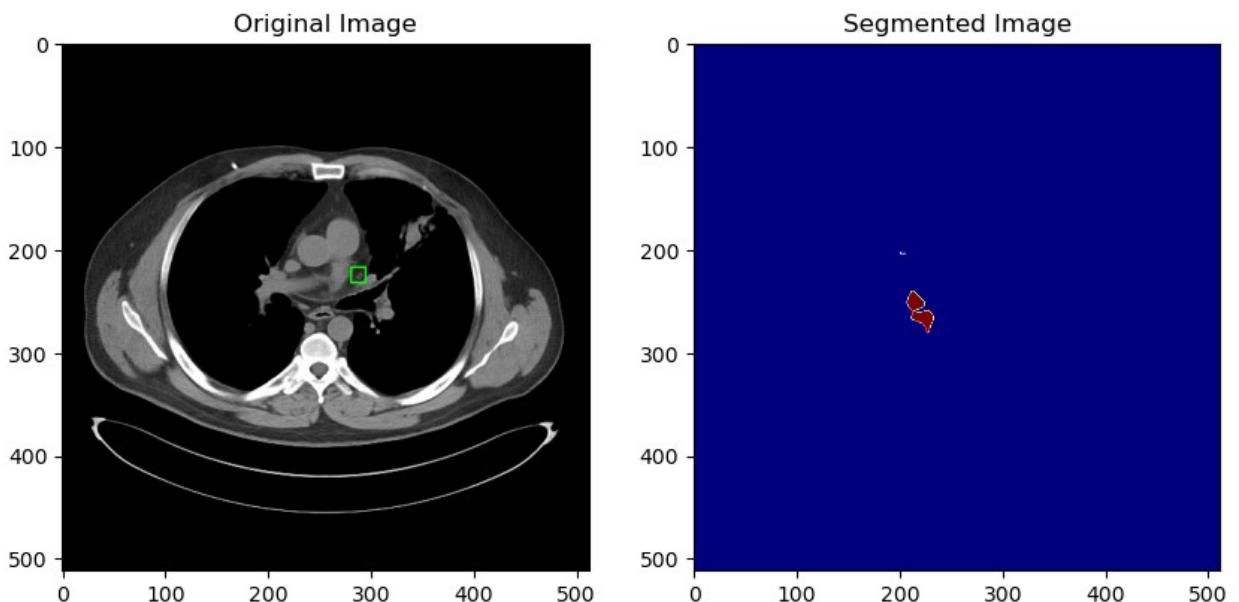


Image: 000266\_04\_02\_098.png  
Class 0: 98.99%  
Class 8: 1.00%  
Class 15: 0.01%

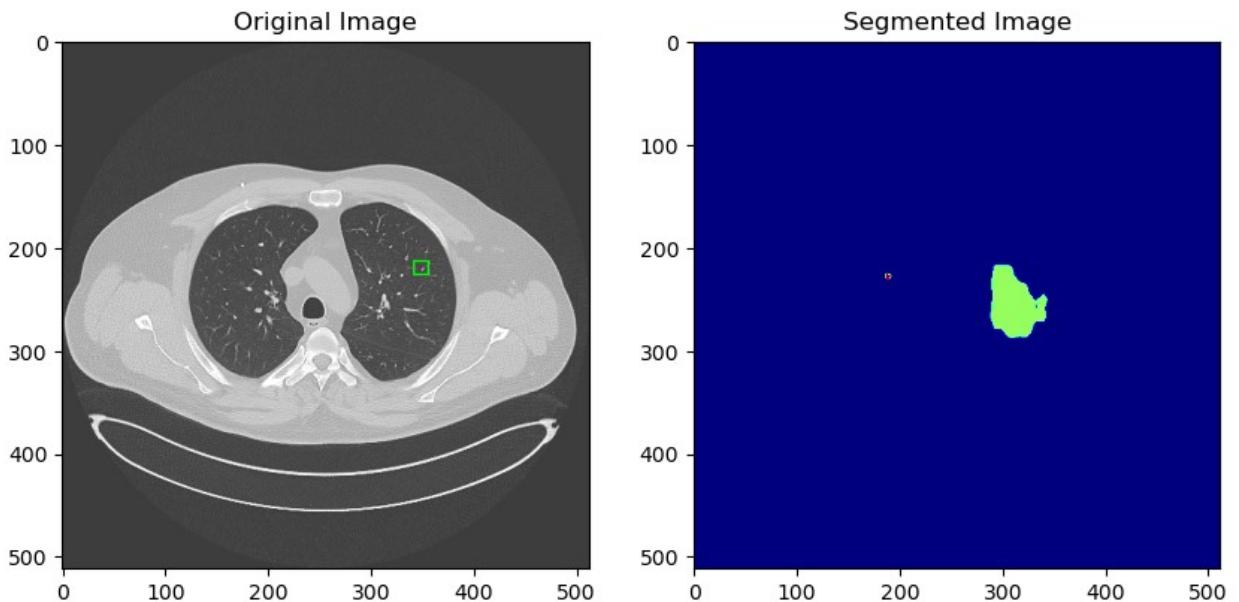


Image: 000266\_04\_02\_150.png  
Class 0: 100.00%

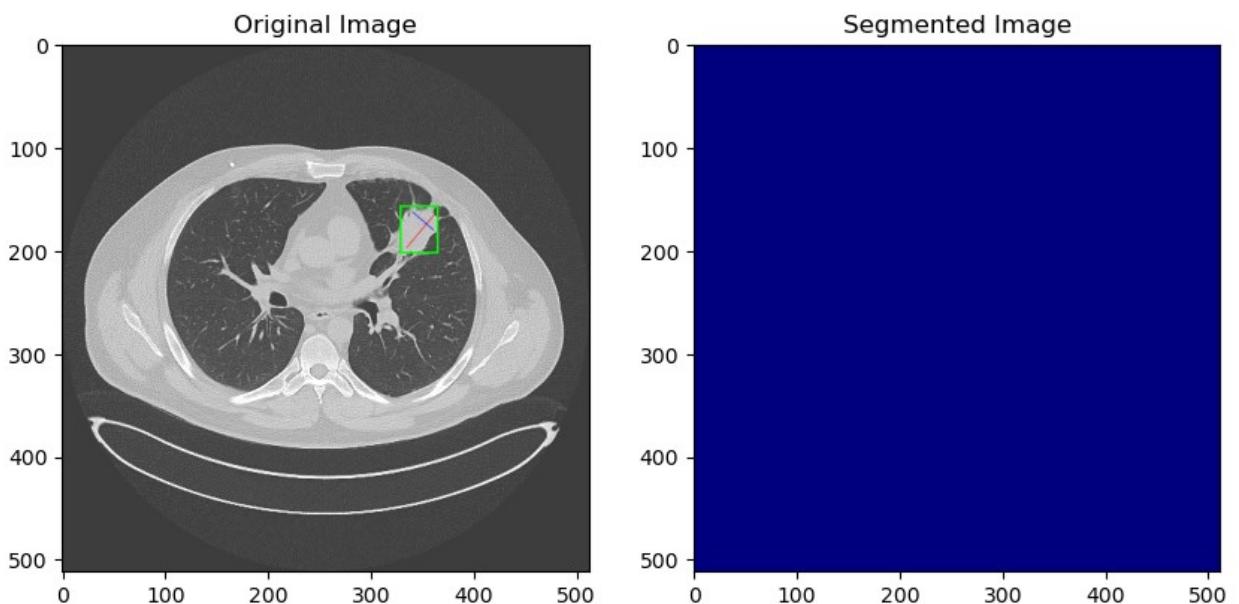


Image: 000271\_12\_02\_237.png  
Class 0: 99.43%  
Class 14: 0.57%

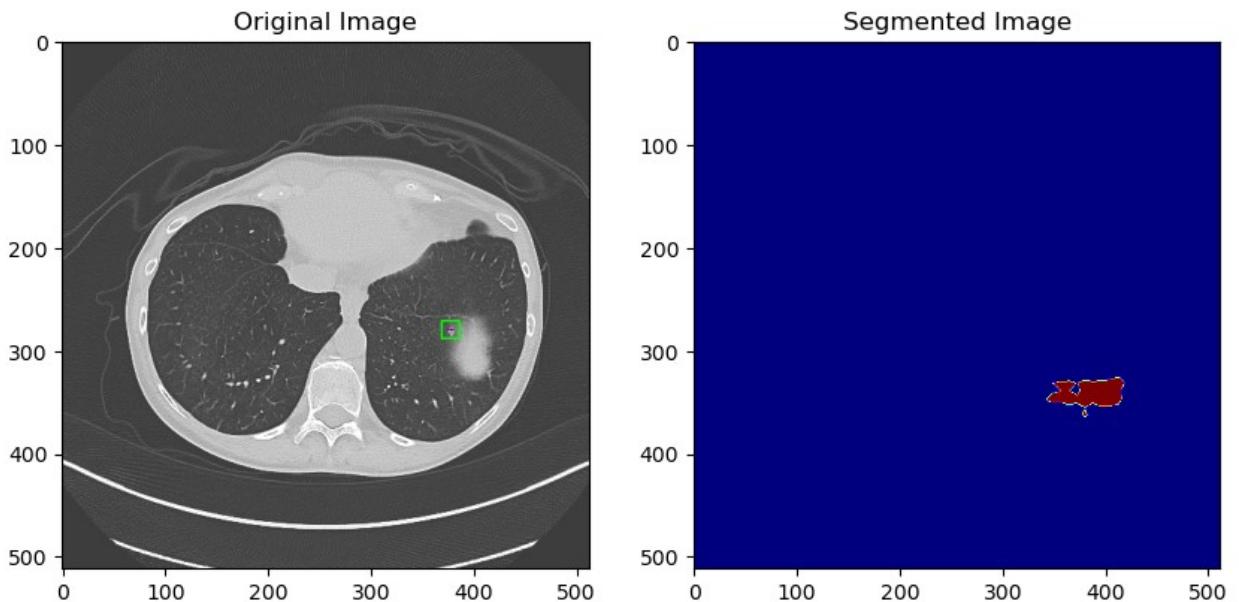


Image: 000271\_12\_02\_242.png  
Class 0: 100.00%

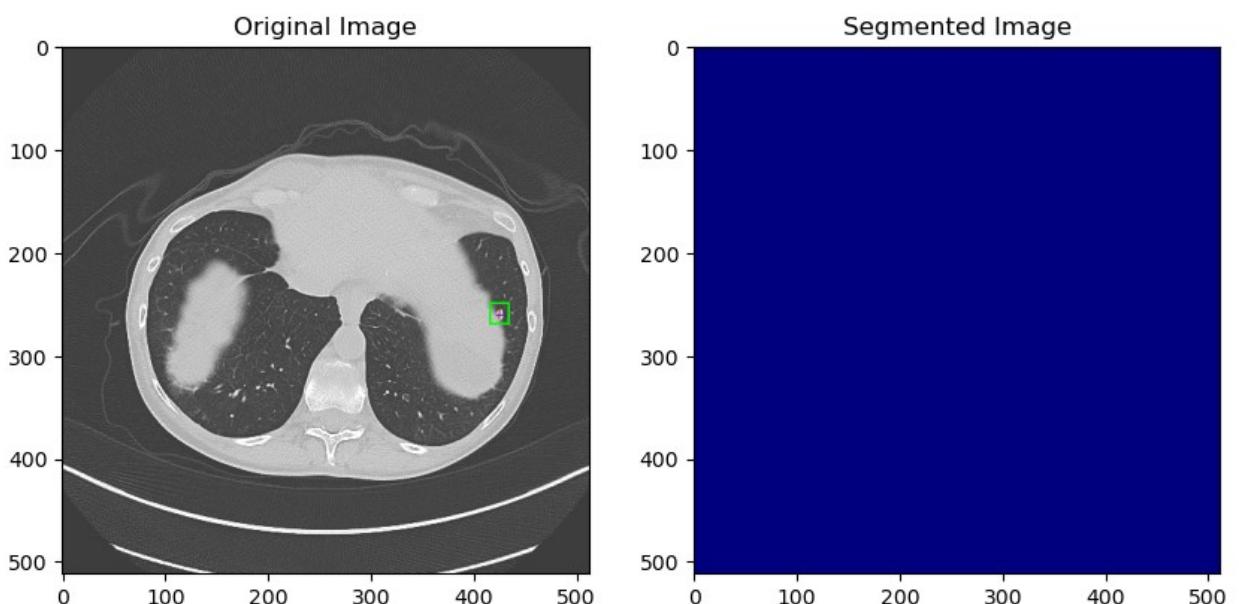


Image: 000276\_05\_02\_188.png  
Class 0: 80.87%  
Class 14: 19.13%

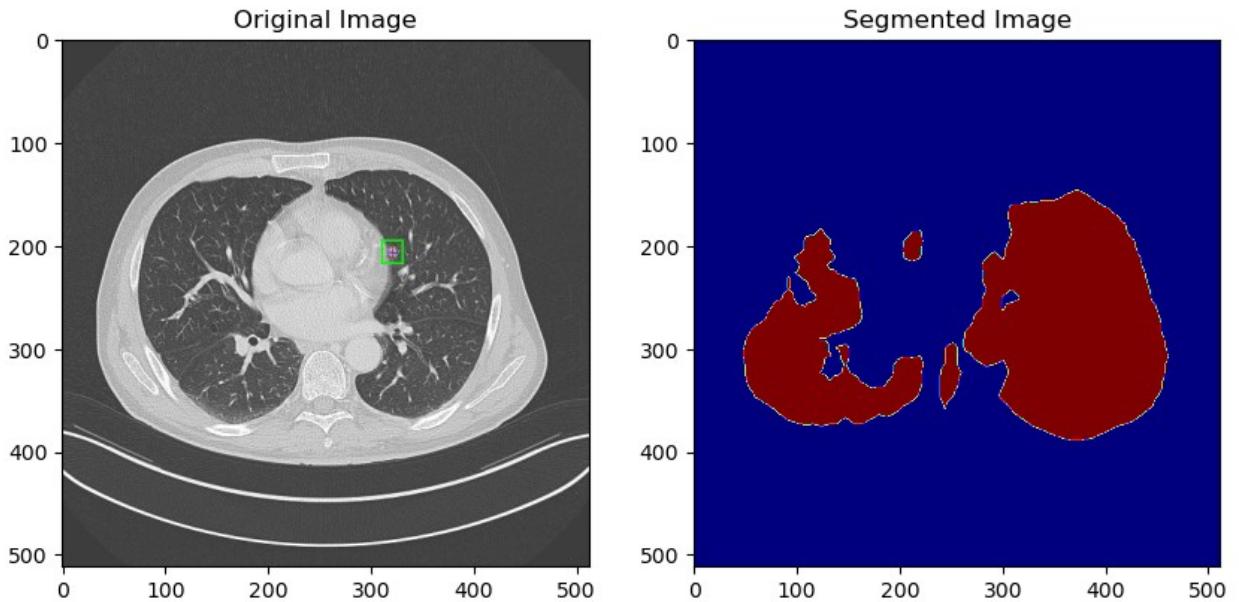


Image: 000278\_07\_02\_182.png  
Class 0: 100.00%

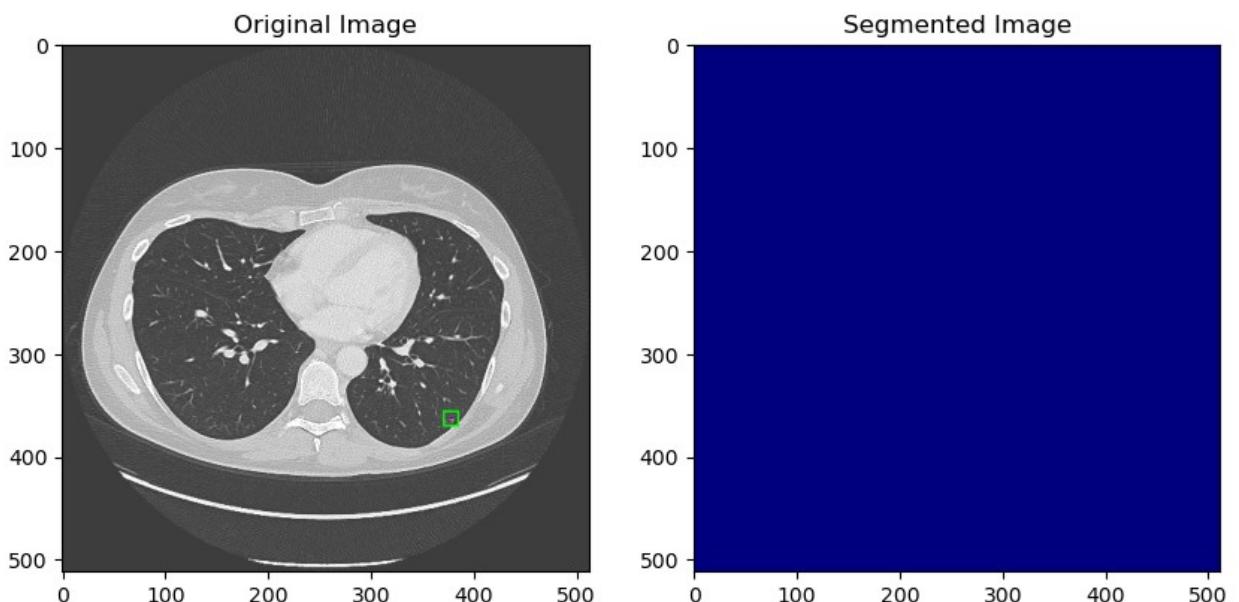


Image: 000280\_02\_03\_200.png  
Class 0: 69.12%  
Class 11: 30.88%

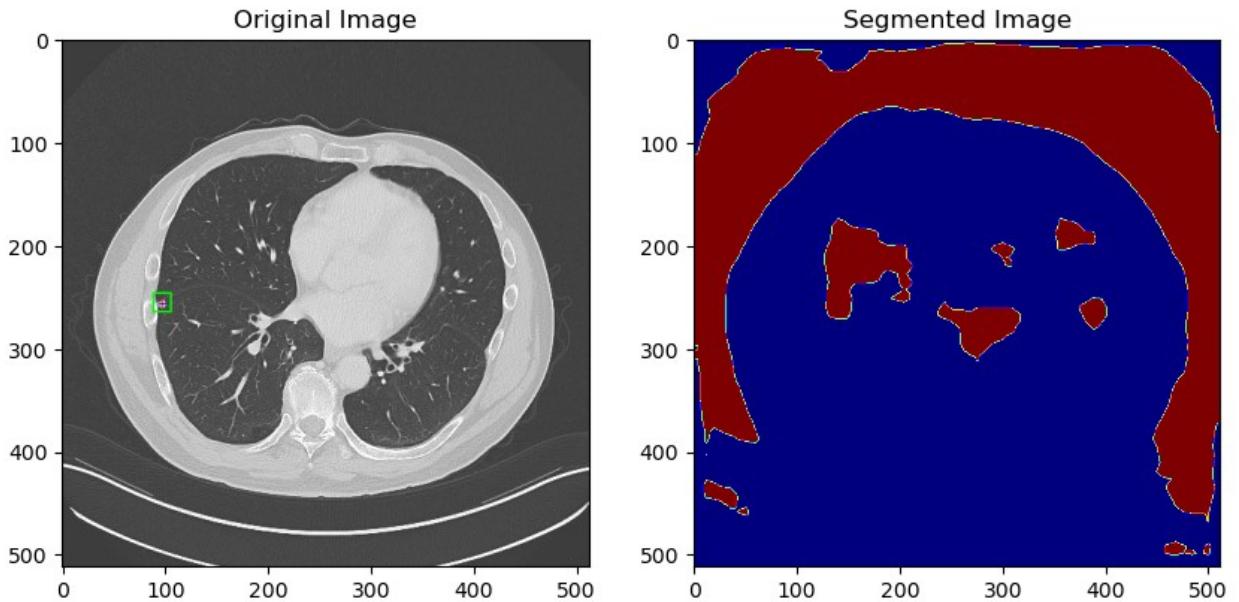


Image: 000282\_04\_02\_120.png

Class 0: 99.04%

Class 3: 0.96%

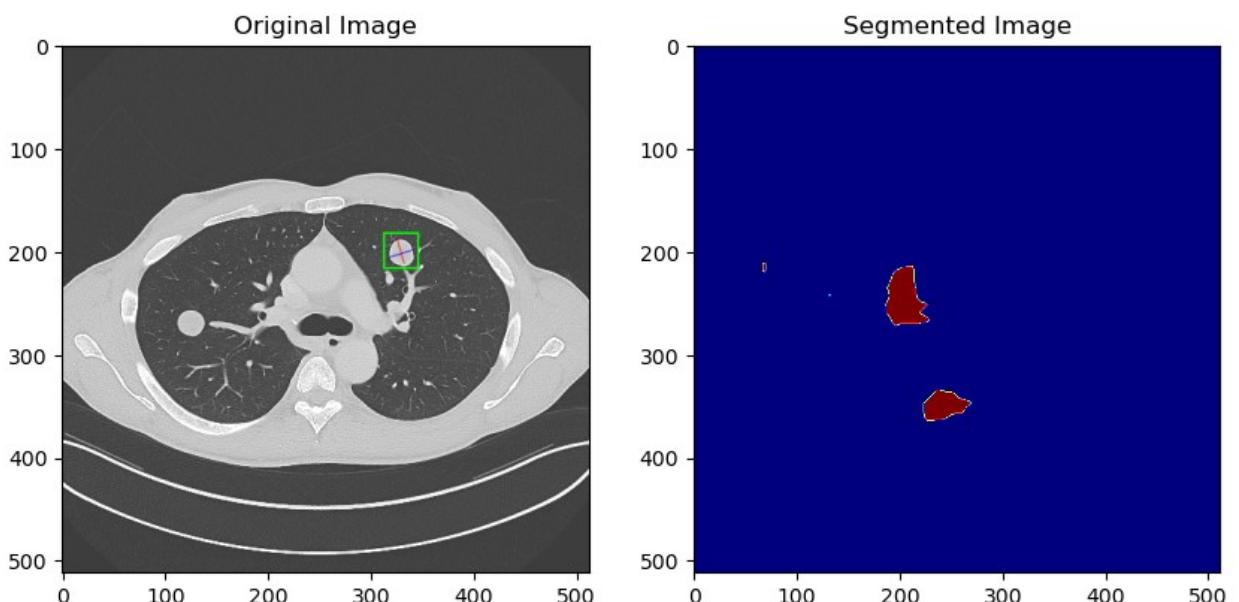


Image: 000283\_13\_02\_106.png

Class 0: 89.15%

Class 3: 9.60%

Class 12: 1.25%

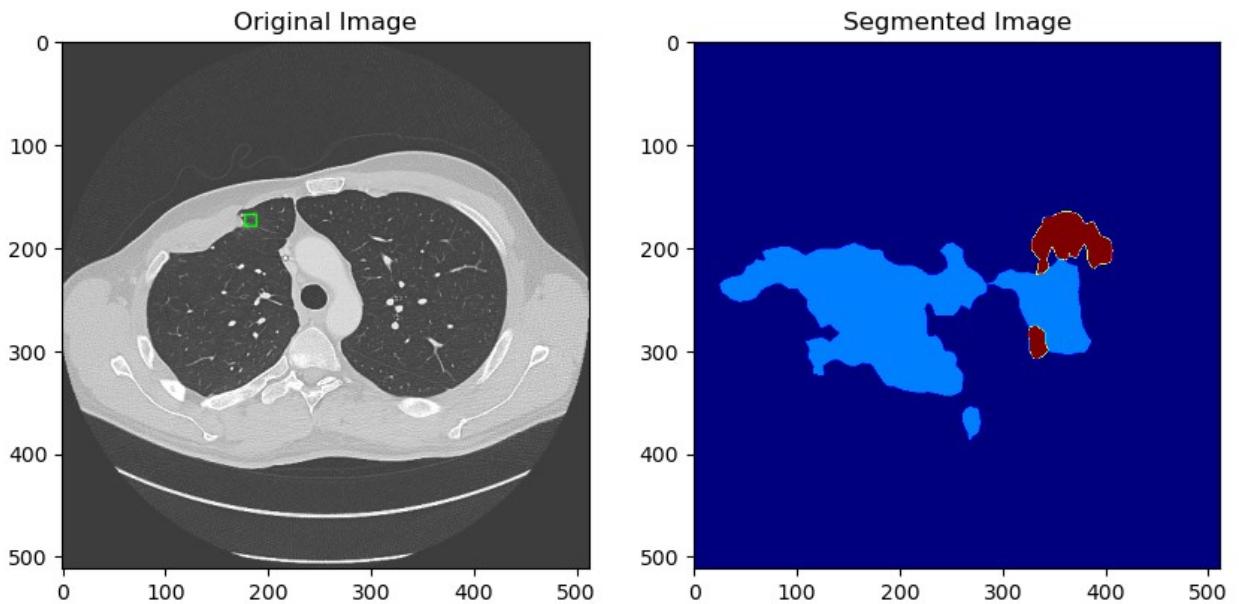


Image: 000284\_01\_02\_105.png  
Class 0: 100.00%

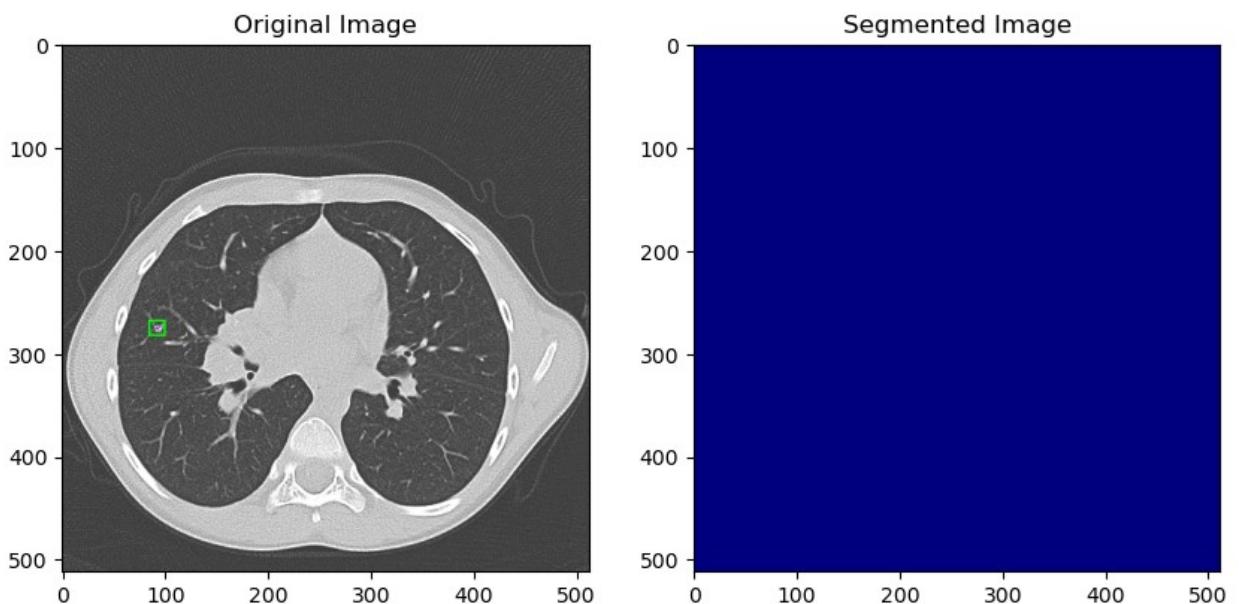


Image: 000284\_01\_02\_121.png  
Class 0: 100.00%

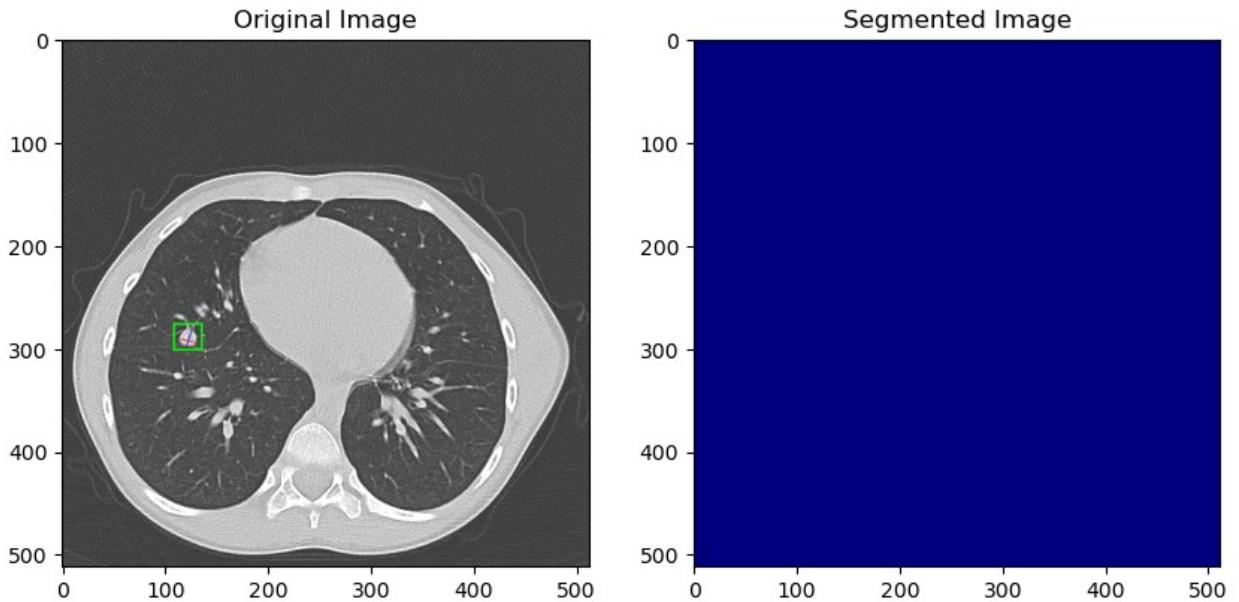


Image: 000284\_02\_02\_018.png  
Class 0: 97.14%  
Class 14: 2.46%  
Class 15: 0.40%

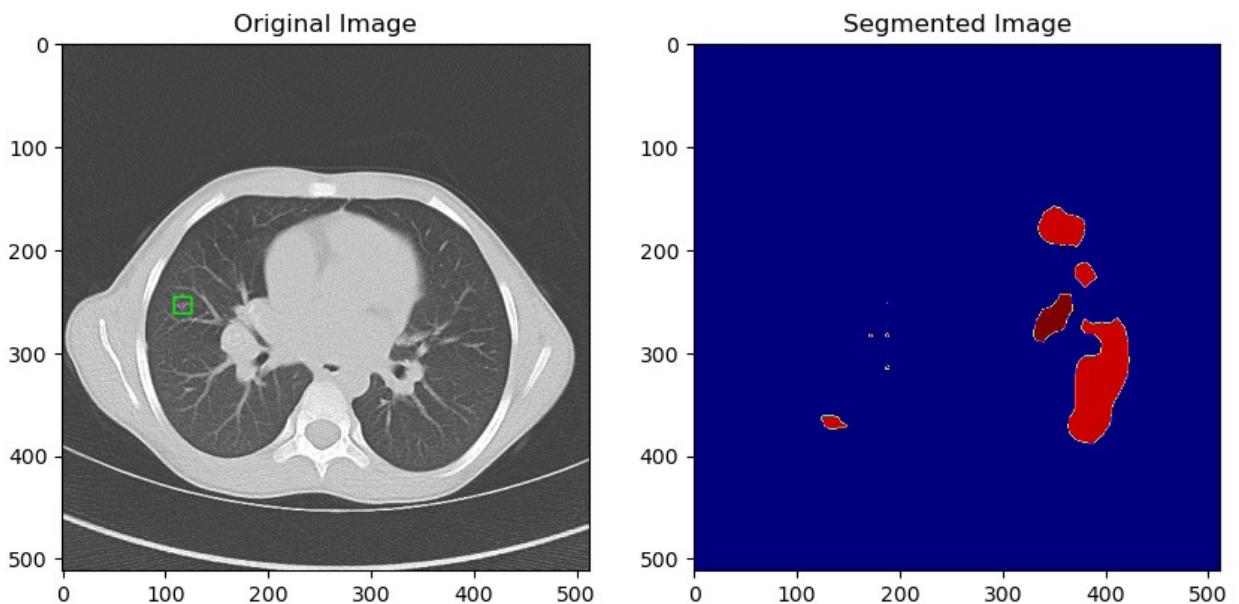


Image: 000284\_03\_01\_084.png  
Class 0: 100.00%

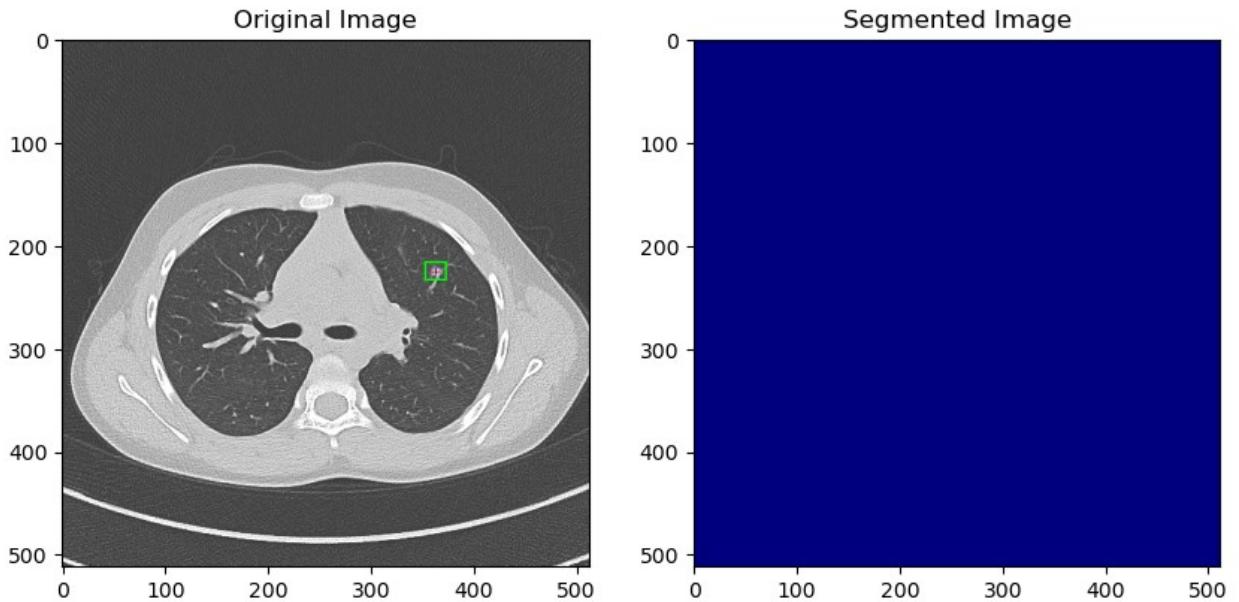


Image: 000293\_06\_03\_154.png

Class 0: 99.86%

Class 15: 0.14%

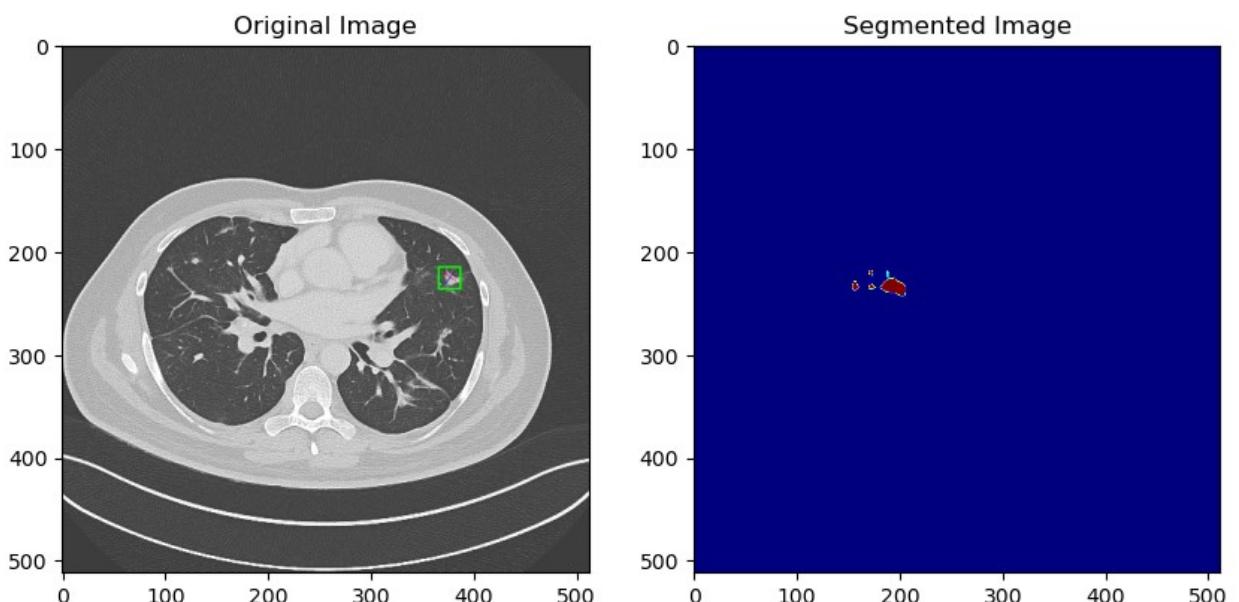


Image: 000293\_06\_03\_161.png

Class 0: 99.09%

Class 8: 0.20%

Class 14: 0.14%

Class 16: 0.58%

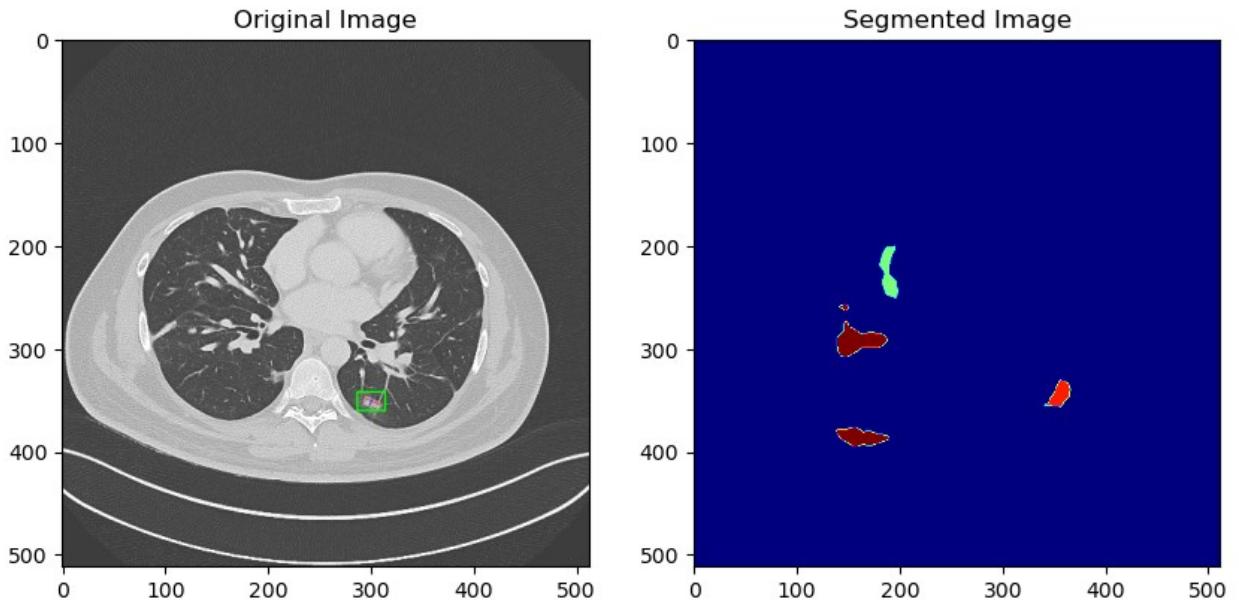


Image: 000293\_06\_03\_176.png  
Class 0: 82.31%  
Class 11: 17.47%  
Class 14: 0.22%

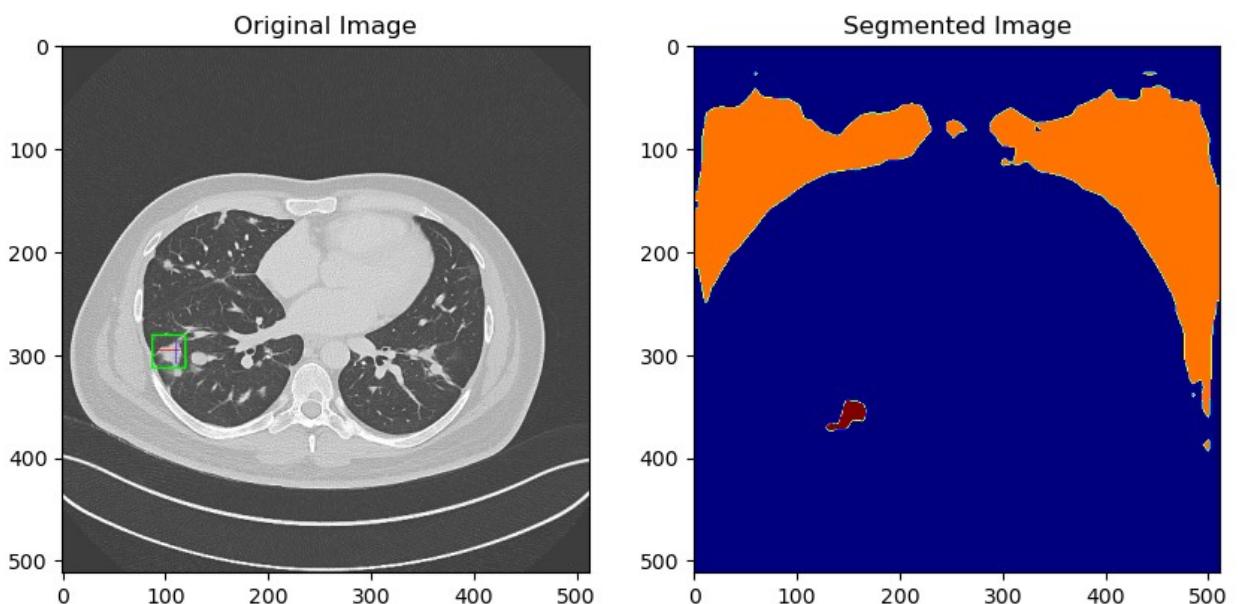


Image: 000304\_01\_01\_210.png  
Class 0: 100.00%

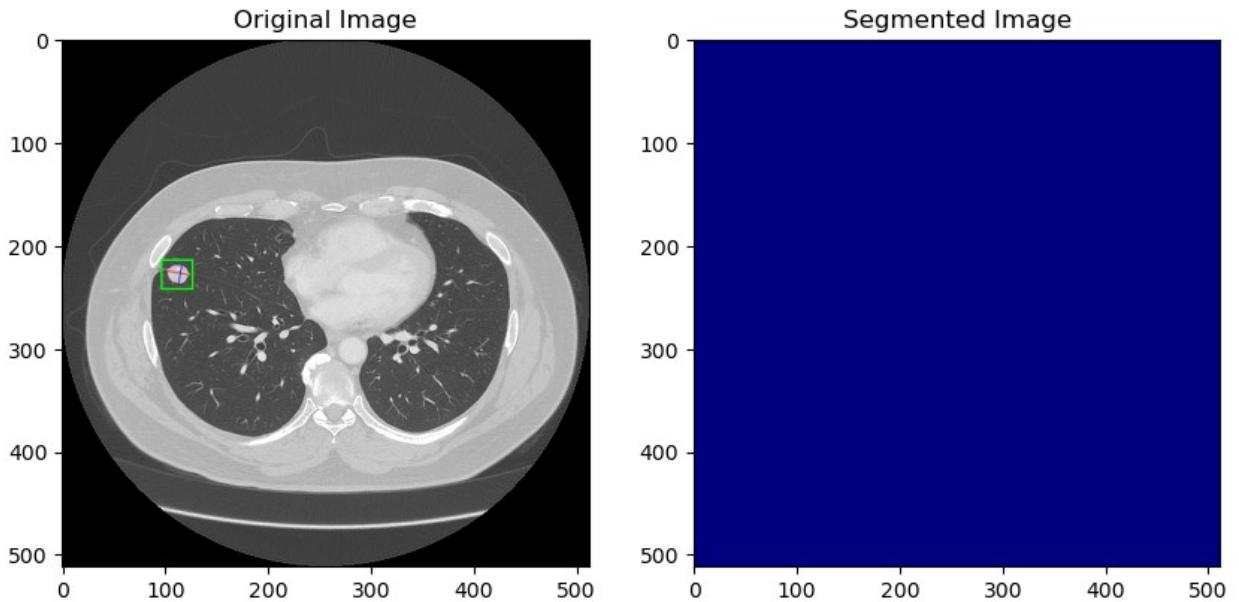


Image: 000306\_06\_02\_126.png

Class 0: 99.41%

Class 15: 0.59%

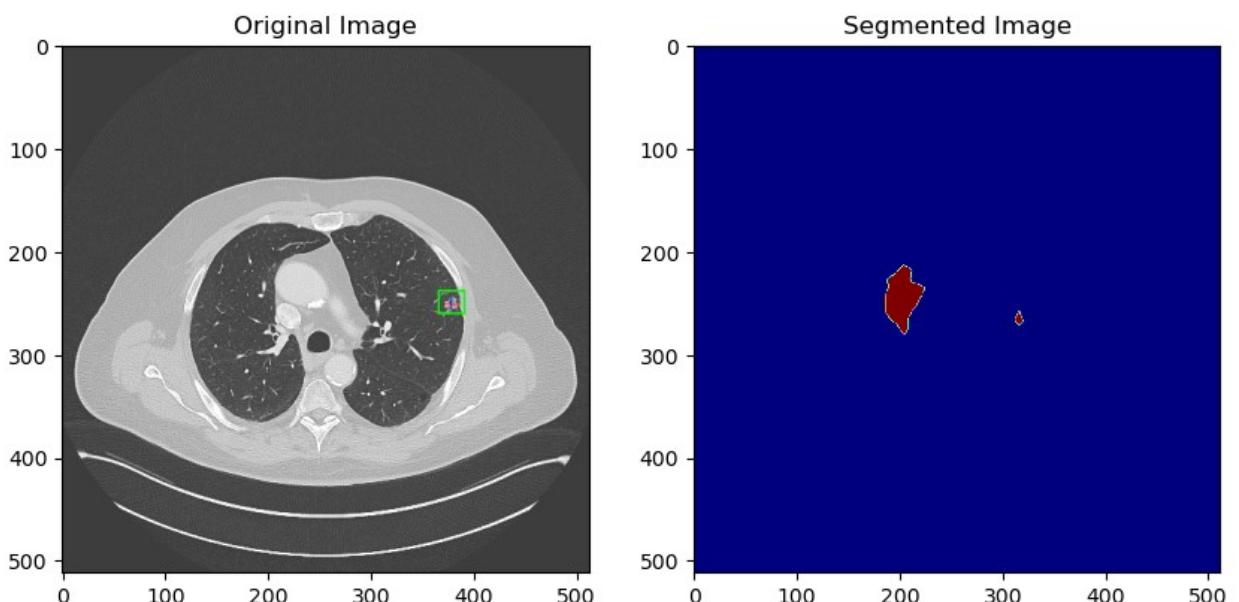


Image: 000306\_06\_02\_201.png

Class 0: 96.51%

Class 8: 3.49%

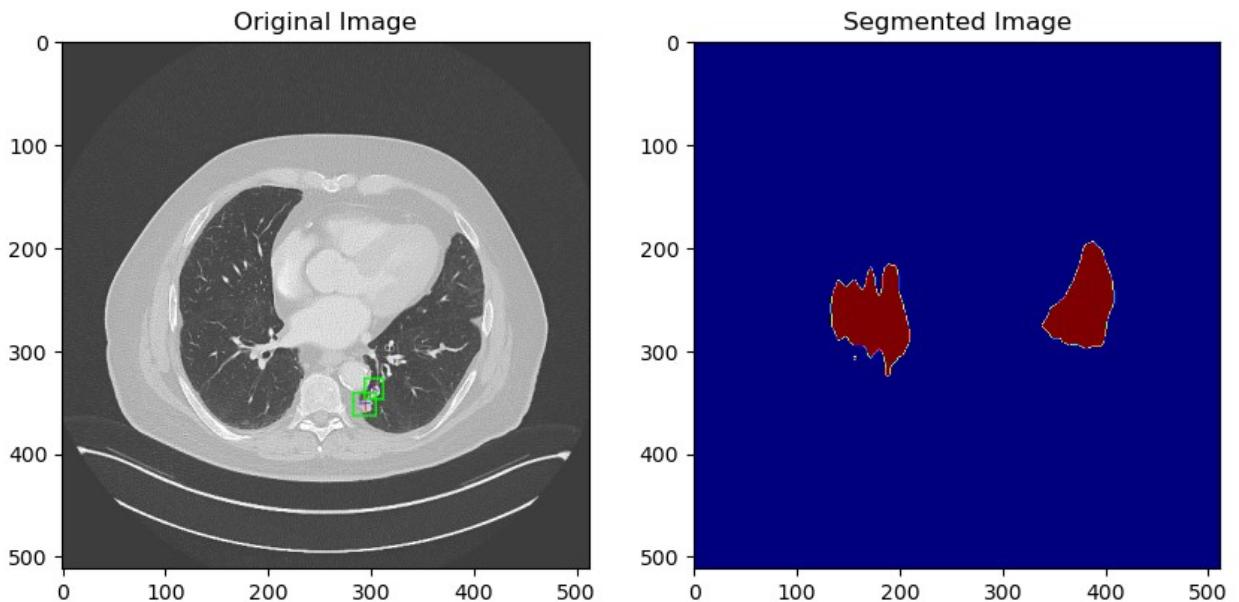


Image: 000308\_03\_02\_091.png  
Class 0: 100.00%

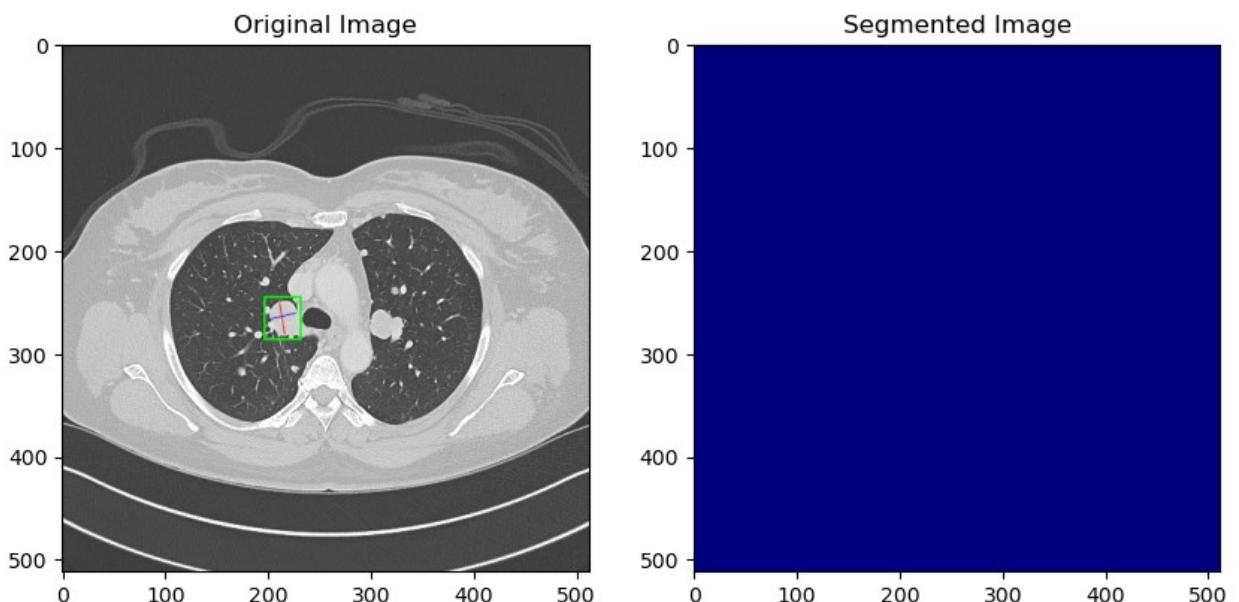


Image: 000308\_03\_02\_122.png  
Class 0: 100.00%

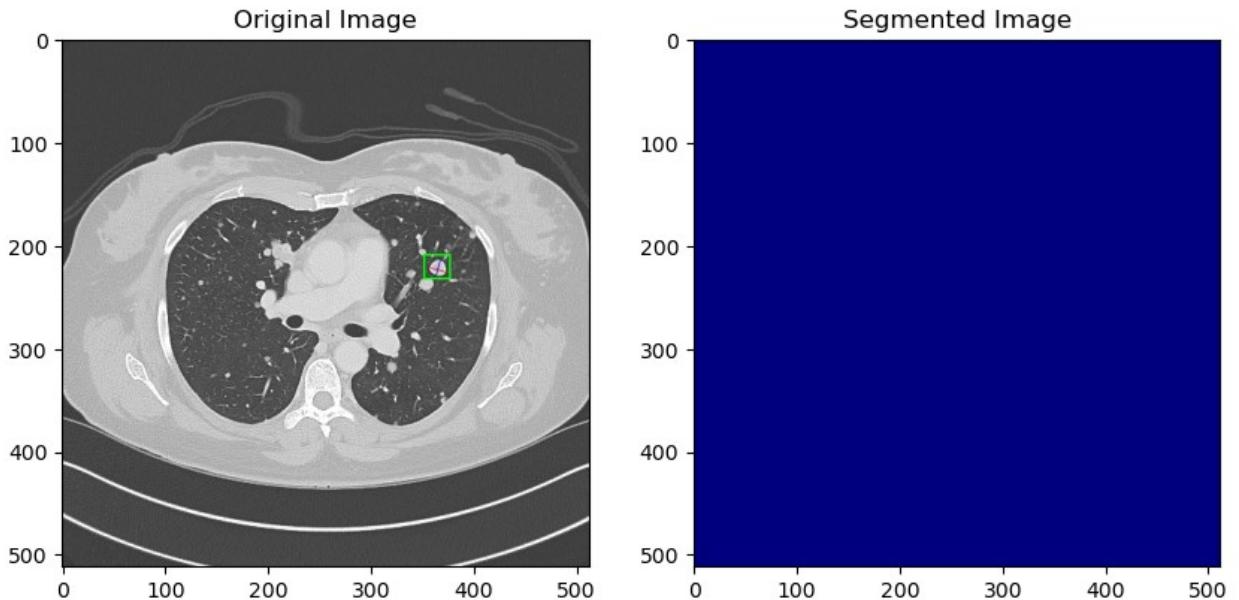


Image: 000310\_01\_01\_115.png  
Class 0: 100.00%

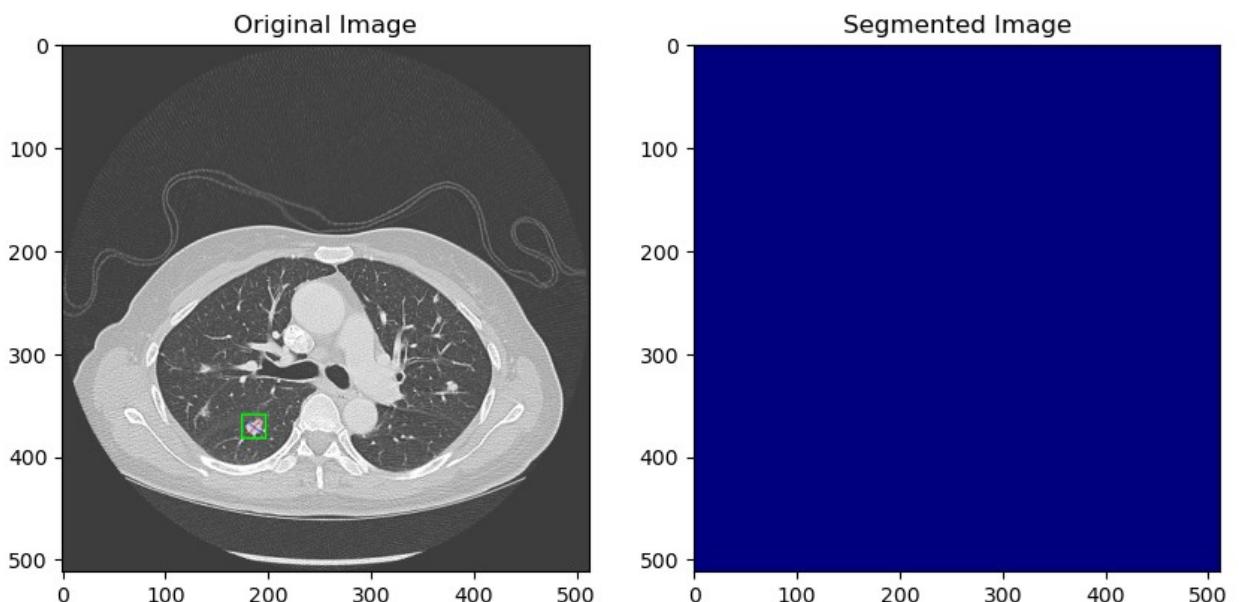


Image: 000314\_04\_02\_183.png  
Class 0: 97.47%  
Class 11: 2.53%

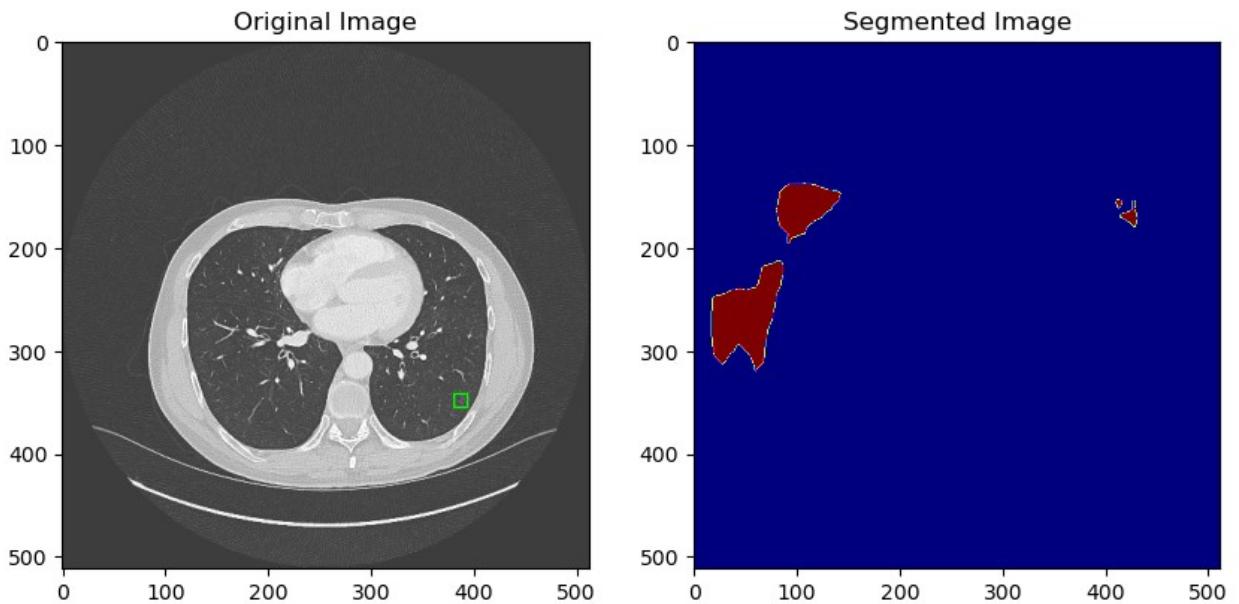


Image: 000315\_04\_03\_094.png  
Class 0: 100.00%

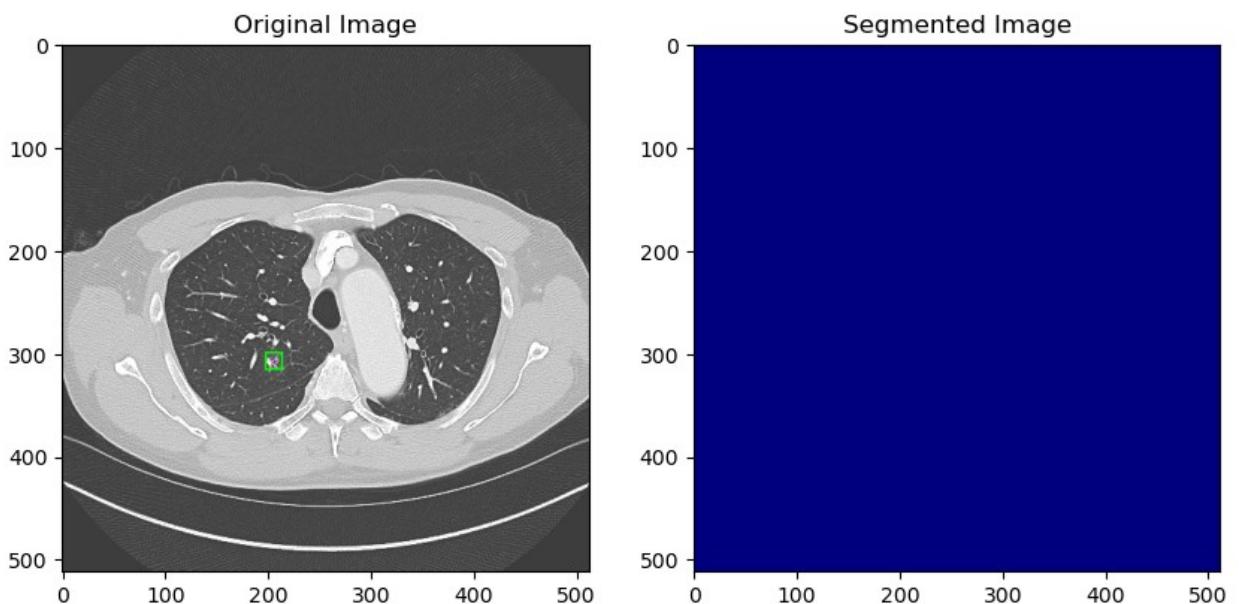


Image: 000315\_04\_03\_145.png  
Class 0: 99.50%  
Class 14: 0.50%

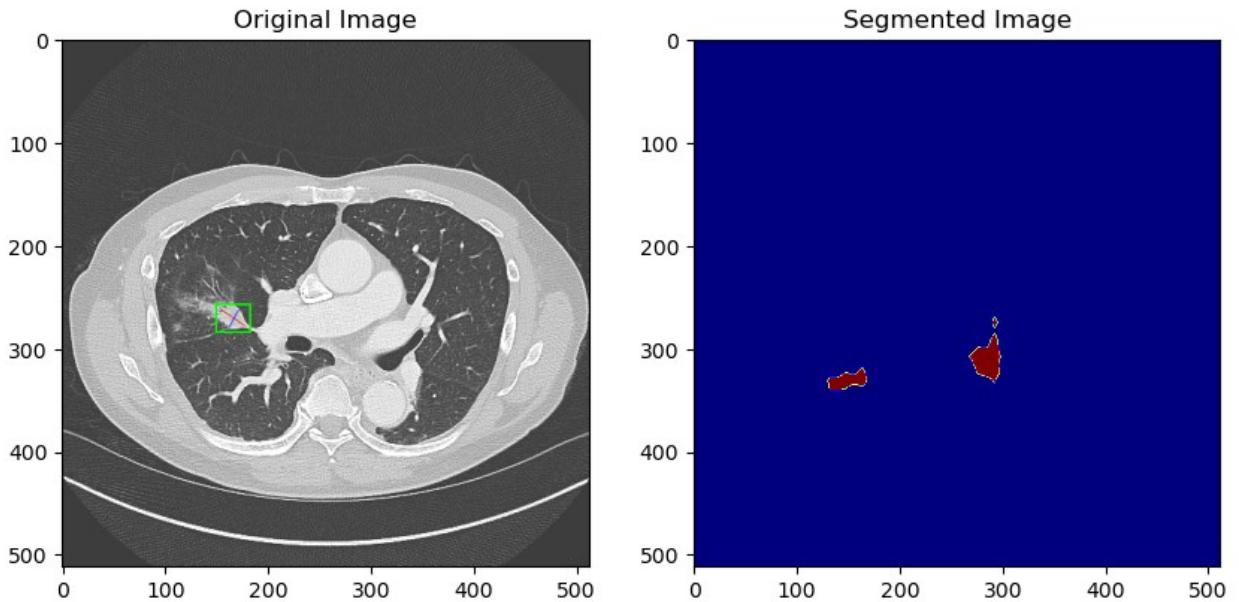


Image: 000316\_01\_01\_071.png

Class 0: 94.13%

Class 20: 5.87%

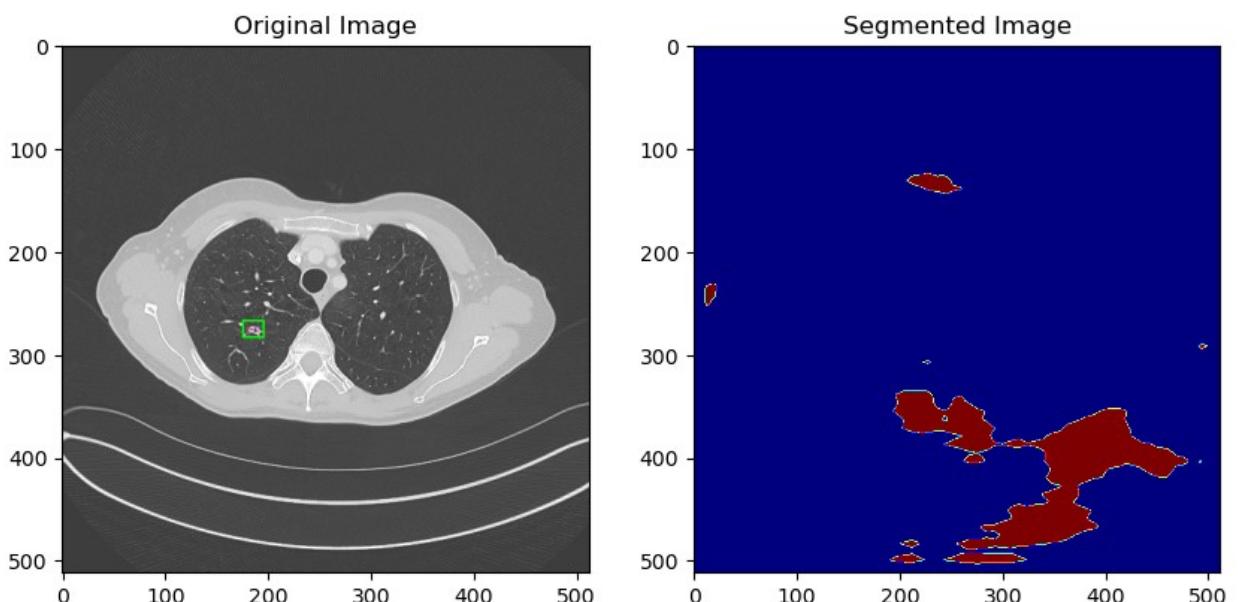


Image: 000328\_08\_03\_167.png

Class 0: 98.08%

Class 11: 1.92%

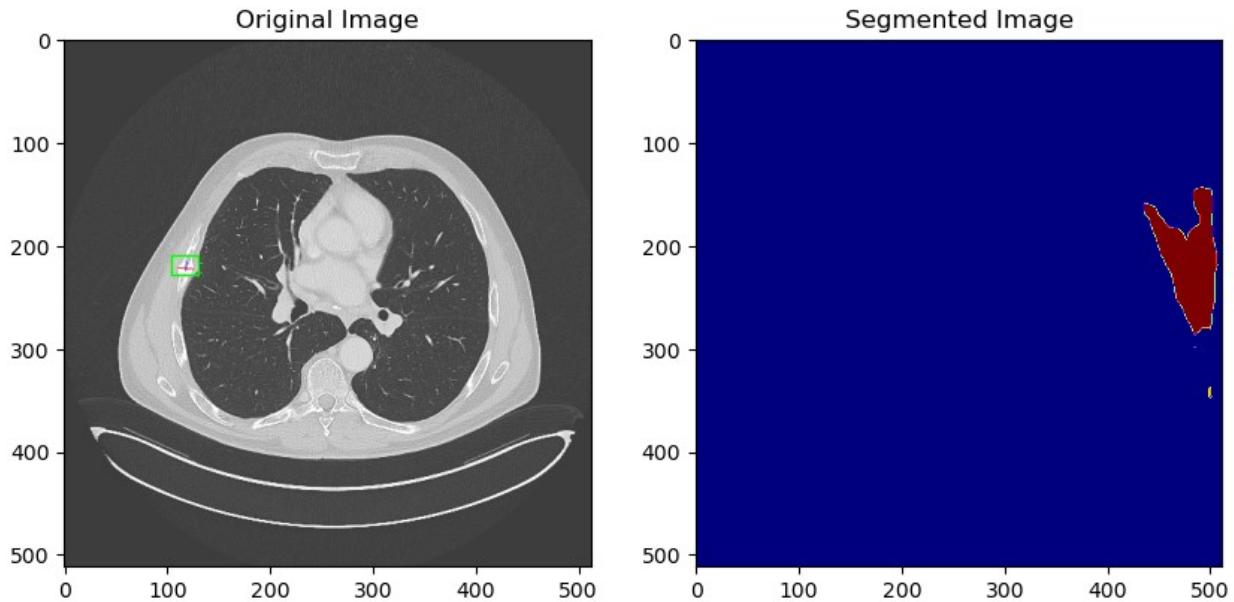


Image: 000328\_08\_03\_172.png  
Class 0: 99.83%  
Class 11: 0.17%

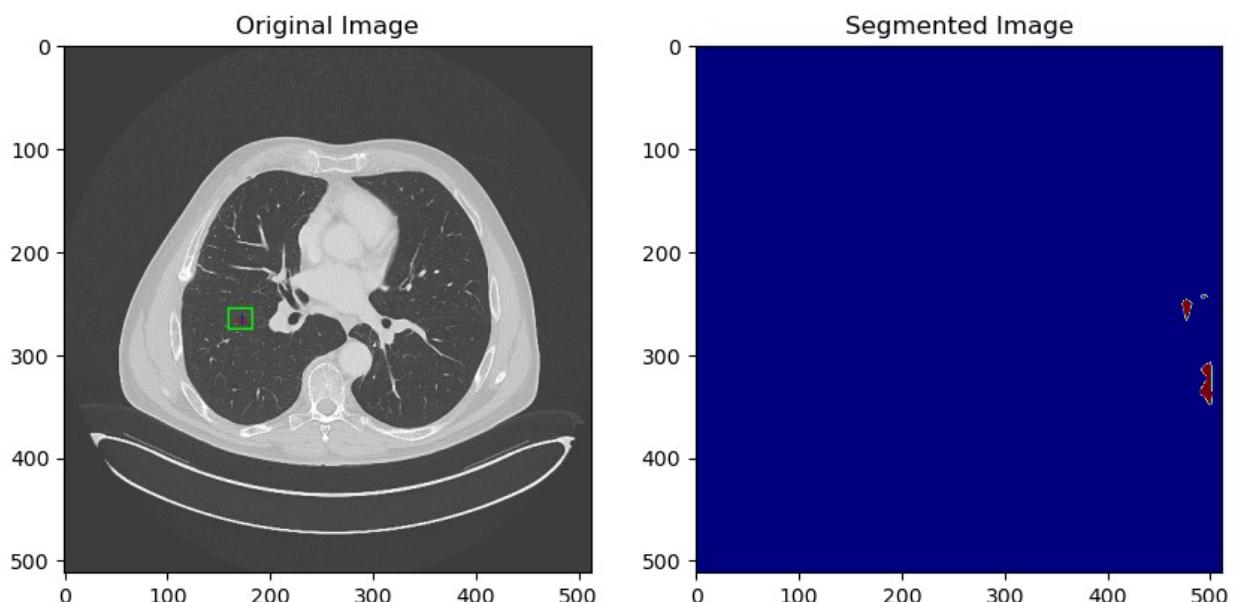


Image: 000328\_08\_03\_180.png  
Class 0: 96.83%  
Class 8: 3.12%  
Class 14: 0.05%

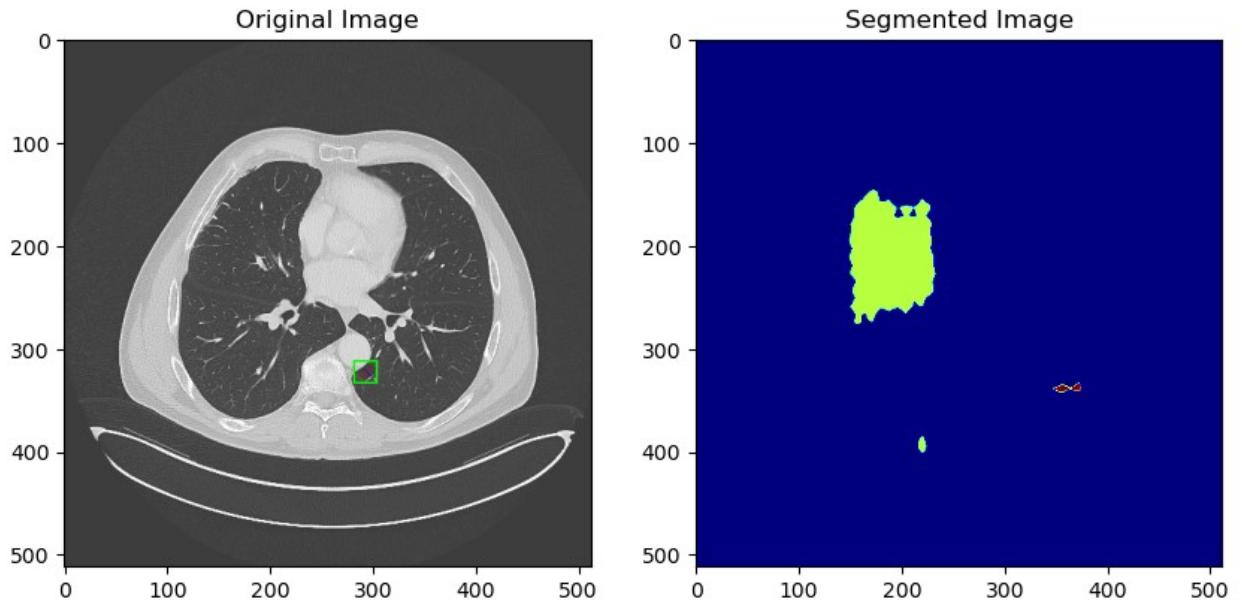


Image: 000569\_08\_01\_020.png  
Class 0: 99.80%  
Class 10: 0.20%

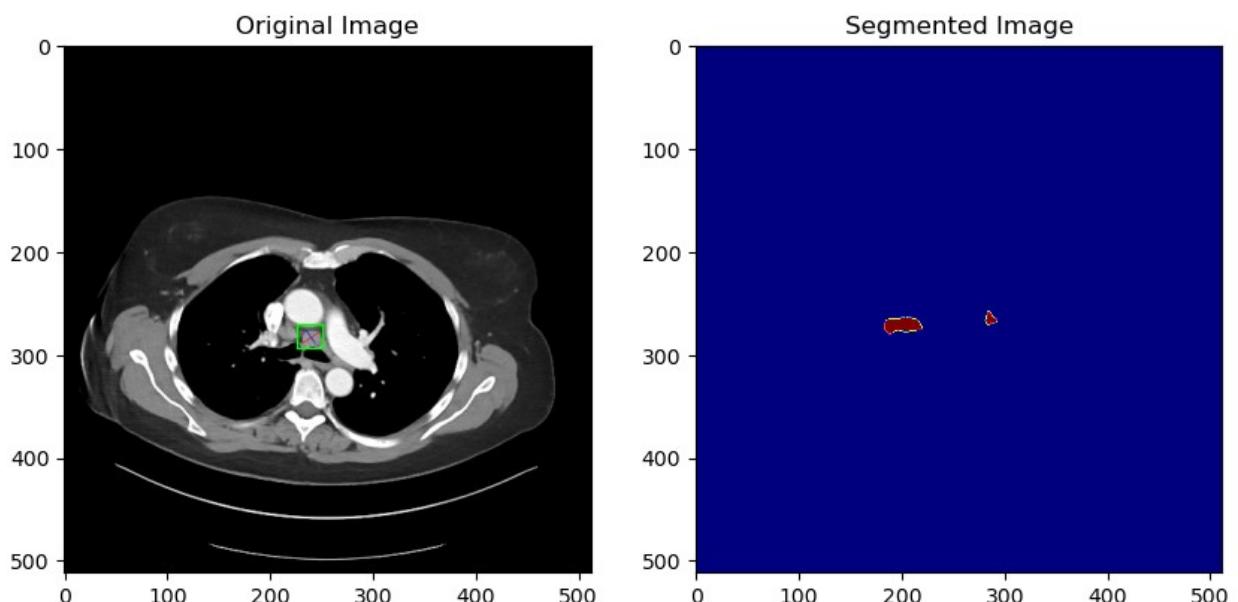


Image: 000747\_03\_03\_172.png  
Class 0: 99.86%  
Class 8: 0.14%

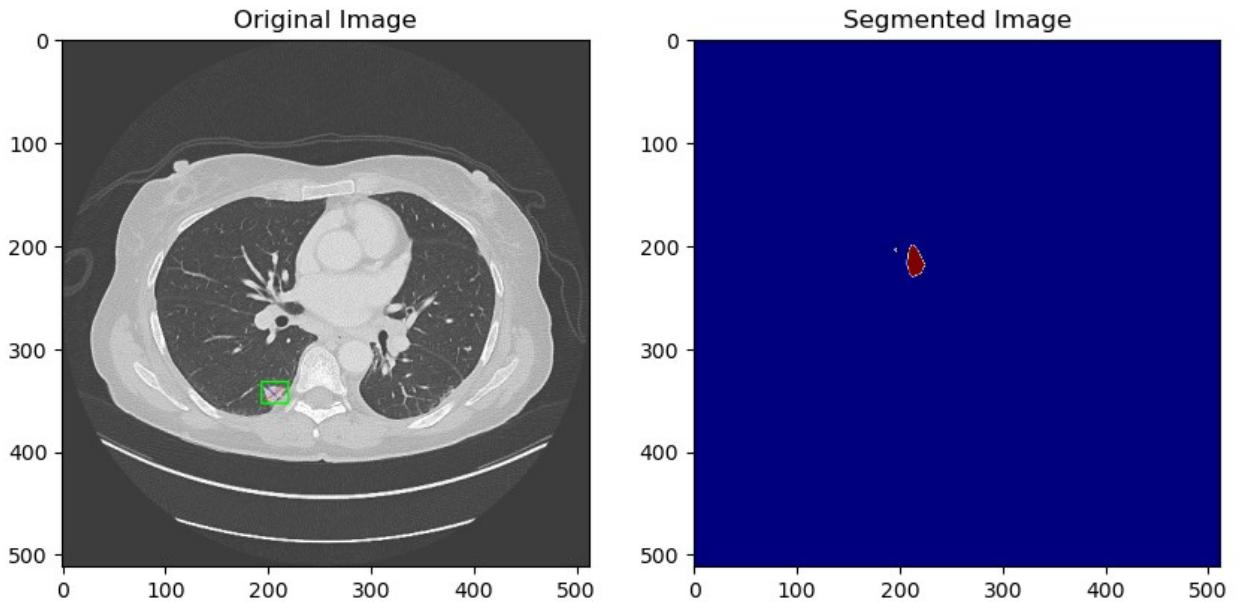


Image: 000749\_03\_02\_108.png  
Class 0: 99.97%  
Class 8: 0.03%

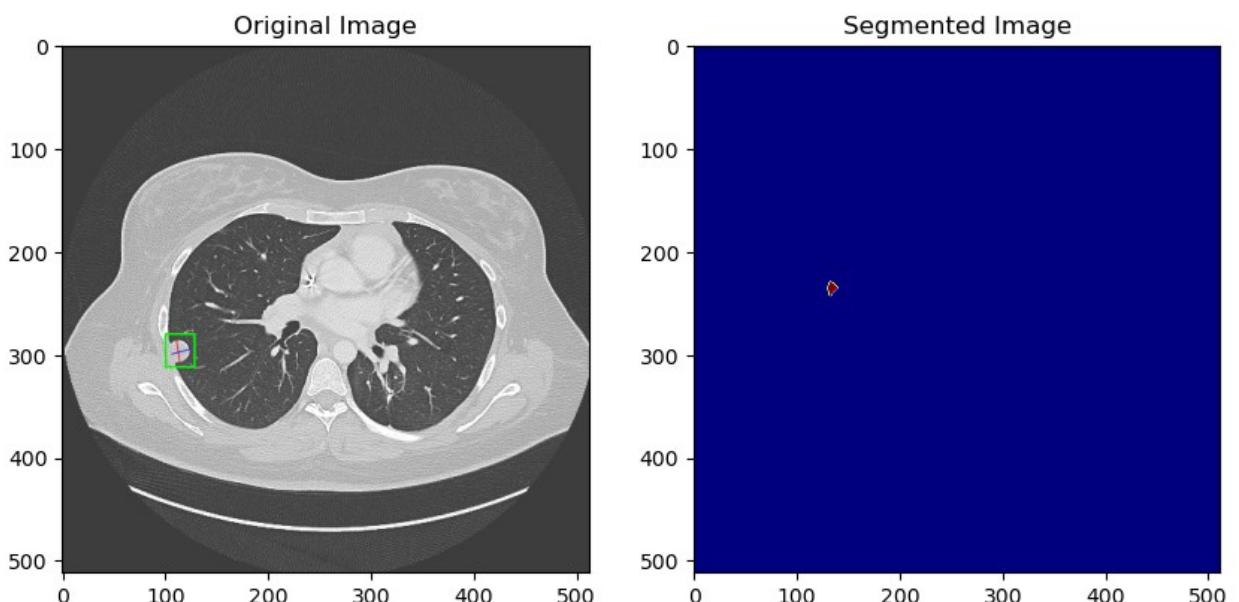


Image: 000874\_03\_02\_219.png  
Class 0: 83.28%  
Class 11: 16.72%

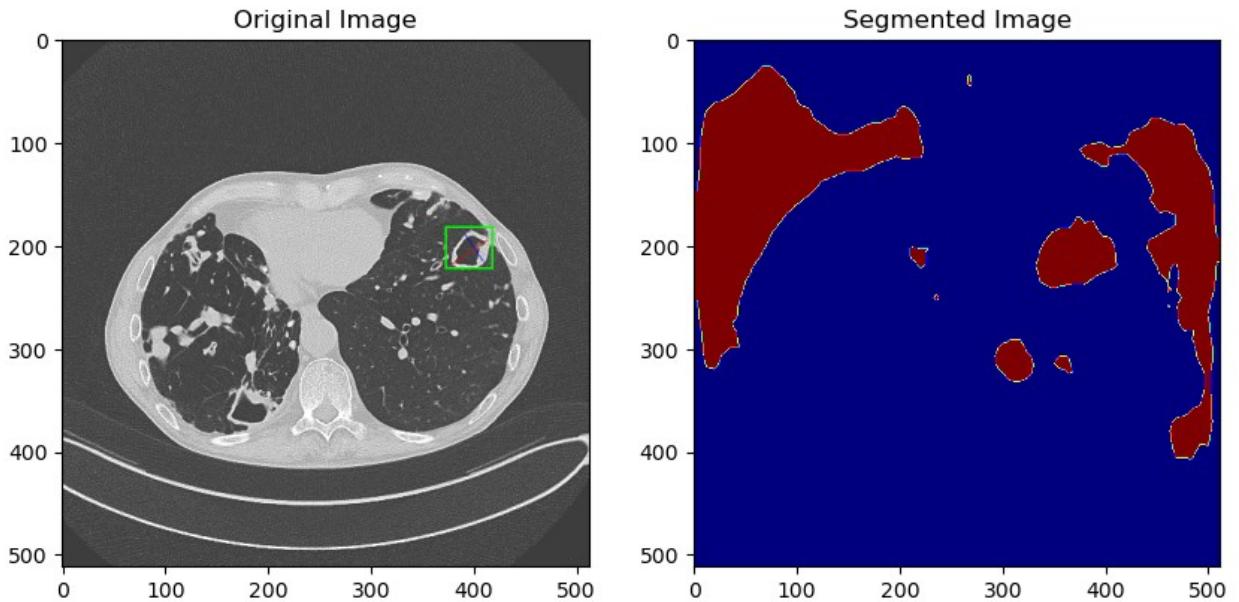


Image: 001083\_09\_01\_093.png

Class 0: 95.53%

Class 3: 4.47%

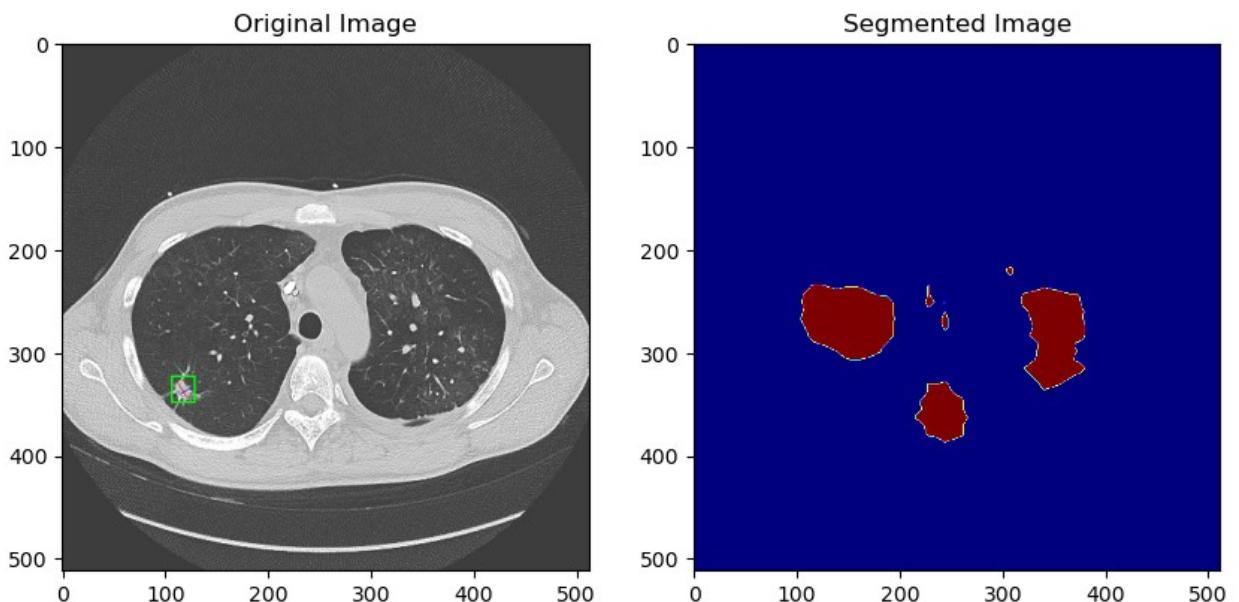


Image: 001230\_03\_02\_148.png

Class 0: 89.94%

Class 14: 10.06%

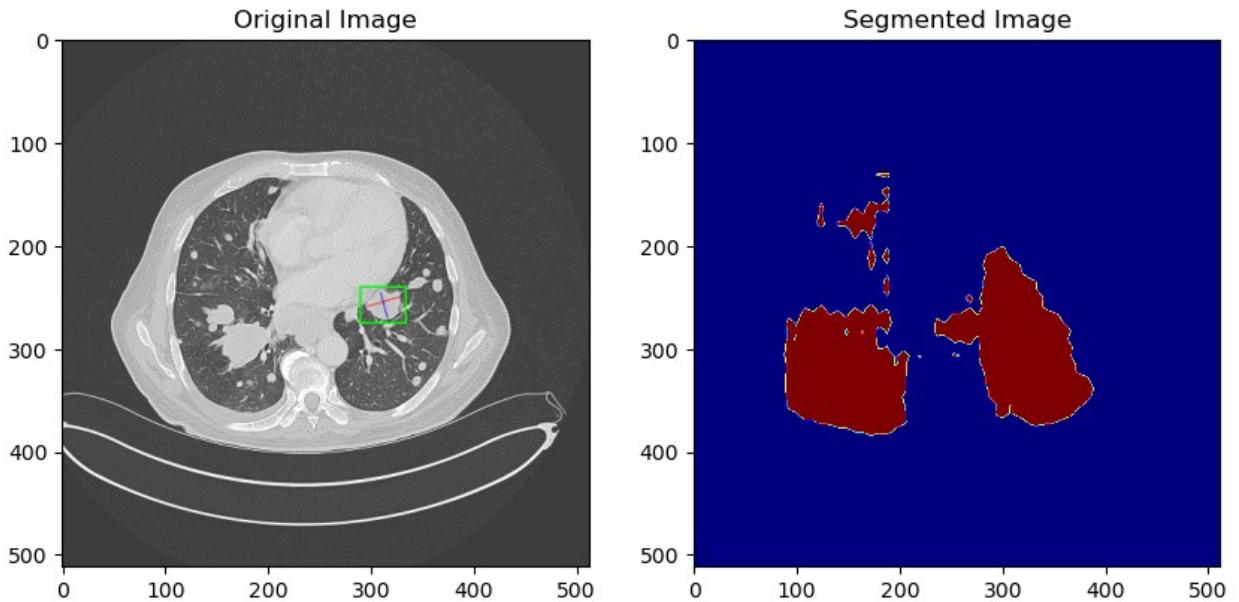


Image: 001337\_01\_02\_176.png

Class 0: 99.99%

Class 16: 0.01%

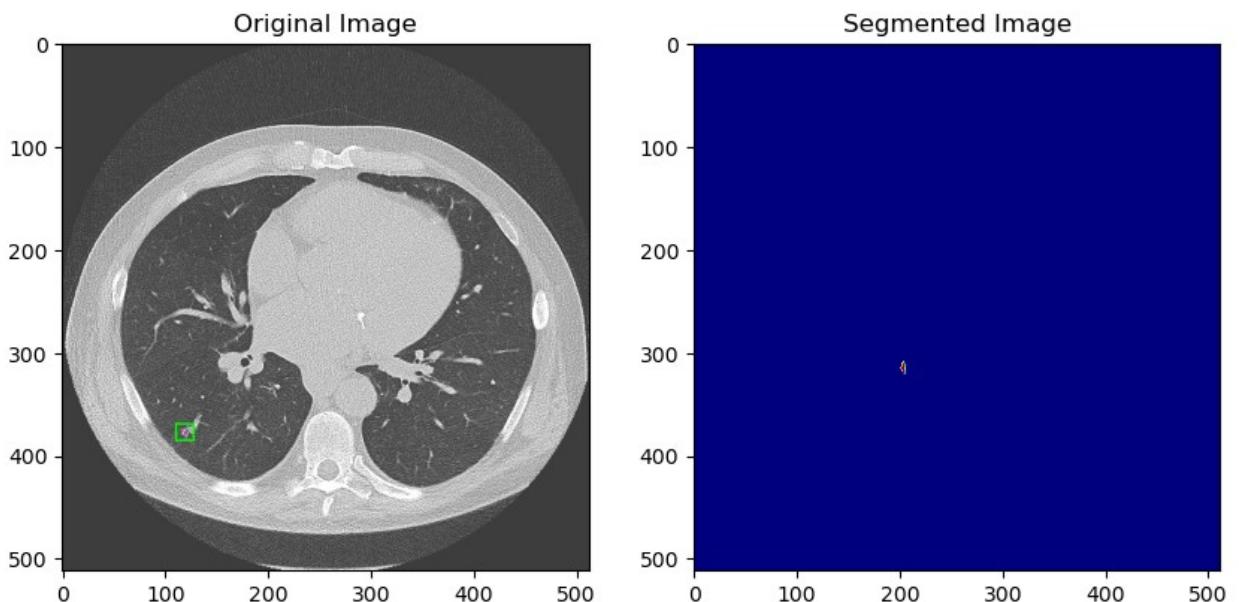


Image: 001404\_01\_01\_139.png

Class 0: 96.50%

Class 11: 3.29%

Class 14: 0.21%

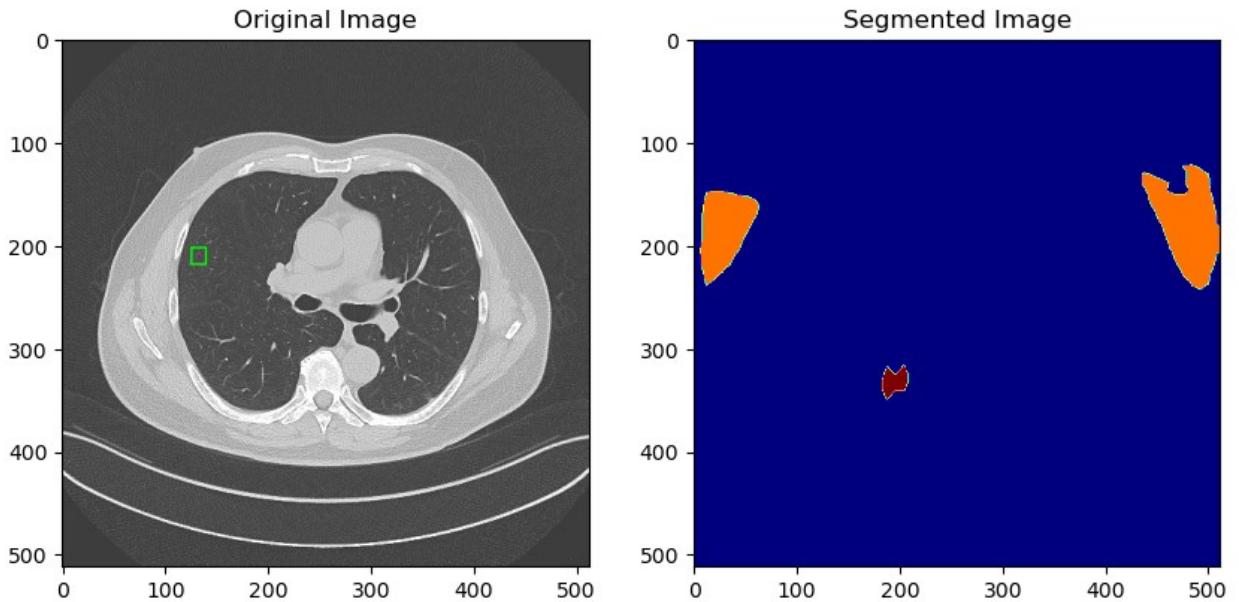


Image: 001574\_13\_01\_090.png  
Class 0: 94.48%  
Class 8: 0.79%  
Class 15: 4.73%

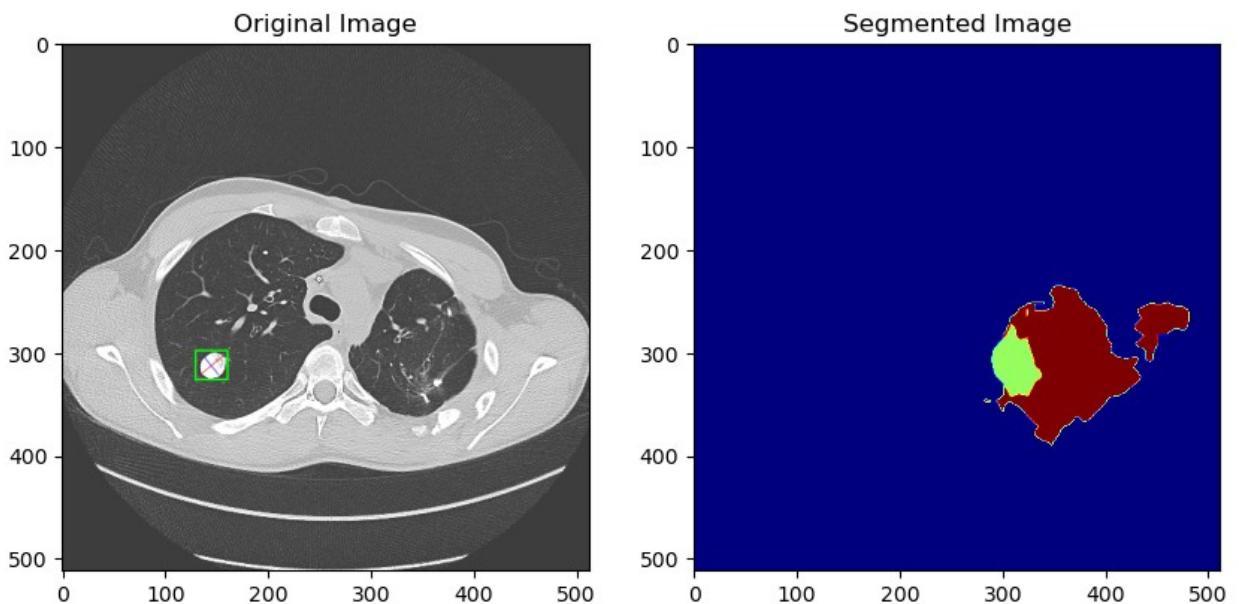


Image: 001598\_15\_02\_231.png  
Class 0: 92.05%  
Class 8: 7.95%

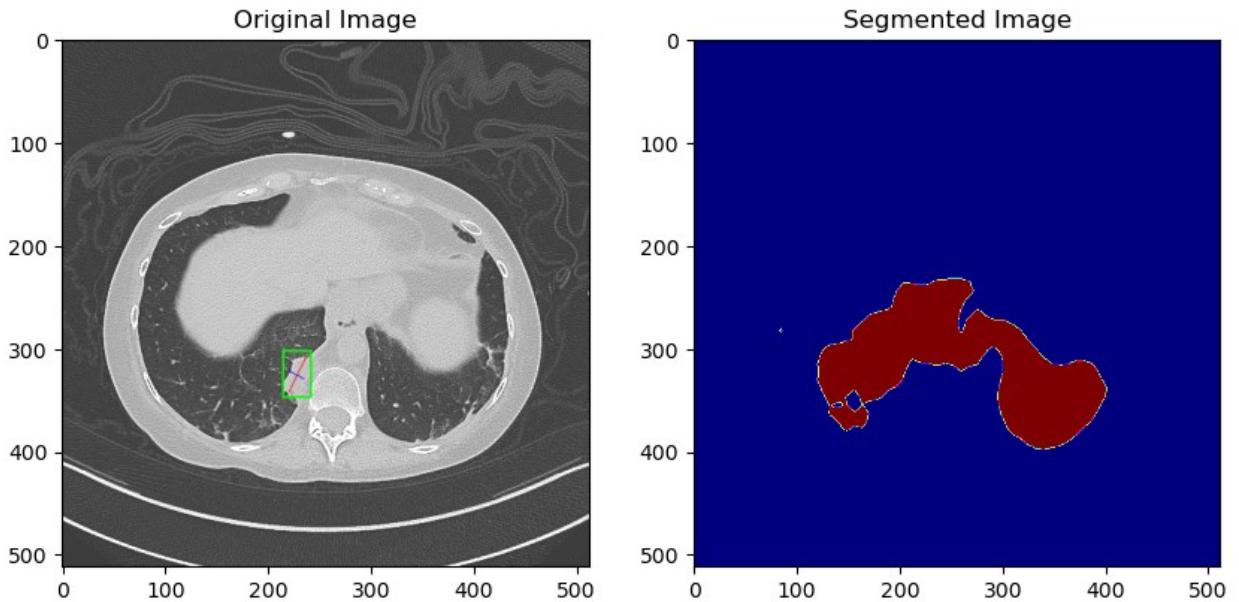


Image: 001797\_01\_02\_221.png  
Class 0: 100.00%

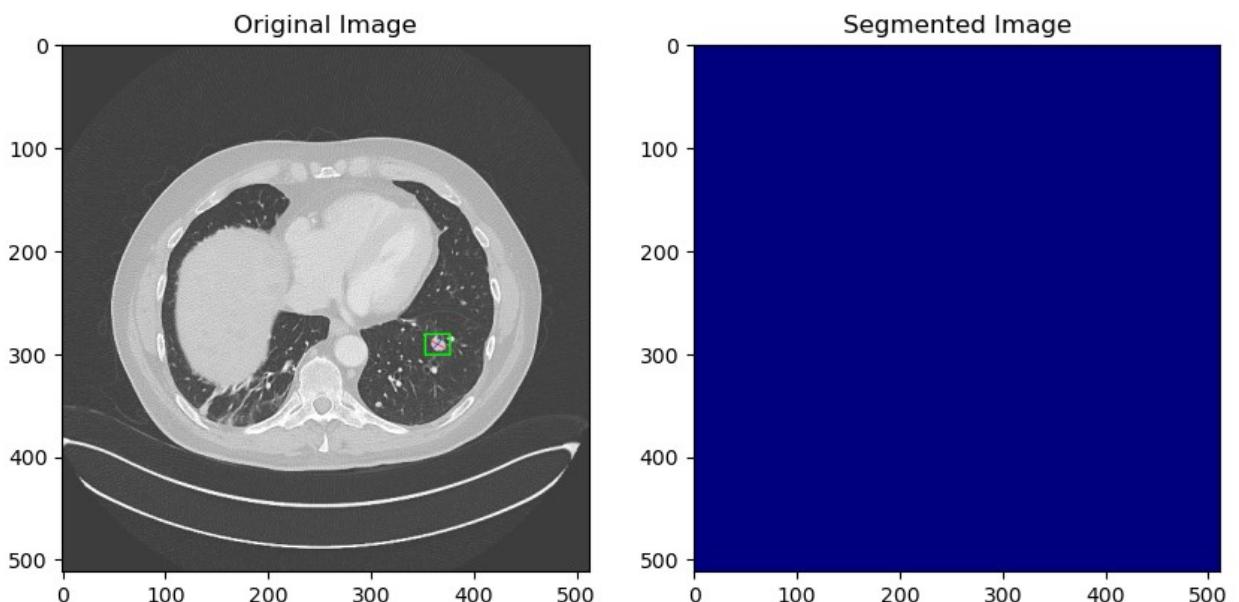


Image: 002124\_02\_02\_251.png  
Class 0: 98.34%  
Class 3: 0.80%  
Class 11: 0.87%

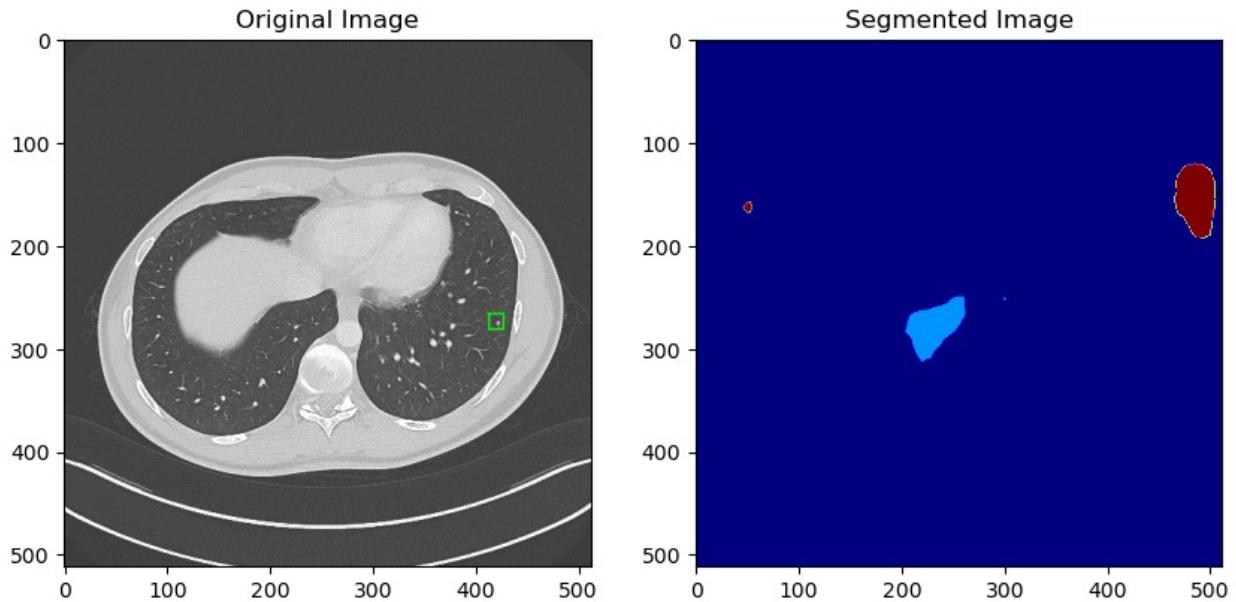


Image: 002241\_02\_03\_218.png

Class 0: 81.29%

Class 11: 18.71%

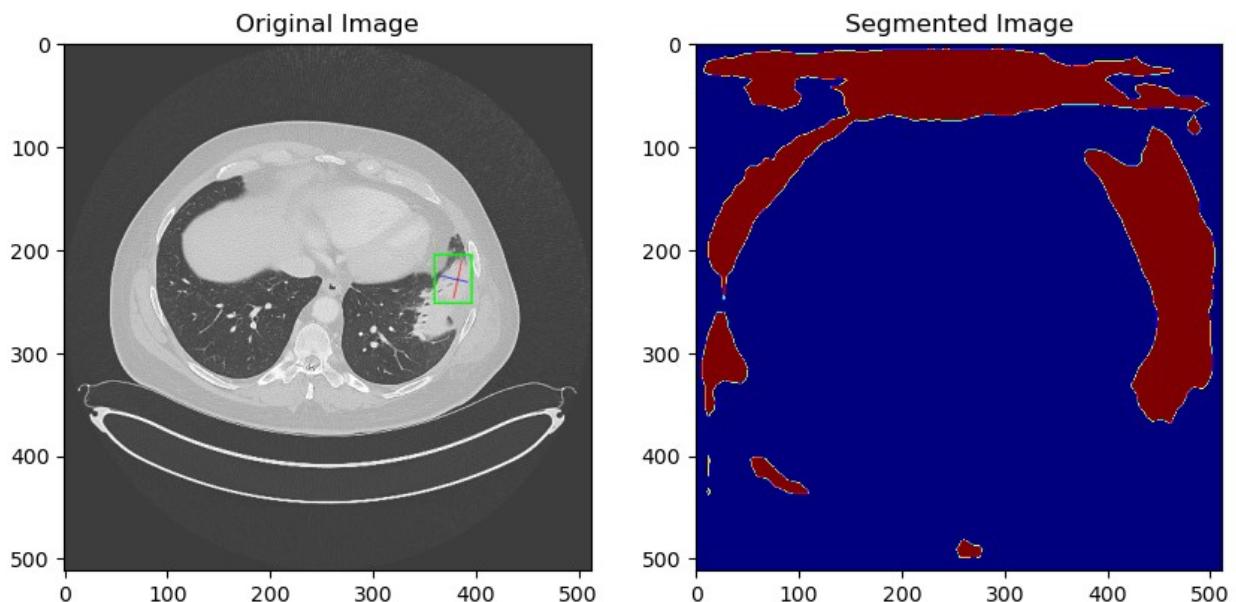


Image: 002265\_01\_01\_016.png

Class 0: 93.22%

Class 3: 6.78%

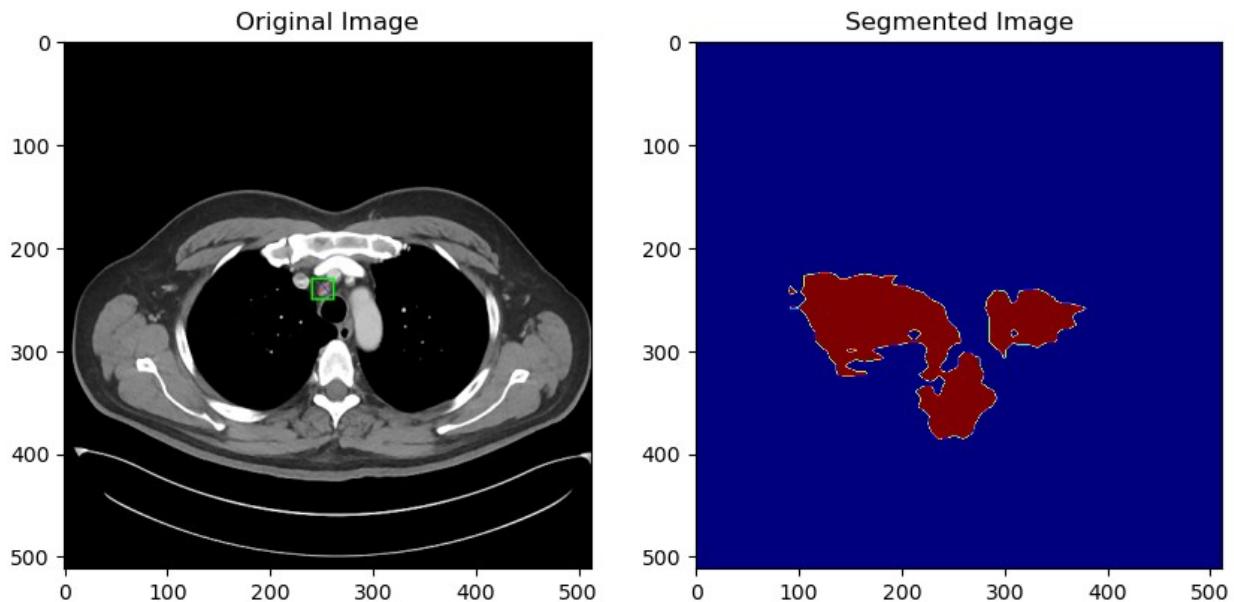


Image: 002265\_02\_01\_031.png  
Class 0: 99.98%  
Class 3: 0.02%

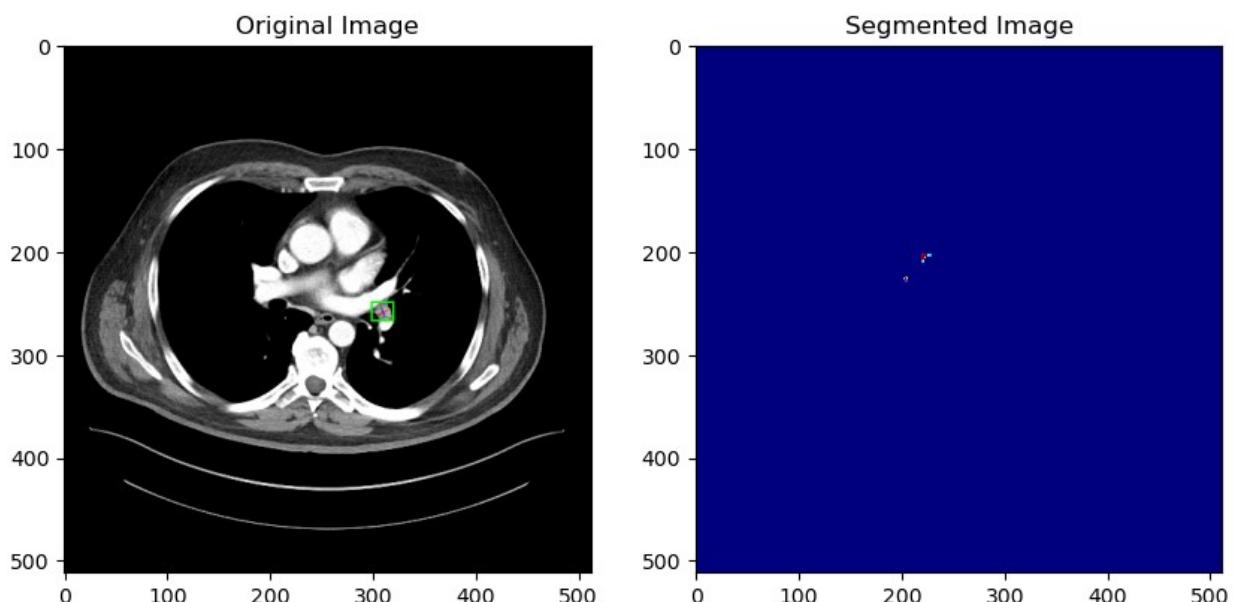


Image: 002276\_05\_03\_078.png  
Class 0: 99.14%  
Class 11: 0.86%

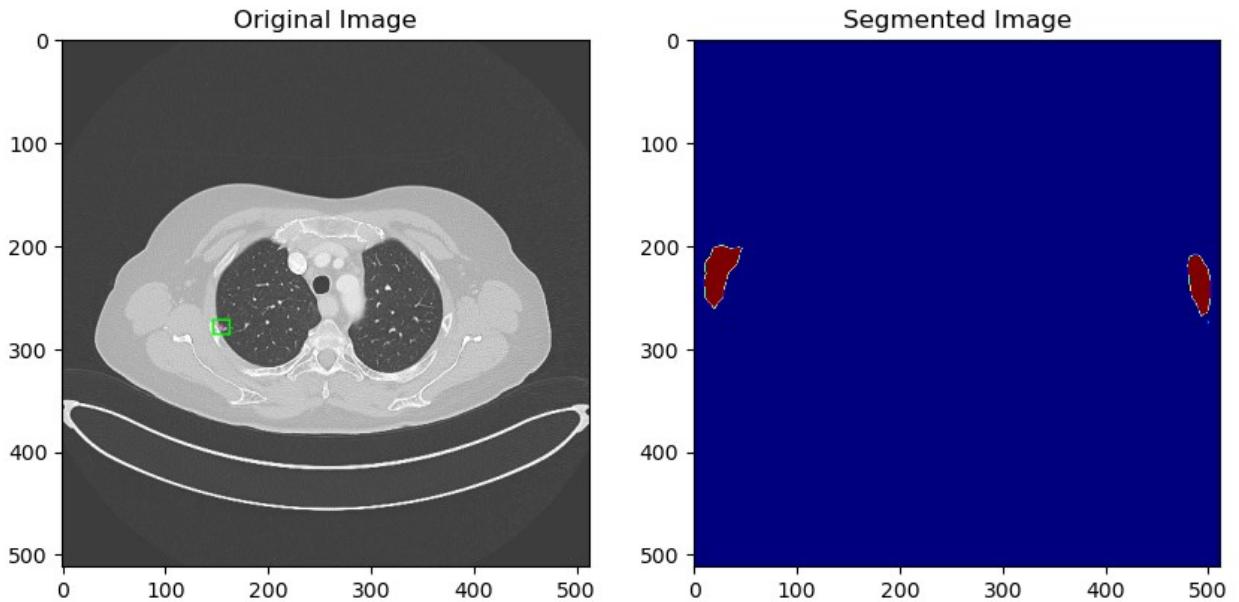


Image: 002408\_01\_01\_161.png  
Class 0: 100.00%

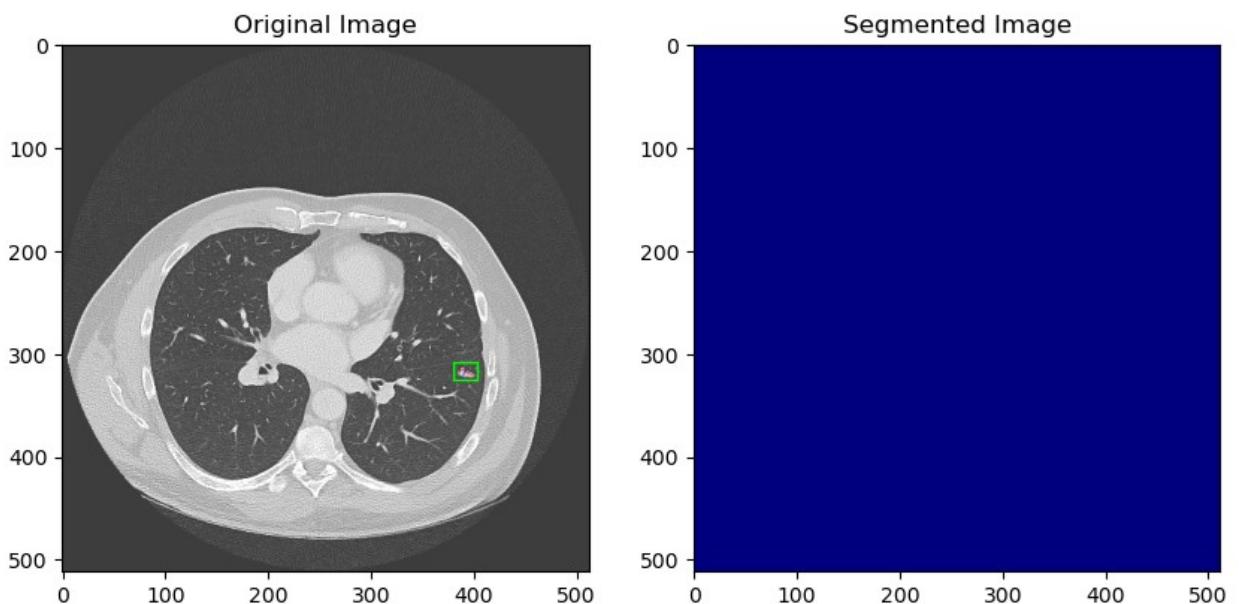


Image: 002435\_04\_01\_230.png  
Class 0: 89.29%  
Class 7: 9.38%  
Class 8: 1.33%

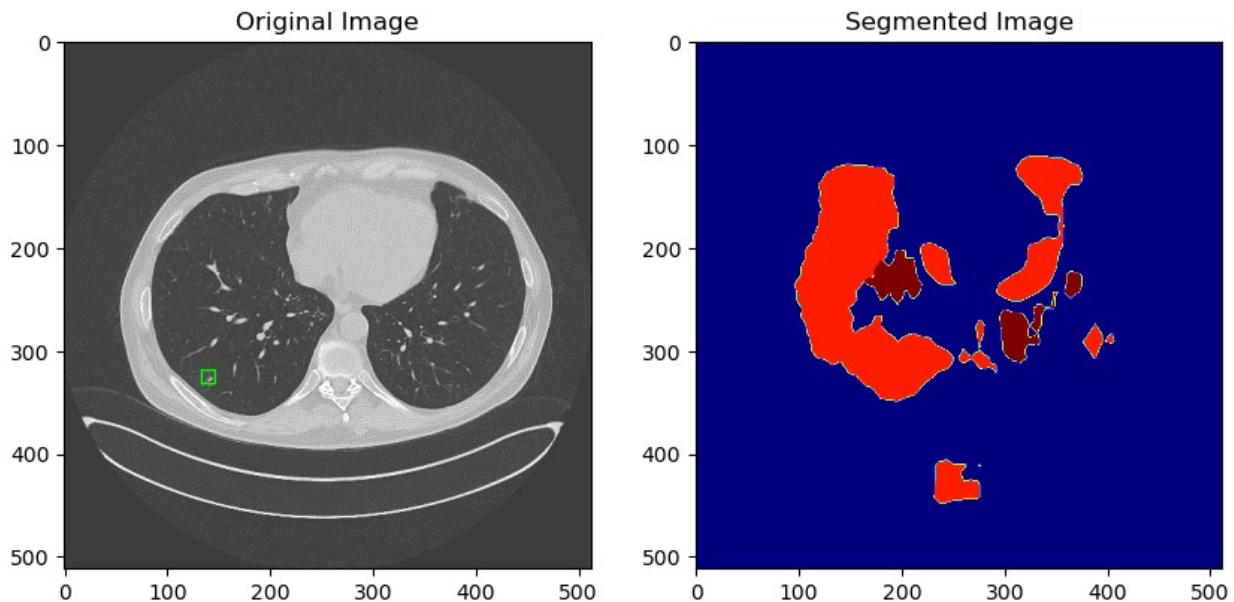


Image: 002463\_01\_01\_029.png

Class 0: 89.19%

Class 3: 10.81%

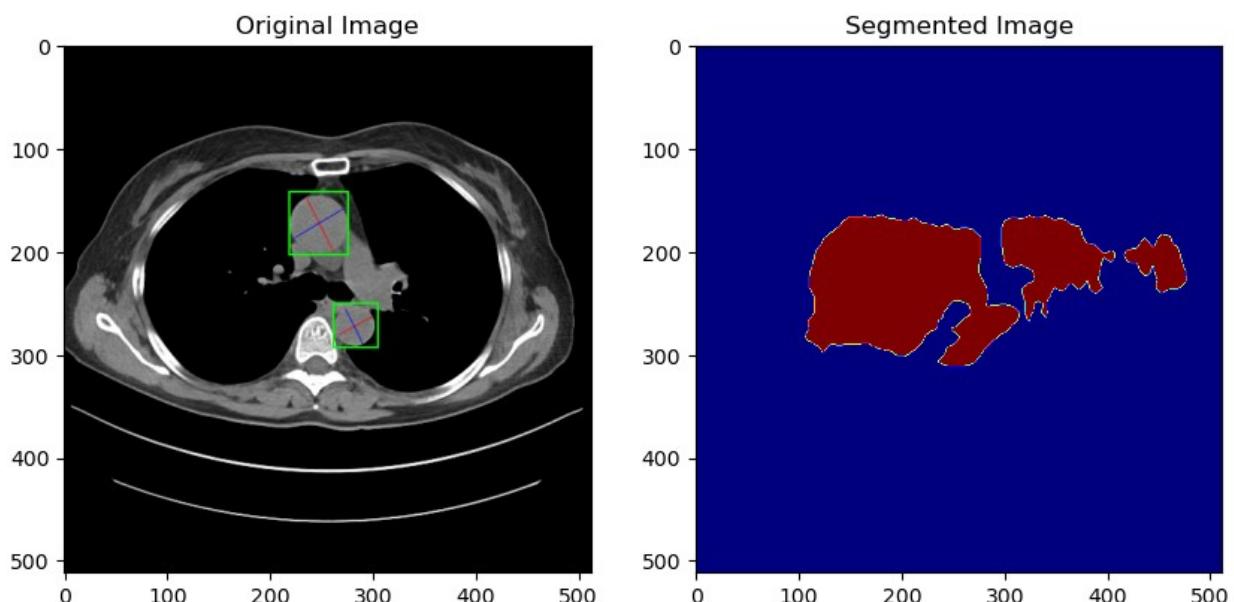


Image: 002601\_01\_01\_237.png

Class 0: 98.81%

Class 11: 1.19%

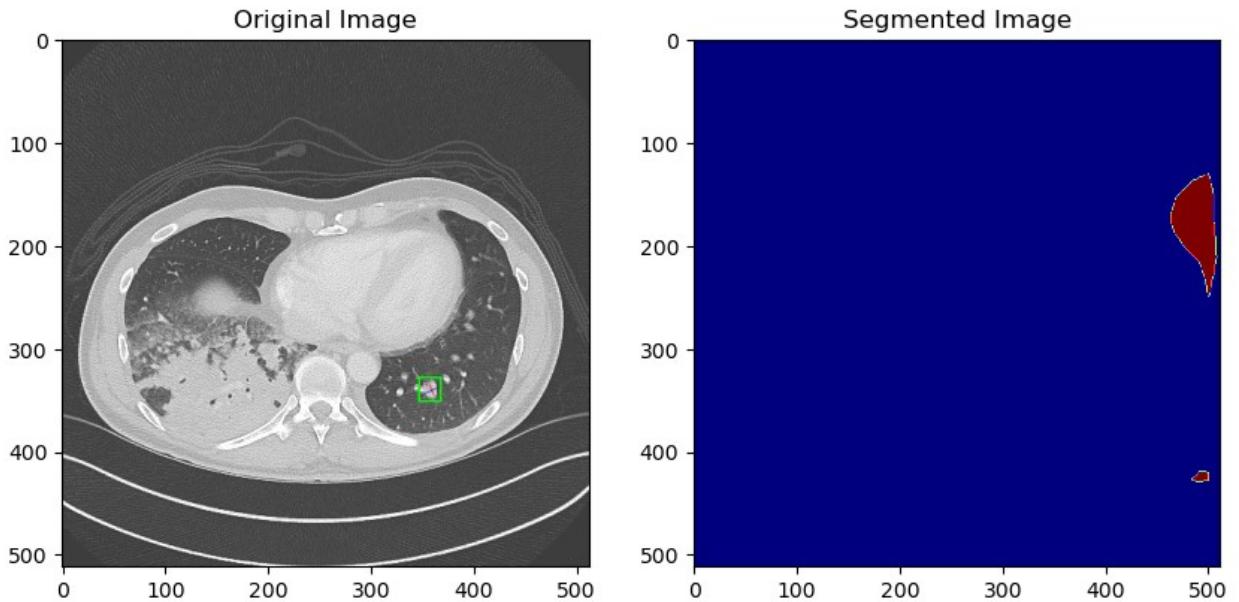


Image: 002639\_05\_01\_141.png  
Class 0: 92.37%  
Class 10: 0.05%  
Class 15: 7.59%

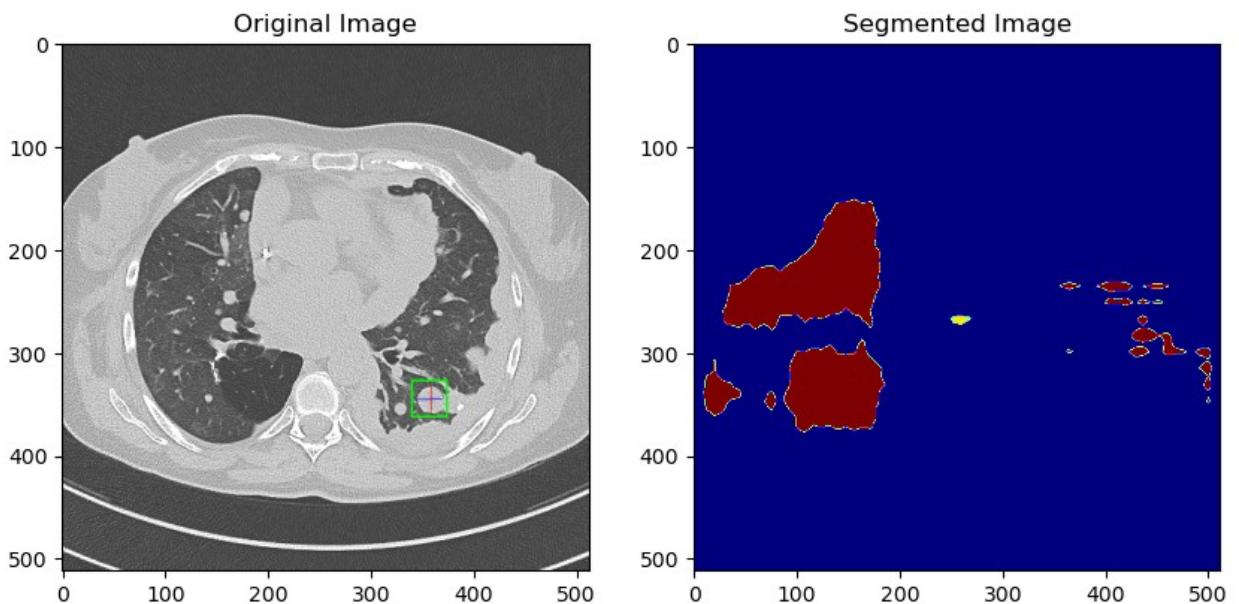


Image: 002701\_04\_03\_160.png  
Class 0: 82.04%  
Class 14: 17.96%

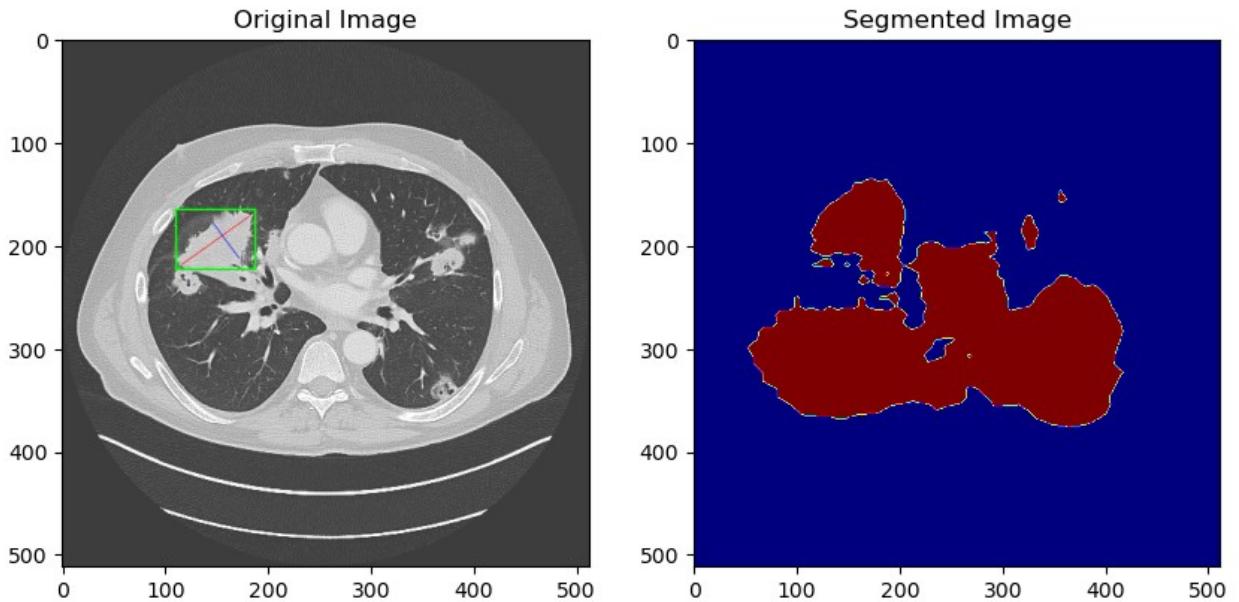


Image: 003038\_05\_01\_063.png  
Class 0: 100.00%

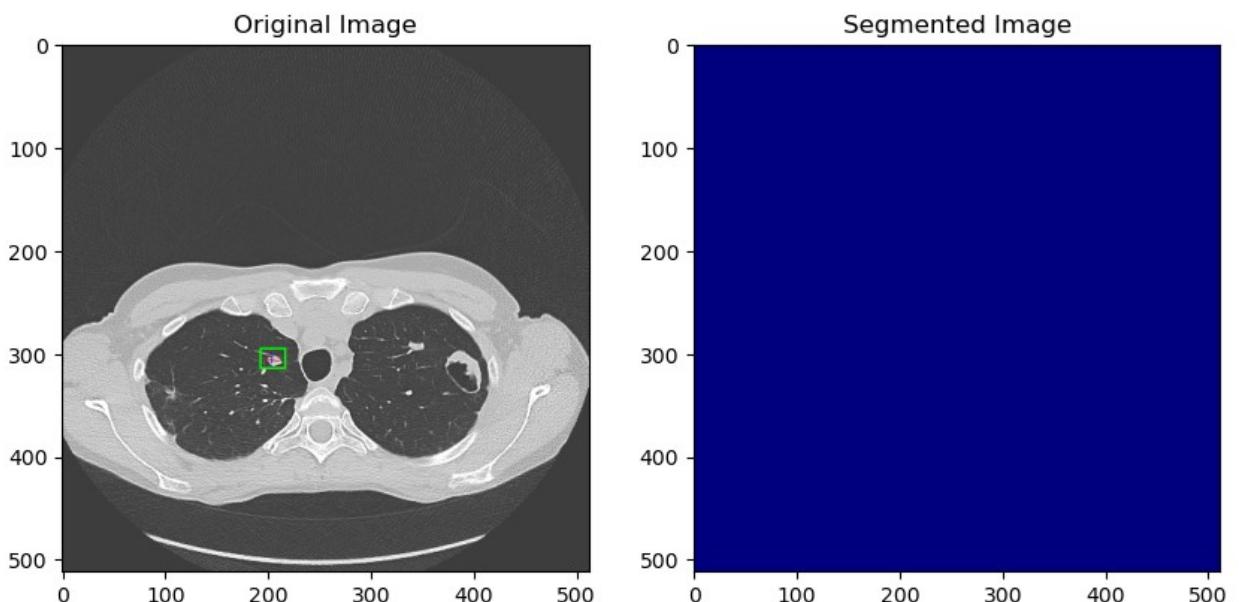


Image: 003311\_02\_01\_028.png  
Class 0: 97.19%  
Class 3: 2.75%  
Class 13: 0.06%

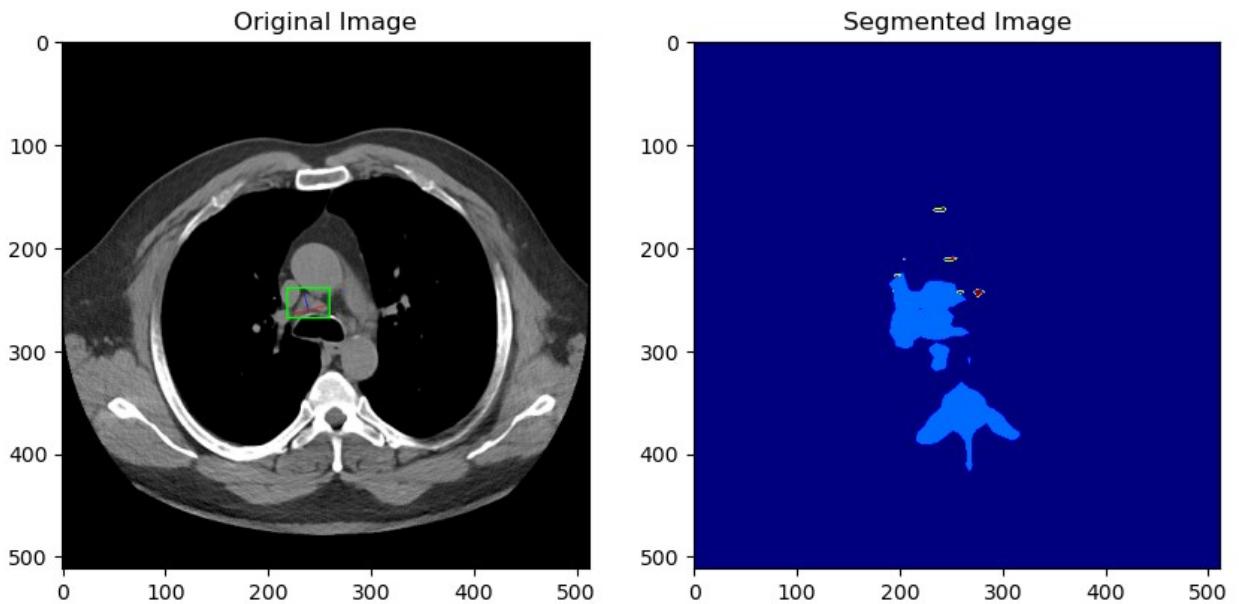


Image: 003380\_03\_01\_140.png  
Class 0: 100.00%

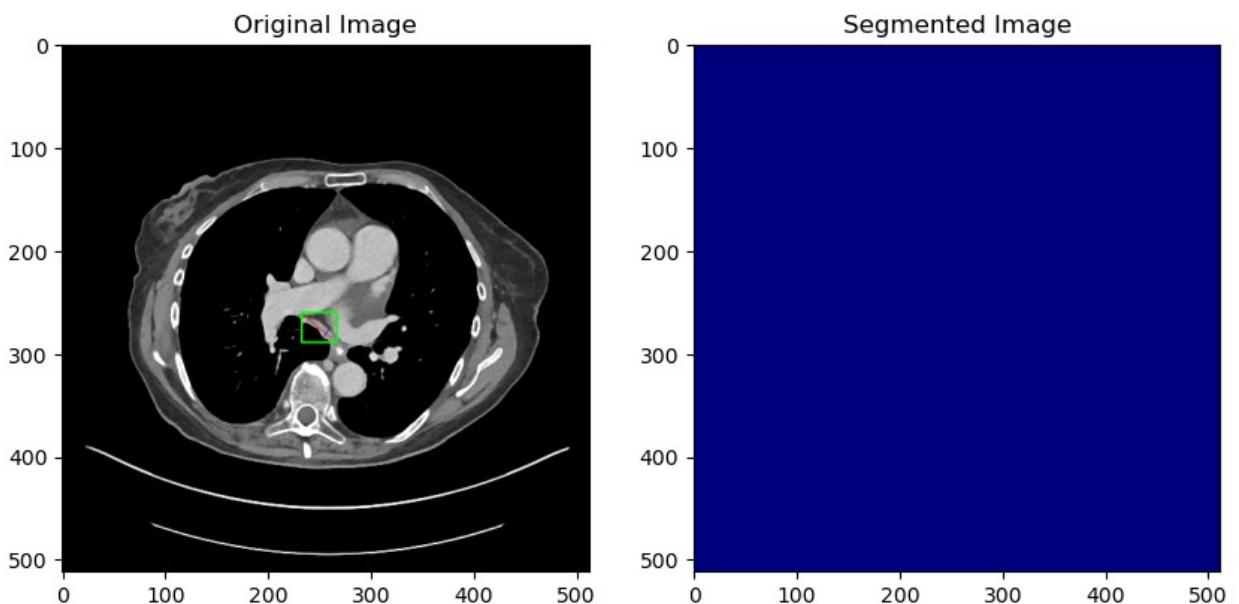


Image: 003412\_03\_01\_108.png  
Class 0: 100.00%

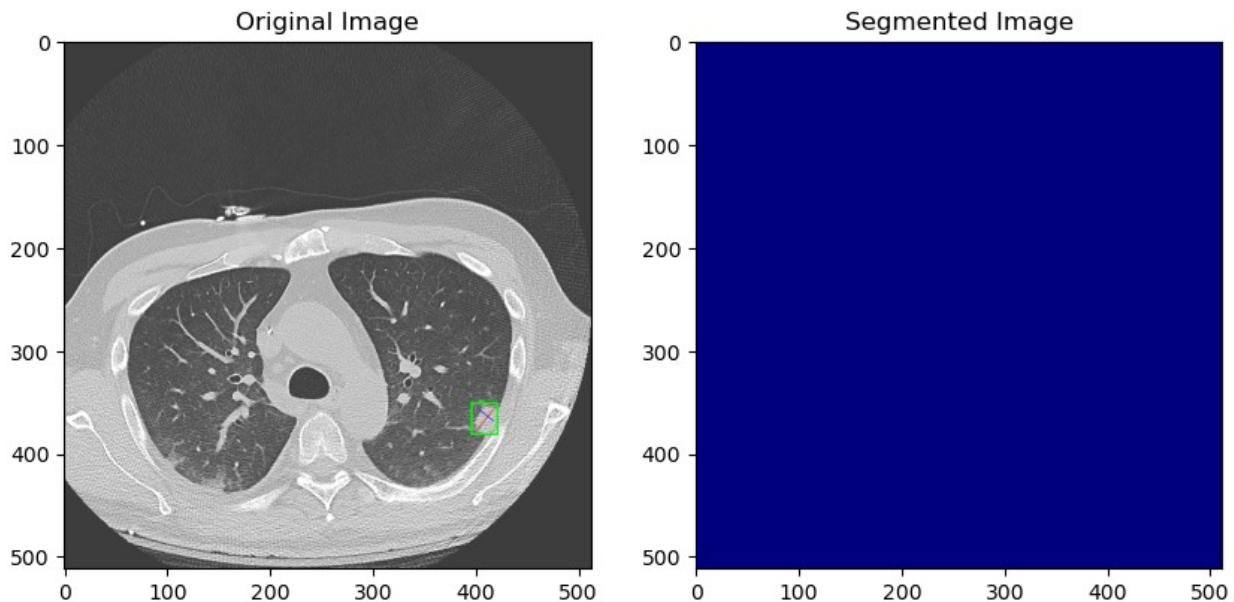


Image: 003601\_02\_01\_076.png  
Class 0: 99.74%  
Class 3: 0.26%

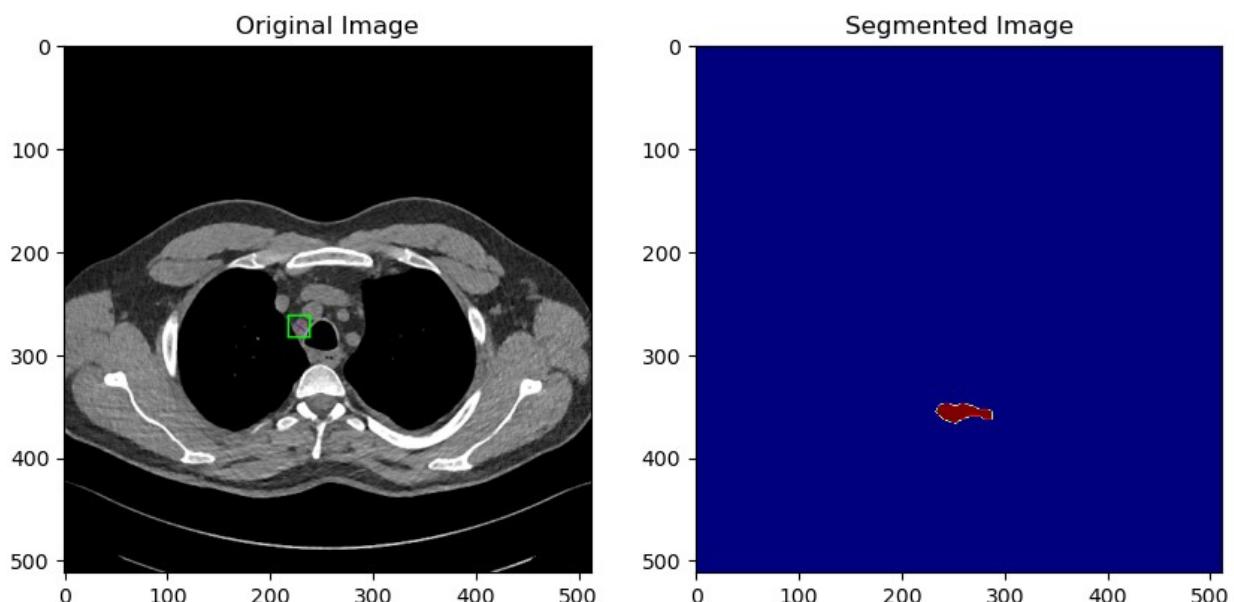
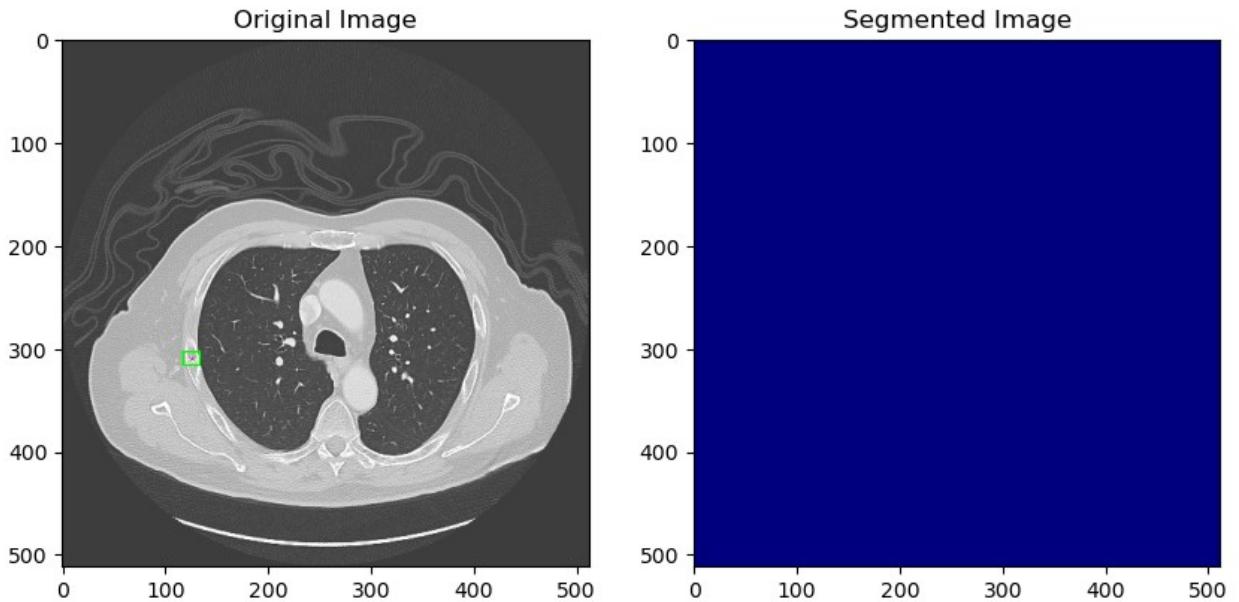


Image: 004085\_01\_02\_107.png  
Class 0: 100.00%



```

import torch
import torchvision.transforms as T
from torchvision.models.segmentation import deeplabv3_resnet50
import cv2
import numpy as np
import os
import pandas as pd

# Load the pre-trained DeepLabV3 model
model = deeplabv3_resnet50(pretrained=True)
model.eval() # Set model to evaluation mode

# Define transformation for input images
transform = T.Compose([
    T.ToPILImage(),
    T.Resize((512, 512)), # Resize to match model input size
    T.ToTensor(),
    T.Normalize(mean=[0.485, 0.456, 0.406], std=[0.229, 0.224, 0.225])
])

# Path to the folder with lung cancer images
image_folder = os.path.expanduser("Test cases")

# Initialize dataset to store results
results = []

def segment_image(image):
    """Segment the given image using DeepLabV3."""
    input_tensor = transform(image).unsqueeze(0) # Add batch dimension
    with torch.no_grad():

```

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        output = model(input_tensor)['out'][0]
        output_predictions = output.argmax(0).numpy() # Convert to NumPy
array
    return output_predictions

def calculate_class_percentages(segmented):
    """Calculate the percentage of each class in the segmented
image."""
    total_pixels = segmented.size
    unique, counts = np.unique(segmented, return_counts=True)
    class_percentages = {int(k): (v / total_pixels) * 100 for k, v in
zip(unique, counts)}
    return class_percentages

# Process all images in the folder
for filename in os.listdir(image_folder):
    if filename.endswith((".jpg", ".png", ".jpeg")):
        # Load the image
        image_path = os.path.join(image_folder, filename)
        image = cv2.imread(image_path)
        image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)

        # Perform segmentation
        segmented = segment_image(image)

        # Calculate class-wise percentages
        percentages = calculate_class_percentages(segmented)

        # Store results for this image
        result = {"Filename": filename}
        result.update(percentages) # Add class percentages to the
result
        results.append(result)

        # Display progress (optional)
        print(f"Processed: {filename} | Class Percentages:
{percentages}")

# Create a DataFrame from the results and save as CSV
df = pd.DataFrame(results).fillna(0) # Fill NaNs with 0 for missing
classes
csv_path =
os.path.expanduser("~/Downloads/lung_cancer_class_percentages.csv")
df.to_csv(csv_path, index=False)
print(f"\nDataset saved to: {csv_path}")

C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\
_utils.py:208: UserWarning: The parameter 'pretrained' is deprecated
since 0.13 and may be removed in the future, please use 'weights'
instead.

```

```
    warnings.warn(  
C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\  
_utils.py:223: UserWarning: Arguments other than a weight enum or  
`None` for 'weights' are deprecated since 0.13 and may be removed in  
the future. The current behavior is equivalent to passing  
`weights=DeepLabV3_ResNet50_Weights.COCO_WITH_VOC_LABELS_V1`. You can  
also use `weights=DeepLabV3_ResNet50_Weights.DEFAULT` to get the most  
up-to-date weights.  
    warnings.warn(msg)  
  
Processed: 000001_03_01_088.png | Class Percentages: {0: 100.0}  
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Processed: 000058_07_01_170.png | Class Percentages: {0: 100.0}
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Processed: 000103_09_01_019.png | Class Percentages: {0:
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```
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```

```
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Processed: 001598_15_02_231.png | Class Percentages: {0: 92.05245971679688, 8: 7.947540283203125}
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Processed: 002241_02_03_218.png | Class Percentages: {0: 81.28585815429688, 11: 18.714141845703125}
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Processed: 002408_01_01_161.png | Class Percentages: {0: 100.0}
Processed: 002435_04_01_230.png | Class Percentages: {0: 89.2913818359375, 7: 9.375, 8: 1.3336181640625}
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Processed: 003038_05_01_063.png | Class Percentages: {0: 100.0}
Processed: 003311_02_01_028.png | Class Percentages: {0: 97.19467163085938, 3: 2.7496337890625, 13: 0.055694580078125}
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Processed: 003412_03_01_108.png | Class Percentages: {0: 100.0}
Processed: 003601_02_01_076.png | Class Percentages: {0: 99.73793029785156, 3: 0.2620697021484375}
Processed: 004085_01_02_107.png | Class Percentages: {0: 100.0}
```

Dataset saved to:

C:\Users\Medhavi\Downloads\lung\_cancer\_class\_percentages.csv

```

import torch
import torchvision.transforms as T
from torchvision.models.segmentation import deeplabv3_resnet50
import cv2
import numpy as np
import os
import pandas as pd

# Load the pre-trained DeepLabV3 model
model = deeplabv3_resnet50(pretrained=True)
model.eval() # Set model to evaluation mode

# Define transformation for input images
transform = T.Compose([
    T.ToPILImage(),
    T.Resize((512, 512)), # Resize to match model input size
    T.ToTensor(),
    T.Normalize(mean=[0.485, 0.456, 0.406], std=[0.229, 0.224, 0.225])
])

# Path to the folder with lung cancer images
image_folder = os.path.expanduser("Malignant cases")

# Initialize dataset to store results
results = []

def segment_image(image):
    """Segment the given image using DeepLabV3."""
    input_tensor = transform(image).unsqueeze(0) # Add batch dimension
    with torch.no_grad():
        output = model(input_tensor)['out'][0]
        output_predictions = output.argmax(0).numpy() # Convert to NumPy array
    return output_predictions

def calculate_class_percentages(segmented):
    """Calculate the percentage of each class in the segmented image."""
    total_pixels = segmented.size
    unique, counts = np.unique(segmented, return_counts=True)
    class_percentages = {int(k): (v / total_pixels) * 100 for k, v in zip(unique, counts)}
    return class_percentages

# Process all images in the folder
for filename in os.listdir(image_folder):
    if filename.endswith((".jpg", ".png", ".jpeg")):
        # Load the image
        image_path = os.path.join(image_folder, filename)

```

```

image = cv2.imread(image_path)
image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)

# Perform segmentation
segmented = segment_image(image)

# Calculate class-wise percentages
percentages = calculate_class_percentages(segmented)

# Store results for this image
result = {"Filename": filename}
result.update(percentages) # Add class percentages to the
result
results.append(result)

# Display progress (optional)
print(f"Processed: {filename} | Class Percentages: {percentages}")

# Create a DataFrame from the results and save as CSV
df = pd.DataFrame(results).fillna(0) # Fill NaNs with 0 for missing
classes
csv_path =
os.path.expanduser("~/Downloads/lung_cancer_class_percentages1.csv")
df.to_csv(csv_path, index=False)
print(f"\nDataset saved to: {csv_path}")

C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\
_utils.py:208: UserWarning: The parameter 'pretrained' is deprecated
since 0.13 and may be removed in the future, please use 'weights'
instead.
    warnings.warn(
C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\
_utils.py:223: UserWarning: Arguments other than a weight enum or
`None` for 'weights' are deprecated since 0.13 and may be removed in
the future. The current behavior is equivalent to passing
`weights=DeepLabV3_ResNet50_Weights.COCO_WITH_VOC_LABELS_V1`. You can
also use `weights=DeepLabV3_ResNet50_Weights.DEFAULT` to get the most
up-to-date weights.
    warnings.warn(msg)

Processed: Malignant case (1).jpg | Class Percentages: {0: 6.5097808837890625, 11: 93.49021911621094}
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Processed: Malignant case (101).jpg | Class Percentages: {0: 100.0}
Processed: Malignant case (102).jpg | Class Percentages: {0: 98.93951416015625, 15: 1.06048583984375}

```

```
Processed: Malignant case (103).jpg | Class Percentages: {0: 99.99732971191406, 15: 0.0026702880859375}
Processed: Malignant case (104).jpg | Class Percentages: {0: 100.0}
Processed: Malignant case (105).jpg | Class Percentages: {0: 98.14109802246094, 8: 1.8589019775390625}
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Processed: Malignant case (107).jpg | Class Percentages: {0: 98.17619323730469, 8: 0.9822845458984375, 15: 0.841522216796875}
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Processed: Malignant case (110).jpg | Class Percentages: {0: 36.273193359375, 11: 63.726806640625}
Processed: Malignant case (111).jpg | Class Percentages: {0: 38.42926025390625, 11: 61.57073974609375}
Processed: Malignant case (112).jpg | Class Percentages: {0: 49.839019775390625, 11: 50.160980224609375}
Processed: Malignant case (113).jpg | Class Percentages: {0: 82.82051086425781, 11: 17.179489135742188}
Processed: Malignant case (114).jpg | Class Percentages: {0: 83.60214233398438, 11: 16.397857666015625}
Processed: Malignant case (115).jpg | Class Percentages: {0: 59.51080322265625, 11: 40.48919677734375}
Processed: Malignant case (116).jpg | Class Percentages: {0: 67.71888732910156, 11: 32.28111267089844}
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Processed: Malignant case (118).jpg | Class Percentages: {0: 99.94544982910156, 11: 0.037384033203125, 15: 0.0171661376953125}
Processed: Malignant case (119).jpg | Class Percentages: {0: 98.94828796386719, 11: 1.0517120361328125}
Processed: Malignant case (12).jpg | Class Percentages: {0: 99.52926635742188, 11: 0.470733642578125}
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Processed: Malignant case (124).jpg | Class Percentages: {0: 1.0288238525390625, 11: 98.97117614746094}
Processed: Malignant case (125).jpg | Class Percentages: {0: 2.5226593017578125, 11: 97.47734069824219}
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Processed: Malignant case (126).jpg | Class Percentages: {0: 4.2774200439453125, 11: 95.72257995605469}
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Processed: Malignant case (128).jpg | Class Percentages: {0: 8.47930908203125, 11: 91.52069091796875}
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Processed: Malignant case (131).jpg | Class Percentages: {0: 83.40301513671875, 11: 16.59698486328125}
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Processed: Malignant case (143).jpg | Class Percentages: {0: 84.09309387207031, 11: 15.906906127929688}
Processed: Malignant case (144).jpg | Class Percentages: {0: 51.49421691894531, 11: 48.50578308105469}
Processed: Malignant case (145).jpg | Class Percentages: {0: 8.386611938476562, 11: 91.61338806152344}
Processed: Malignant case (146).jpg | Class Percentages: {0: 87.060546875, 11: 12.939453125}
Processed: Malignant case (147).jpg | Class Percentages: {0: 70.33233642578125, 11: 29.66766357421875}
Processed: Malignant case (148).jpg | Class Percentages: {0:
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Processed: Malignant case (186).jpg | Class Percentages: {0: 82.76023864746094, 11: 17.239761352539062}
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Processed: Malignant case (189).jpg | Class Percentages: {0: 100.0}
Processed: Malignant case (19).jpg | Class Percentages: {0: 55.43174743652344, 15: 44.56825256347656}
Processed: Malignant case (190).jpg | Class Percentages: {0: 100.0}
Processed: Malignant case (191).jpg | Class Percentages: {0: 99.69520568847656, 8: 0.171661376953125, 11: 0.1331329345703125}
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Processed: Malignant case (193).jpg | Class Percentages: {0: 100.0}
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Processed: Malignant case (208).jpg | Class Percentages: {0: 100.0}
Processed: Malignant case (209).jpg | Class Percentages: {0: 100.0}
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Processed: Malignant case (238).jpg | Class Percentages: {0: 100.0}
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```

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Processed: Malignant case (87).jpg | Class Percentages: {0: 45.46546936035156, 11: 54.53453063964844}
Processed: Malignant case (88).jpg | Class Percentages: {0: 4.5917510986328125, 11: 95.40824890136719}
Processed: Malignant case (89).jpg | Class Percentages: {0: 98.41156005859375, 15: 1.58843994140625}
Processed: Malignant case (9).jpg | Class Percentages: {0: 31.454086303710938, 11: 37.908172607421875, 14: 30.637741088867188}
Processed: Malignant case (90).jpg | Class Percentages: {0: 99.11422729492188, 11: 0.2254486083984375, 15: 0.6603240966796875}
Processed: Malignant case (91).jpg | Class Percentages: {0: 87.29133605957031, 11: 12.708663940429688}
Processed: Malignant case (92).jpg | Class Percentages: {0: 94.89212036132812, 11: 1.7238616943359375, 15: 3.3840179443359375}
Processed: Malignant case (93).jpg | Class Percentages: {0: 98.18534851074219, 15: 1.8146514892578125}
Processed: Malignant case (94).jpg | Class Percentages: {0: 98.21739196777344, 15: 1.7826080322265625}
Processed: Malignant case (95).jpg | Class Percentages: {0: 99.30801391601562, 20: 0.691986083984375}
Processed: Malignant case (96).jpg | Class Percentages: {0: 100.0}
Processed: Malignant case (97).jpg | Class Percentages: {0: 100.0}
Processed: Malignant case (98).jpg | Class Percentages: {0: 98.16703796386719, 8: 1.3378143310546875, 20: 0.495147705078125}
Processed: Malignant case (99).jpg | Class Percentages: {0: 99.99542236328125, 20: 0.00457763671875}
```

Dataset saved to:

C:\Users\Medhavi\Downloads\lung\_cancer\_class\_percentages1.csv

```
import torch
import torchvision.transforms as T
from torchvision.models.segmentation import deeplabv3_resnet50
import cv2
import numpy as np
import os
import pandas as pd

# Load the pre-trained DeepLabV3 model
model = deeplabv3_resnet50(pretrained=True)
model.eval() # Set model to evaluation mode

# Define transformation for input images
transform = T.Compose([
    T.ToPILImage(),
    T.Resize((512, 512)), # Resize to match model input size
    T.ToTensor(),
    T.Normalize(mean=[0.485, 0.456, 0.406], std=[0.229, 0.224, 0.225])
])
```

```

# Path to the folder with lung cancer images
image_folder = os.path.expanduser("Benign cases")

# Initialize dataset to store results
results = []

def segment_image(image):
    """Segment the given image using DeepLabV3."""
    input_tensor = transform(image).unsqueeze(0) # Add batch dimension
    with torch.no_grad():
        output = model(input_tensor)['out'][0]
        output_predictions = output.argmax(0).numpy() # Convert to NumPy array
    return output_predictions

def calculate_class_percentages(segmented):
    """Calculate the percentage of each class in the segmented image."""
    total_pixels = segmented.size
    unique, counts = np.unique(segmented, return_counts=True)
    class_percentages = {int(k): (v / total_pixels) * 100 for k, v in zip(unique, counts)}
    return class_percentages

# Process all images in the folder
for filename in os.listdir(image_folder):
    if filename.endswith(("jpg", ".png", ".jpeg")):
        # Load the image
        image_path = os.path.join(image_folder, filename)
        image = cv2.imread(image_path)
        image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)

        # Perform segmentation
        segmented = segment_image(image)

        # Calculate class-wise percentages
        percentages = calculate_class_percentages(segmented)

        # Store results for this image
        result = {"Filename": filename}
        result.update(percentages) # Add class percentages to the result
        results.append(result)

        # Display progress (optional)
        print(f"Processed: {filename} | Class Percentages: {percentages}")

# Create a DataFrame from the results and save as CSV

```

```
df = pd.DataFrame(results).fillna(0) # Fill NaNs with 0 for missing
classes
csv_path =
os.path.expanduser("~/Downloads/lung_cancer_class_percentages2.csv")
df.to_csv(csv_path, index=False)
print(f"\nDataset saved to: {csv_path}")

C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\
_utils.py:208: UserWarning: The parameter 'pretrained' is deprecated
since 0.13 and may be removed in the future, please use 'weights'
instead.
    warnings.warn(
C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\
_utils.py:223: UserWarning: Arguments other than a weight enum or
`None` for 'weights' are deprecated since 0.13 and may be removed in
the future. The current behavior is equivalent to passing
`weights=DeepLabV3_ResNet50_Weights.COCO_WITH_VOC_LABELS_V1`. You can
also use `weights=DeepLabV3_ResNet50_Weights.DEFAULT` to get the most
up-to-date weights.
    warnings.warn(msg)

Processed: Benign case (1).jpg | Class Percentages: {0:
89.67514038085938, 11: 9.734344482421875, 15: 0.59051513671875}
Processed: Benign case (10).jpg | Class Percentages: {0:
57.23609924316406, 11: 42.76390075683594}
Processed: Benign case (100).jpg | Class Percentages: {0: 100.0}
Processed: Benign case (101).jpg | Class Percentages: {0:
89.29252624511719, 3: 10.702133178710938, 8: 0.005340576171875}
Processed: Benign case (102).jpg | Class Percentages: {0:
76.26152038574219, 3: 23.738479614257812}
Processed: Benign case (103).jpg | Class Percentages: {0:
92.3553466796875, 15: 7.6446533203125}
Processed: Benign case (104).jpg | Class Percentages: {0:
90.56510925292969, 3: 9.434890747070312}
Processed: Benign case (105).jpg | Class Percentages: {0:
90.56510925292969, 3: 9.434890747070312}
Processed: Benign case (106).jpg | Class Percentages: {0:
96.15516662597656, 3: 1.2561798095703125, 15: 2.588653564453125}
Processed: Benign case (107).jpg | Class Percentages: {0:
96.15516662597656, 3: 1.2561798095703125, 15: 2.588653564453125}
Processed: Benign case (108).jpg | Class Percentages: {0:
77.02178955078125, 3: 22.208786010742188, 10: 0.7694244384765625}
Processed: Benign case (109).jpg | Class Percentages: {0:
85.28366088867188, 3: 14.716339111328125}
Processed: Benign case (11).jpg | Class Percentages: {0:
54.57191467285156, 11: 45.42808532714844}
Processed: Benign case (110).jpg | Class Percentages: {0:
84.45205688476562, 15: 15.547943115234375}
Processed: Benign case (111).jpg | Class Percentages: {0:
82.69462585449219, 11: 17.305374145507812}
```

```
Processed: Benign case (112).jpg | Class Percentages: {0:  
68.24836730957031, 11: 31.751632690429688}  
Processed: Benign case (113).jpg | Class Percentages: {0:  
68.24836730957031, 11: 31.751632690429688}  
Processed: Benign case (114).jpg | Class Percentages: {0:  
98.78044128417969, 11: 0.9235382080078125, 15: 0.2960205078125}  
Processed: Benign case (115).jpg | Class Percentages: {0:  
98.78044128417969, 11: 0.9235382080078125, 15: 0.2960205078125}  
Processed: Benign case (116).jpg | Class Percentages: {0:  
97.784423828125, 3: 0.2391815185546875, 11: 1.934814453125, 16:  
0.0415802001953125}  
Processed: Benign case (117).jpg | Class Percentages: {0:  
99.56130981445312, 11: 0.438690185546875}  
Processed: Benign case (118).jpg | Class Percentages: {0: 100.0}  
Processed: Benign case (119).jpg | Class Percentages: {0:  
99.59068298339844, 10: 0.208282470703125, 15: 0.2010345458984375}  
Processed: Benign case (12).jpg | Class Percentages: {0:  
36.590576171875, 11: 63.409423828125}  
Processed: Benign case (120).jpg | Class Percentages: {0:  
63.2904052734375, 11: 36.7095947265625}  
Processed: Benign case (13).jpg | Class Percentages: {0:  
1.5594482421875, 11: 98.4405517578125}  
Processed: Benign case (14).jpg | Class Percentages: {0:  
64.53208923339844, 11: 35.46791076660156}  
Processed: Benign case (15).jpg | Class Percentages: {0:  
78.87535095214844, 11: 21.124649047851562}  
Processed: Benign case (16).jpg | Class Percentages: {0:  
78.87535095214844, 11: 21.124649047851562}  
Processed: Benign case (17).jpg | Class Percentages: {0: 100.0}  
Processed: Benign case (18).jpg | Class Percentages: {0: 100.0}  
Processed: Benign case (19).jpg | Class Percentages: {0:  
41.302490234375, 11: 58.697509765625}  
Processed: Benign case (2).jpg | Class Percentages: {0:  
82.2479248046875, 15: 17.7520751953125}  
Processed: Benign case (20).jpg | Class Percentages: {0:  
58.46290588378906, 10: 0.0270843505859375, 11: 41.510009765625}  
Processed: Benign case (21).jpg | Class Percentages: {0:  
69.70100402832031, 3: 30.298995971679688}  
Processed: Benign case (22).jpg | Class Percentages: {0:  
99.46441650390625, 3: 0.2803802490234375, 11: 0.2552032470703125}  
Processed: Benign case (23).jpg | Class Percentages: {0:  
99.46441650390625, 3: 0.2803802490234375, 11: 0.2552032470703125}  
Processed: Benign case (24).jpg | Class Percentages: {0:  
71.14639282226562, 11: 28.853607177734375}  
Processed: Benign case (25).jpg | Class Percentages: {0:  
98.75221252441406, 15: 1.1569976806640625, 16: 0.090789794921875}  
Processed: Benign case (26).jpg | Class Percentages: {0:  
99.95155334472656, 15: 0.0484466552734375}  
Processed: Benign case (27).jpg | Class Percentages: {0:
```

```
99.95155334472656, 15: 0.0484466552734375}
Processed: Benign case (28).jpg | Class Percentages: {0:
96.58470153808594, 15: 3.4152984619140625}
Processed: Benign case (29).jpg | Class Percentages: {0:
97.21717834472656, 11: 2.7740478515625, 15: 0.0087738037109375}
Processed: Benign case (3).jpg | Class Percentages: {0:
91.82662963867188, 15: 8.173370361328125}
Processed: Benign case (30).jpg | Class Percentages: {0:
91.26205444335938, 11: 8.737945556640625}
Processed: Benign case (31).jpg | Class Percentages: {0:
51.398468017578125, 11: 48.601531982421875}
Processed: Benign case (32).jpg | Class Percentages: {0:
52.211761474609375, 11: 47.788238525390625}
Processed: Benign case (33).jpg | Class Percentages: {0:
60.7666015625, 15: 39.2333984375}
Processed: Benign case (34).jpg | Class Percentages: {0:
69.62928771972656, 15: 30.370712280273438}
Processed: Benign case (35).jpg | Class Percentages: {0:
98.63243103027344, 11: 1.3675689697265625}
Processed: Benign case (36).jpg | Class Percentages: {0: 100.0}
Processed: Benign case (37).jpg | Class Percentages: {0:
99.06997680664062, 15: 0.930023193359375}
Processed: Benign case (38).jpg | Class Percentages: {0: 100.0}
Processed: Benign case (39).jpg | Class Percentages: {0:
97.40333557128906, 15: 2.5966644287109375}
Processed: Benign case (4).jpg | Class Percentages: {0:
30.527496337890625, 11: 69.47250366210938}
Processed: Benign case (40).jpg | Class Percentages: {0:
71.84410095214844, 15: 28.155899047851562}
Processed: Benign case (41).jpg | Class Percentages: {0:
94.37065124511719, 15: 5.6293487548828125}
Processed: Benign case (42).jpg | Class Percentages: {0:
65.23284912109375, 11: 34.76715087890625}
Processed: Benign case (43).jpg | Class Percentages: {0:
50.92658996582031, 11: 49.07341003417969}
Processed: Benign case (44).jpg | Class Percentages: {0:
83.72993469238281, 11: 16.270065307617188}
Processed: Benign case (45).jpg | Class Percentages: {0:
26.334762573242188, 11: 73.66523742675781}
Processed: Benign case (46).jpg | Class Percentages: {0: 100.0}
Processed: Benign case (47).jpg | Class Percentages: {0:
77.78091430664062, 15: 22.219085693359375}
Processed: Benign case (48).jpg | Class Percentages: {0:
39.36805725097656, 15: 60.63194274902344}
Processed: Benign case (49).jpg | Class Percentages: {0:
37.12501525878906, 15: 62.87498474121094}
Processed: Benign case (5).jpg | Class Percentages: {0:
97.60780334472656, 11: 2.3921966552734375}
Processed: Benign case (50).jpg | Class Percentages: {0:
```

```
33.21266174316406, 15: 66.78733825683594}
Processed: Benign case (51).jpg | Class Percentages: {0:
50.67939758300781, 15: 49.32060241699219}
Processed: Benign case (52).jpg | Class Percentages: {0:
98.88763427734375, 15: 1.11236572265625}
Processed: Benign case (53).jpg | Class Percentages: {0:
92.95272827148438, 11: 7.047271728515625}
Processed: Benign case (54).jpg | Class Percentages: {0:
94.390869140625, 14: 5.609130859375}
Processed: Benign case (55).jpg | Class Percentages: {0:
94.61936950683594, 11: 5.3806304931640625}
Processed: Benign case (56).jpg | Class Percentages: {0:
74.95918273925781, 15: 25.040817260742188}
Processed: Benign case (57).jpg | Class Percentages: {0:
99.86724853515625, 15: 0.13275146484375}
Processed: Benign case (58).jpg | Class Percentages: {0: 100.0}
Processed: Benign case (59).jpg | Class Percentages: {0:
99.61967468261719, 3: 0.3803253173828125}
Processed: Benign case (6).jpg | Class Percentages: {0:
97.77908325195312, 11: 2.220916748046875}
Processed: Benign case (60).jpg | Class Percentages: {0:
84.01298522949219, 3: 0.655364990234375, 16: 15.331649780273438}
Processed: Benign case (61).jpg | Class Percentages: {0:
97.74093627929688, 11: 2.259063720703125}
Processed: Benign case (62).jpg | Class Percentages: {0:
84.1217041015625, 3: 0.4852294921875, 16: 15.39306640625}
Processed: Benign case (63).jpg | Class Percentages: {0:
84.1217041015625, 3: 0.4852294921875, 16: 15.39306640625}
Processed: Benign case (64).jpg | Class Percentages: {0:
75.37803649902344, 11: 24.621963500976562}

Processed: Benign case (65).jpg | Class Percentages: {0:
75.37803649902344, 11: 24.621963500976562}
Processed: Benign case (66).jpg | Class Percentages: {0:
68.57948303222656, 11: 31.420516967773438}
Processed: Benign case (67).jpg | Class Percentages: {0:
94.73419189453125, 11: 5.26580810546875}
Processed: Benign case (68).jpg | Class Percentages: {0:
98.36845397949219, 11: 1.6315460205078125}
Processed: Benign case (69).jpg | Class Percentages: {0:
98.02169799804688, 11: 0.1708984375, 15: 1.807403564453125}
Processed: Benign case (7).jpg | Class Percentages: {0:
99.81155395507812, 3: 0.008392333984375, 11: 0.1800537109375}
Processed: Benign case (70).jpg | Class Percentages: {0:
49.231719970703125, 11: 50.768280029296875}
Processed: Benign case (71).jpg | Class Percentages: {0:
92.62237548828125, 11: 7.37762451171875}
Processed: Benign case (72).jpg | Class Percentages: {0:
92.62237548828125, 11: 7.37762451171875}
Processed: Benign case (73).jpg | Class Percentages: {0:
```

```
96.48513793945312, 15: 3.514862060546875}
Processed: Benign case (74).jpg | Class Percentages: {0:
75.7171630859375, 11: 24.2828369140625}
Processed: Benign case (75).jpg | Class Percentages: {0:
75.7171630859375, 11: 24.2828369140625}
Processed: Benign case (76).jpg | Class Percentages: {0:
25.965118408203125, 11: 74.03488159179688}
Processed: Benign case (77).jpg | Class Percentages: {0:
96.84944152832031, 15: 3.1505584716796875}
Processed: Benign case (78).jpg | Class Percentages: {0:
84.9212646484375, 15: 15.0787353515625}
Processed: Benign case (79).jpg | Class Percentages: {0:
88.763427734375, 15: 11.236572265625}
Processed: Benign case (8).jpg | Class Percentages: {0:
99.81155395507812, 3: 0.008392333984375, 11: 0.1800537109375}
Processed: Benign case (80).jpg | Class Percentages: {0:
99.78103637695312, 15: 0.218963623046875}
Processed: Benign case (81).jpg | Class Percentages: {0:
49.35569763183594, 11: 50.64430236816406}
Processed: Benign case (82).jpg | Class Percentages: {0:
87.95814514160156, 11: 12.041854858398438}
Processed: Benign case (83).jpg | Class Percentages: {0:
97.37968444824219, 11: 2.6092529296875, 15: 0.0110626220703125}
Processed: Benign case (84).jpg | Class Percentages: {0:
99.36294555664062, 11: 0.637054443359375}
Processed: Benign case (85).jpg | Class Percentages: {0:
99.36294555664062, 11: 0.637054443359375}
Processed: Benign case (86).jpg | Class Percentages: {0:
99.53384399414062, 11: 0.466156005859375}
Processed: Benign case (87).jpg | Class Percentages: {0:
96.42791748046875, 11: 3.57208251953125}
Processed: Benign case (88).jpg | Class Percentages: {0:
88.94920349121094, 11: 11.050796508789062}
Processed: Benign case (89).jpg | Class Percentages: {0: 100.0}
Processed: Benign case (9).jpg | Class Percentages: {0:
57.23609924316406, 11: 42.76390075683594}
Processed: Benign case (90).jpg | Class Percentages: {0:
95.96748352050781, 11: 4.0325164794921875}
Processed: Benign case (91).jpg | Class Percentages: {0:
95.96748352050781, 11: 4.0325164794921875}
Processed: Benign case (92).jpg | Class Percentages: {0:
92.22183227539062, 11: 6.31256103515625, 14: 1.465606689453125}
Processed: Benign case (93).jpg | Class Percentages: {0:
90.24505615234375, 11: 9.584808349609375, 15: 0.170135498046875}
Processed: Benign case (94).jpg | Class Percentages: {0:
99.5635986328125, 11: 0.4364013671875}
Processed: Benign case (95).jpg | Class Percentages: {0:
99.5635986328125, 11: 0.4364013671875}
Processed: Benign case (96).jpg | Class Percentages: {0:
```

```

99.89089965820312, 11: 0.109100341796875}
Processed: Benign case (97).jpg | Class Percentages: {0:
99.89089965820312, 11: 0.109100341796875}
Processed: Benign case (98).jpg | Class Percentages: {0: 100.0}
Processed: Benign case (99).jpg | Class Percentages: {0:
99.77378845214844, 11: 0.2262115478515625}

Dataset saved to:
C:\Users\Medhavi\Downloads/lung_cancer_class_percentages2.csv

import torch
import torchvision.transforms as T
from torchvision.models.segmentation import deeplabv3_resnet50
import cv2
import numpy as np
import os
import pandas as pd

# Load the pre-trained DeepLabV3 model
model = deeplabv3_resnet50(pretrained=True)
model.eval() # Set model to evaluation mode

# Define transformation for input images
transform = T.Compose([
    T.ToPILImage(),
    T.Resize((512, 512)), # Resize to match model input size
    T.ToTensor(),
    T.Normalize(mean=[0.485, 0.456, 0.406], std=[0.229, 0.224, 0.225])
])

# Path to the folder with lung cancer images
image_folder = os.path.expanduser("Normal cases")

# Initialize dataset to store results
results = []

def segment_image(image):
    """Segment the given image using DeepLabV3."""
    input_tensor = transform(image).unsqueeze(0) # Add batch dimension
    with torch.no_grad():
        output = model(input_tensor)['out'][0]
        output_predictions = output.argmax(0).numpy() # Convert to NumPy array
    return output_predictions

def calculate_class_percentages(segmented):
    """Calculate the percentage of each class in the segmented image."""
    total_pixels = segmented.size

```

```

        unique, counts = np.unique(segmented, return_counts=True)
        class_percentages = {int(k): (v / total_pixels) * 100 for k, v in
zip(unique, counts)}
        return class_percentages

# Process all images in the folder
for filename in os.listdir(image_folder):
    if filename.endswith((".jpg", ".png", ".jpeg")):
        # Load the image
        image_path = os.path.join(image_folder, filename)
        image = cv2.imread(image_path)
        image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)

        # Perform segmentation
        segmented = segment_image(image)

        # Calculate class-wise percentages
        percentages = calculate_class_percentages(segmented)

        # Store results for this image
        result = {"Filename": filename}
        result.update(percentages) # Add class percentages to the
result
        results.append(result)

        # Display progress (optional)
        print(f"Processed: {filename} | Class Percentages:
{percentages}")

# Create a DataFrame from the results and save as CSV
df = pd.DataFrame(results).fillna(0) # Fill NaNs with 0 for missing
classes
csv_path =
os.path.expanduser("~/Downloads/lung_cancer_class_percentages3.csv")
df.to_csv(csv_path, index=False)
print(f"\nDataset saved to: {csv_path}")

C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\
_utils.py:208: UserWarning: The parameter 'pretrained' is deprecated
since 0.13 and may be removed in the future, please use 'weights'
instead.
    warnings.warn(
C:\Users\Medhavi\anaconda3\Lib\site-packages\torchvision\models\
_utils.py:223: UserWarning: Arguments other than a weight enum or
`None` for 'weights' are deprecated since 0.13 and may be removed in
the future. The current behavior is equivalent to passing
`weights=DeepLabV3_ResNet50_Weights.COCO_WITH_VOC_LABELS_V1`. You can
also use `weights=DeepLabV3_ResNet50_Weights.DEFAULT` to get the most
up-to-date weights.
    warnings.warn(msg)

```

```
Processed: Normal case (1).jpg | Class Percentages: {0:  
66.27464294433594, 15: 33.72535705566406}  
Processed: Normal case (10).jpg | Class Percentages: {0:  
48.174285888671875, 11: 51.825714111328125}  
Processed: Normal case (100).jpg | Class Percentages: {0:  
91.88423156738281, 3: 8.115768432617188}  
Processed: Normal case (101).jpg | Class Percentages: {0:  
99.48539733886719, 3: 0.4215240478515625, 11: 0.0522613525390625, 15:  
0.0408172607421875}  
Processed: Normal case (102).jpg | Class Percentages: {0:  
96.17691040039062, 3: 3.0483245849609375, 10: 0.4451751708984375, 11:  
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```

```
Processed: Normal case (81).jpg | Class Percentages: {0: 99.95193481445312, 15: 0.048065185546875}
Processed: Normal case (82).jpg | Class Percentages: {0: 77.12516784667969, 15: 22.874832153320312}
Processed: Normal case (83).jpg | Class Percentages: {0: 43.981170654296875, 15: 56.018829345703125}
Processed: Normal case (84).jpg | Class Percentages: {0: 56.28013610839844, 15: 43.71986389160156}
Processed: Normal case (85).jpg | Class Percentages: {0: 56.14013671875, 15: 43.85986328125}
Processed: Normal case (86).jpg | Class Percentages: {0: 90.69252014160156, 15: 9.307479858398438}
Processed: Normal case (87).jpg | Class Percentages: {0: 95.06378173828125, 15: 4.93621826171875}
Processed: Normal case (88).jpg | Class Percentages: {0: 61.40327453613281, 11: 38.59672546386719}
Processed: Normal case (89).jpg | Class Percentages: {0: 96.75559997558594, 3: 0.1232147216796875, 11: 3.121185302734375}
Processed: Normal case (9).jpg | Class Percentages: {0: 35.81809997558594, 11: 64.18190002441406}
Processed: Normal case (90).jpg | Class Percentages: {0: 79.78630065917969, 11: 20.213699340820312}
Processed: Normal case (91).jpg | Class Percentages: {0: 98.31008911132812, 3: 0.1018524169921875, 11: 1.5880584716796875}
Processed: Normal case (92).jpg | Class Percentages: {0: 99.82719421386719, 11: 0.1728057861328125}
Processed: Normal case (93).jpg | Class Percentages: {0: 99.38316345214844, 11: 0.6168365478515625}
Processed: Normal case (94).jpg | Class Percentages: {0: 99.96414184570312, 11: 0.035858154296875}
Processed: Normal case (95).jpg | Class Percentages: {0: 100.0}

Processed: Normal case (96).jpg | Class Percentages: {0: 100.0}
Processed: Normal case (97).jpg | Class Percentages: {0: 77.06031799316406, 11: 22.939682006835938}
Processed: Normal case (98).jpg | Class Percentages: {0: 99.96566772460938, 3: 0.0064849853515625, 15: 0.0278472900390625}
Processed: Normal case (99).jpg | Class Percentages: {0: 83.66889953613281, 11: 16.331100463867188}

Dataset saved to:
C:\Users\Medhavi\Downloads\lung_cancer_class_percentages3.csv

import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

# Load the CSV file into a pandas DataFrame
csv_file = "~/Downloads/lung_cancer_class_percentages3.csv" # Replace with your CSV filename
```

```

data = pd.read_csv(csv_file)

# Drop the 'Filename' column as it is not required for class percentages
class_percentages = data.drop(columns=['Filename'])

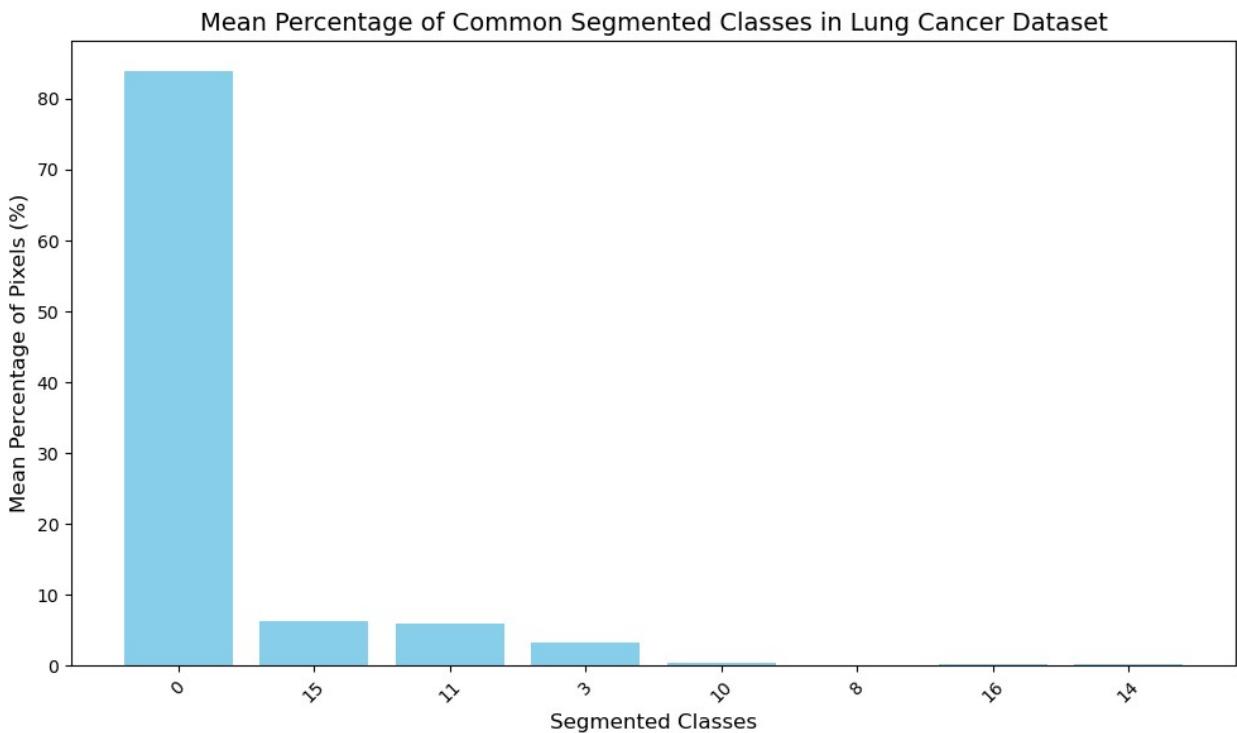
# Calculate the mean percentage for each class across all images
mean_percentages = class_percentages.mean()

# Plot the bar chart
plt.figure(figsize=(10, 6))
plt.bar(mean_percentages.index, mean_percentages.values,
color='skyblue')

# Add labels and title
plt.xlabel('Segmented Classes', fontsize=12)
plt.ylabel('Mean Percentage of Pixels (%)', fontsize=12)
plt.title('Mean Percentage of Common Segmented Classes in Lung Cancer Dataset', fontsize=14)
plt.xticks(np.arange(len(mean_percentages.index)), mean_percentages.index, fontsize=10, rotation=45)

# Display the graph
plt.tight_layout()
plt.show()

```



```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

# Load the CSV file into a pandas DataFrame
csv_file = "~/Downloads/lung_cancer_class_percentages2.csv" # Replace
with your CSV filename
data = pd.read_csv(csv_file)

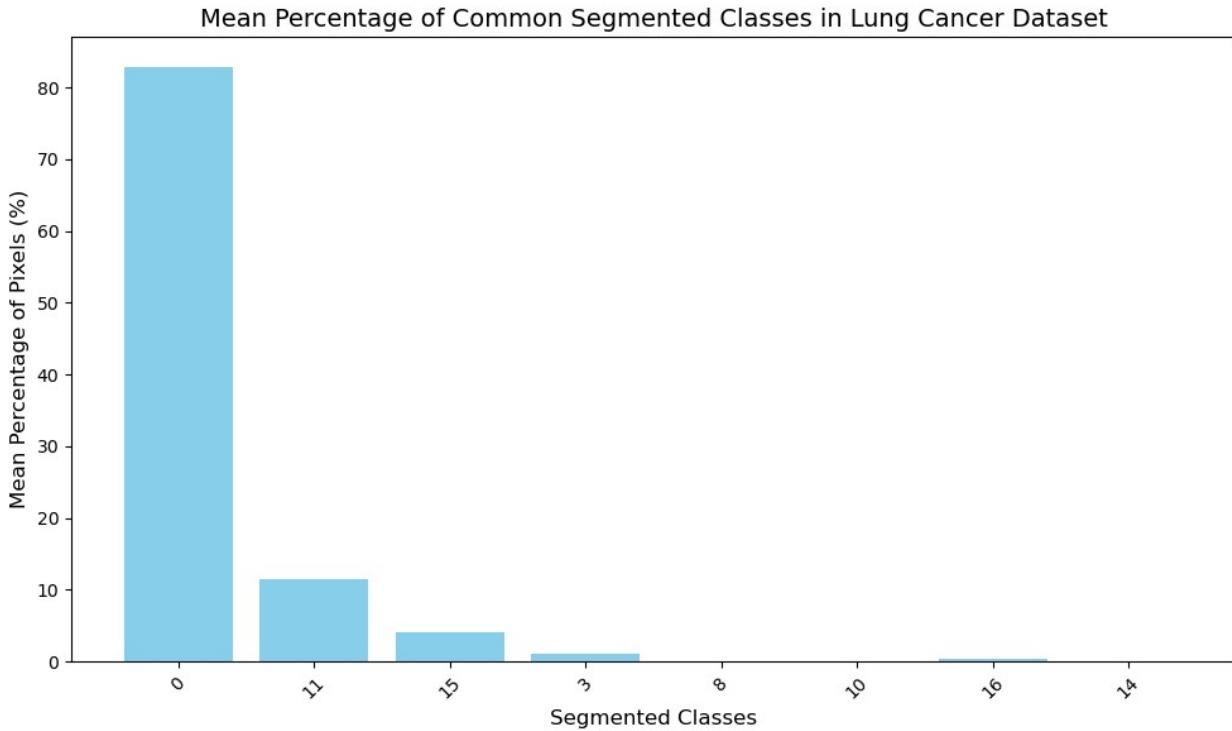
# Drop the 'Filename' column as it is not required for class
percentages
class_percentages = data.drop(columns=['Filename'])

# Calculate the mean percentage for each class across all images
mean_percentages = class_percentages.mean()

# Plot the bar chart
plt.figure(figsize=(10, 6))
plt.bar(mean_percentages.index, mean_percentages.values,
color='skyblue')

# Add labels and title
plt.xlabel('Segmented Classes', fontsize=12)
plt.ylabel('Mean Percentage of Pixels (%)', fontsize=12)
plt.title('Mean Percentage of Common Segmented Classes in Lung Cancer
Dataset', fontsize=14)
plt.xticks(np.arange(len(mean_percentages.index)),
mean_percentages.index, fontsize=10, rotation=45)

# Display the graph
plt.tight_layout()
plt.show()
```



```

import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

# Load the CSV file into a pandas DataFrame
csv_file = "~/Downloads/lung_cancer_class_percentages1.csv" # Replace with your CSV filename
data = pd.read_csv(csv_file)

# Drop the 'Filename' column as it is not required for class percentages
class_percentages = data.drop(columns=['Filename'])

# Calculate the mean percentage for each class across all images
mean_percentages = class_percentages.mean()

# Plot the bar chart
plt.figure(figsize=(10, 6))
plt.bar(mean_percentages.index, mean_percentages.values,
color='skyblue')

# Add labels and title
plt.xlabel('Segmented Classes', fontsize=12)
plt.ylabel('Mean Percentage of Pixels (%)', fontsize=12)
plt.title('Mean Percentage of Common Segmented Classes in Lung Cancer Dataset', fontsize=14)
plt.xticks(np.arange(len(mean_percentages.index)), ,

```

```
mean_percentages.index, fontsize=10, rotation=45)

# Display the graph
plt.tight_layout()
plt.show()
```

